BROWNFIELD SOLUTIONS LTD

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

BRT PROPERTIES (KENT) LTD

Vale Road, Northfleet

Geo-Environmental Assessment Report

PD/C3476/8382 Rev A

June 2019

Gravesham Borough Council

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EXECUTIVE SUMMARY	
Site Location and Description	The site covers an area of approximately 0.85 hectares and is situated circa 1.8km south west of Gravesend Town Centre. It is currently disused and unoccupied, with any previous buildings or structures having been removed. Suspected underground fuel storage tanks (USTs) indicated to remain present underlying the northern area of the site, associated with the adjacent garage.
Ground Conditions	The majority of the site is indicated to have been occupied by a chalk pit, which was gradually infilled between the 1930s and mid-1970s. Within the footprint of the chalk pit, made ground comprising sandy gravels and soft clays was encountered to depths of between 4.3m and 9.8m bgl. The entirety of the site was covered with hardstanding of either asphalt gravels or concrete. Within the footprint of the infilled chalk pit, the made ground was underlain by structureless chalk and recovered as slightly sandy gravelly silt (Grade Dm). Outside the footprint of the infilled chalk pit, the made ground was typically only a thin veneer less than 0.5m thick, comprising concrete hardstanding and silty clays. Soft friable slightly gravelly sandy clay was encountered underlying the made ground at depths of 0.4m and 0.45m bgl. Chalk bedrock was encountered from depths of 0.85m and 0.90m bgl and recovered as slightly sandy silty sandy gravel (Grade Dc) and slightly sandy gravelly silt (Grade Dm).
Soil Contamination	The deeper made ground has been identified as a source of lead, whilst the shallower asphalt-containing made ground is a pervasive source of PAHs and coal tar which are unsuitable for a residential end use and mitigation measures are required. Asbestos fibres have been identified in three samples at the site and subsequently quantification analysis has been undertaken on these. Loose chrysotile fibres were detected at concentrations of 0.002% w/w (one sample from BH1) and <0.001% w/w(trace).
Groundwater Contamination	No groundwater was encountered during the intrusive investigation on-site. The first monitoring visit to the site has not identified any groundwater within the installed standpipes. Consequently the site is not considered to pose a risk to controlled waters.
Ground Gas	Gas monitoring results indicate that the site falls within the Green classification of the Boyle and Witherington Traffic Light System therefore no gas protection measures are considered to be necessary.
Outline Remedial Strategy	The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR. Where gardens or soft landscaping are present a cover of "clean" subsoil and topsoil should be provided to break the pathway to site end users. Any in-situ fuel tanks will have to be removed together with any petroleum hydrocarbon impacted soils encountered around and below the tanks.
Waste	Waste Acceptance Criteria (WAC) testing was outside the scope of this investigation. Hazardous properties have been identified within the made ground, predominantly attributable to the coal-tar containing asphalt made ground. Whilst hazardous properties have also been encountered within the deeper made ground deposits with BH2, these were within strata located 6.5m bgl and therefore, unlikely to be removed during the construction phase.
Foundations and Floor Slabs	Piles are considered to be the most suitable option for this site. However, the exact choice of piling system and the detailed design of piles are beyond the scope of this report and should be undertaken by a piling specialist.
Highways	CBR values of 2% are likely to be achieved in undisturbed natural clay soils for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer. Equilibrium CBR values are likely to be <2% within the made ground.
Drainage	The use of soakaways within the natural ground is not feasible at the site due to the depth to the chalk bedrock and presence of thick relatively impermeable made ground strata underlying the site.
Further Work	• Decommissioning and removal of any remaining USTs and associated pipework. • Design of Remedial Strategy and confirmation with the Local Authority / EA / NHBC • Detailed foundation design. • Detailed foundation design.

This executive summary should be read in conjunction with the full report, reference PD/C3476/8382 Rev A,and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

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DRAWINGS

Drawing Number	Rev	Title
C3476/01	-	Site Location Plan
C3476/02	-	Site Features Plan
6223-PD-20	B	Proposed Site Plan, Street Scene Site Section & Location Plan
C3476/03	-	Exploratory Hole Location Plan
C3476/04	-	Soil Contamination Plan

APPENDICIES

Appendix	Title
Appendix A	BSL Methodology and Guidance
Appendix B	Explosive Ordnance Desk Top Study
Appendix C	Exploratory Hole Logs
Appendix D	Chemical Laboratory Test Certificates
Appendix E	Geotechnical Laboratory Test Certificates
Appendix F	Ground Gas Monitoring Results
Appendix G	Waste Classification Report

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1.0 INTRODUCTION

1.1 Context

This report describes a Geo-Environmental Assessment carried out by Brownfield Solutions Limited (BSL) for BRT Properties (Kent) Ltd on a site off Vale Road, Northfleet and has been completed in general accordance with the following guidance:

- CLR11 Model Procedures for the Management of Land Contamination.
- BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites.
- BS5930: 2015 Code of Practice for Ground Investigations.
- BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules plus UK National Annex.
- BS EN 1997-2:2007 Eurocode 7 Geotechnical design. Ground investigation and testing plus UK National Annex.

1.2 Objectives and Scope

The objectives of this Geo-Environmental Assessment were to determine the environmental setting and ground conditions of the site, highlighting potential risks and areas of concern that may govern the development under the current planning regime. This assessment is also intended to fulfil the requirements of a Ground Investigation Report (GIR) as detailed in BS EN 1997-2:2007.

Following the Desk Study, an exploratory intrusive investigation was undertaken to confirm the findings of the preliminary CSM and risk assessment and meet any objectives that had not been satisfied. The exploratory investigation was undertaken using window sampling, cable percussive drilling, gas and groundwater monitoring, laboratory chemical and geotechnical testing, with reporting on the findings.

1.3 Proposed Development

The proposed development is for a residential end use comprising 10 No. 2-bed flats within a three-storey residential building, with associated car parking and soft landscaping areas as shown on the Offset Architects' Proposed Site Plan, Street Scene Site Section & Location Plan Rev B, drawing No. 6223-PD-20 provided to BSL by the client.

1.4 Previous Reports

This report should be read in conjunction with BSL's Desk Study Assessment Report (Ref: BM/C3476/6655) issued in February 2017. This report focussed on a wider study area; with the focus of this intrusive investigation being the easternmost part of that study site.

1.5 Limitations

This assessment has been prepared in accordance with the relevant current legislative framework, guidance and risk assessment methodology as outlined in Appendix A. BSL is not liable for any subsequent changes in the guidance and legislation.

The findings and opinions conveyed via this report are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

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There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore have not been considered by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.

This report has been prepared for the sole use and reliance of the Client, BRT Properties (Kent) Ltd. No other third parties may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL). If any unauthorised third party comes into possession of this report, they rely on it at their own risk and BSL do not owe them any Duty of Care.

The investigation carried out on the site has been conducted to provide the best information on the ground conditions within site access and budgetary constraints. The inherent variation of ground conditions allows only for definition of the actual conditions at the locations and depths of exploratory locations at the time of the investigation. Different ground conditions may exist that have not been identified within this investigation.

The recommendations in this report assume that ground levels will remain as existing, unless stated otherwise within the report. If there is to be any re-profiling (e.g. to create development platforms or flood defences) then the recommendations may not apply.

The groundwater results described are only representative of the dates on which they were recorded, and levels may vary seasonally (e.g. due to changes in weather).

This assessment has been based on the proposed planning layouts provided. Any subsequent change to the planning layout may have an impact on the validity of recommendations made within this report. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

Although every effort has been made to position exploratory holes in the least sensitive areas of the site, exploratory hole positions were located approximately as part of this investigation and no guarantee can be given as to their accuracy. Consideration should be given to the possibility that exploratory holes excavated as part of this investigation and indeed any previous ground investigation work by others may be encountered beneath or within the influence of individual foundations. BSL cannot be held responsible for structural failures caused by the location of foundations of any form of structure within the influence of exploratory holes.

Where it has not been possible to reasonably use an EC7 compliant investigation technique, a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon engineering experience, local precedent where applicable and relevant published information.

The chemical testing carried out for this report was not scoped to comply with the requirements of the water supply company and further work may be required, unless otherwise stated.

Notwithstanding site observations concerning the presence or otherwise of archaeological issues, asbestos-containing materials (ACM) or invasive weeds (e.g. Japanese knotweed), this report does not constitute a formal survey of these potential issues.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

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2.0 SUMMARY OF PREVIOUS REPORTS

2.1 Summary of the BSL Desk Study Assessment Reports

A Desk Study Assessment Report (Ref: BM/C3476/6655 Rev A) for the site was completed by Brownfield Solutions Ltd in February 2017. The proposed development at the time of the Desk Study incorporated residential units occupying a study area of 0.85 hectares, as shown on the STARC Architects Summary of Proposed Development Scheme 3 drawing provided by the Client.

Since the publication of the Desk Study, BSL understand that the redevelopment proposal for the site has been reduced to approximately 0.20 hectares, located in the eastern part of the wider study area. A summary of the relevant points from the Desk Study for the wider site is presented below:

- The majority of the southern and central areas of the site had been excavated out as a chalk pit by the mapping of 1932. This gradually reduces in size on the mapping of 1939 and 1952; and by 1972 the chalk pit only occupies the south-eastern corner of the site.
- By 1952, a garage had been established in the northern area of the site. A series of tanks had been installed along the southern boundary by 1972 and had been removed by the mapping of 2010.
- The site is not been designated as contaminated land under Part 2A of the Environmental Protection Act 1990.
- Gravesham Borough Council hold no evidence to suggest that the site poses an immediate risk to human health. A Remediation Notice for the site was not considered necessary.
- Geology comprises made ground overlying the Seaford Chalk Formation and Newhaven Chalk Formation bedrock (Principal Aquifer). No superficial deposits are indicated to be present according to mapping.
- No faults are shown within an influencing distance of the site.
- The site is located within a Source Protection Zone (Zone 1 – Inner Catchment).
- Elevated concentrations of ammonia were recorded in the groundwater within the Springhead Road landfill located 30m to the south.
- There are no watercourses within 500m of the site and no surface water features within 250m.
- No radon protection measures are required.
- The risk to human health from on-site sources was considered to be moderate.
- The risk to controlled waters was considered to be moderate.

2.2 Summary of the Site Specific UXO Desk Study

In accordance with CIRIA Report C681, BSL have reviewed non-specialist unexploded ordnance (UXO) data for the site using the Zetica Regional Bomb Risk Map. The map indicates the site to be in an area where the bomb risk is high and further consideration of UXO is required. Consequently, BSL commissioned a site-specific Explosive Ordnance Desk Top Study (Ref: EOD/19/1915DTS, issued 31st January 2019) and this is presented in Appendix B.

A summary of the relevant points from the Explosive Ordnance Desk Top Study is presented below:

- Available WWII mapping indicates HE bombs were dropped 120m south and 380m north of the site. This bombing incident is poorly recorded and is part of the 106 or 108 bombs dropped on Northfleet in August 1940.
- Aerial photography in 1945 shows that the site is mostly an open excavation, with a building to the north. The area has been assessed for bomb damage using available photographs and maps; with some scoring of the ground being identified but this could be due to the chalk pit.
- The exact dates on the backfilling of the chalk pit is unknown although the mapping indicates this was carried out prior to 1952. It was not uncommon to dispose of blitz-rubble in this manner.

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- The risk level on the site is Medium and given that some UXO retains the potential to detonate if disturbed with possible severe consequences, it is concluded that it would be prudent to ensure that basic precautions are taken to ensure that the project can proceed in the safest possible manner and that any residual risk posed by UXO is as low as it is reasonably practical to achieve.
- The expected bomb penetration depth is 12m below 1939 ground level; although the depth of the chalk pit is unknown, and this should be taken into consideration.

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3.0 METHOD OF INVESTIGATION

3.1 Objectives

To confirm the risks to the identified receptors and confirm the ground conditions in respect to the identified geotechnical and geo-environmental risks, an appropriate intrusive investigation was undertaken as per the recommendations of the Phase I Desk Study Assessment.

The aim of the fieldwork was to:

- Investigate ground conditions on the site and the potential need for detailed investigation.
- Install standpipes to allow future monitoring.
- Assess the potential contamination on the site and obtain samples for contamination screening.
- Assess the potential impact of any contamination on controlled waters.
- Obtain geotechnical information on the ground conditions at the site for preliminary foundation design and preliminary pavement design purposes.
- Give an assessment of the geo-environmental risks associated with redevelopment of the site.

3.2 Site Works

The following site works have been undertaken at the site as part of the intrusive investigation between the dates of Tuesday 12th February and Wednesday 13th February 2019.

Method	No.	Range Depths (m bgl)	Purpose
Window sample boreholes – Tracked WS rig	6	3.00 – 5.00	Establish general ground conditions on site. Allow Standard Penetration Tests (SPTs) to be carried out and obtain samples for contamination and geotechnical and testing. Installation of ground gas and water monitoring wells.
Cable percussive boreholes	3	8.45 - 13.45	Assess deeper ground conditions, carry out SPTs and obtain samples for contamination and geotechnical and testing. Installation of ground gas and water monitoring wells.

The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing No C3476/03. The exploratory hole logs are presented in Appendix C.

The exploratory holes were logged by an experienced geo-environmental engineer in general accordance with the following guidance:

- BS 5930:2015 Code of Practice for Site Investigations.
- BS EN 14688-1:2018 Geotechnical Investigation and Testing – Identification and classification of soil.
- BS EN ISO 14689:2018 Geotechnical investigation and testing – Identification and classification of rock'.
- CIRIA C574 Engineering in Chalk.

As a specialist UXO study, commissioned prior to the commencement of the intrusive investigation, identified a medium risk of UXO. In order to minimise the risk to operatives during the ground investigation works, all borehole locations were scanned with a hand-held magnetometer by a specialist UXO surveyor.

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3.3 Sampling

During the drilling of the exploratory holes, representative samples were taken at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing. They were stored and transported in general accordance with BS 10175:2011+A2:2017.

The type of sample was dependent upon the stratum and the purpose of analysis in accordance with current environmental and geotechnical guidance.

The distribution of samples taken across the site is recorded on the exploratory logs and a summary of the samples taken is presented in the table below:

Type	Number
Environmental (ES)	28
Disturbed (D)	51
U100 (U)	3

3.4 Laboratory Testing

As part of the initial assessment for potential contamination of the site, selected samples were taken for the purpose of chemical contamination testing.

The following suite of determinands were chosen to screen for potential site impacts at a UKAS approved laboratory:

Determinand	No of Samples
BSL Default Soil Suite: Arsenic, Cadmium, Chromium (III), Chromium (VI), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), total phenol, free cyanide, water soluble sulphate (2:1 Extract), soil organic matter and pH.	13
Petroleum Hydrocarbons (TPH CWG) inc BTEX and MTBE.	6
Petroleum Hydrocarbons Screen (Sum C10 – C40) (TPH Screen).	6
Volatile Organic Compounds (VOCs) by GC-MS	2
Semi Volatile Organic compounds (SVOCs) by GC-MS	2
Asbestos Screen.	8
Asbestos Quantitative Analysis.	3
Coal Tar Analysis	4

Chemical Test Results are presented in Appendix D.

Representative disturbed samples were obtained for all soil types encountered. Selected samples have been scheduled for testing at an approved laboratory in accordance with BS 1377 'Method of Test for Soils for Civil Engineering Purposes' and BS EN ISO 17892- Parts 1-12:2018 'Geotechnical investigation and testing. Laboratory testing of soil'.

The following tests have been scheduled for geotechnical purposes:

Description	No of Samples
Natural Water Content.	4
Plasticity Index Analysis.	4
pH Value.	5
Water Soluble Sulphate Contents.	5
Determination of One-Dimensional Consolidation properties.	1
Determination of Undrained Shear Strength in Triaxial Compression.	2

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Geotechnical Tests results are presented in Appendix E.

3.5 Monitoring

Gas and water monitoring standpipes were installed in seven boreholes and a programme of six monitoring visits to the site has been undertaken. All gas monitoring was undertaken using GA 2000 / GA 5000 or GFM426 type infrared gas meter with integral electronic flow analysers.

Measurements of the percentage volume in air (%v/v) of oxygen (O_2), carbon dioxide (CO_2) and methane (CH_4) were recorded in addition to the percentage Lower Explosive Limit (%LEL) of methane and the atmospheric pressure. Flow measurements on each standpipe (l/hr) were also taken. (Note: 100% LEL equates to 5% by volume).

Standpipes were constructed in accordance with the relevant guidance. A summary of the installation construction is presented in the table below:

Location and Depth	Internal Diameter Pipe	Response Zone (m bgl)	Targeted Strata	Purpose
BH1 12.00m	50mm HDPE	9.00 – 12.00	Chalk	Groundwater / Ground Gas
BH2 9.00m	50mm HDPE	3.00 – 9.00	Made Ground	Ground Gas
WS1 3.00m	35mm PVC	1.00 – 3.00	Made Ground	Ground Gas
WS2 5.00m	35mm PVC	1.00 – 5.00	Made Ground	Ground Gas
WS3 3.00m	35mm PVC	1.00 – 3.00	Made Ground	Ground Gas
WS4 5.00m	35mm PVC	2.00 – 5.00	Made Ground	Groundwater
WS5 5.00m	35mm PVC	1.00 – 5.00	Chalk	Groundwater

The gas monitoring visits will record peak and steady state conditions. Peak results are those that occur on opening the valve on the borehole tap. Steady state conditions are those that occur a period of time afterwards when the initial (accumulated) gases have been purged from the borehole.

Ground gas monitoring results are presented in Appendix F of this report.

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4.0 GROUND CONDITIONS

4.1 Made Ground

Made ground was encountered within all the exploratory holes across the site and was observed from ground level to depths of between 0.40m (WS5) and 9.80m bgl (BH2).

Asphalt and concrete hardstanding were recorded across the entirety of the study site. Concrete was encountered from the surface in three locations (WS4 to WS6) to depths of between 0.08m and 0.35m bgl. Dense to very dense asphalt gravel was encountered in the remaining six exploratory holes to depths of between 0.27m and 1.23m bgl.

The made ground underlying the site represented infill material used within the former chalk pit, and typically comprised soft to firm clays, with varying amounts of sand, gravel and cobbles as minor constituents. Bands of granular material, typically comprising sandy gravels, were encountered at shallower depths, with cohesive made ground deposits prevailing below c. 3.00 to 5.00m bgl.

The gravels and cobbles typically comprised brick fragments, with localised deposits of concrete, limestone (WS1), chalk, glass (WS2) and flint. Metal fragments were recovered from all three cable percussive boreholes (BH1 – BH3) in the form of either sheet metal or isolated pipework sections.

Ash was only identified within one location (WS1) in the south-western area of the site and was limited to a thin band of gravelly sand between 1.79m and 2.20m bgl. Clinker gravel was also identified in the shallower made ground in this borehole between 1.48m and 1.60m bgl. Rare angular coal fragments were identified within cohesive made ground soils in two locations (WS1, WS3) in the southern area of the site.

Localised organic deposits have been encountered in two locations on-site; in WS2 between 3.6m and 3.9m bgl, and in WS4 between 2.20m and 4.55m bgl. These comprised slightly gravelly silty clays with slight organic odours and rare fibrous material.

4.2 Natural Superficial Strata

Soft friable slightly gravelly sandy clay was encountered underlying the made ground in two locations (WS5 and WS6) at depths of 0.40m and 0.45m bgl respectively in the north-eastern area of the site. This cohesive stratum was recorded at a thickness of 0.45m and contained chalk gravels.

4.3 Bedrock

Structureless chalk was encountered from depths of 0.85m and 0.90m bgl within WS5 and WS6 respectively in the north-eastern area of the site. This was recovered as slightly sandy silty sandy gravel (Grade Dc) and slightly sandy gravelly silt (Grade Dm). Gravels and clasts of chalk were generally weak and of low density. Corresponding SPT N-values within these two boreholes ranged between 15 and 35. It is considered likely that these two locations represent the natural undisturbed chalk strata and are located outside the boundary of the former chalk pit.

Structureless chalk was also encountered within the three cable percussive boreholes at depths of between 4.3m (BH3) and 9.8m bgl (BH2). This was recovered as slightly sandy gravelly silt (Grade Dm), with corresponding SPT N-values ranging between 16 and 21. Gravels and clasts of chalk were generally very weak to weak and of low to medium density.

The observed chalk is considered to be representative of the Seaford Chalk Formation and Newhaven Chalk Formation bedrock.

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4.4 Groundwater

No groundwater was encountered during the intrusive investigation within any of the exploratory holes on-site. Subsequent monitoring to date has not recorded groundwater within any of the seven installed monitoring wells.

4.5 Observations

Contamination
During the works undertaken by BSL observations for both visual and olfactory evidence of contamination were made.

No hydrocarbon odours or staining were noted within either the made ground or natural strata underlying the site. With the exception of ashy sands and clinker gravel in WS1, and coal fragments observed as a minor constituent in the made ground soils in WS1 and WS3, no visual or olfactory evidence of contamination was recorded at the site.

UXO Anomalies
During the works, all exploratory hole locations were scanned with a hand-held magnetometer to the base of the boreholes. Ferrous anomalies were encountered within two locations (WS1 and WS3) below 3.0m bgl in the southern area of the site, resulting in the termination of these boreholes. Metal fragments (sheet and pipework fragments) were recovered from the made ground in all three cable percussive boreholes on-site, which preceded ferrous anomaly recordings using the magnetometer.

Excavations
The dense to very dense nature of the asphalt surfacing proved difficult to excavate on-site; requiring breaking out with a hydraulic breaker.

The sides of the boreholes were generally stable and were not prone to collapsing during excavation and drilling.

The basal depth of the made ground in window sample boreholes WS1 to WS4 was not determined. In WS1 and WS3, the presence of a ferrous anomaly underlying the borehole below 3.0m bgl prevented further drilling, whilst in WS2 and WS4 the made ground was still encountered at the base of the window sample boreholes at 5.0m bgl.

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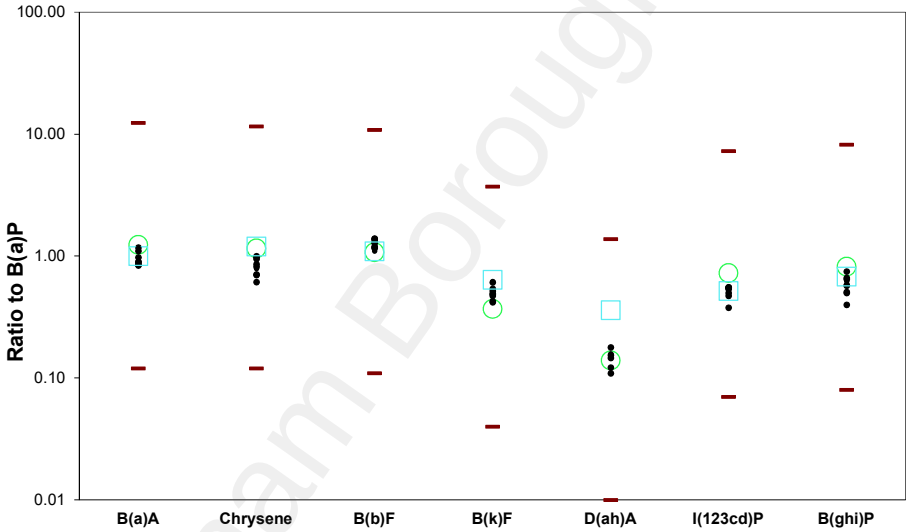
5.0 TEST RESULTS

5.1 Chemical Testing Results - Soils

The samples were tested for an assessment of the chemical contamination and results were examined with reference to a selection of guidance documents as detailed in Appendix A. In this case the LQM/CIEH S4ULs and DEFRA C4SLs for a residential end use without homegrown produce have been adopted as Tier 1 generic screening values.

B(a)P as a Surrogate Marker
BSL considered the main drivers for PAHs to be benzo(a)pyrene and naphthalene. This is as a result of B(a)P possessing carcinogenic properties and thus being the most toxic of the PAHs, and naphthalene the most volatile and soluble. Based on the above assumption for PAHs, BSL have undertaken an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines.

The graph summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA documents.



Key:
B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene; B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene
● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data △ = Mean ratio to B(a)P from all data at the site
□ = Mean ratio to B(a)P for UK data presented by HPA ▬ = Upper and Lower limits (order of magnitude from Culp data)

All the data points that could be used to calculate ratios fall inside the upper or lower limits. Based on this distribution of data it is considered that B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

The apparent exceedance of the relevant screening value for a residential without homegrown produce end use is taken as indicating further detailed assessment or remedial action is required. A summary of the chemical testing is presented below, whilst the full results are presented in Appendix E.

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Metals
Two samples tested contained the following elevated determinands:

Location	Metal	Concentration (mg/kg)	C4SL (mg/kg)
BH2 at 6.5m bgl	Lead	2200	330
WS2 at 3.7m bgl	Lead	650	330

Polycyclic Aromatic Hydrocarbons (PAHs) / Total Petroleum Hydrocarbons (TPH)
Exceedances of the adopted screening values for several PAH & TPH species were recorded in the shallow made ground in two locations (WS2 and BH2), as summarised in the table below:

Location	Strata	Species	Concentration (mg/kg)	S4UL / C4SL (mg/kg)
BH2 at 0.20m (SOM = 7%)	Made ground – Asphalt (0-0.60m)	Benzo(a)pyrene	110	3.2
		Aromatic TPH >C21-C35	2500	1100
WS2 at 0.50m (SOM = 8.3%)	Made ground – Asphalt (0-1.10)	Naphthalene	530	13.0
		Benzo(a)pyrene	4500	3.2
		Aromatic TPH >C21-C35	4000	1100
WS2 at 1.20m (SOM = 1.2%)	Made ground – gravel with brick (1.10-1.60m)	Benzo(a)pyrene	29	2.5

[1] The screening value selected was based on Soil Organic Matter (SOM) content of individual samples.

BTEX and MTBE
No elevated BTEX or MTBE compounds have been detected above residential end use screening values, where available.

Volatile Organic Compounds (VOCs)
No elevated SVOCs have been detected above residential end use screening values, where available.

Semi - Volatile Organic Compounds (SVOCs)
No elevated SVOCs have been detected above residential end use screening values, where available.

Coal Tar
Coal tar has been identified in all four of the samples of asphalt-containing made ground tested, as summarised in the table below:

Sample Location	Coal Tar (mg/kg)
BH1 at 0.20m bgl	219
BH2 at 0.20m bgl	1350
BH3 at 0.15m bgl	201
WS2 at 0.50m bgl	2350

Asbestos
Loose chrysotile fibres have been identified in three samples of made ground underlying the site, as summarised in the table below:

Sample Location	Depth (m bgl)	Strata Description	Asbestos Containing Material Type Detected	Total % Asbestos in Sample (w/w)
BH1	0.60	MADE GROUND: Soft friable slightly sandy gravelly clay with low brick cobble content.	Loose Fibres - Chrysotile	0.002

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Sample Location	Depth (m bgl)	Strata Description	Asbestos Containing Material Type Detected	Total % Asbestos in Sample (w/w)
BH2	6.50	MADE GROUND: Soft friable slightly sandy gravelly clay with low brick cobble content	Loose Fibres – Chrysotile	<0.001
WS1	1.90	MADE GROUND: Loose ashy gravelly sand with low brick cobble content.	Loose Fibres – Chrysotile	<0.001

5.2 Photo-Ionisation Detection (PID) Monitoring

PID head space monitoring was undertaken on all environmental samples taken during the ground investigation at the site, the results are recorded on the exploratory hole logs. All of the samples tested recorded PID results of between 0.0ppm and 0.1ppm, indicating that no significant volatile vapour contamination was present.

5.3 Waste Acceptance Criteria (WAC) Results

Waste Acceptance Criteria (WAC) testing was outside the scope of this intrusive investigation, and the guidance given below is generalised.

The Landfill Directive (Directive 1999/31/EC on the landfilling of waste, Decision 2003/33/EC and Landfill Regulations 2005) led to the establishment of a methodology for classifying wastes. Wastes can only be accepted at a landfill if they meet the relevant Waste Acceptance Criteria (WAC) for that type of landfill. There are three different WAC criteria, these are:

- Inert waste.
- Stable Non-Reactive Hazardous Waste.
- Hazardous waste.

WAC testing is used to determine that the waste is suitable to be disposed of into a landfill site. A waste must comply with the WAC limits for the relevant hazardous or non-hazardous landfill (i.e. non-hazardous or inert), otherwise the soil will need to be pre-treated.

Note wastes should first be classified based on their total concentrations and given the classification of either hazardous or non-hazardous. This is discussed in detail in Section 7.7. WAC testing is only required if the end disposal route is a landfill and WAC analysis must **not** be used for waste classification and hazardous waste assessment purposes.

5.4 Permanent Ground Gases

Six gas monitoring visits have been carried out on-site between 15th March and 12th June2019. Results are summarised in the table below:

	CH_4 (%)		CO_2 (%)		O_2 (%)		CO (ppm)		H_2S (ppm)		Flow	
	Min	Max	Min	Max	Min	Min	Min	Max	Min	Max	Min	Max
Peak	0.0	0.0	0.1	3.0	15.4	21.6	0.0	3.0	0.0	0.0	-0.20	0.60
Steady	0.0	0.0	0.0	1.4	17.4	21.9	0.0	0.0				

Notes: CH_4 = Methane; CO_2= Carbon dioxide; O_2= Oxygen; CO= Carbon Monoxide; H_2S= Hydrogen Sulphide; TVOC (PID)= Total Volatile Organic Compounds (as measured with Photo Ionisation Detector); ppm= Parts Per Million.

No methane was detected within any of the standpipes during the monitoring visits, whilst the highest peak carbon dioxide concentrations were recorded in BH1 and BH2 (3.0%v/v).

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The atmospheric pressures ranged from 991mb to1017mb during the monitoring rounds, which were conducted during periods of rising, steady and falling pressure.

No groundwater was encountered within any of the standpipes. .

The results are presented in Appendix F.

5.5 Geotechnical Testing

In Situ Hand Shear Vane Tests
Nine hand shear vane tests were carried out on suitable cohesive soils recovered from the window sample boreholes. The results and distribution of the hand shear vane tests are recorded in kPa on the Exploratory Hole Logs which are presented in Appendix C.

In Situ Standard Penetration Tests
Standard Penetration Tests (SPTs) were carried out within the window sample and cable percussive boreholes at regular 1.0m to 1.5m intervals. The results of the individual blows and the N-values are recorded on the Exploratory Hole Logs.

All SPT N values are uncorrected. Density and strength descriptors are reported in accordance with the guidelines stated in BS 5930:2015, incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

Plasticity Index Analysis
Plasticity index results ranged between 15% and 17% indicating the clays to be of low plasticity. Associated water contents ranged between 15% and 29%.

After modification of particle size in accordance with NHBC Chapter 4.2, the modified plasticity indices are in the range 12.15% to 16.32%, indicating the soils to be of low volume change potential.

Undrained Shear Strength
One undisturbed sample was tested for undrained shear strength in triaxial compression and the results are summarised below:

Location	Depth (m bgl)	Shear Strength (kPa)	Mode of Failure
BH1	12.00 – 12.45	257	Plastic

One Dimensional Consolidation Properties
The one-dimensional consolidation properties were as follows:

Location	Depth (m bgl)	Initial MC (%)	Initial Bulk Density (Mg/m^3)	Applied Pressure (kPa)	Mv (m^2/MN)	Qualitative Compressibility
BH2	11.00 – 11.45	31	1.83	0	-	-
				100	0.270	Medium
				200	0.080	Low
				400	0.063	Low
				800	0.046	Low
				100	7.6E-08	Very low

Dry Density/Moisture Content

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Dry Density/Moisture Content relationship testing was carried out on three samples of the chalk strata. The samples and the results are as follows.

Location and Depth	Moisture Content (%)	Saturated MC (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)
BH1 at 9.50m bgl	30	32	1.89	1.45
BH2 at 10.50m bgl	30	31	1.91	1.47
BH3 at 4.50m bgl	28	31	1.87	1.46
BH2 at 11.00m bgl	32	32	1.97	1.49

The bulk dry density of the chalk was determined to be between 1.45Mg/m3 and 1.49Mg/m3, which would suggest a low density in accordance with CIRIA C574, with a water content between 31% and 32%.

5.6 Aggressive Ground Conditions

Water soluble sulphate testing was undertaken on thirteen samples of made ground and two samples of the natural chalk strata.

Made Ground
The results revealed soluble sulphate (SO_4) contents of between 0.046g/l and 1.96g/l. Associated pH values were obtained which ranged between 7.6 and 10.7 indicating neutral to slightly alkaline conditions.

Natural Strata
The results revealed soluble sulphate (SO_4) contents of between 0.017g/l and 0.33g/l. Associated pH values were obtained which ranged between 8.5 and 8.6, indicating slightly alkaline conditions.

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6.0 GEOTECHNICAL ASSESSMENT

6.1 Ground Model Summary

The site is currently disused and unoccupied, with any previous buildings or structures having been removed. Suspected underground fuel storage tanks (USTs) may remain present underlying the northern area of the site, associated with the adjacent garage.

The majority of the site is indicated to have been occupied by a chalk pit, which was gradually infilled between the 1930s and mid-1970s. Within the footprint of the chalk pit, made ground comprising sandy gravels and soft clays was encountered to depths of between 4.3m and 9.8m bgl. The entirety of the site was covered with hardstanding of either asphalt gravels or concrete.

Within the footprint of the infilled chalk pit, the made ground was underlain by structureless chalk and recovered as slightly sandy gravelly silt (Grade Dm).

Outside the footprint of the infilled chalk pit, the made ground was typically only a thin layer less than 0.5m thick, comprising concrete hardstanding and silty clays. Soft friable slightly gravelly sandy clay was encountered underlying the made ground at depths of 0.4m and 0.45m bgl. Chalk bedrock was encountered from depths of 0.85m and 0.90m bgl and recovered as slightly sandy silty sandy gravel (Grade Dc) and slightly sandy gravelly silt (Grade Dm).

No groundwater was encountered during the intrusive investigation. The initial post-works monitoring visit in March 2019 did not identify any groundwater within the installed standpipes on-site.

The finished floor level for the proposed development is indicated to be 22.70m AOD.

The existing site levels are indicated to range from 23.45m AOD along the northern boundary of the site, to 22.4m AOD in the south-west and 22.52m AOD in the south-east.

However, the northern area of the site (previously recorded as being a locked compound during BSL's February 2017 site walkover) is typically elevated by up to 1.00m above the remainder of the study site. Generally, the existing ground levels in the vicinity of the proposed building footprint range between 22.52m and 22.67m AOD, requiring the slight raising of levels in this area.

6.2 Soil Parameters

The test results have been evaluated to derive geotechnical soil parameters for the site. Depth vs SPT N-value graphs for the made ground and chalk bedrock are provided separately below to provide a profile of the ground conditions underlying the site.

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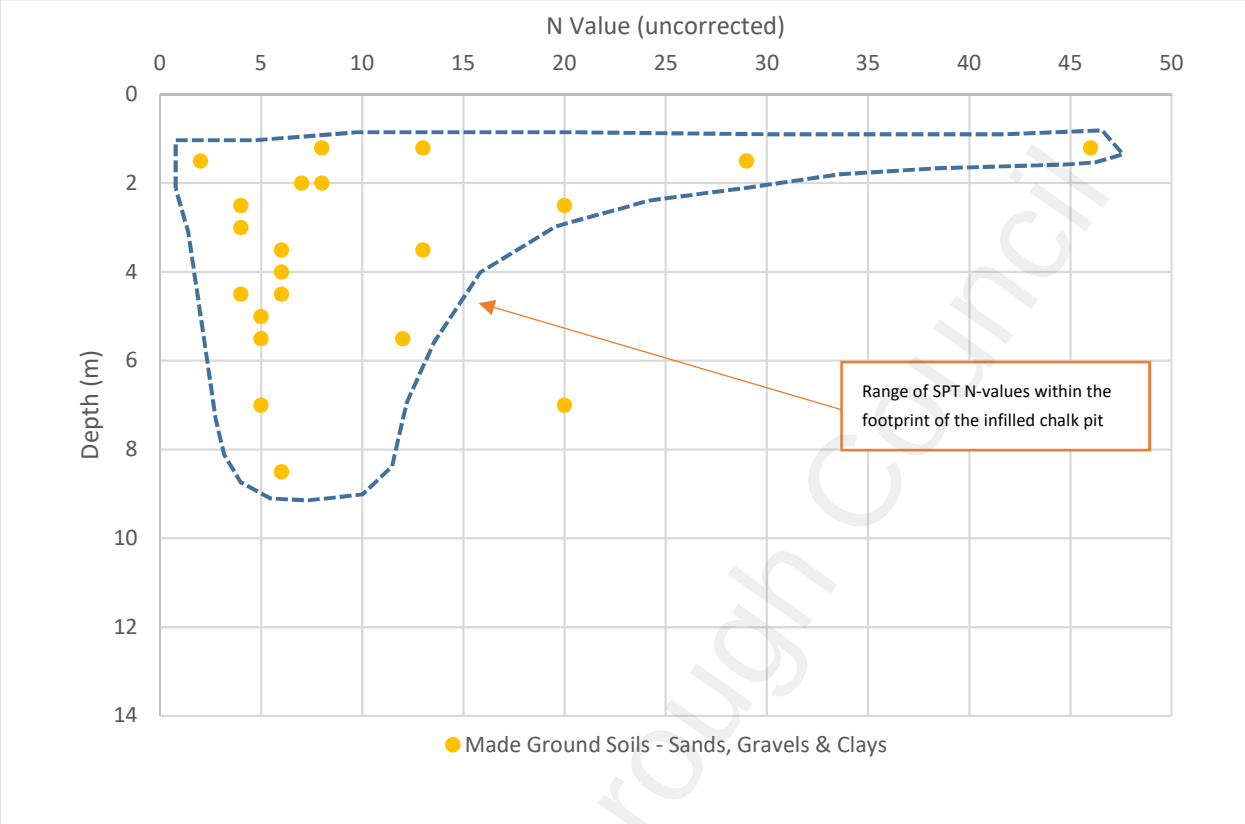
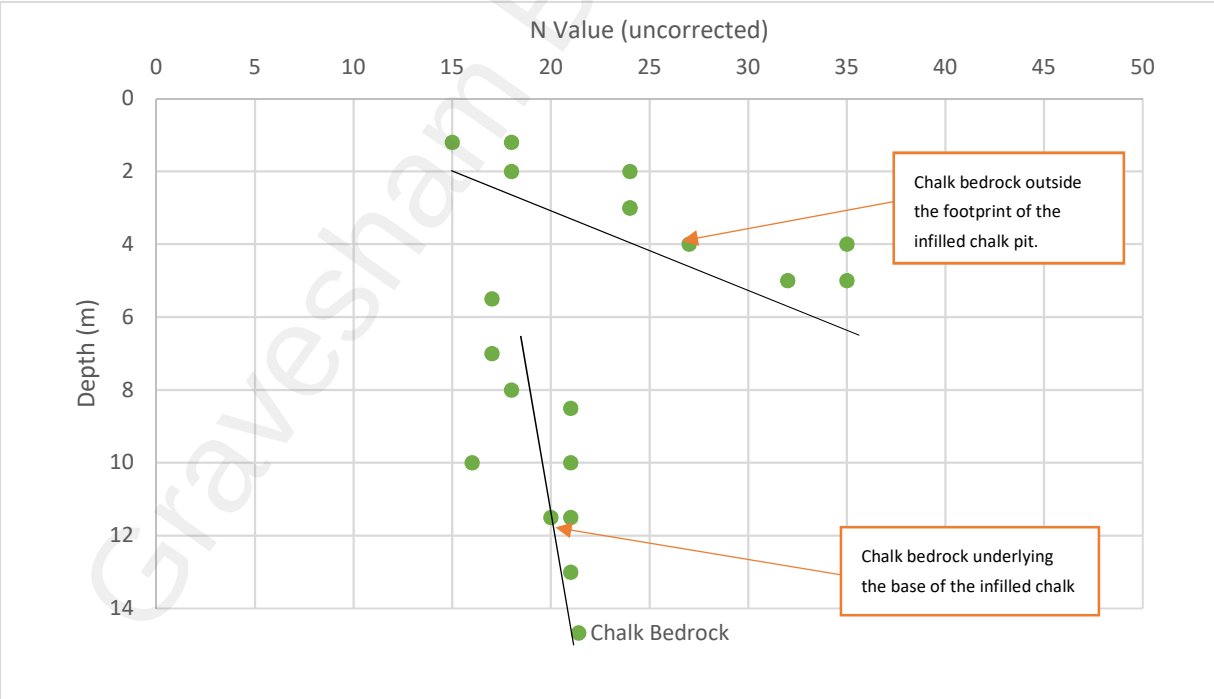
Made Ground



Chalk Bedrock



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The SPT vs Depth graphs show that there is a large variation in the strength/density of the made ground deposits within the footprint of the infilled chalk pit. Between 1.20m and 1.50m bgl. the corresponding N-values ranged between 4 and 46, with an average of 17, whilst between 2.00m and 2.5m bgl the corresponding N-values ranged between 2 and 20, with an average of 8. Generally, the strength/density of the made ground soils decreases with depth, with the majority of the N-values being less than10.

The depth of the Seaford Chalk Formation and Newhaven Chalk Formation bedrock underlying the site is clearly identifiable by the sharp increase in the N-values. One made ground anomaly lies within this data set (BH1 at 7.00 – 7.45m bgl); although the strata predominantly comprised chalk with rare brick fragments and is likely to be the reworked base of the chalk pit between 7.10m and 8.50m bgl.

Five hand shear vane tests were undertaken within the cohesive made ground. Stroud and Butler, 1975, suggested a relationship between SPT N-value and undrained shear strength (Cu) in glacial tills; Cu = f1 x N, where f1 is a factor for plasticity. The plasticity indices for the cohesive strata underlying the site ranged between 15% and 17% indicating the clays to be of low plasticity. The average f1 value for this plasticity range was 4.5. However, given the heterogeneous nature of made ground the results should be used cautiously. The results are summarised in the table below:

Strata (Depth; m bgl)	SPT N-Value Range (mean)	SPT N-Value to Cu (kPa) Conversion Range (mean)	Undrained Shear Strength Testing (kPa) (mean)
MADE GROUND: (0.0 – 9.8m)	2 – 46 (9)	9 – 130.5 (39)	12 – 35 (28)[1]
Natural CHALK underlying infilled Chalk Pit (Min 4.3m bgl to Max 9.8m+)	16 – 21 (19)	-	257[2]
Natural CHALK outside infilled Pit footprint (0.85m – 5.0m +)	15 – 35 (25)	-	-

[1] Obtained from field shear vane data.
[2] Obtained from undrained shear strength in triaxial compression testing in the laboratory.

In the absence of groundwater during the intrusive investigation, water softening is not considered to be a significant influencing factor on the shear strength.

6.3 Foundations

The proposed residential end use comprises 10 No. 2-bed flats within a traditional three-storey residential building and is considered to be classed as Geotechnical Category 2 in accordance with Eurocode 7.

Preliminary design by calculation has been undertaken to determine the design resistance of the bearing strata in the following section. No proposed structural loads were available at the time of writing; therefore, the following recommendations are provisional and should be reviewed at the detailed design stage. However, for the purpose of this assessment a typical load of 50kN has been assumed per storey.

The majority of the strata encountered underlying the site has been interpreted to comprise cohesive and granular made ground associated with the infilling of the former chalk pit on-site, to a maximum depth of 9.8m bgl. Clays are generally soft and of low strength, whilst the shallower sand and gravel deposits are typically loose.

Therefore, due to the heterogeneity of the made ground and the low strength/density values, shallow pad/strip foundations would not be considered suitable for supporting foundations.

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Therefore, a deep foundation solution will be required for the proposed building, transferring loads through the made ground/fill to the underlying Seaford Chalk Formation and Newhaven Chalk Formation bedrock.

Piles
Due to the depth of made ground on site, the use of shallow foundations is not considered feasible for the proposed development. Therefore, the most suitable foundations are considered to be piles extending through the made ground and superficial deposits end bearing on chalk which was observed to depths of between 4.30m and 9.80m bgl.

Driven pre-cast concrete piles, bored piles with the use of casing or continuous flight auger (CFA) piles are all considered potentially suitable piling solutions for this site.

Piles should be extended through the made ground and the superficial deposits. Depending on the structural loadings and design requirements, piles will likely utilise a combination of skin friction and end-bearing resistance, transferring the majority of the load to the underlying competent chalk bedrock. Piles should extend a minimum of five pile diameters into the bearing stratum to fully mobilise end-bearing resistance and shaft resistance.

Driven piles, including small displacement, large displacement, and driven cast in-situ piles, while considered technically and economically feasible are not recommended for this site as noise from their installation may impact surrounding businesses/residents and ground vibrations caused by piling operations may induce consolidation of the relatively loose/soft soils in the vicinity of the site that may result in settlement of nearby structures.

The exact choice of piling system and the detailed design of piles are beyond the scope of this report and should be undertaken by a piling specialist.

Design guidance for piled foundations in chalk is provided in CIRIA C574 (2002).

As a guide, for CFA piles founded in chalk, the ultimate base resistance may be determined through the equation $q_u = 200N$.

In this equation, q_u is the ultimate base resistance in kN/m^2 and N is the average SPT N value around the pile tip at the assumed depth. The design base resistance may be limited by the compressive strength of the concrete used to construct the pile.

For CFA piles founded in chalk, the ultimate shaft resistance for the portion of the pile embedded in the chalk bedrock may be determined through the equation $\bar{\tau}_{sf} = 0.45\bar{\sigma}_v{}'$.

In this equation, $\bar{\tau}_{sf}$ is the average ultimate shaft resistance in kN/m^2 and $\bar{\sigma}_v{}''$ is the mean vertical effective stress over the length of the pile shaft. This design equation should be used with extreme caution in the case that the average ultimate shaft resistance exceeds 110kN/m^2 or the mean vertical effective stress exceeds 200kN/m^2 as the data used in the derivation of this equation did not extend outside these limits.

The frictional contribution of the overburden soils comprised of made ground overlying localised clay deposits is considered negligible for design purposes due to their variability and generally soft/loose nature of the soils encountered.

For design of CFA piles, the frictional contribution of the made ground should be omitted unless a significant resistance can be proven through plate load testing. Additionally, the design should be based on the final ground level, if any excavation is proposed, rather than the current ground elevations.

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Based on the design guidance outlined above and the results of the site investigation, estimated allowable bearing capacities for single vertical CFA piles founded in chalk bedrock have been determined for a variety of different pile sizes/lengths assuming the ground elevations will remain the same as they are now; these are presented in the table below for guidance.

Pile Length (m bgl)	Pile Diameter (m)			
	0.2	0.3	0.4	0.5
	Allowable Axial Load (kN)			
12	35	50	65	85

Assumed design loads should be confirmed via static load testing. Dynamic load testing (i.e. CAPWAP or similar) is not usually recommended for piles in chalk as the results tend to overestimate the static shaft resistance, due to the shearing behaviour of chalk, unless the pile toe is displaced at least 6mm.

Regardless of the pile type ultimately selected, consideration should be given to the potential for dissolution features within the chalk bedrock. While not encountered in this investigation, dissolution features may be present at various locations and depths across the site. These can lead to loss of drilling support fluids in bored piles, loss of concrete if a high slump concrete product is used, and loss of pile base resistance if piles are founded on or underlain by dissolution features.

The piles should be designed to resist uplift forces, including ground heave. In these cases, only the shaft resistance of the pile should be considered for preliminary design purposes along with the buoyant self-weight of the pile. To confirm a final pile design, a trial pile test is recommended.

If any increase to existing ground elevations are proposed (i.e. fill placement) or if any dewatering operations are proposed in the vicinity of the site, the piles should be designed to resist potential down drag forces (negative skin friction).

All piling design and installation works should be completed by a suitably qualified specialist contractor, ideally with experience completing piles in chalk bedrock. Detailed pile installation records should be kept.

The proposed development layout indicates that the building footprint will be overlap the infilled chalk pit boundary, resulting in it being founded on competent shallow chalk bedrock at some areas and located over circa. 9.8m of made ground in others. Differential settlement and rotational settlement could potentially be a factor and needs to be assessed during the foundation design stage. If design constraints permit, consideration should be given to relocating approximately 5-10m to the west in order to avoid the chalk pit boundary and efforts should be made to avoid constructing buildings spanning over steep former highwalls of the pit.

Working Platform
Prior to the commencement of piling works, a working platform will be required for tracked plant. This should be designed and installed in accordance with BR470 (BRE 2004) based on the plant requirements, data and rig loadings.

UXO
Based on the available information to date, specialist UXO advice will be required for all groundworks, including piling. The UXO risk level on the site has been is considered to be Moderate and given that some UXO retains the potential to detonate if disturbed with possible severe consequences, it has been concluded that it would be prudent to ensure that basic precautions are taken.

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However, ferrous anomalies were encountered within two locations (WS1 and WS3) below 3.0m bgl in the southern area of the site and metal fragments were recovered from the made ground within the exploratory holes. The presence of metal fragments may impede the future use of magnetometry to detect UXO on-site.

Piling Risk Assessment
A risk assessment is likely to be necessary for piling, as there is a possibility that this could lead to creation of new pathways for migration of contamination.

6.4 Building Near Trees

The clay soils on site are of low volume change potential. Where foundation excavations (or piles if adopted) encounter cohesive strata in the vicinity of existing, proposed or recently removed trees, foundations should be adjusted in full accordance with NHBC Standards Chapter 4.2.

Where foundation depths due to trees already present or recently removed exceeds 1.50m there is a possibility for heave to occur on removal of the tree and guidance states that compressible material or void former is required against the inside face of the foundation / ground beam.

Where foundations are constructed on clay soils within the influencing distance of trees including proposed planting, the upper section of the pile (to the recommended minimum founding depth) should be sleeved or overbored to allow for clay volume change. Bored, cast-in-place piles are well suited to counteracting heave.

6.5 Floor Slabs

Due to the piled foundation solution, suspended pre-cast concrete floor slabs could be utilised.

Where foundation depths due to trees already present exceeds 1.50m there is a possibility for heave to occur on removal of the tree. NHBC Guidance states that either a precast concrete floor, a suspended timber or in-situ concrete floor must be used. We recommend the former, the required void size beneath floor slabs on this site is 200mm.

The final floor slab design should be of sufficient thickness and sufficiently reinforced to accept the envisaged applied loads, without unacceptable total or differential movement.

6.6 Site Preparation and Construction

There are a number of services crossing the site, including the UK Power Network's electricity cable which bisects the site from east to south-west. To allow remediation and construction, all services will need to be disconnected and any suspected dead services are confirmed as dead by testing.

Instability of excavations through natural soils is not anticipated provided they are not exposed to adverse weather conditions for any substantial period of time. Instability of the made ground should be allowed for. All excavations should be carried out in accordance with CIRIA Report 97 'Trenching Practice'.

Excavation depths should generally be readily achieved using conventional plant (JCB or similar) although high specification plant (tracked 360° or similar) is recommended to maintain the build programme. Breaking equipment may also be required locally to penetrate old foundations, tank cradles (if present) and the shallow asphalt gravels associated with the site's historic uses.

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The presence of substantial depths of made ground across the site may result in settlement of roads and newly installed drainage / utilities. This should be taken into consideration during the design of infrastructure, which may include flexible joints to allow for some differential settlement.

6.7 Concrete Classification

Laboratory pH and sulphate testing was undertaken on 13 samples of made ground. The data set had over ten results and as such the mean of the highest 20% of the test results has been taken as the characteristic value which is 1.593g/l. The characteristic value of the lowest 20% of the pH of the samples is 8.07.

Laboratory pH and sulphate testing was undertaken on two samples of chalk bedrock. The data set had between less than five results and as such the highest sulphate value and lowest pH value were taken as characteristic values. The characteristic value for soluble sulphate is 0.33g4/l and the pH is 8.5.

The site is underlain by impermeable deposits therefore the groundwater has been classified as static.

The results of laboratory pH and sulphate content indicate that ACEC Class AC-2s and sulphate class DS-3 conditions prevail in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005. The specific concrete mixes (the Design Concrete Class) to be used on site will be determined by the site specific concrete requirements in terms of the durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM) detailed in Part D of BRE Special Digest 1 with further guidance in Pt E and F.

6.8 Highways

Based on Table 5.1 from DMRB IAN 73/06 Rev 1 equilibrium CBR values of 2% are likely to be achieved in undisturbed natural clay soils for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer. Equilibrium CBR values are likely to be <2% within the made ground.

Where the CBR is found to be less than 2%, the sub-grade is unlikely to be suitable for both the trafficking of site plant and as a permanent highway foundation without improvement of the soils.

To achieve the required design CBR value, improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5 and may include proof rolling, excavation and re-engineering / replacement of weaker soils, the inclusion of a geogrid or use of stabilisation techniques such as the addition of hydraulic binders (e.g. cement/lime).

Based on the fines content of the soils, they are considered to be frost susceptible, therefore highway construction should be a minimum thickness of 450mm to mitigate against the risk.

Care should be taken to ensure the stratum at formation level is protected against inclement weather, as this is likely to lead to surface deterioration and a decrease in soils strengths.

6.9 Soakaways

The use of soakaways within the natural ground is not feasible at the site due to the presence of relatively impermeable strata underlying the site.

For drainage systems, flexible jointed pipes should be used wherever possible; particular care should be taken for the avoidance of leaks in both water supply and drainage pipework.

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7.0 ENVIRONMENTAL ASSESSMENT

7.1 Contamination

Soils - General
The proposed development is of residential end-use comprising 10 No. 2-bed flats within a three-storey residential building; therefore, residential without plant uptake screening values have been adopted for the purpose of this assessment.

Based on the testing undertaken it would appear that there is localised contamination within the made ground in the form of metals (lead), PAHs and heavy-end hydrocarbons. The locations and contaminant types are shown on the Soil Contamination Plan, Drawing No. C3476/04, with the contamination being discussed based on its location on-site below:

Shared Amenity/Park Space (Northern Area)
Three exploratory hole locations (BH2, WS5 and WS6) were located within this area.

Exceedances of the screening levels for benzo(a)pyrene were identified within the shallow made ground in BH2. The sample from 0.20m bgl also contained an exceedance of hydrocarbons in the aromatic range C21-C35. These exceedances were recorded within an asphalt-containing made ground and it is considered to be attributable to the presence of asphalt and coal tar within this strata.

Based on the existing and proposed site levels, the presence of concrete hardstanding and asphalt gravel within this area will require the removal of approximately 0.60m of material in order to accommodate a suitable growing medium for proposed planting in this area. This reduction will involve the complete removal of the asphalt gravel encountered in BH2, whilst also removing all the made ground encountered in WS5 and WS6 (up to a maximum of 0.45m thick).

Trace levels of asbestos fibres were identified in the sample from BH2 at 6.50m bgl, as well as elevated levels of lead in exceedance of the adopted screening values. This sample was contained within cohesive made ground deposits that ranged from 4.50m to 9.80m bgl. Given the lead and asbestos fibres' encapsulation within this clay and its depth, the risk is considered to be low and no remediation is required.

Car Parking (South-Western Area)
One exploratory hole location (WS1) was located in this area.

Trace levels of asbestos fibres were identified in the sample from WS1 at 1.90m bgl, but this was located within an isolated 310mm thick band of ashy granular made ground. Post-development this area will remain covered with hardstanding, effectively 'capping' the affected strata. Given this, the risk is considered to be low and no remediation is required.

Proposed Building Footprint (Central, Eastern and South-Eastern Area)
Five exploratory hole locations (BH1, BH3, WS2, WS3 and WS4) were located either within, or in the immediate vicinity of, the proposed building footprint.

Elevated levels of lead were identified within the organic, cohesive made ground in WS2. However, this exceedance was encountered within an isolated 300mm thick band strata from 3.6m bgl and will be within the proposed building footprint.

Loose asbestos fibres (0.002%) were identified in the of made ground sample from BH1 at 0.6m bgl. This location was also located within the proposed building footprint. However, given the proximity of soft landscaping, this is likely to pose a risk to the end-user and mitigation is required.

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Exceedances of the screening levels for some PAH determinands were identified within the shallow made ground in samples from WS2, as well as in the petroleum hydrocarbons aromatic range C21-C35 in one sample from BH2. These exceedances were recorded within an asphalt-containing made ground and it is considered to be attributable to the presence of asphalt and coal tar within this strata. In order to create a working platform / piling mat it is likely that the asphalt layer, between ground level and 1.10m bgl will be removed in this area of the site, thus removing the source of volatile contamination from below the building footprint. An elevated concentration of benzo(a)pyrene was recorded within the gravel made ground at 1.10-1.60m, should this material remain onsite, this will be suitably mitigated by its depth and position below the building footprint, thus breaking the pathway to the end user.

Groundwater
No groundwater was encountered during the intrusive investigation on-site. The monitoring visits to date have not identified any groundwater within the installed standpipes.

Permanent Ground Gases
In order to assess the ground gas situation and the requirement for ground gas precautionary measures at the site, guidance was taken from CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings' and BS8485:2015+A1:2019 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

As the proposed end-use is for low rise residential, CIRIA C665 dictates that the gas monitoring results should be assessed in accordance with the Boyle and Witherington.

The Boyle and Witherington methodology uses the concept of a Gas Screening Value (GSV) which is calculated using the following equation: (max gas concentration / 100) x maximum flow.

A maximum positive flow of 0.6/hr has been used to calculate the GSVs. These calculated GSV's for the site are presented below.

Gas	Calculated GSV (l/h)	Typical Concentration Exceeded	Classification (NHBC)
Methane	0.0006	No	Green
Carbon Dioxide	0.018	No	Green

The GSV for carbon dioxide and methane place the site into the Green classification of the Boyle and Witherington Traffic / NHBC Light System as outlined in CIRIA C665 and therefore no ground gas precaution measures are considered to be necessary

Utilities
The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR.

As the site is brownfield, there is the assumption that barrier pipe would be utilised, although requirements should be confirmed by risk assessment and with the water supply company.

7.2 Qualitative Risk Assessment

The CSM has been revised based on the findings of the site investigation and laboratory testing results and these are presented overleaf.

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Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
On site **Made ground** Metals, PAHs, TPH	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Low Likelihood	Medium	Moderate / Low	Made ground has been encountered underlying the site to a maximum depth of 9.8m bgl. This predominantly comprises clays with localised bands of granular strata at shallower depths. No evidence of household or industrial landfilling has been identified on-site. Contamination within the shallow site soils was noted to be present within BH2 and WS2. Contamination was attributed to an asphalt / coal tar band of made ground. It is anticipated that this layer of made ground will be removed from site to accommodate a piling mat, and to accommodate a clean cover layer in the north of the site. Given this, the source of contamination will be removed, thus mitigating the risk to the end-user.
On site **Made ground** Asbestos	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Low Likelihood	Medium	Moderate / Low	Post-development, the majority of the central and southern areas of the site will be covered by hardstanding, breaking the pathway to site end-users. Shared amenity and park areas (soft landscaping) are proposed on-site and at this stage, it is considered likely that the pathway in these areas could be broken through the effective use of either clean cover layers, geotextile marker layers and/or 'hard dig' layers. This risk to site end-users is currently considered to be moderate/low.
On site **Made Ground** Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Likely	Medium	Moderate	Given the present of PAHs, TPH and volatile contamination within the shallow made ground at the site. Contaminants within the soil could potentially attack the clean potable water supply pipe, contaminants should be assessed in accordance with the relevant guidance to determine the correct pipe material and level of precautions required.
On site **Made ground / Infilled Chalk Pit** Ground Gas (carbon dioxide and methane)	Migration into confined spaces, inhalation and asphyxiation/ explosion	End-users / property / structures	Unlikely	Severe	NHBC Category Green	Localised deposits of organic clays have been encountered in two locations on-site; in WS2 between 3.6m and 3.9m bgl, and in WS4 between 2.2m and 4.55m bgl. These are considered to be of low gas generation potential and have been targeted by the monitoring standpipes installed within these two locations. The gas monitoring has recorded concentrations of methane <1%v/v and carbon dioxide <5%v/v. Flows are low at generally less than 0.6l/hr. the site is NHBC Green category and gas protection measures are not required.
On site **USTs** Hydrocarbon contamination	Root uptake, ingestion, direct contact, inhalation of dusts and vapours	End-users / property / structures	Unlikely	Medium	Low	The on-site underground storage tanks (USTs) have been identified as potential sources of hydrocarbon contamination. However, during the intrusive investigation, BSL did not identify any visual or olfactory evidence to suggest hydrocarbon impaction of the underlying soils or groundwater. PID head space monitoring on all environmental samples recorded PID results of between 0.0ppm and 0.1ppm, indicating that no significant volatile vapour contamination was present. The site should be subject to source removal; this would involve the removal of tanks and any associated pipework remaining under the site.

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Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
Off-Site Garage and Fuel Pump Hydrocarbon contamination	Root uptake, ingestion, direct contact, inhalation of dusts and vapours	End-users / property / structures	Unlikely	Medium	Low	In the absence of any visual or olfactory evidence of hydrocarbon impaction within the underlying soils, the risk from the adjacent garage and fuel pump is considered to be low.
Off-Site Railway Line Metals, PAHs	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	The railway presents a potential source of contamination associated with spillage or leakage of materials or substances from train engines and other rolling stock or cargo. However, the railway is at the base of a cutting, with a significant vertical off-set from the site, therefore groundwater would likely flow towards the cutting, meaning any contamination from the railway lines would have to move against the direction of flow to reach the site. Furthermore, any contaminants from the railway would be at significant depth below the site. The risk is therefore considered to be low.
Off-Site Infilled Chalk Pit / Refuse Tip Ground Gas (carbon dioxide and methane)	Migration into confined spaces, inhalation and asphyxiation/ explosion	End-users / property / structures	Unlikely	Severe	NHBC Category Green	Springhead Road landfill site located 30m to the south is managed by Kent County Council's Waste Management Unit. This is located within a former chalk pit, which was listed as a refuse tip on the 1972 mapping. The most recent report (September 2016) provided by Gravesham Borough Council as part of BSL's previous Desk Study Assessment indicated that ground gas monitoring points nearest the site have not detected any methane, and the highest concentration of carbon dioxide was 7%v/v. Gas monitoring undertaken by BSL on the site has found gas concentrations fall within the Green classification of NHBC/Boyle and Witherington and therefore gas protection measures are not required.
Off-Site Electricity Sub-Station PCBs	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	An electricity substation located 73m to the north-east was first identified on the mapping of 1972. The use of PCBs within these structures were generally phased out by the 1970s. Given the distance to site and relatively immobile nature of PCBs, the associated risk is considered to be low.

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Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
Made Ground & USTs PAHs, Metals, Hydrocarbons	Overland flow / migration through saturated zone	Surface waters	Unlikely	Mild	Very Low	In the absence of any watercourses within 500m of the site or surface water features within 250m, the site is considered to pose a negligible risk to surface waters.
	Leaching through unsaturated zone / Migration through saturated zone	Principal Aquifer (Ground-water)	Unlikely	Medium	Low	During BSL's intrusive investigation, no groundwater has been identified within any of the exploratory holes on-site. No perched water was identified within the relatively impermeable made ground deposits. No groundwater was encountered within the deeper cable percussive boreholes, indicating that the underlying chalk is unsaturated to at least 13m below existing ground levels. Furthermore, the made ground contains significant horizons of clay and finer soils which will tend to inhibit downward migration of percolating rainfall and any entrained contamination.

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7.3 Summary of Identified Risks

Human Health
Exceedances of PAHs and banded TPH were recorded in BH2 and WS2 within a shallow layer of made ground, comprising predominantly asphalt/coal tar. Given the proposed development, this material would be unsuitable as a development platform and would therefore be removed from site, thus removing the source, given this, no specific remediation is required in respect to these particular contaminants.

Deeper made ground was recorded to exceed assessment criteria for lead, however, given the depth of this at >3.00m, there is considered to be sufficient barriers in place to break the pathway between the contamination and the site end-user. Given this, no remediation is required in respect to lead.

Asbestos free fibres were recorded within a sample from BH1 at 0.60m bgl. Given the proximity of soft landscaping to this area and the nature of asbestos contamination, the risk cannot be discounted. As a result, a cover system is recommended within soft landscaping areas to mitigate the risk. Elsewhere, hardstanding will, in effect, act as a break layer.

The infilled chalk pit on-site and the Springfield Road landfill site 30m to the south were identified as potential sources of ground gas that posed a potential risk of migration to the proposed residential properties. Therefore, gas monitoring was carried out over six visits following the ground investigation and installation of monitoring standpipes. The ground conditions encountered underlying the site did not represent a significant gas source and the concentration of CO_2 (maximum 3.0%) and methane (not detected) together with a maximum flow rate of 0.6l/hr place the site within the Green category of the Boyle and Witherington NHBC traffic light system. Therefore, gas protection measures are not considered necessary for the proposed development.

Controlled Waters
Information provided by Kent County Council identified threshold exceedances of ammonia in the groundwater nearest the site and pertained to regular monitoring at the Springhead Road landfill located 30m to the south.

During BSL's intrusive investigation, no groundwater has been identified within any of the exploratory holes on-site. No perched water was identified within the relatively impermeable made ground deposits. No groundwater was encountered within the deeper cable percussive boreholes, indicating that the underlying chalk is unsaturated to at least 13m below existing ground levels. Therefore, the risk to the Principal Aquifer within the chalk from this site is currently considered to be low.

It is considered that the source of ammonia is likely to be from the offsite landfill rather than other made ground outside of the landfill boundary.

In the absence of any watercourses within 500m of the site or surface water features within 250m, the site is considered to pose a negligible risk to surface waters.

7.4 Remedial Measures

The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR.

Where gardens or soft landscaping are present a cover of "clean" subsoil and topsoil should be provided to break the pathway to site end users. This should be 600mm thick in garden and soft landscaping areas in accordance with BRE 465, and 450mm in public open space areas subject to the removal of asphalt/coal

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tar contaminated made ground. This will allow plants to be grown and prevent undesirable soils being brought to the surface. The inclusion of a hi-vis geotextile marker layer at the base or a 100mm thick "clean" validated coarse granular, 'hard dig' layer is recommended.

After installation of the clean cover, soil depths should be verified by a suitably qualified independent geo-environmental engineer, such as BSL.

At present the made ground is exposed at the surface and this is likely to be contributing to diffuse pollution of controlled waters in the area via leaching. The inclusion of a cover system containing a degree of cohesive material, together with the hard cover supplied by the proposed development, will have the effect of reducing rainfall infiltration and consequently contributing to a general betterment of groundwater and surface water quality.

No hydrocarbon contamination has been identified in the vicinity of the suspected tanks in the northern area of the site. However, any in-situ fuel tanks will have to be removed together with any petroleum hydrocarbon impacted soils encountered around and below the tanks. Any free phase hydrocarbons should be removed from the surface of the groundwater and treated or disposal of according to current legislation. If tanks are encountered, then works should cease in that area and BSL consulted for advice.

Gas Protection Measures
Based on the ground gas monitoring results, no mitigation measures are required. No radon protection is required for new buildings at this location.

General
It is recommended that the approval of the Regulators (Local Authority / NHBC / Environment Agency) is obtained in regard to the above prior to any irrevocable action is taken at the site.

A watching brief is recommended during groundworks for any unidentified sources of contamination. If any gross contaminated material is encountered works should cease in that area and BSL consulted.

In addition to the above, potential Japanese Knotweed has been identified on site and should be inspected and remediated by a suitably qualified specialist if present.

7.5 Asbestos

The investigation of asbestos issues within structures was beyond the scope of this report. However, guidance from UK Government indicates that asbestos should be assumed to be present in buildings unless proven otherwise.

Any asbestos within structures will require removal prior to re-development. This will need to be done by a suitably qualified experienced and licensed contractor, who ensures that adequate PPE is provided to operatives, and that all the relevant legislation is adhered to.

In addition, the presence of asbestos within the ground will require, a safe system of work to be set up on site to deal with the asbestos risk from the made ground. This may include but be not limited to:

- The use of qualified personnel where required.
- Careful segregation of stockpiles on site.
- Defining transport routes.
- Cleaning down of machinery in designated areas.
- Decontamination unit for ground workers.
- Damping down of soils to prevent dust migration.

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Asbestos fibres have been identified in three samples at the site and subsequently quantification analysis has been undertaken on these. Loose chrysotile fibres were detected at concentrations of 0.002% w/w (one sample from BH1) and <0.001% w/w (trace).

At these concentrations the liberation of fibres is considered to be unlikely and no specific precautionary measures with regards to asbestos are likely to be required at the site. The level of precautions required are at the discretion of the principal contactor on site however good site practices including minimising the generation of dusts should be adhered to and sufficient to mitigate against the risk from asbestos. In addition, site personnel should have the risk communicated at the induction stage. It is recommended that the asbestos in construction materials assessment tool is used at the site to inform asbestos licensing and control measures.

Excavations in soils containing asbestos should comply with the CL:AIRE publication 'Interpretation for Managing and working with Asbestos in Soil and Construction and Demolition Materials' (CARSOIL) and CAR 2012. All such works will need to be agreed with the regulatory bodies (HSE and/or LA).

Additional guidance is provided within the BSL methodology Guidance Note in Appendix A.

7.6 Health and Safety Issues

During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. The risk to construction and ground workers is assessed in the table below:

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
General Made Ground	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Unlikely	Medium	Low
Asbestos Fibres	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Low Likelihood	Medium	Moderate/Low

Levels of Chrysotile asbestos have been identified in three sample to date, ranging from trace to 0.002% w/w, and trace levels of asbestos are assumed across the site. The risk from asbestos should be highlighted in the method statements and site induction. If further evidence of asbestos is encountered in the soils, work should cease until asbestos control measures have been agreed and put in place.

The risk from made ground will be mitigated by standard PPE including gloves. Welfare facilities should be made available to wash before hand to mouth activities.

General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with the relevant protective clothing, footwear and gloves. These protective items should not be removed from the site and personnel should be instructed as to why and how they are to be used.
- Handwashing and boot-washing facilities should be provided.
- Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

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7.7 Waste

As described in the 'Waste Duty of Care Code of Practice (2016)' any substance or object that the holder discards, intends to discard or is required to discard is a waste. It is the responsibility of the waste producer to classify this waste. The classification process is described in the 'Guidance on the classification and assessment of waste' WM3 and aims to determine whether the waste is Hazardous or Non-Hazardous to human health and the environment.

Any material excavated on site may be classified as waste and it is a statutory responsibility of the holder of a material to form their own view on whether or not it constitutes waste. This includes determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. If soils are required to be removed from site, then there are three main options for the disposal of soils:

1. Re-use on another site (subject to suitability of the soils and complying with relevant waste legislation).
2. Disposal to a permitted waste recycling facility.
3. Disposal to a landfill site.

Note that wastes should first be classified based on their total concentrations and given the classification of either hazardous or non-hazardous. WAC testing is then **only** required if the end disposal route is landfill.

Leaching test results obtained as part of landfill WAC analysis must **not** be used for waste classification and hazardous waste assessment purposes.

Details of how material should be classified for waste disposal are presented in the BSL Methodology and Guidance in Appendix A and are summarised in the table below.

	PRIOR TO LEAVING SITE			
Classification based on Total Concentrations[1]	Non-Hazardous Waste		Hazardous Waste	
	IF SOILS CANNOT BE RE-USED ELSEWHERE AND MUST GO TO LANDFILL			
WAC testing	Below inert WAC limit values	Above inert WAC limit values	Below hazardous WAC limit values[4]	> WAC limit values
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill[2]	HAZARDOUS landfill	PRE-TREATMENT[3]

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.
4 Possibility that wastes could be classified as stable Nonreactive HAZARDOUS waste in non-hazardous Landfill (e.g. soils containing low concentrations of asbestos, gypsum or sulphate bearing soils).

Waste classified as non-hazardous can be accepted into a non-hazardous landfill without having to pass any numerical WAC.

Soils above hazardous WAC limit values require pre-treatment prior to disposal. The effective pre-treatment, typically involving separation, sorting and screening, can offer cost savings through reducing the hazardous nature and volumes of soil. Costs for disposal of non-hazardous/hazardous soils are significant compared to the disposal of inert material.

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Waste Classification - Total Concentrations
We have reviewed the testing results and assessed them through a waste classification database which allows users to code and classify waste as defined in the EWC (European Waste Catalogue) based on EC Regulation 1272/2008 on the Classification, Labelling and Packaging of Substances and Mixtures (CLP) and latest Environment Agency guidance (WM3 "Guidance on the classification and assessment of waste -Technical Guidance").

Thirteen samples were tested to assess whether they contained any contaminants in the hazardous range when screened against assessment criteria within WM3. The Assessment is presented in Appendix G, whilst the three samples classified as hazardous have been summarised below.

Sample Location	Strata	Elevated Determinands	Waste Classification
BH2 at 0.2m bgl	MADE GROUND: Dark grey sandy gravel predominantly of asphalt, with low cobble content of brick.	HP 3(i): Flammable, HP7: Carcinogenic, HP11: Mutagenic.	Hazardous
BH2 at 6.5m bgl	MADE GROUND: Light greyish brown slightly sandy gravelly clay.	HP7: Carcinogenic, HP14: Ecotoxic	Hazardous
WS2 at 0.5m bgl	MADE GROUND: Dark grey sandy gravel predominantly of asphalt, with low cobble content of brick.	HP 3(i): Flammable, HP7: Carcinogenic, HP10: Toxic for reproduction, HP11: Mutagenic, HP14: Ecotoxic.	Hazardous

Further testing of the soils (WAC testing) may be required in order to satisfactorily categorise the soil for its suitability for disposal to landfill.

Asbestos
Within the made ground on-site, two samples of trace asbestos fibres were encountered, along with one sample containing 0.002% fibres. No visible asbestos containing materials (ACMs) were identified during the intrusive investigation. Where encountered in the soils, asbestos was only found at levels that would classify it as non-hazardous

However, a watching brief should be maintained for evidence of Asbestos Containing Materials (ACMs), any ACMs observed should be handpicked and disposed of in accordance with current asbestos disposal regulations.

The possibility of automatic inert classification of the naturally occurring "clean" soils should be explored in accordance with Section 4.3 of the EA guidance document. The Council Decision includes a list of wastes in Section 2.1.1 of the document that are assumed to be inert and therefore acceptable at a landfill for inert waste without testing. This is the case if:

- They are single stream waste of a single waste type (although different waste types from the list may be accepted together if they are from a single source); and
- There is no suspicion of material or substances such as metals, asbestos, plastics, chemicals, etc to an extent which increases the risk associated with the waste sufficiently to justify contamination and they do not contain other classes of landfill.

Waste Acceptance Criteria (WAC)
Waste Acceptance Criteria (WAC) testing was outside the scope of this investigation and the guidance given below is general.

General
If any gross hydrocarbon contaminated material is encountered during the construction phase, it is possible that this may be classified as hazardous and testing should be undertaken at that time.

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Where it is necessary to dispose material off site it is recommended that materials are segregated and sufficient time is allowed to further classify the actual soil arisings that constitute the waste, including discussion with landfill sites and waste transfer stations to find the best disposal route. It is illegal to dilute and mix soils without a suitable permit.

Re-use of Soils

By definition in law, any material excavated from the ground becomes waste at the moment of excavation. If that soil (now a "waste") is then placed on another part of the development site (or used on another development site) without an appropriate materials management plan, permit or exemption being in place, by law this material is defined as "illegally deposited waste".

Landfill tax rules were updated on 1 April 2018 and as a result of the change, HM Revenue & Customs (HMRC) can now recover landfill tax on illegally deposited waste on construction sites. This could lead to excessive costs without the correct documentation in place. In addition, a person who makes, knowingly causes or knowingly facilitates a disposal to be made at an unauthorised site, is now also liable to pay Landfill Tax.

In order to comply with UK legislation and avoid excessive costs, if the re-use of soils is proposed on site, this should be done in accordance with the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE DoWCoP) also known as a Materials Management Plan (MMP). Regardless of implementing the DoWCoP or not, all sites should have some form of materials tracking in place in compliance with current legislation. Any re-use scheme should also be designed to minimise disposal costs. Further guidance is provided in the BSL Methodology and Guidance in Appendix A.

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8.0 CONCLUSIONS

8.1 Summary

Environmental
The deeper made ground has been identified as a source of lead, whilst the shallower asphalt-containing made ground is a pervasive source of PAHs and coal tar which are unsuitable for a residential end use and mitigation measures are required in the form of a combination of source removal and the introduction of clean cover system in soft landscaped areas to act as a break layer and provide a growth medium for new planting.

No evidence of hydrocarbon contamination has been identified given the previous fuel storage in the north of the site. This potential source should be subject to removal, this would involve the excavation and disposal off site of any remaining tanks and removal or treatment of gross contamination (if present) down to an acceptable concentration.

No groundwater has been identified underlying the site to a depth of at least 13m below the existing site level, either during the intrusive investigation or initial monitoring visit.

Waste Acceptance Criteria (WAC) testing was outside the scope of this investigation. Hazardous properties have been identified within the made ground, predominantly attributable to the coal-tar containing asphalt made ground. Whilst hazardous properties have also been encountered within the deeper made ground deposits with BH2, these were within strata located 6.5m bgl and therefore, unlikely to be removed during the construction phase.

Geotechnical
Due to the heterogeneity of the made ground and the low strength/density values, shallow pad/strip foundations would not be considered suitable for supporting foundations. Therefore, foundations for the proposed building will need to be transferred through the made ground/fill to the underlying Seaford Chalk Formation and Newhaven Chalk Formation bedrock.

Piles are considered to be the most suitable foundation solution for the proposed development, however, the exact choice of piling system and the detailed design of piles are beyond the scope of this report and should be undertaken by a piling specialist.

The use of soakaways within the natural ground is not feasible at the site due to the depth to the chalk bedrock and presence of thick relatively impermeable made ground strata underlying the site.

8.2 Further Work

The following further work is considered necessary to progress the site to construction phase:

- Decommissioning and removal of any remaining USTs and associated pipework / impacted soils.
- Design of Remedial Strategy and confirmation with the Local Authority / EA / NHBC
- Detailed foundation design.

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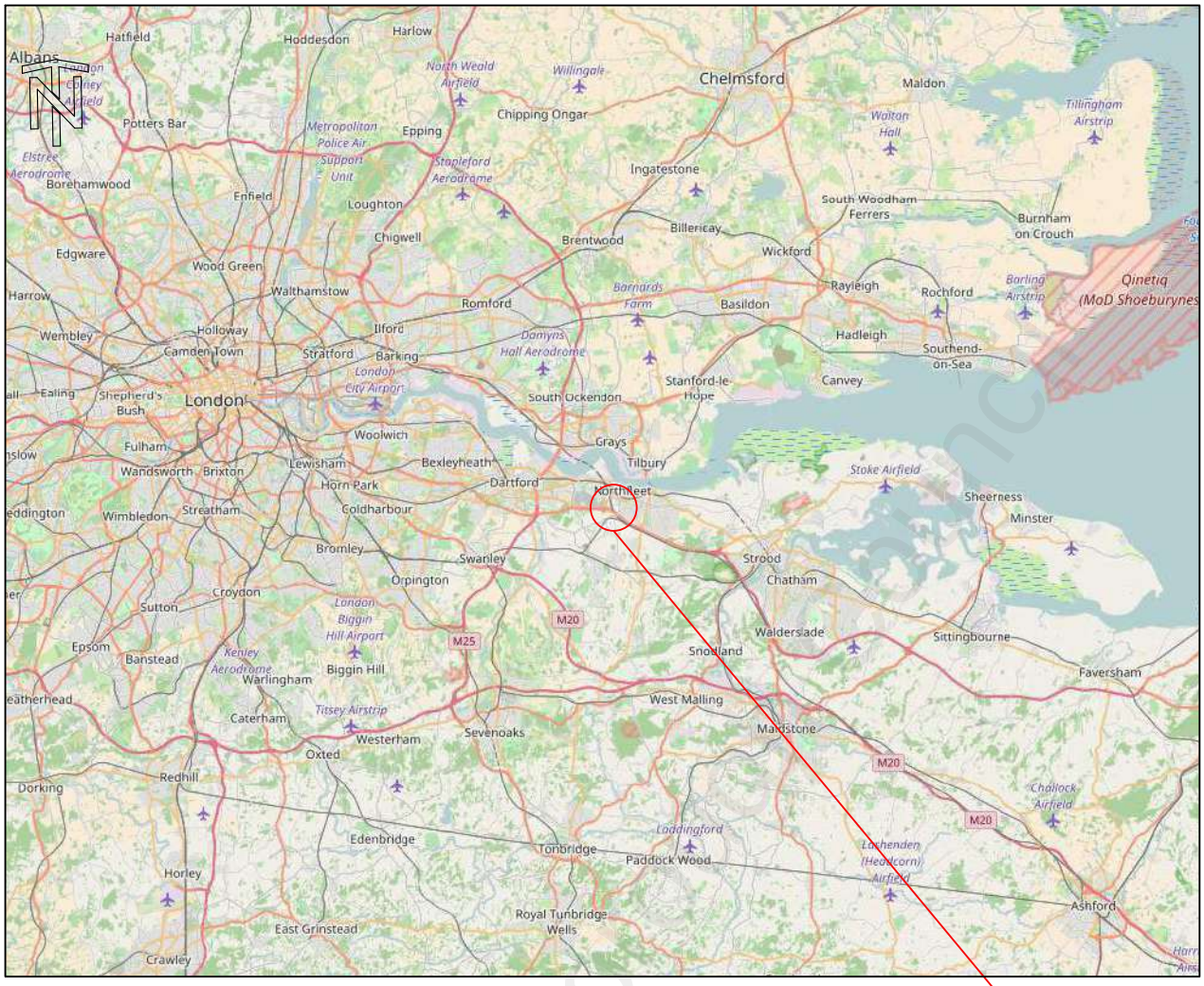
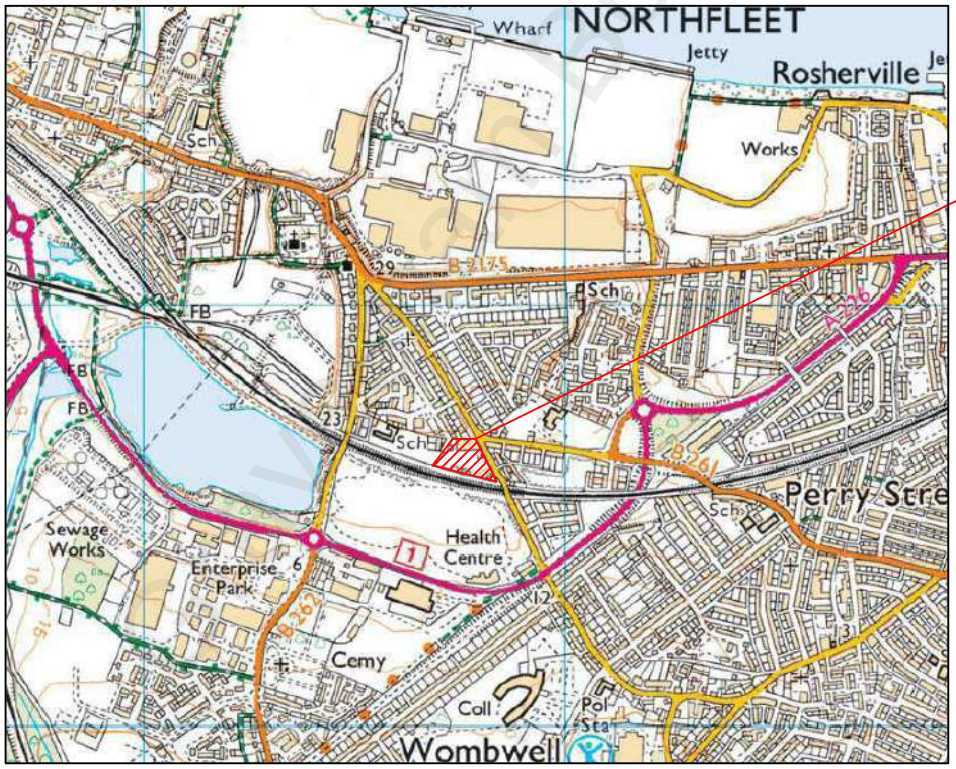
DRAWINGS

Gravesham Borough Council



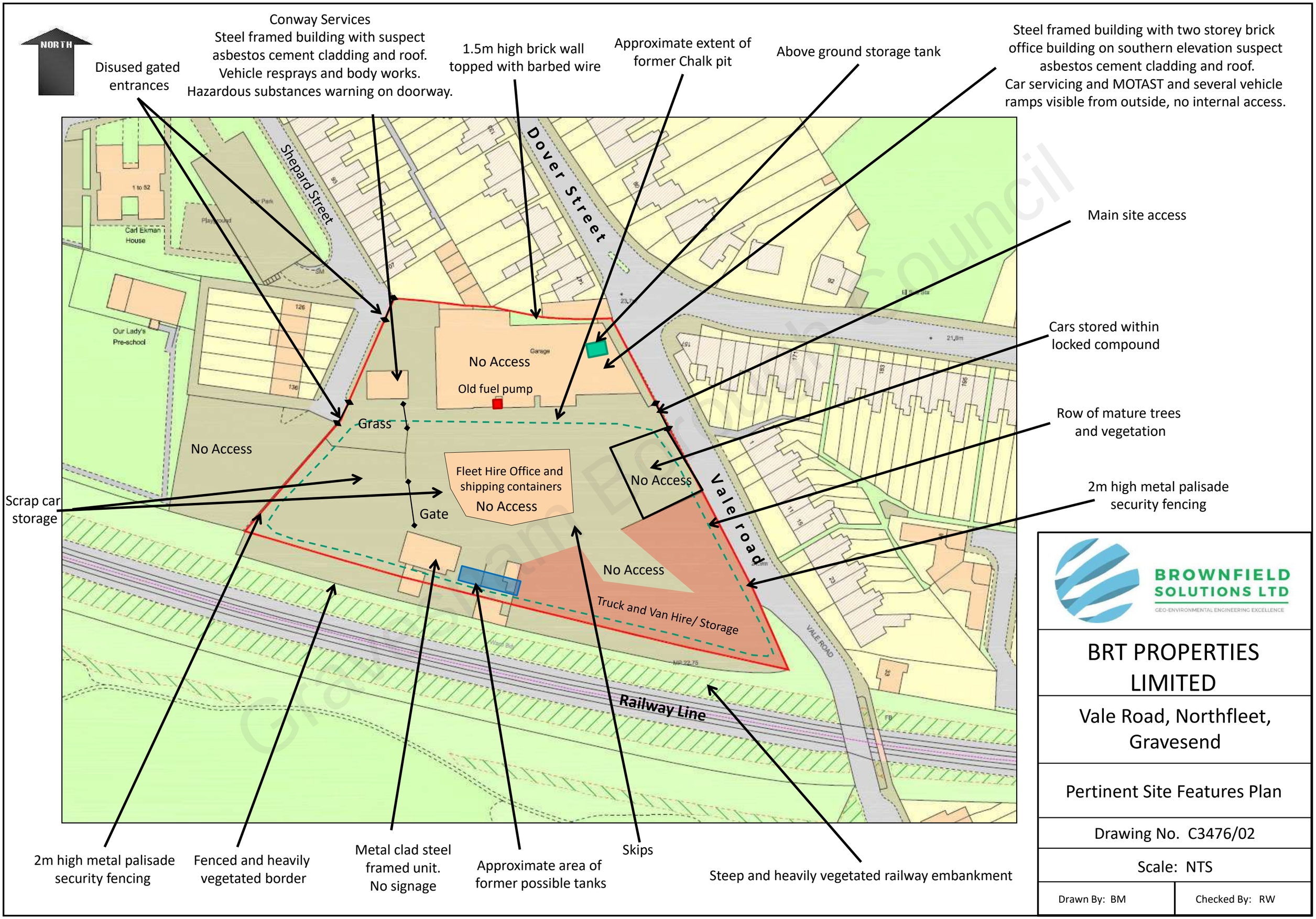


SITE

CLIENT	DRAWING DETAIL		
BRT PROPERTIES LIMITED	SITE LOCATION PLAN		
PROJECT TITLE	DATE	SCALE	
VALE ROAD, NORTHFLEET GRAVESEND	FEB 2017	NTS	
	DRAWING NUMBER	REVISION	
	C3476/01	–	

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

DRAWN	CHECKED
BM	RW



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BRT PROPERTIES LIMITED

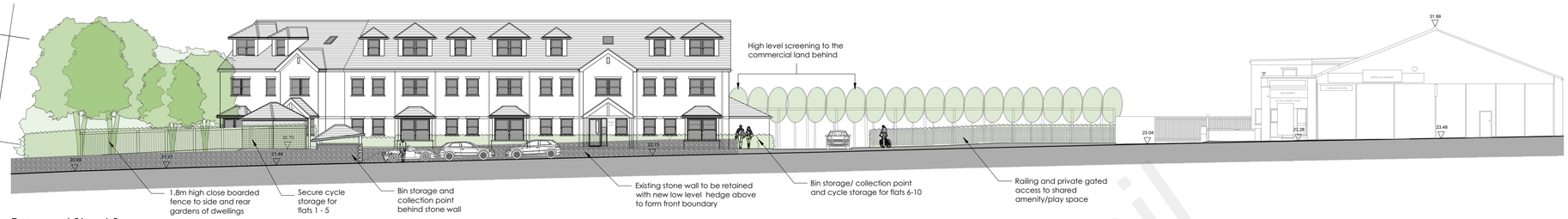
Vale Road, Northfleet, Gravesend

Pertinent Site Features Plan

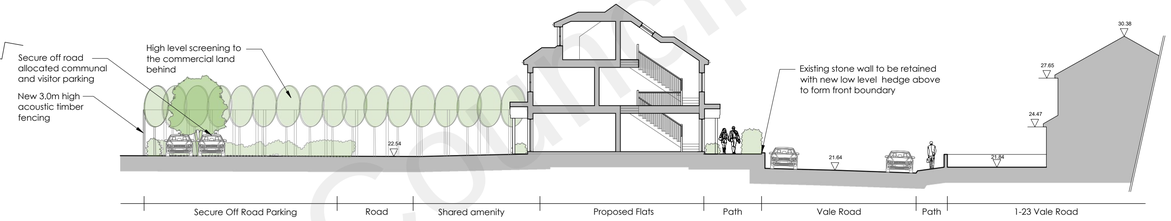
Drawing No. C3476/02

Scale: NTS

Drawn By: BM | Checked By: RW



Proposed Street Scene
SCALE 1:200



Proposed Site Section A-A
SCALE 1:200

Proposed Site Plan
SCALE 1:200

0m 5m 10m 15m 20m
Scale Bar 1:200

0m 25 50m 75m 100m 125m
Scale Bar 1:1250

AREA SCHEDULE

Unit	Size	GIA
1	2B/ 3P	62.3m²
2	2B/ 4P	88.6m²
3	2B/ 3P	67.5m²
4	2B/ 4P	86.7m²
5	2B/ 4P	93.5m²
6	2B/ 3P	69.9m²
7	2B/ 4P	70.5m²
8	2B/ 4P	75.7m²
9	2B/ 3P	70.7m²
10	2B/ 3P	89.2m²

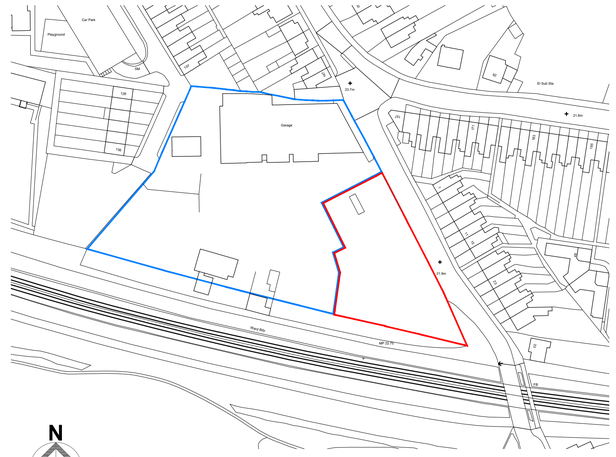
[Total Unit Mix 10No. 2-Bed Flats]

Car Parking Spaces

Allocated 10No. (1:1 Ratio)
Visitor 3No.

Total 13No.

Cycle Parking 12No. (In sheds)



Site Location Plan
SCALE 1:1250

Landscape Key:

- Existing tree/shrub planting
- Proposed new low shrub/hedge planting
- Proposed stilted high level hedge planting
- Grass/Lawn area
- Permeable pavement
- Permeable vehicular driveway
- Permeable pedestrian and communal paving
- +48.50 Proposed levels
- 23.50 Existing levels
- Bollard lighting
- 3-4m column lighting
- CCTV CCTV Points
- Communal refuse/recycling
- E Electric car charge point

Rev	Date	Comments
B	10.01.19	Amendments based on Planning Officers comments
A	20.09.18	Amendments based on client's comments

PLANNING

Client
BRT Properties Kent Ltd

Project
2 Vale Road,
Northfleet,
Gravesend,
Kent,
DA11 8BZ

Title
Proposed Site Layout Plan, Street Scene, Site Section & Location Plan

Project No.	Date
6223	SEP 2018
Drawing No. 6223-PD-20	Revision B
Scale AS SHOWN @A1	Drawn DR
	Check RR

Nepicar House, London Road
Wrotham Heath, TN15 7RS

phone: 01732 753333
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info@offsetarchitects.co.uk
www.offsetarchitects.co.uk

offset architects

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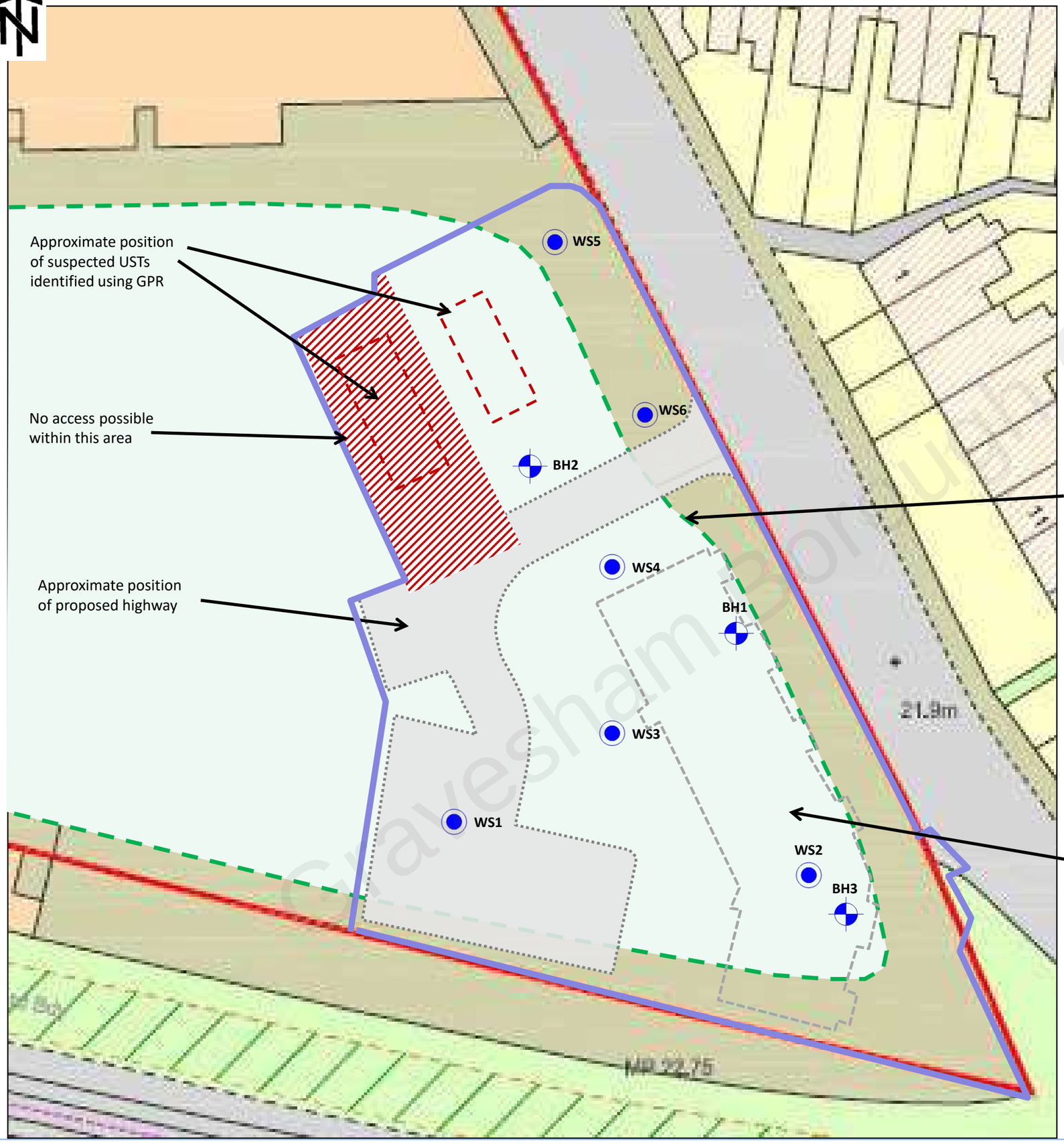

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KEY

WS1 Window Sample Borehole

BH1 Cable Percussive Borehole

Approximate extent of study site for BSL's intrusive investigation

Approximate extent of study site within BSL's Desk Study Assessment Report

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
3. DRAWING NOT FOR CONSTRUCTION PURPOSES.

REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

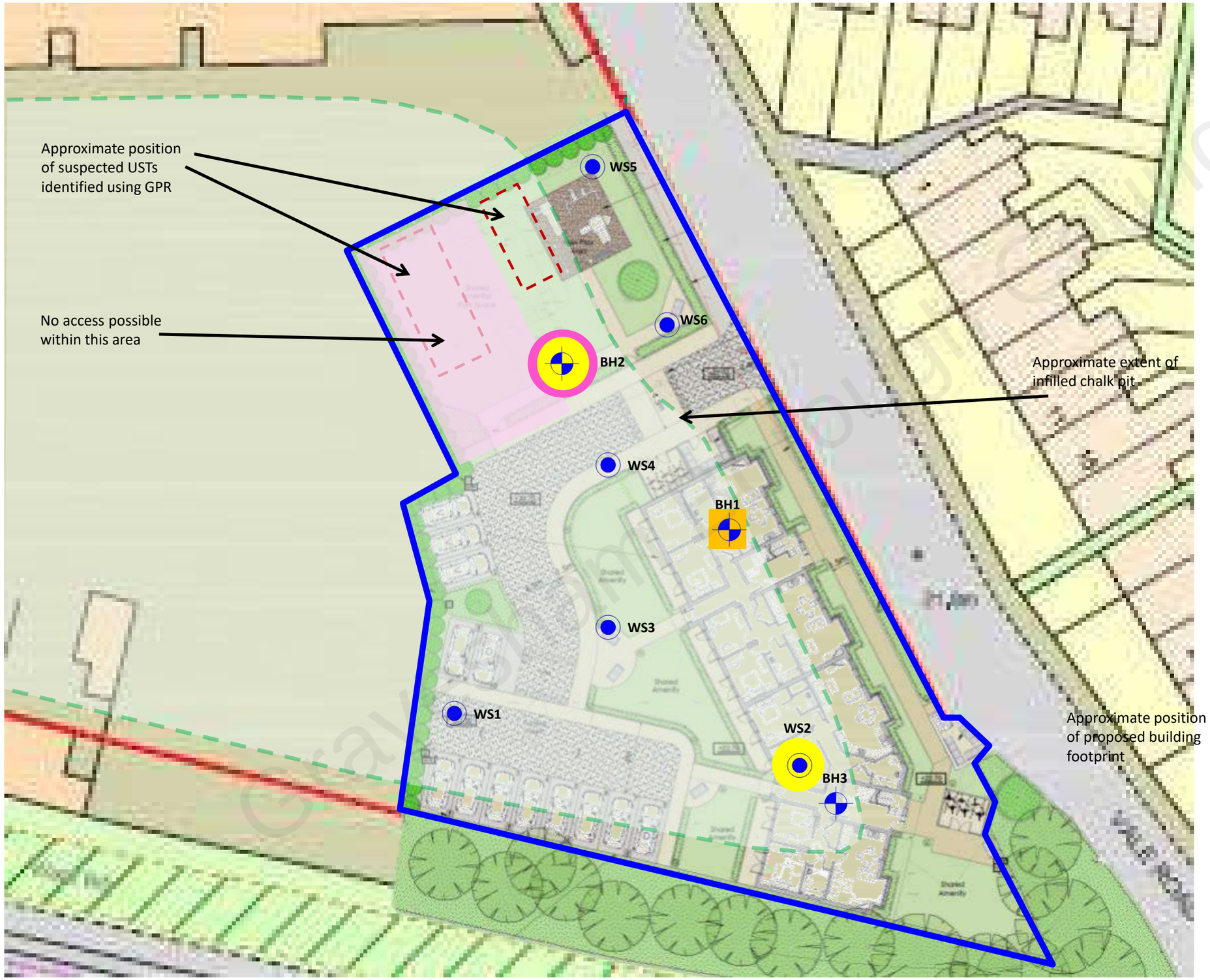
CLIENT
BRT PROPERTIES (KENT) LTD

PROJECT TITLE
VALE ROAD, NORTHFLEET

DRAWING TITLE
EXPLORATORY HOLE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C3467/03	-	NTS	18/02/19

DRAWN BY	CHECKED BY
PD	XXX



KEY

- WS1 — Window Sample Borehole
- BH1 — Cable Percussive Borehole
- Approximate extent of study site for BSL's intrusive investigation
- Approximate extent of study site within BSL's Desk Study Assessment Report
- PAH Species identified in exceedance of their adopted screening values within top 1.5m of soils
- Asbestos fibres identified at or above 0.001% (> Trace) within top 1.5m of soils

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
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REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

CLIENT
BRT PROPERTIES (KENT) LTD

PROJECT TITLE
VALE ROAD, NORTHFLEET

DRAWING TITLE
SOIL CONTAMINATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C3467/04	A	NTS	08/04/19

DRAWN BY	CHECKED BY
PD	AJS

Gravesham Borough Council

APPENDIX A

BSL Methodology and Guidance

Gravesham Borough Council

BSL Methodology and Guidance – Geo-Environmental Assessment Reports

This Appendix provides information on the approaches, methods and guidance used by Brownfield Solutions Ltd in the preparation of this report.

The term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential soils and groundwater contamination). The term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements). It should be noted that this is an integrated investigation and these two main aspects are related, unless otherwise specified within the report.

Desk Studies are written in broad agreement with BS 10175:2011+A2:2017. The first stage of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011+A2:2017), often referred to as a Phase 1 Desk Study Assessment, comprising a desk study and walk-over survey, which culminates in the Preliminary Risk Assessment. A preliminary conceptual site model (CSM) is developed. From this are identified any geotechnical and geo-environmental hazards and the qualitative degree of risk associated with them.

From the geo-environmental perspective, the hazard Identification process uses professional judgement to evaluate all the hazards in terms of possible contaminant linkages (of source-pathway-receptor). Possible contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and generic risk assessment.

The second stage is the Ground Investigation, Generic Risk Assessment and Geotechnical Interpretation. This represents the further assessment mentioned above. The Ground Investigation comprises field work and laboratory testing based on the findings of the Preliminary Risk Assessment, to reduce uncertainty in the geotechnical and geo-environmental hazard identification. This may include the exploratory, main and supplementary Investigations described in BS 10175:2011+A2:2017.

Gravesham Borough Council

Legislative Background

Environmental liabilities and risks have been evaluated in terms of a source -pathway - target relationship in accordance with the approach set out in:

- The 1995 Environment Act;
- The Contaminated Land (England) Regulations 2000;
- The DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land.

Contaminated land is defined within the legislative framework as land which is in such condition by reason of substances in, on or under the land that:

1) Significant harm is being caused or there is a significant possibility of such harm being caused;
2) Significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

- **Source** - substances that are potential contaminants or pollutants that may cause harm;
- **Pathway** - a potential route by which contaminants can move from the source to the receptor;
- **Receptor** - a receptor that may be harmed, for example the water environment, humans and water.

Where a source, pathway and target are all present a pollutant linkage exists and there is potential for harm to be caused. The presence of a source does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm. The nature and importance of both pathways and receptors are site specific and will vary according to the intended end use of the site, its characteristics and its surroundings.

The key principle which supports the SPR approach is 'suitable for use' criteria. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and, taking into account the proposed use of the site.

Relevant Guidance Documents
This report has been prepared in accordance with the list of guidance below however the list is not exhaustive:

- DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990.
- CLR11 – Model Procedures.
- Brownfields – Managing the development of previously developed land – A client's guide, CIRIA 2002.
- DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002.
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002.
- Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003).
- BS 10175:2011+A2:2017.

Relevant Legislative Documents
The following is a non-exhaustive list of legislative framework documents that has been considered in the production of this report:

- The Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (2012).
- The Environment Protection Act (1990).
- The Water Resources Act (1991).
- The Environment Act (1995).
- The Contaminated Land (England) Act (2000).
- The Pollution Prevention and Control (England and Wales) Regulations (2000).
- The Landfill Regulations (England and Wales) Regulations (2002).
- The Landfill (England and Wales) (Amendment) Regulations (2004).
- Contaminated Land (England) Regulations (2012).
- Health and Safety at Work Act.

Gravesham Borough Council

Contaminated Land Risk Assessment

Contaminated Land Risk Assessment is a technique that identifies and considers the associated risk, determines whether the risks are significant and whether action needs to be taken. The four main stages of risk assessment are:

Hazard Identification → Hazard Assessment → Risk Estimation → Risk Evaluation

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. The starting point of the risk assessment is to identify the context of the problem and the objectives of the process. Under CLR11, three tiers of risk assessment exist - Preliminary, Generic Quantitative and Detailed Quantitative.

Formulating and developing a conceptual model for the site is an important requirement of risk assessment, this supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of preliminary risk assessment, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process.

Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk.

The risk assessment process needs to take into account the degree of confidence required in decisions. Identification of uncertainties is an essential step in risk assessment.

The likelihood of an event is classified on a four-point system using the following terms and definitions from CIRIA C552:

- **High likelihood**: There is a pollution linkage and an event appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution;

- **Likely**: There is a pollution linkage and all the elements are present and in the right place, which means it is probable that an event will occur. Circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;

- **Low likelihood**: There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain even over a longer period such event would take place, and is less likely in the short term;

- **Unlikely**: There is a pollution linkage but circumstances are such that it is improbable the event would occur even in the long term.

The severity is also classified using a system based on CIRIA C552. The terms and definitions are:

- **Severe**: Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. A short-term risk to a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
  Examples – High concentrations of contaminant on surface of recreation area, major spillage of contaminants from site into controlled waters, explosion causing building to collapse;

- **Medium**: Chronic damage to human health ('significant harm' as defined in DETR 2000). Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
  Examples - Concentrations of contaminants exceed the generic assessment criteria, leaching of contaminants from a site to a Principal or Secondary Aquifer, death of species within a designated nature reserve;

- **Mild**: Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures, services or the environment;
  Examples – Pollution of non-classified groundwater or damage to buildings rendering it unsafe to occupy.

- **Minor**: harm, not necessarily significant harm, which may result in financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by use of personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.

Crawley Borough Council

Examples – Presence of contaminants at such concentrations PPE is required during site work, loss of plants in landscaping scheme or discolouration of concrete.

Once the likelihood and severity have been determined, a risk category can be assigned using the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very Low	Very low
	No Linkage	No risk			

Definitions of the risk categories obtained from the above table are as follows together with an assessment of the further work that might be required:

- **Very high**: There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability. Urgent investigation and remediation are likely to be required;

- **High**: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the longer term;

- **Moderate**: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it would be more likely to be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term;

- **Low**: It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild;

- **Very Low**: There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Some linkages may be identified which constitutes a theoretical connection between a source and a receptor, but professional judgement shows them not to be possible for some reason. These are labelled 'no linkage' in the summary table and no further action is required.

Gravesham Borough Council

Ground Gas Guidance

Redevelopment on brownfield sites is an ever increasing occurrence, including those sites where a potential ground gas issue is present.

BS8485:2015+A1:2019 and CIRIA C665 is the current guidance which gives up-to-date advice on all aspects of ground gas. It outlines good practice in investigation, the collection of relevant data and monitoring programmes in a risk-based approach to gas contaminated land. Two semi-quantitative methods are set out for the assessment of risk:

1. For low rise housing with a ventilated under floor void at minimum 150 mm (Boyle and Witherington);
2. For all other development types (Wilson and Card).

Both methods use the concept of Gas Screening Values (GSVs) to identify levels of risk. The mitigation and management of potentially unacceptable risk is described with reference to both passive and active systems of gas. Source removal is also discussed as an option.

CIRIA C665 and the advice it contains has been prepared to be generally consistent with CLR11 *Model Procedures for the management of land contamination* (Defra and Environment Agency, 2004a). The aim of CIRIA C665 is a consistent approach to decision making, particularly relating to the scope of protective design measures on a site specific basis.

Legislative Framework
CIRIA C665 provides technical guidance however also recognises the context into which the guidance has to be employed. Government policy is based upon a "suitable for use approach", which is relevant to both the current and proposed future use of land. When considering the current use of land, Part IIA of the Environment Protection Act 1990 provides the regulatory regime. The presence of hazardous ground gases could provide the "source" in a "pollutant linkage" which could lead the regulator to determine that considerable harm or there is a significant possibility of such harm being caused. Under such circumstances, the regulator would determine the land to be "contaminated land" under the provisions of the Act, setting out the process of remediation as described in the DETR Circular 02/2000 *Statutory guidance on contaminated land* (DETR, 2000a).

Frequency and Duration of Monitoring
The monitoring period for a specific site covers the "worst case" scenario. A "worst case" scenario will occur during falling atmospheric pressure and, in particular, weather conditions such as rainfall, frost and dry weather.

The benefits of the additional information and whether it is likely to change the scope of gas protection should be considered, as are the consequences of failing to characterise adequately pollutant linkages. Investigations concerned with soil gas are required to provide monitoring data sufficient to allow prediction of worst case conditions enabling the confident assessment of risk and subsequent design of appropriate gas protection schemes. Monitoring programmes should not be an academic exercise in data collection.

Below are matrices that will aid in determining an appropriate number of gas monitoring visits and the length of monitoring period.

Typical/idealised periods of monitoring

		Generation of Potential Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	1 month	2 months	3 months	6 months	12 months
	Moderate (Flats)	2 months	3 months	6 months	12 months	24 months
	High (Residential with Gardens)	3 months	6 months	6 months	12 months	24 months

Gravesham Borough Council

Typical/idealised frequency of monitoring

		Generation of Potential Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	4	6	6	12	12
	Moderate (Flats)	6	6	9	12	24
	High (Residential with Gardens)	6	9	12	24	24

Note

1 NHBC guidance also recommends this period of monitoring (Boyle and Witherington, 2007).
2 There is no industry consent over "high", "medium" or "low" generation potential of source.
3 At least two sets of readings should be at low and falling atmospheric pressure (but not restricted to periods below <1000 mb) known as worst case conditions. Historical data can be used as part of the data set (Table 5.5b).

It is recommended that newly installed monitoring wells are left for 24 hours to allow the soil gas to reach equilibrium. It should be recognised, however, that some soil gas regimes could take considerably longer (up to seven days). Interpretation of any initial readings should take this equilibrium process into account.

Gravesham Borough Council

Contaminated Land Screening Values

In assessing the potential for contamination Brownfield Solutions Limited (BSL) follows UK guidance and current best practice.

General
The current recommended method for assessing contamination is on the basis of:

Source-Pathway-Receptor

Where any one of these "pollution linkages" is absent there is deemed to be no risk.

Fundamentally receptors can be considered as humans and controlled waters (surface and ground waters).

The purpose of using Tier 1 screening levels is to have a simple means of assessing the potential contamination of a site and to inform decisions on whether further investigation is warranted or whether an option to undertake clean up based on the data to hand is cost effective.

Human Health
Current UK guidance is provided by DEFRA and the Environment Agency (EA). Publications forming part of the guidance include; CLEA Model, toxicological reports and soil guideline values (SGV), collectively referred to as the CLEA Guidance. The CLEA Guidance has included a number of publications which have provided initial screening values for soil contamination based on standard land uses and soil assumptions.

CLEA guidance has gone through a number of revisions, all of the original SGV's that were published have been withdrawn and publication of new SGV's commenced in 2009.

For determinands where no SGVs are available, S4UL values have been published using the CLEA 1.06 Model. These are the third set of generic assessment criteria generated by CIEH, and replace the previous two sets of GACs. The revised S4UL values are based on greater knowledge of relevant toxicology and further consideration of exposure frequencies.

No SGV or S4UL is available for lead as this is derived based on blood lead levels. C4SL values for six determinands including lead was published by DEFRA/CL:AIRE in December 2014 and they represent a low risk as opposed to minimal risk. The C4SL values are based on a sandy loam with 6% Soil Organic Matter. These screening values were published by DEFRA for Part 2A use, although with the dual purpose for use under planning. However these have not been officially accepted by Local Government for use under planning. S4ULs remain the first reference due to the broader range of end uses and soil organic content.

The preference from the EA is that site specific screening levels are used wherever possible. Due to numerous factors it is not always possible to utilise site specific values. In these instances the following data sources are used in the order of preference given below:

- CIEH S4UL values (derived by CIEH/LQM)
- DEFRA/CL:AIRE C4SL's
- CL:AIRE GAC values
- Current UK SGV's
- Guidance from other European countries
- Guidance from the outside Europe

Controlled Waters
The European Water Framework Directive (WFD) became UK law in December 2003. It was created to ensure that European countries manage their rivers, groundwater and lakes so that they stay healthy for people and for wildlife.

This is achieved by the use of chemical standards for surface waters and groundwater. These values describe concentrations of chemicals that are not expected to cause harm to environmental organisms or human health, provided they are not exceeded. The same chemical may have several standards for different environmental regimes, and for different protection objectives.

Statutory Standards are set in legislation and if exceeded, this constitutes non-compliance with statutory obligations. European Directives are implemented in England and Wales by corresponding statutory instruments (i.e. regulations). The statutory instruments can be the exact same standards as they appear in the Directive or be more stringent.

A number of non-statutory standards also exist, these are set by various organisations (including the EA) for chemicals that are considered to be of concern, but are not covered by any specific legislation.

Gravesham Borough Council

The chemical standards used in the UK to control impaction of contamination on controlled waters are Environmental Quality Standards (EQS). The EQS's cover a large number of compounds.

Where certain compounds are not covered by the EQS these are commonly compared to the UK Drinking Water Standards (DWS).

Further Assessment

When screening values are exceeded then further consideration is required. This could include the use of simple measures to break the pollution pathway and mitigate the risk, further more detailed investigation, including the deriving of site specific values to better define the risk and to design appropriate remedial measures.

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			Proposed End Use														
			Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
Source	Contaminant	Unit SOM (%)	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
LQM S4UL	Arsenic	mg/kg	37	37	37	40	40	40	640	640	640	79	79	79	170	170	170
LQM S4UL	Cadmium	mg/kg	11	11	11	85	85	85	190	190	190	120	120	120	532	532	532
LQM S4UL	Chromium (III)	mg/kg	910	910	910	910	910	910	8600	8600	8600	1500	1500	1500	33000	33000	33000
LQM S4UL	Chromium (VI)	mg/kg	6	6	6	6	6	6	33	33	33	7.7	7.7	7.7	220	220	220
LQM S4UL	Copper	mg/kg	2400	2400	2400	7100	7100	7100	68000	68000	68000	12000	12000	12000	44000	44000	44000
C4SL	Lead	mg/kg	200	200	200	330	330	330	2300	2300	2300	760	760	760	1400	1400	1400
LQM S4UL	Mercury, Elemental	mg/kg	1.2	1.2	1.2	1.2	1.2	1.2	58	58	58	16	16	16	30	30	30
LQM S4UL	Nickel	mg/kg	180	180	180	180	180	180	980	980	980	230	230	230	3400	3400	3400
LQM S4UL	Selenium	mg/kg	250	250	250	430	430	430	12000	12000	12000	1100	1100	1100	1800	1800	1800
LQM S4UL	Zinc	mg/kg	3700	3700	3700	40000	40000	40000	730000	730000	730000	81000	81000	81000	170000	170000	170000
LQM S4UL	Phenol (total)	mg/kg	280	550	1100	750	1300	2300	760	1500	3200	760	1500	3200	760	1500	3200
LQM S4UL	Acenaphthene	mg/kg	210	510	1100	3000	4700	6000	84000	97000	100000	15000	15000	15000	29000	30000	30000
LQM S4UL	Acenaphthylene	mg/kg	170	420	920	2900	4600	6000	83000	97000	100000	15000	15000	15000	29000	30000	30000
LQM S4UL	Anthracene	mg/kg	2400	5400	11000	31000	35000	37000	520000	540000	540000	74000	74000	74000	150000	150000	150000
LQM S4UL	Benz(a)anthracene	mg/kg	7.2	11	13	11	14	15	170	170	180	29	29	29	49	56	62
LQM S4UL	Benzo(a)pyrene	mg/kg	2.2	2.7	3.0	3.2	3.2	3.2	35	35	36	5.7	5.7	5.7	11	12	13
LQM S4UL	Benzo(b)fluoranthene	mg/kg	2.6	3.3	3.7	3.9	4	4	44	44	45	7.1	7.2	7.2	13	15	16
LQM S4UL	Benzo(ghi)perylene	mg/kg	320	340	350	360	360	360	3900	4000	4000	640	640	640	1400	1500	1600
LQM S4UL	Benzo(k)fluoranthene	mg/kg	77	93	100	110	110	110	1200	1200	1200	190	190	190	370	410	440
LQM S4UL	Chrysene	mg/kg	15	22	27	30	31	32	350	350	350	57	57	57	93	110	120
LQM S4UL	Dibenz(a,h)anthracene	mg/kg	0.24	0.28	0.30	0.31	0.32	0.32	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4
LQM S4UL	Fluoranthene	mg/kg	280	560	890	1500	1600	1600	23000	23000	23000	3100	3100	3100	6300	6300	6400
LQM S4UL	Fluorene	mg/kg	170	400	860	2800	3800	4500	63000	68000	71000	9900	9900	9900	20000	20000	20000
LQM S4UL	Indeno(1,2,3,cd)pyrene	mg/kg	27	36	41	45	46	46	500	510	510	82	82	82	150	170	180
LQM S4UL	Naphthalene	mg/kg	2.3	5.6	13	2.3	5.6	13	190	460	1100	4900	4900	4900	1200	1900	3000
LQM S4UL	Phenanthrene	mg/kg	95	220	440	1300	1500	1500	22000	22000	23000	3100	3100	3100	6200	62000	6300
LQM S4UL	Pyrene	mg/kg	620	1200	2000	3700	3800	3800	54000	54000	54000	7400	7400	7400	15000	15000	15000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 5 - 6	mg/kg	42	78	160	42	78	160	3200	5900	12000	570000	590000	600000	95000	130000	180000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 6 - 8	mg/kg	100	230	530	100	230	530	7800	17000	40000	600000	610000	620000	150000	220000	320000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 8 - 10	mg/kg	27	65	150	27	65	150	2000	4800	11000	13000	13000	13000	14000	18000	21000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 10 - 12	mg/kg	130	330	760	130	330	770	9700	23000	47000	13000	13000	13000	21000	23000	24000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 12 - 16	mg/kg	1100	2400	4300	1100	2400	4400	59000	82000	90000	13000	13000	13000	25000	25000	26000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 16 - 35	mg/kg	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 35 - 44	mg/kg	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 5 - 7	mg/kg	70	140	300	370	690	1400	26000	46000	86000	56000	56000	56000	76000	84000	92000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 7 - 8	mg/kg	130	290	660	860	1800	3900	56000	110000	180000	56000	56000	56000	87000	95000	100000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 8 - 10	mg/kg	34	83	190	47	110	270	3500	8100	17000	5000	5000	5000	7200	8500	9300
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 10 - 12	mg/kg	74	180	380	250	590	1200	16000	28000	34000	5000	5000	5000	9200	9700	10000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 12 -16	mg/kg	140	330	660	1800	2300	2500	36000	37000	38000	5100	5100	5000	10000	10000	10000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 16 - 21	mg/kg	260	540	930	1900	1900	1900	28000	28000	28000	3800	3800	3800	7600	7700	7800
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 21 - 35	mg/kg	1100	1500	1700	1900	1900	1900	28000	28000	28000	3800	3800	3800	7800	7800	7900
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 35 - 44	mg/kg	1100	1500	1700	1900	1900	1900	28200	28200	28200	3800	3800	3800	7800	7800	7900
LQM S4UL	Benzene	mg/kg	0.087	0.17	0.37	0.38	0.7	1.4	27	47	90	72	72	73	90	100	110
LQM S4UL	Toluene	mg/kg	130	290	660	880	1900	3900	56000	110000	180000	56000	56000	56000	87000	95000	100000
LQM S4UL	Ethyl Benzene	mg/kg	47	110	260	83	190	440	5700	13000	27000	24000	24000	25000	17000	22000	27000
LQM S4UL	Xylene - o	mg/kg	60	140	330	88	210	480	6600	15000	33000	41000	42000	43000	17000	24000	33000
LQM S4UL	Xylene - m	mg/kg	59	140	320	82	190	450	6200	14000	31000	41000	42000	43000	17000	24000	32000
LQM S4UL	Xylene - p	mg/kg	56	130	310	79	180	430	5900	14000	30000	41000	42000	43000	17000	23000	31000
CL:AIRE 2010	MTBE (methyl tert-butyl ether)	mg/kg	49	84	160	49	84	160	7900	13000	24000	49	84	160	49	84	160
LQM S4UL	Chloroethene (Vinyl Chloride)	mg/kg	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4
LQM S4UL	1,2-Dichloroethane (1,2-DCA)	mg/kg	0.0071	0.011	0.019	0.0092	0.013	0.023	0.67	0.97	1.7	29	29	29	21	24	28
LQM S4UL	1,1,1-Trichloroethane	mg/kg	8.8	1.8	39	9	18	40	660	1300	3000	14000	14000	14000	57000	76000	100000
LQM S4UL	1,1,2,2-Tetrachloroethane	mg/kg	1.6	3.4	7.5	3.9	8	17	270	550	11000	1400	1400	1400	1800	2100	2300
LQM S4UL	1,1,1,2-Tetrachloroethane	mg/kg	1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	1400	1400	1400	1500	1800	2100
LQM S4UL	Tetrachloroethene (PCE)	mg/kg	0.18	0.39	0.9	0.18	0.4	0.92	19	42	95	1400	1400	1400	810	1100	1500
LQM S4UL	Tetrachloromethane (carbon tetrachloride)	mg/kg	0.026	0.056	0.13	0.026	0.056	0.13	2.9	6.3	14	890	920	950	190	270	400

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			Proposed End Use														
Source	Contaminant	Unit	Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
		SOM (%)	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
LQM S4UL	Trichloroethene **(TCE)**	mg/kg	0.016	0.034	0.075	0.017	0.036	0.08	1.2	2.6	5.7	120	120	120	70	91	120
LQM S4UL	Trichloromethane (chloroform)	mg/kg	0.91	1.7	3.4	1.2	2.1	4.2	99	170	350	2500	2500	2500	2600	2800	3100
LQM S4UL	Chlorobenzene	mg/kg	0.45	1	2.4	0.46	1	2.4	56	130	290	11000	13000	14000	1300	2000	2900
LQM S4UL	1, 2 Dichlorobenzene	mg/kg	23	55	130	24	57	130	2000	4800	11000	90000	95000	98000	24000	26000	51000
LQM S4UL	1, 3 Dichlorobenzene	mg/kg	0.4	1	2.3	0.44	1.1	2.5	30	73	170	300	300	300	390	440	470
LQM S4UL	1, 4 Dichlorobenzene	mg/kg	61	150	350	61	150	340	4400	10000	25000	17000	17000	17000	26000	36000	36000
LQM S4UL	1, 2, 3 Trichlorobenzene	mg/kg	1.5	3.6	8.6	1.5	3.7	8.8	102	250	590	1800	1800	1800	770	1100	1600
LQM S4UL	1, 2, 4 Trichlorobenzene	mg/kg	2.6	6.4	15	2.6	6.4	15	220	530	1300	15000	17000	19000	1700	2600	4000
LQM S4UL	1, 2, 3, 4 Trichlorobenzene	mg/kg	0.33	0.81	1.9	0.33	0.81	1.9	23	55	130	1700	1700	1800	280	580	860
LQM S4UL	1, 2, 3, 4 Tetrachlorobenzene	mg/kg	15	36	78	24	56	120	1700	3080	4400	830	830	830	1500	1600	1600
LQM S4UL	1, 2, 3, 5 Tetrachlorobenzene	mg/kg	0.66	1.6	3.7	0.75	1.9	4.3	49	120	240	78	79	79	110	120	130
LQM S4UL	1, 2, 4, 5 Tetrachlorobenzene	mg/kg	0.33	0.77	1.6	0.73	1.7	3.5	42	72	96	13	13	13	25	26	26
LQM S4UL	Pentachlorobenzene	mg/kg	5.8	12	22	19	30	38	640	770	830	100	100	100	190	190	190
LQM S4UL	Hexachlorobenze	mg/kg	1.8	3.3	4.9	4.1	5.7	6.7	110	120	120	16	16	16	30	30	30

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See LQM/CIEH S4ULs for Human Health Risk Assessment document for notes regarding derivation.

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Re-Use Of Waste - Guidance Note

Definition of Waste
The Environment Agency considers waste to be *"...any material that is discarded, or intended to be discarded..."* This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

CL:AIRE: Code of Practice
Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. This can be implemented under the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE DoWCoP), also commonly referred to as a "Materials Management Plan".

The developer/contractor is advised to complete all works under the DoWCoP.

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment.
- Material capable of being used in another place on the same site following ex-situ treatment on site.
- Material capable of being used in another development site without treatment (Direct Transfer).
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site.

The Code of Practice requires 4 No. Factors to be addressed:

1. Protection of human health and protection of the environment.
2. Suitability of use, without further treatment.
3. Certainty of use.
4. Quantity of material.

In order to satisfy these requirements the following are required:

i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
v) Volume calculations.
vi) Planning permission for the development.
vii) Contractual details to be clear, regarding who steps in is a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.
Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.
Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

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Waste Classification For Soils

Introduction
Waste producers have a duty of care to classify the waste they are producing:

- before it is collected, disposed of or recovered.
- to identify the controls that apply to the movement of the waste.
- to complete waste documents and records.
- to identify suitably authorised waste management options.
- to prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal
In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept **hazardous**, **non-hazardous** or **inert** wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification
Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not i.e the hazard assessment. The most common EWC waste codes related to soil are:

17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, oil,) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on specific "hazardous properties" which include hazards such as carcinogenicity, flammability and toxicity.

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In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations**.

Waste Definitions

Inert	• Will not undergo any significant physical, chemical or biological transformations. • Will not dissolve. • Will not burn. • Will not physically or chemically react. • Will not biodegrade. • Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. • Has insignificant total leachability and pollutant content. • Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste#	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents either: in the waste alone (for example, by biodegradation), under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints) or by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that is stable and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. If the waste has any disposal route other than a landfill site (e.g. recycling facility, incineration etc) the **WAC is not relevant.** Furthermore the WAC limits **cannot be used to make an assessment of whether a waste is hazardous**. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations[1]	Non-Hazardous Waste		Hazardous Waste	
WAC testing	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous WAC limit values
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill[2]	HAZARDOUS landfill	PRE-TREATMENT[3]

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

Hydrocarbons in Soils
WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However hydrocarbons in soils are a mixture rather than a pure product and are therefore not absolute entries.

Known Oils
The simplest scenario is where the identity of the contaminating oil is known or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs

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to provide an interpretation of the chromatograph to determine if it is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils

Where hydrocarbons are contaminating soils it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

> For contaminated land specific consideration must be given to the following before proceeding;
>
> - The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in WM3 example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
> - The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of **marker compounds** is optional; however it is recommended that where possible the marker compounds should be used. WM3 states:

> If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:
>
> - The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
> - This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D of WM3, and
> - The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land" 2009.
3. Environment Agency "Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria" Nov 2010.
4. Environment Agency "Guidance on the classification and assessment of waste (Technical Guidance WM3)".
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).
6. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
7. 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament
8. Environmental Permitting Guidance The Landfill Directive For the Environmental Permitting (England and Wales) Regulations 2010 Updated March 2010 Version 3.1
9. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

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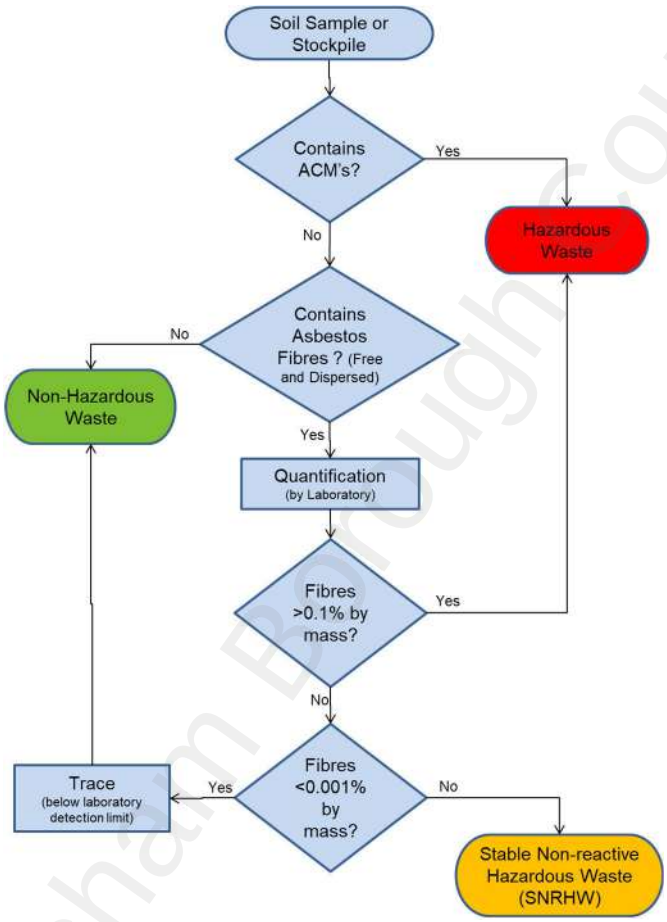
Additional Asbestos Guidance Notes

Disposal
The 1st Edition of WM3 "Guidance on the classification and assessment of waste", details the way in which Asbestos is assessed within soils.

The assessment of asbestos containing waste is dependent on whether the asbestos is present as:

- Fibres that are free and dispersed, or
- Identifiable pieces of asbestos containing materials (ACM's)



Identifiable pieces of asbestos are any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. The result is that commonly soils with visible ACM's are sorted and the ACM's removed by hand picking and separate disposal.
Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site[1]. These levels are often termed "trace" by laboratories.
Asbestos concentrations between 0.001% and 0.1% are stable non-reactive hazardous waste (SNRHW)[1]. Waste transfer stations where soil recycling takes place may be able to take SNRHW, but are unlikely to take soils containing asbestos above trace concentrations.
The following codes should be assigned to the asbestos waste as appropriate:

17 06	**Insulation materials and asbestos-containing construction materials**
17 06 01	Insulation materials containing asbestos
17 06 03	Other insulation materials consisting of or containing hazardous substances
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05	Construction material containing asbestos

WM3 indicates that 17 06 05 would normally be used in preference to 17 06 01 for the asbestos in asbestos contaminated soil and stones.

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Construction materials containing asbestos and "*other suitable materials*" may be landfilled at landfills for non-hazardous waste in accordance with the Landfill Directive without testing.

This means that wastes that are only hazardous because of their asbestos content can be disposed of at landfills for non-hazardous waste in separate landfill cells that only accept asbestos wastes and other suitable materials. The Landfill Directive requires that stable non-reactive hazardous waste shall not be deposited with biodegradable waste (for example organic material, household waste, paper etc..) and must meet the waste acceptance criteria set out in accordance with Annex II.

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether or not the work is licensed or notifiable non-licensed work and may require an Asbestos Management Plan. Work becomes notifiable if it is considered that the control limit could be exceeded.

Brownfield sites frequently have soils that contain asbestos and the presence of asbestos needs to be considered within the context of construction, particularly in relation to groundworks. The exposure of soils and the use of excavators and plant to move soil around increases the possibility of fibres becoming airborne. However it is good site practice to not generate dusts and to employ dust suppression on all sites regardless of the presence of asbestos.

The legal control limit for asbestos is 0.1f/ml over a continuous four hour period. The control limit is not a '*safe*' level and exposure from work activities involving asbestos must be reduced to as far below the control limit as possible.

Clearly the higher the concentrations in the soil the greater potential there is for fibres to be released, however IOM publication TM/88/14 "the release of dispersed asbestos fibres from soil" 1988 concludes that:

- Mixtures of asbestos in dry soils with asbestos content as low as 0.001% can produce airborne respirable asbestos concentrations greater than 0.1f/ml in dust clouds where the respirable dust concentrations are less than 5mg/m^3.
- An action limit is recommended of no higher than 0.001% asbestos in soils above which steps should be taken to minimise exposure to airborne fibres (eg by wetting).
- The addition of relatively small quantities (10%) of water can reduce the airborne fibre concentrations by an order of magnitude.

Where asbestos has been identified at concentrations above 0.001% as free and dispersed fibres in the soil precautions need to be adopted. Concentrations below this are considered to be normal background, although good site practice dictates that the generation of dusts should be avoided and therefore any fugitive fibre release from minor concentrations should be kept to a practical minimum.

End Use

The use of materials containing asbestos and material containing asbestos is prohibited under EU legislation. There is currently a Joint Industry Working Group (JIWG) tasked with producing a Code of Practice for Asbestos in Soil, Made Ground and Construction & Demolition Material that will clarify in due course the position of the various government agencies.

Asbestos containing materials can remain in situ under a suitable cover system which may be hardsurfacing or soft landscaping (with or without hard dig layers and markers).

There is a risk that future maintenance may compromise such systems and details of the presence of asbestos should be kept in the Health and Safety File.

Preliminary publications from JIWG (April 2015) provide guides for decision making in relation to construction. These are at a "Beta" test stage and further publications will be provided in due course.

The re-use of waste soils should be undertaken in accordance with the CL:AIRE Code of Practice and is subject to suitable risk assessments demonstrating low risk . There is nothing that specifically excludes the re-use of soils containing asbestos as fill to raise levels. However the movement of materials increases the risk of fibres becoming airborne and suitable precautions will be required.

The re-use of soils containing asbestos at concentrations above hazardous waste levels is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be feasible where there is a long program for implementation.

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APPENDIX B

Explosive Ordnance Desk Top Study

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EOD Contracts Ltd

International Unexploded Ordnance Risk Mitigation

Many People...
...One Aim

EXPLOSIVE ORDNANCE DESK TOP STUDY FOR:

VALE ROAD, NORTHFLEET, KENT

PROJECT 19152

BROWNFIELD SOLUTIONS

Institute of Explosives Engineers
VOICE OF THE EXPLOSIVES INDUSTRIES

www.eodcontractsltd.com | Tel: 01926 485708

EXPLOSIVE ORDNANCE DESK TOP STUDY

Of

Vale Road, Northfleet, Kent

Conducted by EOD Contracts Limited

On behalf of

Brownfield Solutions

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Gravesham Borough Council

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TERMS AND DEFINITIONS

Anti Aircraft Shells (AA)

Small High Explosive Shells (HE) shells ranging up to 100mm in diameter.

Air Raid Precautions (ARP)

An organisation in the United Kingdom set up in 1937 dedicated to the protection of civilians from the danger of air raids. It included the Raid Wardens' Service that was to report on bombing incidents.

Battlefield Area Clearance (BAC)

The systematic clearance of munitions from military property or old battle sites e.g. ranges, airfields etc.

Borehole Search

The placing of boreholes in a set pattern, then using a magnetometer to take readings at specific depths along each borehole. When used with a geophysical survey system this will give a magnetic signature of the area. The depth of the borehole and the pattern will depend upon the type of Unexploded Bombs (UXB) and the geology of the ground.

Doodle Bug (See Pilotless Aircraft)

Explosive Ordnance (EO)

All munitions containing explosives, nuclear fission/fusion materials and or biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and Small Arms Ammunition (SAA); all mines, torpedoes and depth charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices (IED); and all similar or related items or components explosive in nature.

Explosive Ordnance Clearance (EOC)

See BAC.

Explosive Ordnance Disposal (EOD)

The detection, identification, field evaluation, render safe, recovery and disposal of **UXO**.

Geophysical Survey

The survey of an area using a Magnetometer and geophysical gathering device, after interpretation, this will produce a geophysical map and an object list for any metallic anomalies.

High Explosive (HE)

High explosives burn/detonate at rates of up to 9,000 m/per second.

Incendiary Bomb (IB)

Incendiary bombs ranged from 1kg in size to 500kg the larger sizes were sometimes called Oil Bombs. Fills range from thermite mixtures, phosphorus to kerosene.

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Intrusive Survey

The use of a cone penetrometer (MagCone) or drilled boreholes (MagDrill) to take magnetometer test in a set pattern (see borehole search), or to prove pile positions.

Land Service Ammunition (LSA)

LSA is defined as "All items containing explosives or pyrotechnic compounds which are placed, thrown or projected so as to cause damage to men and equipment during land warfare.

Long Range Rocket (LRR)

The long range rocket sometimes codenamed Big Ben is the V2 rocket designed to deliver an approximate payload of 1000 kg.

Oil Bomb (OB)

A bomb containing a flammable liquid, normally the KC 250 Flam or the C 500 flam.

Pilot less Aircraft (PAC)

A flying bomb (Fly) or doodlebug is the V1 rocket or predecessors designed to deliver an explosive payload of approximately 500kg - 800kg.

Parachute Mine (PM)

Air dropped mine may have been used as a blast effect bomb maximum explosive content 1600lb always fitted with anti-handling and anti-stripping equipment.

Unexploded Bomb (UXB)

Any air dropped bomb that has failed to operate.

Unexploded Ordnance (UXO)

Explosive ordnance that has been primed, fused, armed or otherwise prepared for use or used. It may have been fired, dropped, launched or projected yet remains unexploded either through malfunction or design or for any other cause.

Vengeance Weapons (V)

V1 see Pilot less Aircraft.
V2 see Long Range Rocket.

WWI

World War 1 (1914 – 1918)

WWII

World War 2 (1939 – 1945)

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EXECUTIVE SUMMARY

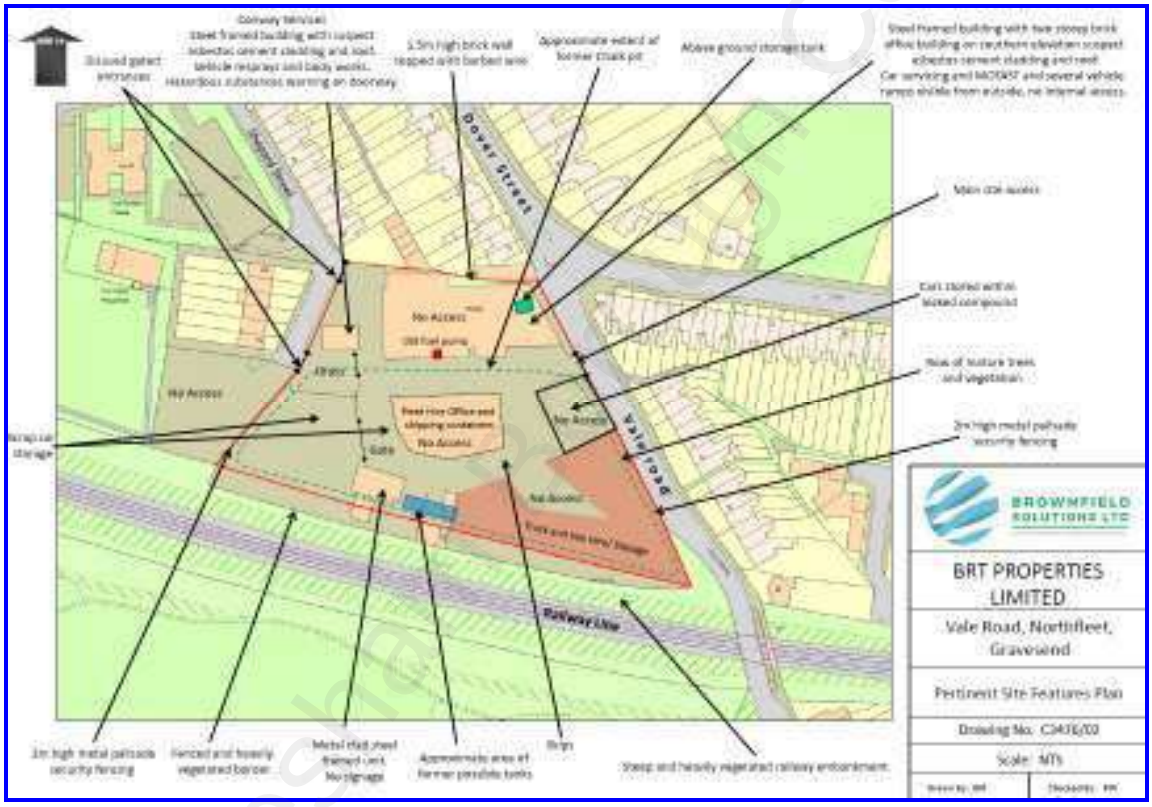
INSTRUCTION

EOD Contracts Ltd, have been commissioned by Brownfield Solutions to undertake a desktop study for potential historic Unexploded Ordnance (UXO) contamination for the future works at Vale Road, Northfleet, Kent (The Site).

Scope of Work

The scope of this EO Risk Assessment/Desk Study is to assess the likelihood of buried EO/UXO within the environs of The Site (See Figure 1), in view of further development. A further aim was to evaluate the implication from UXO contamination during any future intrusive land use.

Figure 1**:** Clients Supplied Site Diagram, This DTS will be covering all areas shown within the Boundary.



LOCATION

The site is located in Northfleet a town in the Gravesham Borough of Kent. During WWII the site was located within the Air Raid Precautions reporting area Region (12) South Eastern Region HQ Tunbridge Wells.

Table 1 Site Location

Title	Description (Centre of Site)
Address	Vale Road, Northfleet, Kent
Post Code	DA11 9QQ
Grid Reference	TQ6276573615
OS (X)	562765
OS (Y)	173615

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SOURCES OF UXO CONTAMINATION

The main sources of UXO contamination that have been researched and are deemed a threat to the site are:

- Air delivered ordnance bombs and sub-munitions/incendiaries
- Anti Aircraft Ammunition (AA)
- Military Usage

KEY FINDINGS

Based on the information researched by EOD Contracts Ltd for the proposed scope of works being carried out within the given site area, the following conclusions have been reached:

Historical UXO Contamination

The indications of UXO contamination are:

Bomb Strikes	The area has reports of bombs to the south and north of the site, the actual locations are not specific
Bomb Damage	Possible scarring which may or may not be bomb craters can be seen in the aerial photographs
Reconstruction	Limited development, possible backfilling of the chalk pit, as this was carried out prior to 1952, there is a possibility of Blitz-Rubble being used
Military Usage	None was noted on the site

Risk Level

The overall risk has been determined to apply to all ground works within the site footprint.

Risk Level	The risk level on site is **MEDIUM** and given that some UXO retains the potential to detonate if disturbed with possible severe consequences, it is concluded that it would be prudent to ensure that basic precautions are taken to ensure that the project can proceed in the safest possible manner and that any residual risk posed by UXO is as low as it is reasonably practical to achieve (ALARP).
Risk Depth	The expected bomb depth is 12m below 1939 ground level, the depth of the chalk pit is unknown and this should be taken into consideration

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RECOMMENDATIONS

It is recommended that the following risk mitigation strategy is executed during all Phases of the project:

Communicating the risks, all stakeholders should be made aware of the UXO situation on the site and the possible impact it may have on the project works and day to day running of the district. Clients have a legal duty under the Construction Design & Management Regulations (CDM) and Health & Safety at Work legislation to provide Designers and Contractors with project specific information needed to identify hazards and risks associated with the design and construction work. The possibility that UXO may be encountered on site falls within the category of a significant risk and as such it should be addressed as early as possible in the lifecycle of the project.

Further planning; the risks posed by UXO should be brought to the attention of the Project Principal Designers and other individuals with a responsibility for project safety and operations at the site. The matter of UXO should be considered critical to project safety and one requiring high priority action.

UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. A competent person as part of the project safety induction course should provide the awareness training. It should be reinforced with specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.

Project overview and the responsibilities of those working on site with regard to duty of care and public safety.

UXO recognition and safety procedures to be followed on discovery of a suspicious object or the alarm being sounded.

Emergency procedures to be followed in the event of an explosion. Evacuation routes, muster stations and accounting for personnel.

Work permits, works methodology and specific UXO risk mitigation methods. Post-incident inspections and returning to normal works.

Prior to any intrusive piling or drilling commencing, UXO safety testing and appropriate clearance certification into the ground to sufficient depth to provide clearance from UXO. This can be done using a progressive drilling process or (where large numbers of piles are to be placed and ground permitting) using a vehicle borne hydraulic system to push a magnetometer into the ground to test for the presence of UXO prior to piling.

UXO safety monitoring of all “at risk” excavations, including geotechnical or archaeological trial pits to be conducted during the project. This should be provided by a UK Home Office Authorised EOD/UXO Contractor using qualified EOD Engineer with specialist locators and detectors to scan the ground ahead of the excavation wherever possible.

Specifically

- Geotechnical investigations, percussive drilling/trial pits/window/samples, require an EOD Engineer over watch

- New foundations with piling should be mitigated by the insertion of a magnetometer to encompass the pile position, this would be carried out using a CPT rig (magcone), the expected radius of the magcone is 1.5m therefore multiple piles could be checked

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- Non-Intrusive Magnetometer surveys generally prove inconclusive on “Brownfield sites”, this is due to the high ferromagnetic background, this methodology is not recommended for this site, therefore shallow excavations should be overseen by an EOD Engineer

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EOD Contracts Ltd can supply a turnkey solution to your UXO requirements. Therefore, the following mitigation strategies can be supplied for land or water based operations:

Intrusive survey using CPT *(Cone Pressure Testing)* or borehole equipment, *supplying risk mitigation to all Borehole and Pile locations, down to a maximum bomb penetration depth determined within this document.*

Non-Intrusive Survey using multiple array system with DGPS *(Differential Global Positioning System).*

Offshore, near-shore, estuarine and freshwater water environments magnetic, side scan and bathymetric supported by state of the art DGPS.

The aforementioned surveys are supported with post processing of data and intrusive investigations if required.

EOD Engineer over watch using Suitably Qualified and Experienced Personnel, normally former British Army, Navy or RAF Bomb Disposal specialists.

Explosive Ordnance Safety Presentations.

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PART 1: INTRODUCTION

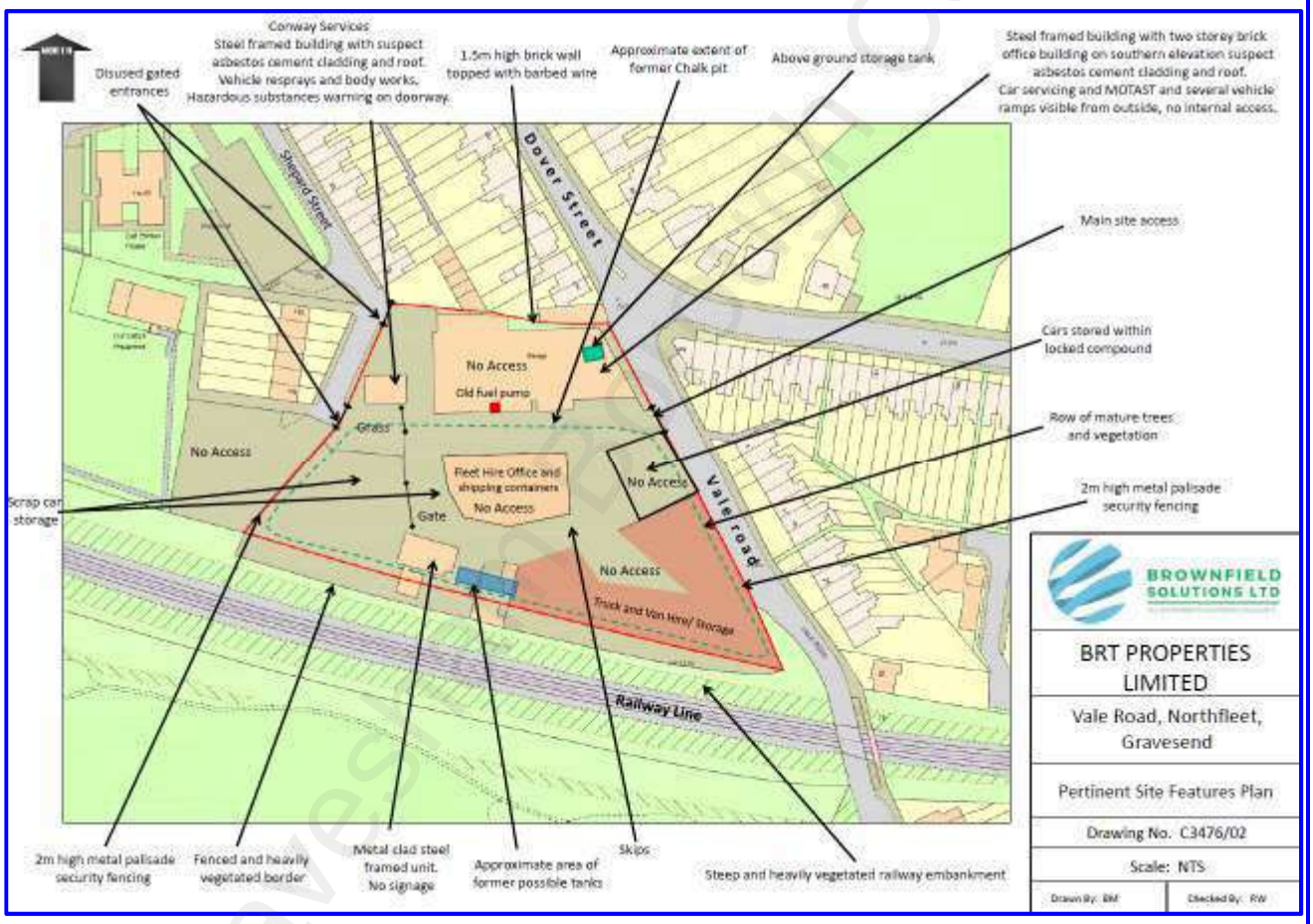
Instruction

EOD Contracts Ltd, have been commissioned by Brownfield Solutions to undertake a desktop study for potential historic Unexploded Ordnance (UXO) contamination for the future works at Vale Road, Northfleet, Kent (The Site).

Scope of Work

The scope of this EO Risk Assessment/Desk Study is to assess the likelihood of buried EO/UXO within the environs of The Site (See Figure 1.1), in view of further development. A further aim was to evaluate the implication from UXO contamination during any future intrusive land use.

Figure 1.1: Clients Supplied Site Diagram, This DTS will be covering all areas shown within the Boundary.



Restrictions

It must be emphasized that a desk study can only indicate the potential for UXO to be present on the site.

This study was written with the site conditions prevailing at the time of the study and no liability can be accepted for any change in the condition of the area.

Please note that our appraisal relies on the accuracy of the information contained in the documents consulted and that EOD Contacts Ltd will in no circumstances be held responsible for the accuracy of such information or data supplied.

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Sensitive Documentation

Information may be classified, restricted or deemed to be confidential in nature to EOD Contracts Limited, where such material has been gained a summary of the documentation has been approved.

Objective

The objective of this document is to define the UXO contamination routes as defined in Unexploded ordnance (UXO) A guide for the construction industry (C681) dated July 2009 and offer remediation methodologies if required.

CIRIA Frame Work

The CIRIA report is intended to provide good practice guidance (code of practice) on how to identify whether a site is likely to be at significant risk of UXO encounter and, if so, to set-out a process that will allow this risk to be managed. To be effective this process must start early in the life of the project (usually before intrusive works commence) and have involved Clients, Advisors and Principle Contractors. Therefore, the ground contractor should be provided with a systematic appraisal of the UXO risk when they become involved. The CIRIA report recommends the following stages be undertaken as part of the risk management process:

- Phase 1 Preliminary Risk Assessment
- Phase 2 Detailed Risk Assessment (Completed and updated in this document)
- Phase 3 Risk Mitigation (The act of ameliorating the risk, the clearance methodology)
- Phase 4 The UXO Risk Management and Implementation Plan

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PART 2: SOURCES OF INFORMATION

Research of the site's history, with regard to military usage, bombing raids and bomb impacts has been undertaken to establish the following:

- Frequency and intensity of enemy bombing raids for the site and immediate vicinity up to 500m.
- Bomb impacts and associated damage on the Site and in the immediate vicinity.
- The potential for UXO to remain on the Site and in the vicinity.
- Records of UXO removal activities for the Site and immediate vicinity.
- The main sources of information consulted include:
- EOD Contracts Ltd company records
- Ministry of Defence records
- Central and Local Government Records
- Public Records Office (Kew)
- Historic Maps and Air Photography
- Open Source information (Internet)

Ministry of Defence (MOD) Records

33 Engineer Regiment (Explosive Ordnance Disposal) Royal Engineers is the unit responsible for maintaining the records concerning conventional Bomb incidents, reports, clearances and related UXO matters. These records are known to be incomplete and are no longer supplied. Based on in-house information released by the MOD previously, it is considered unlikely that any information released will have any significant impact on the findings of this study.

Attack Record Keeping

In general, the quality and accuracy of bombing and shelling records prior to 1942 varied greatly from one region to another. Records relating to the limited air attacks on the United Kingdom are considered to be sufficiently accurate in urban areas to provide a reasonable level of confidence in determining the likelihood that an area was or was not bombed during this period. Wartime records, maps etc held within the civil archives are considerably more comprehensive than those still in existence within the MOD, where it is acknowledged that large numbers of records have been disposed of since 1945. Records from some areas, particularly rural districts or near large bodies of water should still be regarded as an incomplete picture of the extent and effect of the bombing campaign.

Attack Record Accuracy

While an Air Raid was in progress it was inevitable that mistakes would be made in the transcription of rushed verbal reports into the written records. Discrepancies did occur between the total of bombs dropped against detonations witnessed. In some cases records were made several hours after the event and mistakes were inevitable. Some reports were drafted before the full extent of the raid had been determined which has led to significant omissions in the records. Reports of raids on rural

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areas were often witnessed and submitted by untrained individuals and passed through third parties before being recorded. Suspect UXBs occasionally went unreported by local farmers and freeholders who saw the event as insignificant, or were reluctant to report their findings for fear of valuable land or crops being destroyed by the authorities in their attempts to find the UXB. It should also be noted that bomb strikes in water were notoriously difficult to spot, particularly if the bomb had failed to detonate. As a result bomb record accuracy in areas containing large bodies of water or marshland is considered to be questionable.

Errors and Omissions

The accuracy of bombing records has been shown to vary greatly; this may have been a result of the individual record keeper's expertise. Additionally, in some cases, errors occurred as a result of poor or incomplete transcription and copying. Some "errors and omissions" were intentional, designed to serve as dis-information to confuse German intelligence. So long after the event, official verification of such incidents has often proven to be impossible to obtain. At present, UXBs are found on construction sites and other locations where there had been no documentary evidence to suggest their presence. These events, although infrequent, do serve as confirmation that records cannot be considered definitive.

Bibliography

The significant published documents referred to during this study are listed below:

- HO 193 series from National Archives
- HO 198 series from National Archives
- The Blitz Then and Now Volumes 1 to 3
- AA Command Colin Dobinson
- German Air Raids on Britain 1914-1918
- Kent at War Bob Ogley
- Kent War Diary Northfleet
- Kent War Diary Gravesend

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PART 3: SITE DESCRIPTION AND DETAILS

Location

The site is located in Northfleet a town in the Gravesham Borough of Kent. During WWII the site was located within the Air Raid Precautions reporting area Region (12) South Eastern Region HQ Tunbridge Wells.

Table 3.1 Site Location

Title	Description (Centre of Site)
Address	Vale Road, Northfleet, Kent
Post Code	DA11 9QQ
Grid Reference	TQ6276573615
OS (X)	562765
OS (Y)	173615

Description and Current Usage

The site boundaries are to the east is Vale Road, to the south is a Railway Line, to the west is Shepherd Street and to the north is residential properties. At present the site is occupied by a garage (service centre) and other small buildings, the majority of the area appears to be open ground.

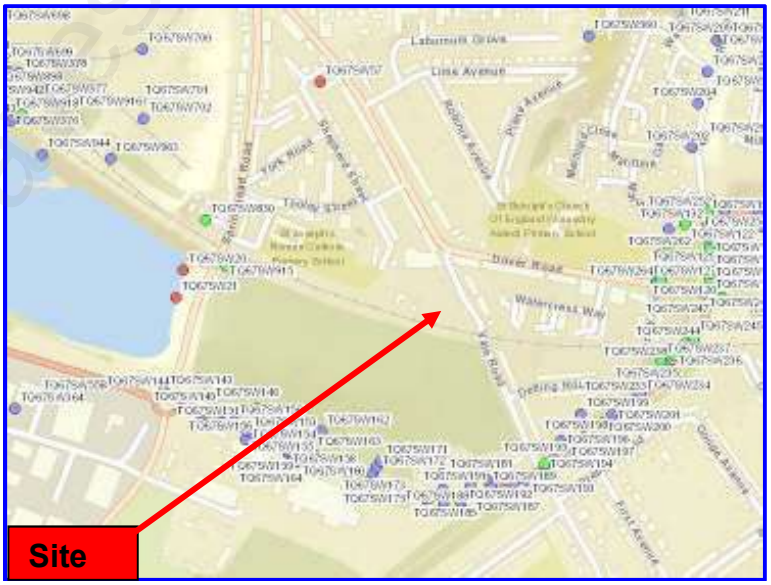
Geology

BGS (British Geological Survey) nearest borehole see Figure 3.1 indicates the following geology:

Table 3.2 Geology

Geological Unit Description	Anticipated Thickness (m)	Anticipated Depth (m bgl)
Made Ground	5	5
Chalk	20	25

Figure 3.1 Borehole Location



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Future Works

At the time of writing this report it is understood that the site will be redeveloped (the exact scope of works is not known at this time). Therefore, it is assumed that the following intrusive construction works will be carried out:

- Geotechnical investigations, percussive drilling/trial pits/window/samples
- Foundations with possible piling
- Services trenching
- Open Excavations

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PART 4: HISTORICAL REVIEW

Historical Mapping and Aerial Photography

The air photograph and historical maps in Annex B indicate that the area was a chalk pit with a building in the north of the site, post WWII the majority of the chalk pit has been infilled, with some small structures in the centre of the site.

The 1945 aerial photograph shows the site is mostly open excavation, with a building to the north. The present configuration of buildings has not greatly changed since the 1960 aerial photograph.

The area has been assessed for bomb damage using the photographs and maps, some scoring of the ground, however this could be due to the chalk pit.

The chalk pit has been backfilled it is unknown as to the exact date, however mapping indicates this was carried out prior to 1952, it was not uncommon to dispose of blitz-rubble in this manner.

WWI

Although many people associate wartime bombing with The Blitz during World War II, the first airborne terror campaign in Britain took place during the First World War. Air raids in World War One caused significant damage and took many lives. German raids on Britain, for example, caused 1,413 deaths and 3,409 injuries.

Site Specific Bombing Information

The map shown in Annex C indicates the Site was not the subject of bombardment during WWI.

WWII

Bombing started as early as October 1939, by the end of the WWII the Luftwaffe had dropped approximately 50,000tonnes of high explosive bombs and 110,000 tonnes of incendiary bombs, this caused over 40,000 UXBs, killed 43,000 people and over 250,000 homes were destroyed.

Northfleet in the Blitz

On June 6, 1940, Northfleet was subjected to what was believed to be the first incendiary-bomb raid on a built-up area in England. More than 1,100 incendiary bombs were dropped on Northfleet during WWII.

The first bombing incident was 16 August 1940 a number of German aircraft dropped 108 high-explosive bombs on Colyer Road Comprehensive School, the lower end of Waterdales, Preston Road, Detling Road, London Road, and Bowaters Paper Mill, causing much damage.

In all, 29 people were killed, 18 seriously and nine slightly injured. A councillor was killed in his car.

Site Specific Bombing Information

Record of air raids on and in the vicinity of the site have been scrutinized, a bomb impact map is attached in Annex D, the mapping indicates HE bombs were dropped 120m south and 380m north of the site, this bombing incident is poorly recorded and is part of the 106 or 108 bombs dropped on Northfleet in August of 1940.

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A Police report states:

MOORE, GEORGE. Inspector. Special Constabulary. (Gravesend Borough Police).
Died 16 August 1940. Aged 51. Husband of Violet Moore of Glenbrook, Cobham Terrace, Greenhithe, Dartford, Kent. George was off duty when he was injured at Vale Road, Northfleet; Kent, and died later the same day on the way to the Gravesend and North Kent Hospital.

Abandoned Bombs/UXO

EOD Contracts records could find no evidence of any abandoned Bombs in or around the subject site.

Anecdotal Information

Denis Llewellyn from Gravesend shares his memories of the Second World War:

"Moving on down Vale Road, houses had lost all their windows, doors blown off, with great gaps in the roofs where tiles had blown away. A few doors down on the right side, I saw an air raid warden's tin hat, with a bullet hole in the top, and lots of blood on the pathway.

At the bus stop opposite Waterdales, the wall was peppered with machine gun bullet holes. Tom said a poor man was killed there, and his bag of vegetables was still there, covered in blood.

A blue car had gone under the railway arch, but the poor man in it was killed.

An air raid shelter in a garden was destroyed in a direct hit, a whole family killed.

Lots of houses were hit with bombs, and it was a lot to take in for a boy of 11 years, but I shall never forget what I saw."

Anti-Aircraft Artillery

The nearest recorded location of heavy anti-aircraft gun (HAA) position is 2,600m SE from the site,

Military Usage

Records for the area of Northfleet indicate limited military use, none are recorded for the site.

Prior Clearance Operations

EOD Contracts could find no evidence to suggest that there have been any prior UXO clearance operations in or around the site footprint.

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PART 5: SOURCES OF UXO CONTAMINATION

The main sources of UXO contamination that have been researched for the site are:

- Air delivered ordnance bombs and sub-munitions/incendiaries
- Anti Aircraft Ammunition (AA)
- Military Usage

General

Due to the fact that there is possible UXO contamination pathways from:

- Close proximity Air delivered ordnance bombs and sub-munitions/incendiaries
- Possible contamination from Blitz-Rubble

UXOs are essentially dangerous; therefore, further information on UXO and Safety is detailed in Annex E.

Bomb Penetration Depths

The expected bomb depths for the site assuming the following criteria:

- 15,000 feet, the vast majority of bombs were dropped from height to avoid AA fire and balloons
- General Purpose Bombs of 50kg to 1000kg
- Near Vertical impact 80 to 90 degrees
- Surface geotechnical conditions are made ground
- Subsurface geotechnical conditions are as per Paragraph 3

Therefore, the expected depths for Air dropped UXBs on site are indicated in **RED** in the following table:

Table 5.1: Bomb Penetration Depths

	Bomb Weights			
Sub Soil Type	50kg	250kg	500kg	1000kg
Soft Rock	2.442	5.016	6.006	7.062
Gravel	2.442	5.016	6.006	7.062
Sand	2.442	5.016	6.006	7.062
Chalk	**3.7**	**7.6**	**9.1**	**10.7**
Shingle	3.7	7.6	9.1	10.7
Dry Clay	3.7	7.6	9.1	10.7
Wet Sand	5.55	11.4	13.65	16.05
Wet Clay	5.55	11.4	13.65	16.05
Average Offset (m)	0.8-1.6	1.6-3.7	3-4.5	3.4-5.3

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* Empirical data taken from 1,000 bombs dropped during WWII, strata and depth from operational excavations.

Bombs on penetration of the surface do not follow a straight-line trajectory they can and do curve; this is called a “J” curve where the bomb’s path bends back towards the surface. This gives what is known as the Offset, which may place a bomb under a structure and at a shallow depth.

Further information on bomb depths and J Curves is in Annex E.

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PART 6: RISK ASSESSMENT

Risk Assessment

Assessing both the likelihood of occurrence and the consequences of the encounter has derived the overall risk for the site from unexploded ordnance. Review of the site's history and geographic location can provide an overall likelihood of encounter factor, which is used in the subsequent determination of a risk level when a Figure can be determined for the consequence.

Likelihood of Encounter

Given the study findings and other criteria (See Annex F Tables) it is considered that there is a **MEDIUM** risk of encountering UXO within the site footprint. This finding is based on assessment of all of the available information and taking account of the following factors:

- It is a matter of historic record that the area was subjected to enemy attack. For the most part, the records provide relatively accurate numbers of strikes however are limited in their precise locations.
- The area has been very lightly developed since WW2. The chalk pit was backfilled, this could be from Blitz Rubble
- The site had no military usage

Encounters of UXO are not uncommon, recent UXO finds are in Annex G.

Consequence of Encounter

The consequence see Annex E of an uncontrolled encounter with UXO, given its lethal design and its unpredictable nature could be catastrophic and warrants a high severity factor. With regards to the consequences, the following factors were considered:

The project works may make use of a number of common ground investigation and construction techniques in its methodology during the project. Any intrusive groundwork has the potential to encounter UXO.

Intrusive earthwork, piling driving and dynamic ground compaction are by nature, aggressive, significant force (kN) is often required to achieve the desired results. As a precaution it is prudent to assume that any external stimulus, no matter how slight, may result in an unstable weapon detonating.

Records of encounters with UXO, particularly where plant machinery has been involved have resulted in detonations of the items with varying degrees of consequence; ranging from slight injuries sustained to piling contractors when a bomb detonated at 6.0m bgl to fatal injuries sustained to a construction worker while conducting near surface machine works on a motorway.

Detonation on land; the effects of a detonation at depth will be more localised and less destructive than one occurring on the surface. Figure 6.1 shows an illustration of the primary blast and fragmentation dispersal from explosive ordnance when it detonates on the surface. The weapon's design, and other key factors such as the ratio of explosive charge weight to total weapon weight (CWR) and the Net Explosive Quantity (NEQ) will determine the size and effects of a blast. The effects will also be enhanced or reduced by a number of factors including, the presence of other energetic materials in close proximity to the blast or if the weapon is buried or exposed on the surface. As a guide Annex E Table 1 gives an indication of the likely blast radius for common types of UXO.

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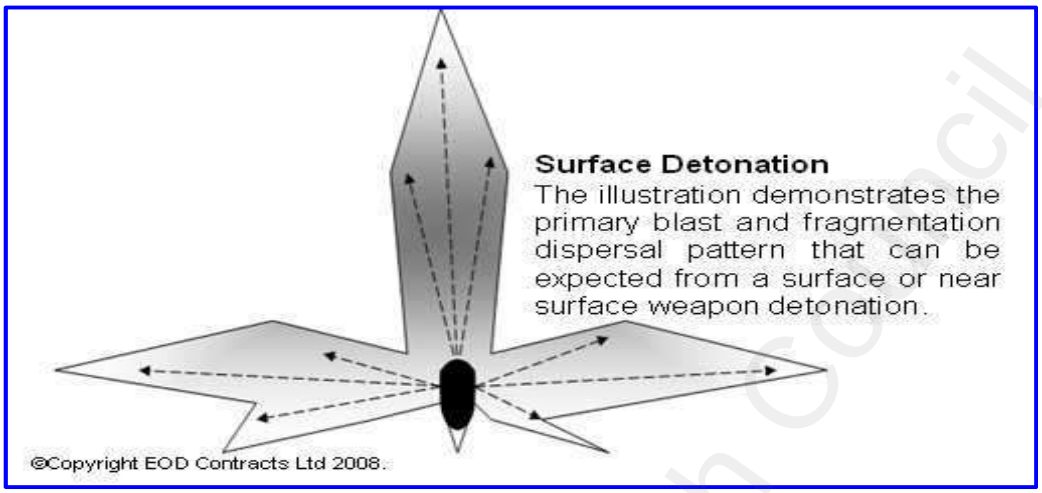
Figure 6.1: Primary Blast & Fragmentation on Land

Blast and fragmentation dispersal.



In addition to the dangers of explosion, many common chemicals used in the manufacture of explosive ordnance fillings are; in sufficient quantity, and level of exposure, toxic or poisonous. Although it is unlikely that such chemicals would be encountered in significant quantity to represent a significant risk to personnel, leakage or venting could pose a risk to the local marine environment. In addition to heavy metals; copper, lead, zinc etc used in the weapon body and fuze, hydrocarbon propellants such as Kerosene may also be present.

Risk Level

The overall risk has been determined to apply to all of the ground within the site footprint. The prevailing risk level has been determined to be **MEDIUM**. The risk from UXO is considered to exist to a maximum depth of 10 metres below the 1939 ground levels.

Encounter Consequences

It is acknowledged that when viewed from a “likelihood versus consequence” scenario; the consequences of an explosion may have the potential to include:

- Multiple casualties or fatalities.
- Extensive damage to high value private and public assets and property.
- Significant delays to the construction project.

Those at Risk

The risk is considered to have the potential to pose a direct and indirect threat to a wide range of individuals and facilities. While the impact on fixed assets can be estimated based on the asset’s proximity to the seat of the explosion. The impact to transient assets and people will, for the most part, be the result of both; proximity to the explosion and the time at which the event occurs. The overall impact therefore has the potential to range from little more than a minor localised event to a level, which may be considered to be a more widespread major incident involving some or all of the following:

- Construction and other specialist personnel carrying out the work.

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- General public in open spaces, at their places of work and transient population on foot or road users in proximity to the construction work.
- Public services including; transport, water, gas and electricity supplies.
- Public facilities, including; buildings, vehicles, other high value assets and equipment.
- Private business property including construction equipment.
- Private residential property in proximity to the work.

At Risk Activities

Based on our understanding of the scope of the most common construction projects, it is considered that a wide range of intrusive processes may be required to complete the project. Any intrusive groundworks has the potential to encounter UXO and each activity therefore has a degree of risk attached to it. The severity or level of the risk is derived as a consequence of activity's; location, methodology and volume or quantity of risk material to be worked, at risk activities are considered to include:

- Site preparation and levelling.
- Intrusive geotechnical and archaeological investigations including drilling and pitting.
- Foundation construction, trenching and other excavations.
- Intrusive construction works, which may include piling.

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PART 7: CONCLUSIONS

Based on the information researched by EOD Contracts Ltd for the proposed scope of works being carried out within the given site area, the following conclusions have been reached:

Historical UXO Contamination

The indications of UXO contamination are:

Bomb Strikes	The area has reports of bombs to the south and north of the site, the actual locations are not specific
Bomb Damage	Possible scarring which may or may not be bomb craters can be seen in the aerial photographs
Reconstruction	Limited development, possible backfilling of the chalk pit, as this was carried out prior to 1952, there is a possibility of Blitz-Rubble being used
Military Usage	None was noted on the site

Risk Level

The overall risk has been determined to apply to all ground works within the site footprint.

Risk Level	The risk level on site is **MEDIUM** and given that some UXO retains the potential to detonate if disturbed with possible severe consequences, it is concluded that it would be prudent to ensure that basic precautions are taken to ensure that the project can proceed in the safest possible manner and that any residual risk posed by UXO is as low as it is reasonably practical to achieve (ALARP).
Risk Depth	The expected bomb depth is 12m below 1939 ground level, the depth of the chalk pit is unknown and this should be taken into consideration

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PART 8: RECOMMENDATIONS

Communicating the risks, all stakeholders should be made aware of the UXO situation on the site and the possible impact it may have on the project works and day to day running of the district. Clients have a legal duty under the Construction Design & Management Regulations (CDM) and Health & Safety at Work legislation to provide Designers and Contractors with project specific information needed to identify hazards and risks associated with the design and construction work. The possibility that UXO may be encountered on site falls within the category of a significant risk and as such it should be addressed as early as possible in the lifecycle of the project.

Further Planning; the risks posed by UXO should be brought to the attention of the Project Principal Designers and other individuals with a responsibility for project safety and operations at the site. The matter of UXO should be considered critical to project safety and one requiring high priority action.

Safety Training; UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. The training should be provided by a competent person as part of the project safety induction course. It should be reinforced with specific safety briefings and tool box talks to individuals involved in conducting intrusive earthworks. The training should cover the following topics to a level commensurate with the audience's responsibilities and duties:

- Project overview and the responsibilities of those working on site with regard to duty of care and public safety
- UXO recognition and safety procedures to be followed on discovery of a suspicious object or the alarm being sounded
- Emergency procedures to be followed in the event of an explosion. Evacuation routes, muster stations and accounting for personnel
- Work permits, works methodology and specific UXO risk mitigation methods. Post incident inspections and returning to normal works

Prior to any intrusive piling or drilling commencing, UXO safety testing and appropriate clearance certification into the ground to sufficient depth to provide clearance from UXO. This can be done using a progressive drilling process or (where large numbers of piles are to be placed and ground permitting) using a vehicle borne hydraulic system to push a magnetometer into the ground to test for the presence of UXO prior to piling.

UXO safety monitoring of all "at risk" excavations, including geotechnical or archaeological trial pits to be conducted during the project. This should be provided by a UK Home Office Authorised EOD/UXO Contractor using qualified EOD Engineer with specialist locators and detectors to scan the ground ahead of the excavation wherever possible.

Specifically

- Geotechnical investigations, percussive drilling/trial pits/window/samples, require an EOD Engineer over watch
- New foundations with piling should be mitigated by the insertion of a magnetometer to encompass the pile position, this would be carried out using a CPT rig (magcone), the expected radius of the magcone is 1.5m therefore multiple piles could be checked
- Non-Intrusive Magnetometer surveys generally prove inconclusive on "Brownfield sites", this is due to the high ferromagnetic background, this methodology is not recommended for this site, therefore shallow excavations should be overseen by an EOD Engineer

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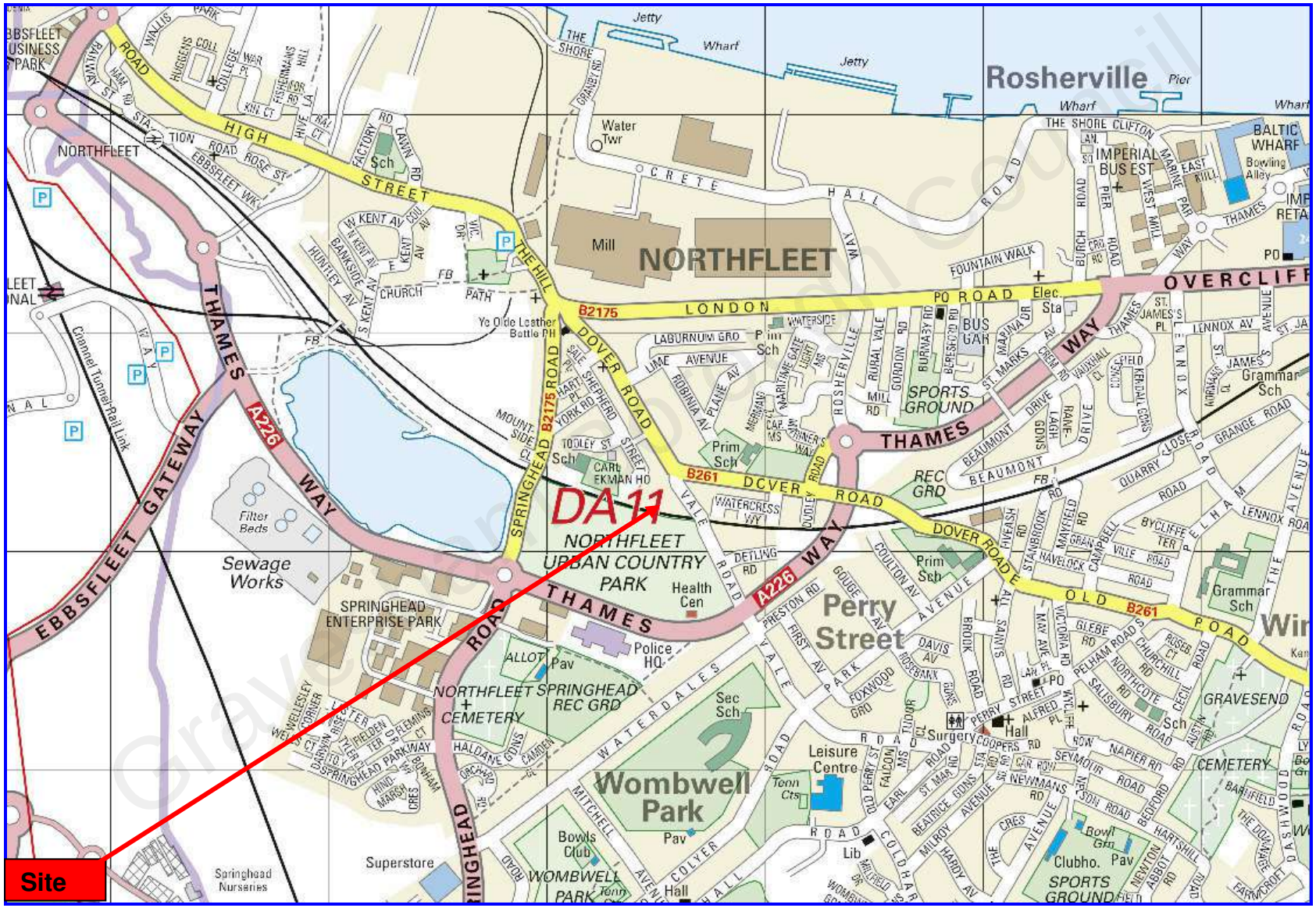
Annex A

SITE LOCATION



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Annex B

HISTORIC AERIAL PHOTOGRAPHS AND MAPS

Index of Historical Maps

Page No.	Date	Scale	Description/Remarks
B-2	1939	NA	Aerial Photograph Oblique. Site appears to have buildings in the north quadrant, the remainder appears to be open ground, partially excavated
B-3	1939	1:2,500	Site appears to have buildings in the north quadrant, the remainder appears to be open ground, partially excavated
B-4	NA	1945	Aerial Photograph. Site appears to have buildings in the north quadrant, the remainder appears to be open ground, partially excavated. The site has scoring may be indicative of bomb craters
B-5	1952	1:1,250	Site appears to have buildings in the north quadrant and in the centre, the remainder appears to be open ground, partially excavated
B-6	1960	NA	Aerial Photograph. Site appears to have buildings in the north quadrant and in the centre, the remainder appears to be open ground, partially excavated
B-7	1977	1:10,000	Site appears to be the present configuration of buildings

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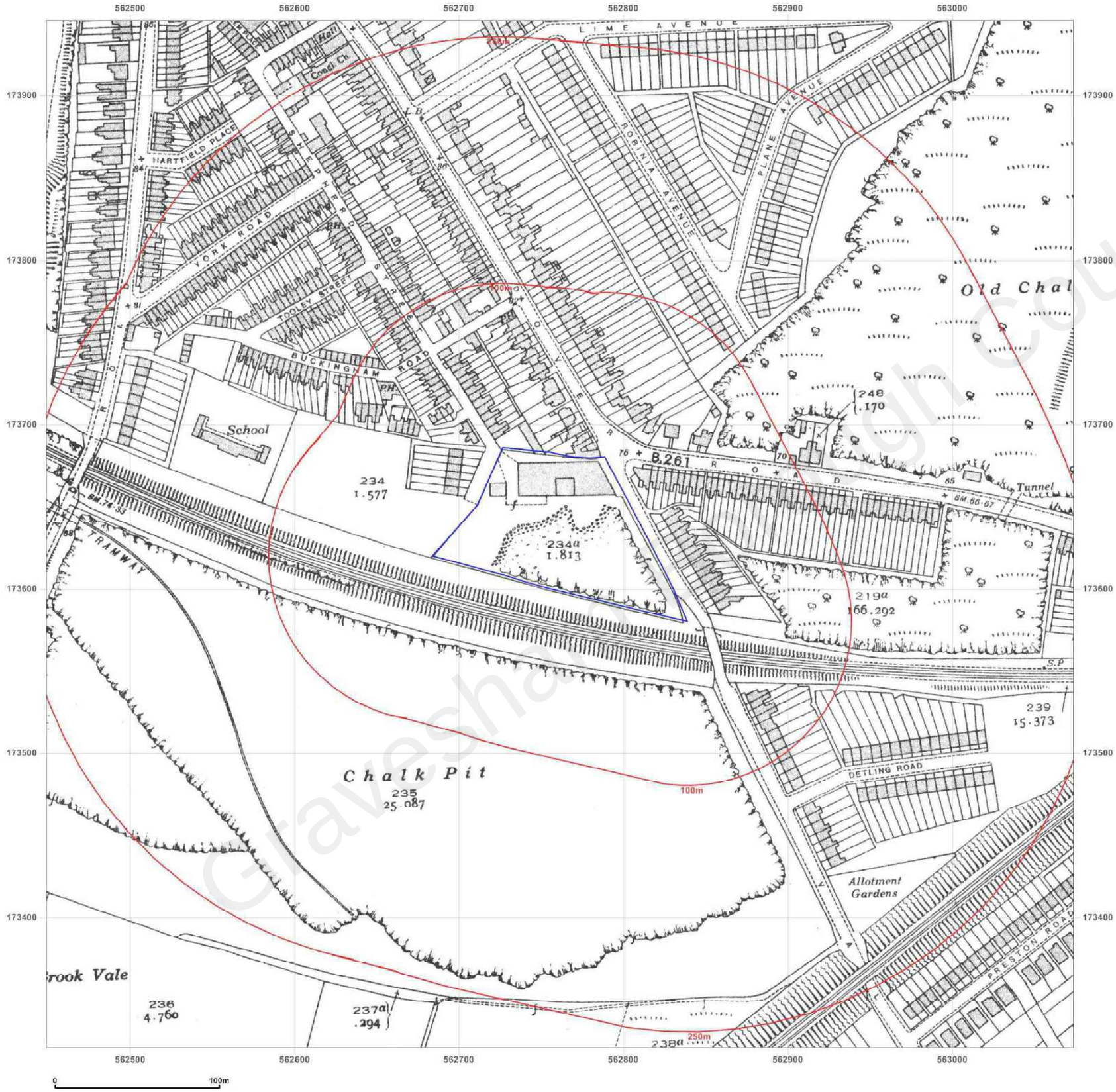
Description/Remarks
AERIAL PHOTOGRAPH Oblique Site appears to have buildings in the north quadrant, the remainder appears to be open ground, partially excavated
Date
1939



emapsite™

Site Details:

Gravesend,Vale Road

Client Ref: EMS_402946_538738
Report Ref: EMS-402946_538738
Grid Ref: 562761, 173633

Map Name: County Series

Map date: **1939**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1939
Revised 1939
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 25 January 2017

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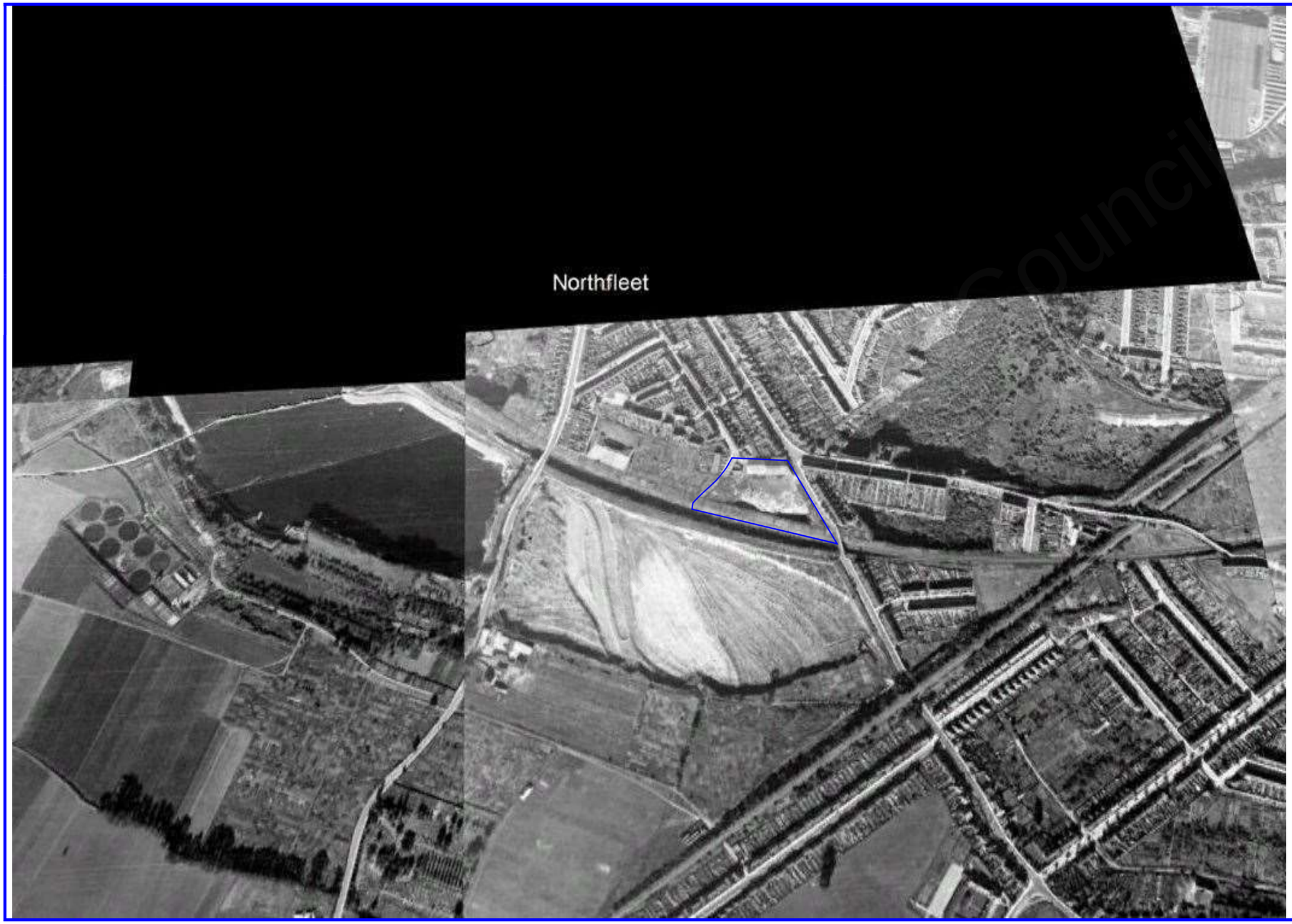


Description/Remarks

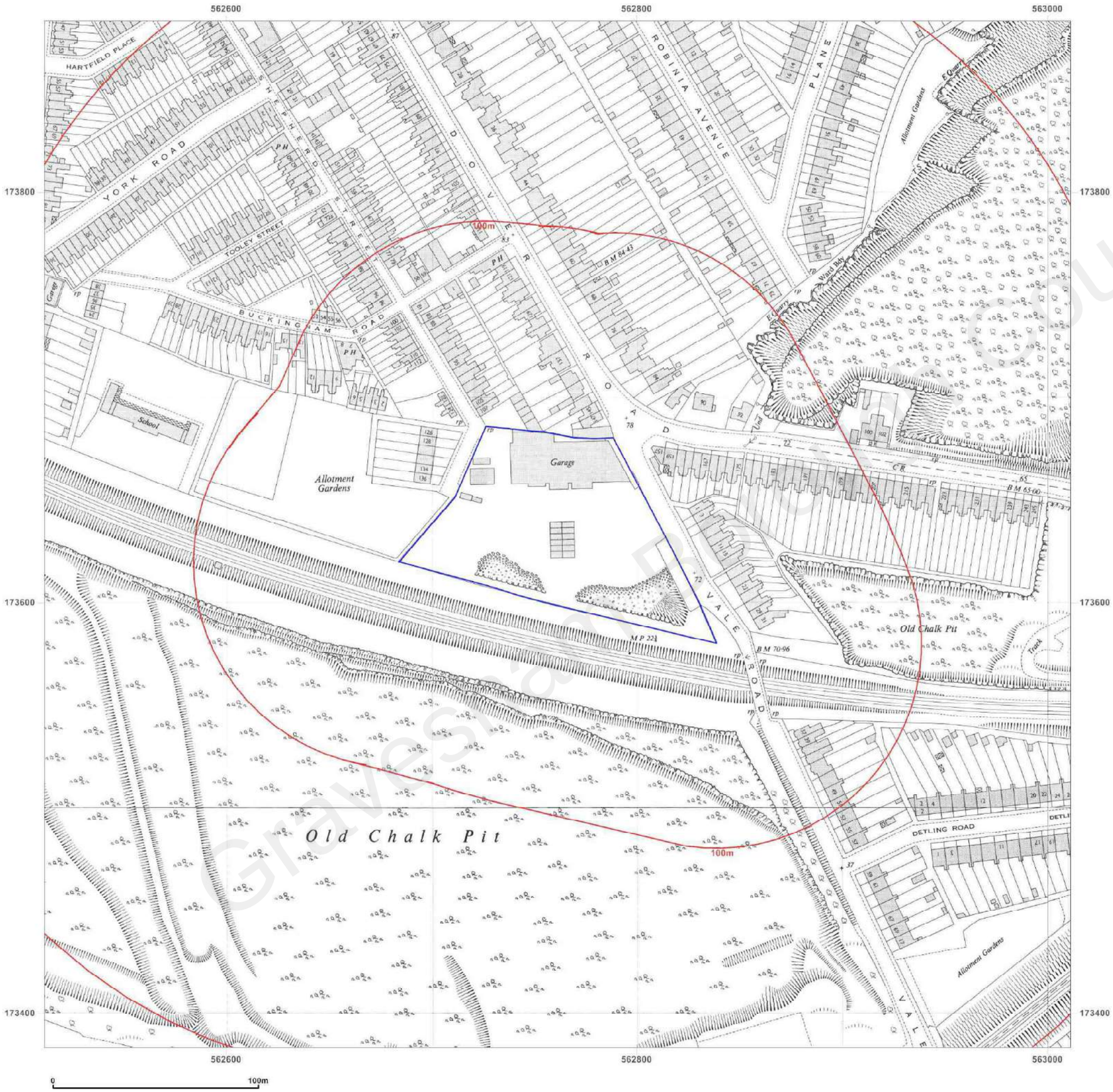
AERIAL PHOTOGRAPH

Site appears to have buildings in the north quadrant, the remainder appears to be open ground, partially excavated.

The site has scoring may be indicative of bomb craters

Date

1945



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Site Details:

Gravesend,Vale Road

Client Ref: EMS_402946_538738
Report Ref: EMS-402946_538738
Grid Ref: 562761, 173633

Map Name: National Grid

Map date: **1952**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
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Surveyed 1952 Revised 1952 Edition N/A Copyright N/A Levelled 1952	Surveyed 1952 Revised 1952 Edition N/A Copyright N/A Levelled 1952
Surveyed 1952 Revised 1952 Edition N/A Copyright N/A Levelled 1952	Surveyed 1952 Revised 1952 Edition N/A Copyright N/A Levelled 1952

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Production date: 25 January 2017

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Description/Remarks

AERIAL PHOTOGRAPH

Site appears to have buildings in the north quadrant and in the centre, the remainder appears to be open ground, partially excavated.

Date

1960

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Site Details:

Gravesend,Vale Road

Client Ref: EMS_402946_538738
Report Ref: EMS-402946_538738
Grid Ref: 562761, 173633

Map Name: National Grid

Map date: **1977**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1977
Revised 1977
Edition N/A
Copyright N/A
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Annex C

BOMB RAIDS WWI

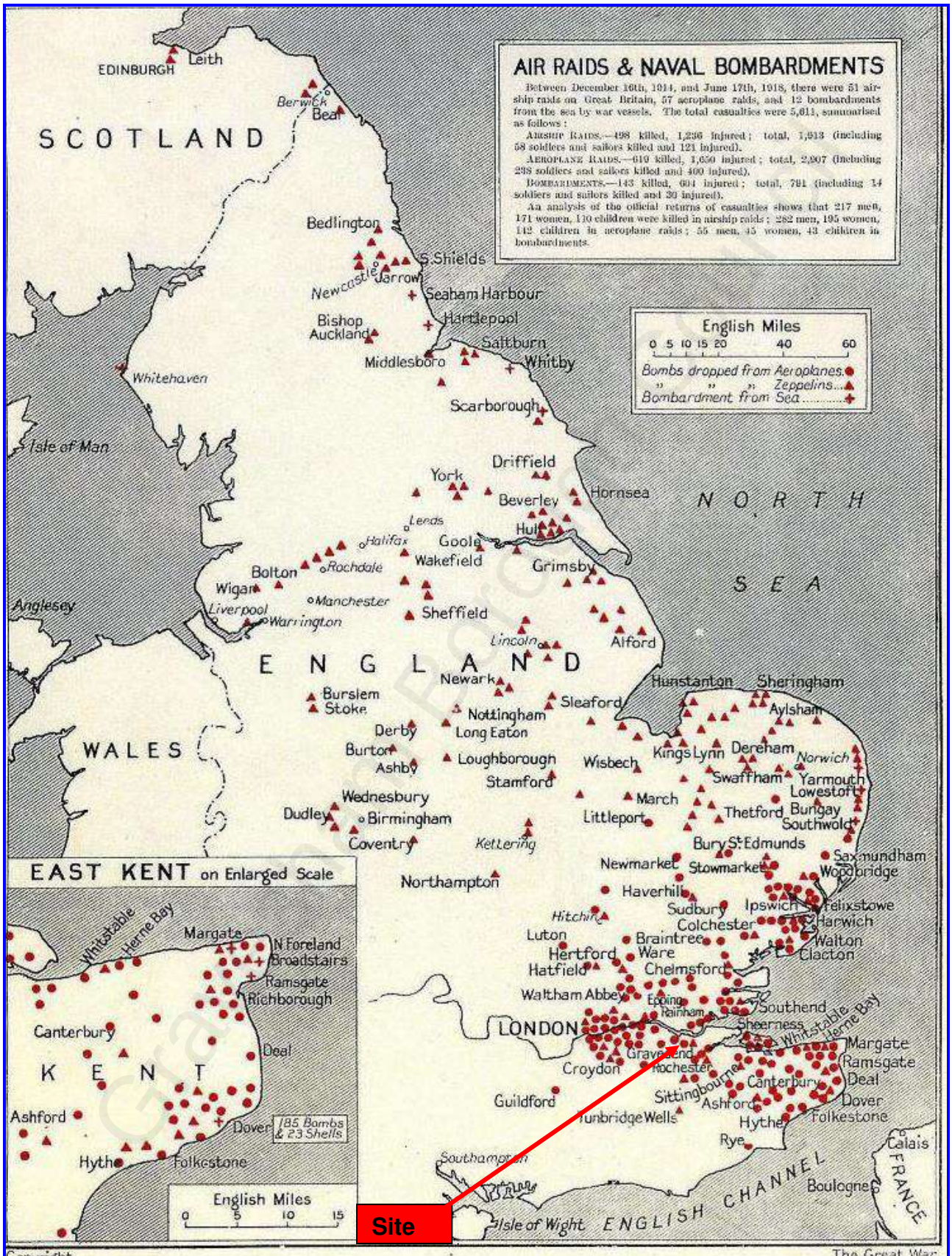

CHART SHOWING THE EXACT LOCALITIES IN ENGLAND AND SCOTLAND THAT SUFFERED FROM HOSTILE AIR RAIDS AND BOMBARDMENTS FROM DECEMBER 16TH, 1914, TO JUNE 17TH, 1918.

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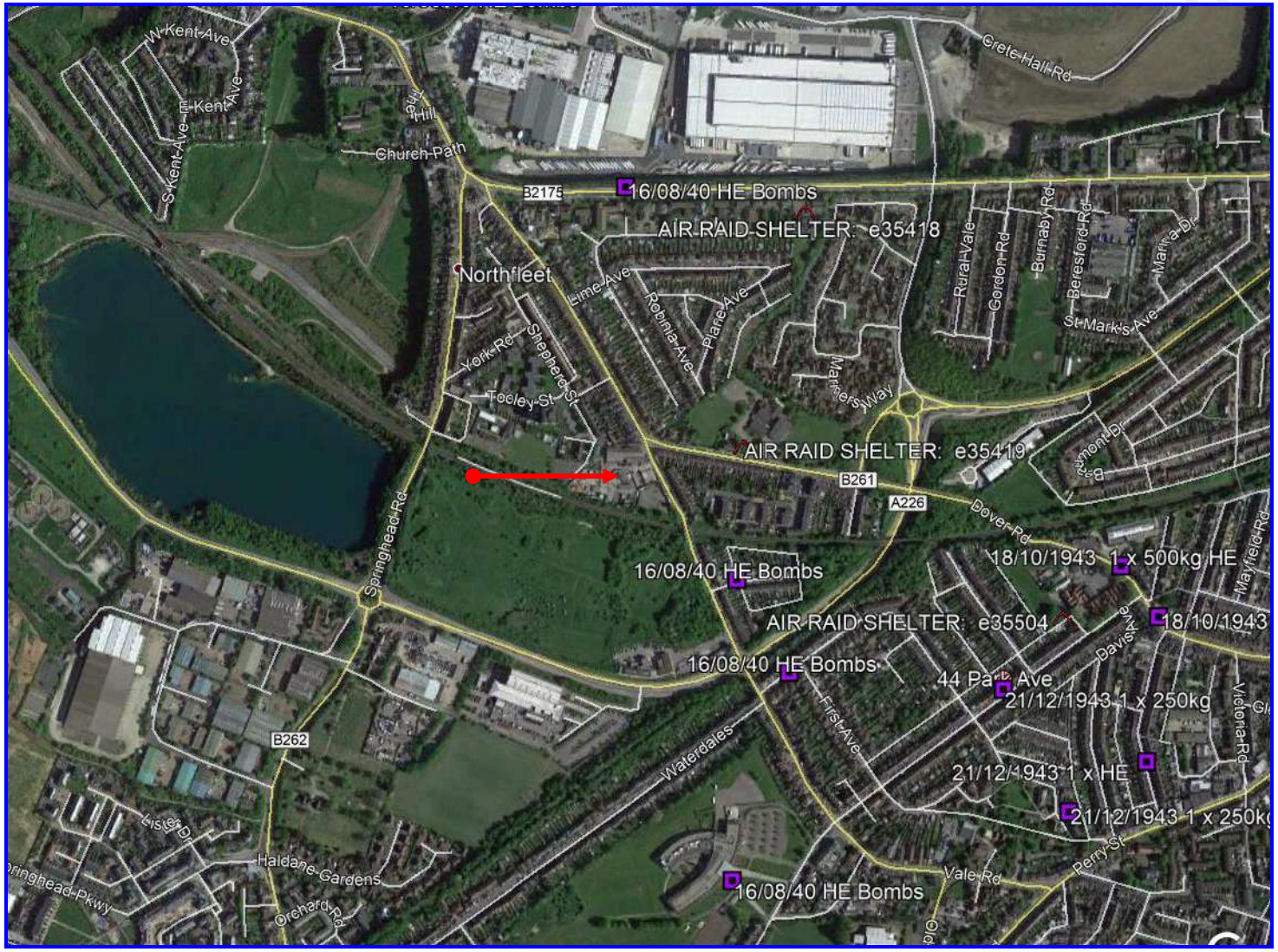
Annex D

UXO CONTAMINATION PATHWAYS
(Bomb Map)

Site Position



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Annex E

EXPLOSIVE ORDNANCE SAFETY AND INFORMATION

UNEXPLODED ORDNANCE

Since the end of WWII, there have been a limited number of recorded incidents in the UK where bombs have detonated during engineering works, though a significant number of bombs have been discovered.

The threat to any proposed investigation or development on the site may arise from the effects of a partial or full detonation of a bomb or ordnance item. The major effects usually being shock, blast, heat and shrapnel damage. It should be noted that the detonation of a 50kg buried bomb could damage brick/concrete structures up to 16m away and unprotected personnel on the surface up to 70m away from the blast. Larger ordnance is obviously more destructive. Table 1 denotes recommended safe distance for UXO.

Table 1: Safety Distances for Personnel

UXO (Kg)	Safety Distances (m)			
	Surface UXO		Buried UXO	
	Protected	Unprotected	Protected	Unprotected
2	2O	200	10	20
10	50	400	20	50
50	70	900	40	70
250	185	1100	120	185
500	200	1250	140	200
1000	275	1375	185	275
3000	450	1750	300	450
5000	575	1850	400	575

Explosives rarely become inert or lose effectiveness with age. Over time, fuzing mechanisms can become more sensitive and therefore more prone to detonation.

This applies equally to items that have been submersed in water or embedded in silt, clay, peat or similar materials.

Once initiated, the effects of the detonation of the explosive ordnance such as shells or bombs are usually extremely fast, often catastrophic and invariably traumatic to the personnel involved.

The degradation of a shell or bomb may also offer a source of explosive contamination into the underlying soils. Although this contamination may still present an explosion hazard, it is not generally recognised that explosives offer a significant toxicological risk at concentrations well below that at which a detonation risk exists.

BOMB PENETRATION DEPTHS

Weapons penetrate a significant depth into the ground and other types of ammunition are designed to permit the weapon time to penetrate deeply into the target before detonating a short time after coming to rest or a considerable number of hours afterwards. The second reason is where the weapon has failed to function as designed becoming a UXB. A number of studies have been carried out into weapon penetration and it is an inevitable consequence of a number of variable factors acting on the bombs trajectory that figures can and do differ significantly. Careful consideration must be given to the weapon's velocity, trajectory and shape. Also surface conditions and subsurface geology. The largest of the common German bombs, (500kg) can

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penetrate to significant depths given favourable conditions for penetration. In the case of projectiles and shells, the potential for deep penetration is significantly less.

A number of assumptions were used in determining the maximum threat depth within the project footprint, which were;

The penetration of sub-surface bombs will be affected by the following:

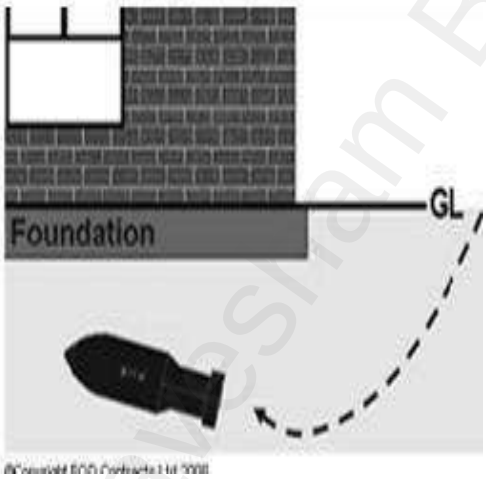
- Height of release
- Weight, shape and design of bomb
- Aerodynamic qualities
- Angle of flight and impact
- Nature of impact surface
- Nature of sub soil

Bombs on penetration of the surface do not follow a straight-line trajectory they can and do curve; this is called a "J" curve where the bomb's path bends back towards the surface. This gives what is known as the Offset, which may place a bomb under a structure and at a shallow depth.

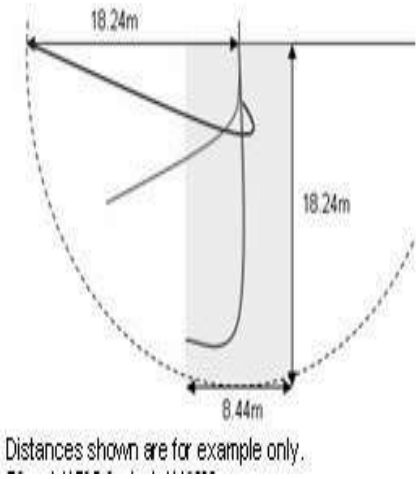
Figure 1*:* Sub-Surface Trajectories & Safety Buffers

Sub Surface Trajectory.

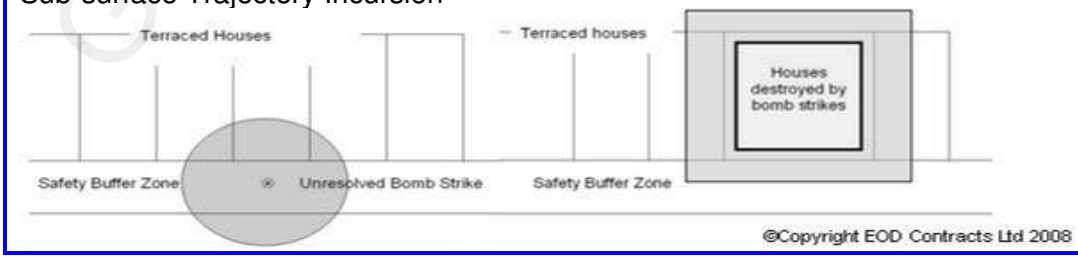
Common Sub-Surface Trajectory [6]



Anomalous Sub-Surface Trajectory [7]



Sub-surface Trajectory Incursion [8]



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Note; *the common sub-surface trajectory will follow a path best described as a 'J' curve. The curve can result in a weapon coming to rest some distance from its impact point. The distance from impact point to resting place is referred to as the "Off set Distance and is normally considered to be 1/3 of the depth. This mechanism can permit a weapon to strike outside a building and travel below ground finally coming to rest within the building footprint. Where a strike is known to have occurred close to a building or structure such as a dock wall, a danger zone should be considered to exist around the area of the strike of sufficient size to accommodate the likely sub-surface travel distance for the weapon.*

Note; *the typical offset distance is shown as the shaded area, on rare occasions a near surface deflection of the weapon can occur and the offset distance can be substantially increased up to 5/4 of the penetration depth. This mechanism does however reduce the penetration depth considerably with the net result that while the offset is increased the overall travel distance is for the most part unaffected.*

Note; *scenario 1 shown top left shows a hypothetical bomb strike outside a structure or building. The strike location has been accurately identified and as a consequence; a potential danger zone (circular shaded area) can be placed around the point of impact. Scenario 2 shown top right; depicts a direct HE bomb or Incendiary strike within a building which totally destroyed the building. In circumstances such as this UXB entry the building rubble may have concealed hole and the weapon may still be present within the building footprint or it may have travelled sub-surface and come to rest outside the footprint. Here the danger zone (square shaded Area) extends outwards on all sides of the original building footprint.*

TYPES OF ORDNANCE

German Air Delivered Ordnance. Technical information on the nature and characteristics of the ordnance used by the German Air Force during both world wars has been available for a number of years. Assessment that began during the 1930's has continued to the present day. Experts have conducted research in many countries as part of national research programmes and as individual research projects. Consequently a well-informed assessment of the threat posed by unexploded ordnance, and the hazards that they represent, can be made with a high degree of confidence.

Terminology. It should be noted that two terms used in bomb records can lead to some confusion as to their meaning and therefore significance. The term Unexploded Bomb (UXB) refers to a bomb that has fallen, failed to function and has been subsequently dealt with and removed from the site. The term Abandoned Bomb (A/UXB) refers to a UXB that could not be found or recovered, or the decision was taken not to pursue the matter further. Consequently the unexploded bomb remains where it came to rest when it was dropped or fell to the present day. It should also be noted the word 'bomb' can be used to describe an airdropped bomb or a shell as in some cases no differentiation was made and the term was interchangeable.

Abandoned Bombs. The records of known abandoned unexploded bomb locations in the London area were released in response to a written Parliamentary Question from Simon Hughes. (Hansard: Volume; 282. Dated 15th October 1996). The information was provided by the Ministry of Defence (MOD) and supplied under an indemnity.

Explosive Ordnance Failure Rates. Over the course of both World Wars a considerable quantity of ordnance dropped on UK targets failed to function as designed and subsequently penetrated the ground without exploding. Information gathered during the war by the MOD and its research partners provide typical failure rates for different types of ordnance. Figures significant to this study are:

- 10% of all German airdropped bombs failed to function as intended.

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- 30% of all anti-aircraft and other types of shells failed to function as intended.

Deductions & Considerations. The following points were considered as part of the assessment and have been given due consideration:

Records were found that indicated that the general area was subjected to heavy bombing.

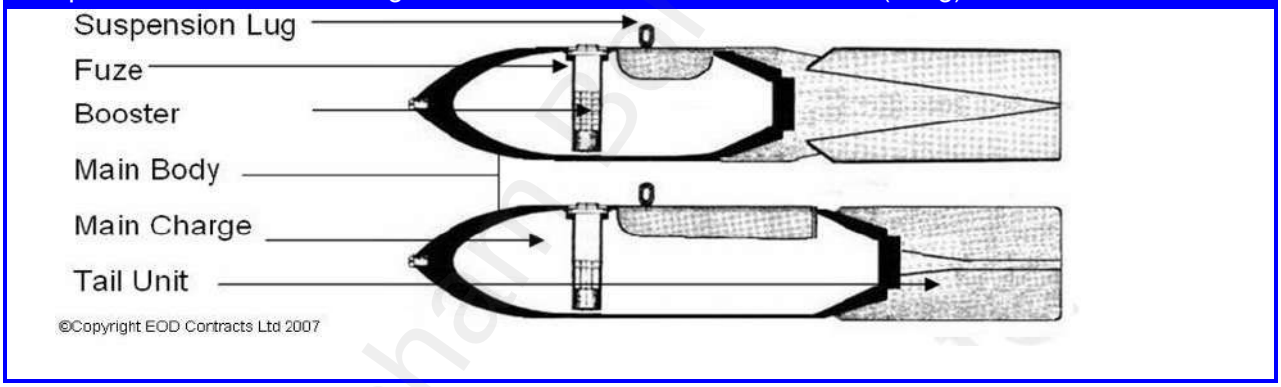
Bombs, which struck previously, hit or burned out targets and did not function; consequently their impact was unseen and therefore no report was ever made.

In all likelihood, the local anti-aircraft battery would have fired a far higher number of shells than the bombers dropped HE bombs. Contamination by anti aircraft shells can not be rules out.

Generic German Bomb Types. The majority of German bombs dropped were 50kg in weight, accounting for approximately 16% of the total bombs dropped. The range of common bombs increased in weight to a maximum of 1700kg. Regardless of size, German bombs were fitted with one or more Electrical Condenser Resistance (ECR) fuzes many of which included a mechanical component. The fuzes were mounted transversely in the bomb body with the booster directly below, and in contact with, the fuze. The booster; sometimes referred to as the Gaine, is composed of a sensitive explosive material (Picric Acid). Picric Acid is known to deteriorate over time becoming increasingly unstable. The internal layout of two common German bombs and a German fuze is shown in Figures 2 & 3.

Figure 2**:** Generic German Bomb Design.

Graphic Cross Section through the most common German bombs (50kg)



Note; the diagram shows that there can be a significant difference in the quantity of High Explosive contained within bombs of similar size and shape; the Grade 1 bomb on the bottom having 30% more HE than the Grade 2 shown at the top. This serves to demonstrate the importance of an accurate identification of any item of UXO.

Figure 3**:** Generic German Bomb Fuze Design.

Graphic Cross Section through a typical German fuze (ECR)

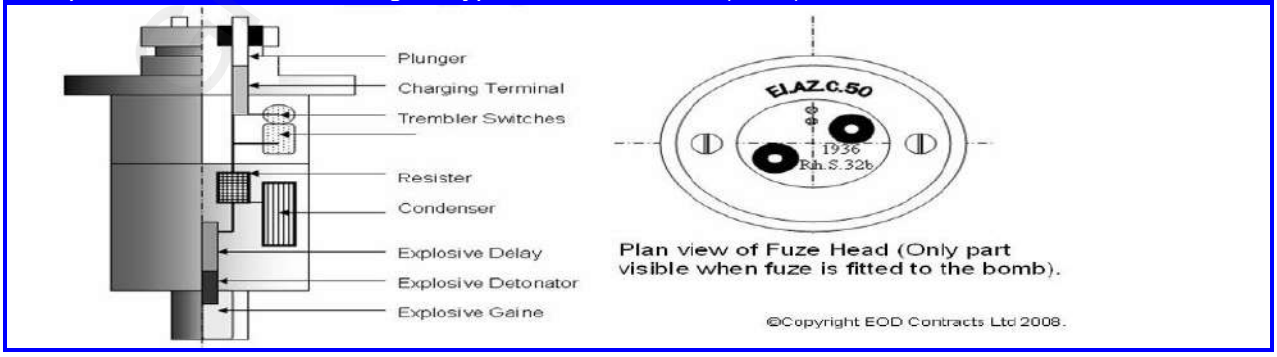


Figure 4**:** Range of HE bombs dropped on the United Kingdom.

German Bombs

NOTE: The smaller sub-munitions (Bomblets) seen to the right, ranged in size between 1 and 3kg, were dropped in large numbers and were intended as incendiary bombs, anti-personnel bombs or as bombs filling both roles. The smaller bomblets were dropped in larger container bombs designed to hold between 360 and 620 of the bomblets. The containers were designed to burst open at a predetermined height above ground level, dispersing the bomblets over a wide area. Air raid damage was far greater by using both incendiary, and HE bombs on a single raid. The fires started by the incendiaries being rapidly spread by the blast waves from the HE bomb. This scenario was shown to devastating effect on the 14th February 1945 in the German city of Dresden. Where fires started and spread by the bombing increased to a point where the oxygen was being sucked into the flames at such a high speed that the fire became a "Fire Storm". At the time the city's population had increased due to a high number of refugees fleeing the Russian advance to the east, the exact civilian death toll from fire and suffocation will never be known, but is considered to be somewhere between 25,000 and 100,000.

High Explosive (HE) Bomb. Some of the most common type of ordnance to be dropped on the United Kingdom, HE bombs are often the type encountered as UXBs. Relatively thick cased, they are still recovered in remarkably good condition. Ranging in size from 50 to 1700 kg, their typical release height (1,500m) allowed them to penetrate deep into the ground as a result of design or flaw. Towards the end of the bombing campaign, as steel became scarce the German Engineers produced a range of bombs that used steel reinforced concrete as the bomb body. Figure 4 shows the range of steel HE bombs dropped on the UK.

Incendiary Bomb. The larger incendiary bombs, containing bottles of white phosphorus and an incendiary mixture contained within a thin steel case were designed to burst on contact with the ground. A fixed dispenser on the aircraft delivered the smaller type of bomb or 'Bomblet' to the target area in container bombs or; both types of container would open dispersing the smaller Incendiary bombs. Relatively small and light they were unlikely to penetrate the ground to any significant depth. However, once concealed in bomb damage rubble or below water they were easily missed and are still unearthed today from in-fill and drained land. Later versions of the incendiary bomb contained an additional explosive charge used as a short delay "Booby Trap" device that contained a significant amount of high explosive. The Booby Trap component was designed to kill or injure fire fighters and hinder the damage control. See Figure 5.

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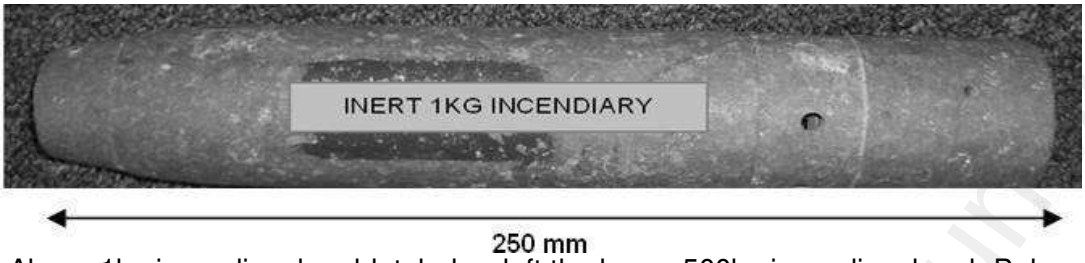
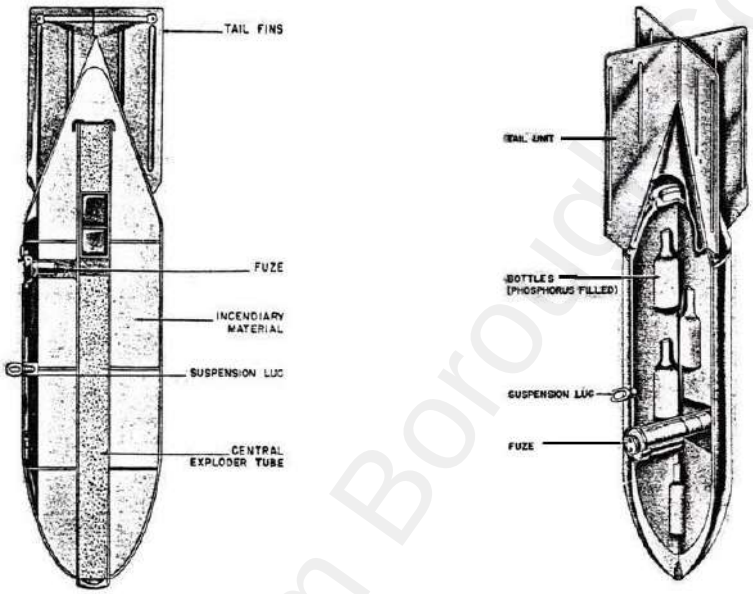
Figure 5**:** Incendiary Bombs.

Common German Incendiary Bombs



Above 1kg incendiary bomblet, below left the larger 500kg incendiary bomb Below right a 50kg incendiary bomb containing bottles of white phosphorus.



Note; Incendiary bomblets were made of a flammable alloy similar in appearance to aluminium, which resists corrosion well. The tail unit was made of thin tin-plate steel and is more prone to have rusted away. Some Incendiary models were fitted with a High Explosive (HE) steel nose. With the tail and explosive nose attached the bomb was 480mm long.

Blast Bomb / Parachute Mine. The parachute mine was extensively used on land and at sea and was fitted with specialist fuzes designed to trigger the weapon at a predetermined altitude, water depth or to switch on other magnetic influence mechanisms to trigger the weapon when a ship approached (Magnetic or Acoustic influence). While early versions were based on the standard 1000kg SD Bomb case others were specially designed and manufactured with an aluminium body, making them extremely difficult to detect using magnetometers. The thin cased versions would normally disintegrate on impact on land and are normally considered to pose little threat to work on land based projects, but the risk increases significantly on projects over water or in marshland. Thicker cased versions however will survive impact and pose a significant risk regardless of the local ground conditions. (See Figure 6)

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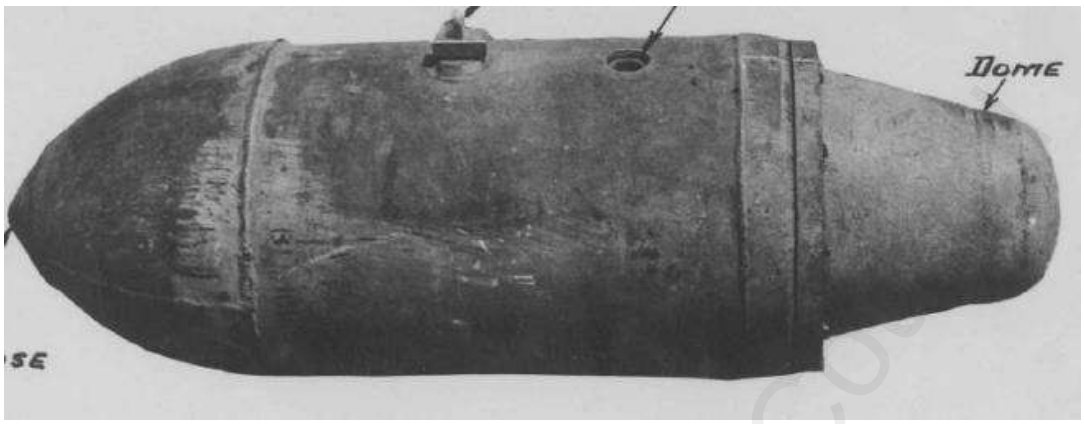
Figure 6**:** Common Airdropped Mines.

Parachute & Ground Mines



Note; all mine fuzes were designed to arm after deployment from the ship, submarine or aircraft, some fuze designs incorporated anti-removal booby traps. Unexploded mines found today are the result of a failure within the arming mechanism or procedure whereby the mine never fully armed. Sudden shock or jarring of a weapon in this state has the potential to complete the arming sequence and could result in the mine detonating with lethal consequences.

Non-Steel Cased Bombs. Used primarily in the construction of training or practice bombs, some high explosive variants were introduced towards the end of the war. With resources running scarce, German Engineers produced a small number of blast bombs with a concrete body. The design utilised a steel framework onto which concrete was cast. The explosive filling was also contained within a thin steel container within the bomb body. Very few “concrete” bombs were dropped on the UK. In common with standard steel cased weapons, this type of bomb can be detected using standard magnetometer detection techniques (albeit; providing a smaller ferromagnetic signature than its all steel counterparts). This type of bomb represents a very small percentage of the total number of bombs dropped worldwide and are not considered a significant threat, particularly when viewed from an overall bomb threat in the UK.

Anti-Personnel Bomb. Generally these were small weapons of 1-3 kilograms in weight and are often referred to as ‘Bomblets’ and possessing similar ground penetration ability as the Incendiary Bomblets. They were often located during the post-raid searches. This type of bomb has been recovered within the bomb rubble being cleared or used as in-fill on construction projects and poses the same potential to function as the Incendiary bomb with a greater potential to cause localised casualties.

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Specialist Bomb. These types of bombs were designed to meet a specific mission requirement. Typically, this would be a design modification or special fusing to enable the bomb to destroy hardened/armoured targets or deep buried and sub-marine targets. Similar to the more common HE bombs, they differ in that they rarely contain large amounts of high explosive. Therefore the consequence of a detonation is reduced but remains a significant risk, particularly when the detonation occurs on or near the surface.

Depth Bombs & Depth Charges. These types of weapons were designed to meet a specific mission requirement. Typically, the modifications would include the type of explosive filling and special fusing to enable the bomb to penetrate to a significant depth into the ground or water before detonating. Depth bombs intended for maritime attack and sub-marine targets would be fitted with one or more fuzes, one of which would be a hydrostatic fuze designed to detonate the bomb at a predetermined depth. The bomb would be fitted with an anti skip ring to reduce the deflection of the bomb as it entered the water. Similar in many ways to Depth Bombs, Depth Charges were exclusively designed to detonate at a predetermined depth. This was achieved by fitting the Charge with a short time delay or hydrostatic fuze. Depth bombs; having a similar configuration to general purpose bombs had the potential to penetrate deeply into the sea bed where an attack occurred in the relatively shallower water of a dock.

Unmanned Rocket Bombs & Missiles. The most famous in this category of weapons were the V1 (Fi103 flying bomb) commonly known as the Doodlebug and the Larger V2 (A4 missile). Both V1 & V2 with high explosive warheads containing 850kg & 1000kg (respectively) represent some of the largest weapons to land in the United Kingdom. Both types were built in a similar manner to an aircraft and would generally disintegrate on impact even if the warhead failed to detonate. The impact would spread debris over a wide area which was difficult to miss and any resulting unexploded 'V' weapons were comprehensively dealt with at the time. For this reason they are rarely encountered on land. However, where a 'V' weapon landed in water the opportunity for the event to have been missed and/or follow-up action abandoned was greater and they continue to pose a significant risk. Other, less well known rocket bombs were also produced by the Luftwaffe to attack maritime targets. Some were equipped with TV/Radio guidance from the parent bomber. Two of the most common were the Fritz X which consisted of an adapted SD1400kg bomb and the Henschel Hs293 which was based on a smaller 500kg bomb. No record of one having been recovered on land as a UXB can be found but these large HE bombs are considered to pose a significant risk, particularly to maritime projects. No records were found to indicate this type of bomb was ever used on targets in the area.

Photoflash Bomb. This type of bomb was dropped by specialist "Pathfinder" aircraft and although this type of bomb can be included with the category of specialist bombs, it is worthy of specific comment due to the danger it may still pose. Photoflash bombs were designed to explode with a blinding flash, rather like a camera flashbulb. They were used to enable photographs to be taken of targets at night and also served to identify ground targets for other aircraft to attack. The speed at which the highly energetic filling detonated, and energy it produced in doing so, was significant. Although these bombs were thin skinned and are prone to corrosion the functioning of one can be compared to a high explosive bomb detonation.

High Explosive Shells & Projectiles. As mentioned previously, one of the most common sources of UXO contamination encountered in the United Kingdom is High Explosive Shells and Projectiles. This is most commonly found to be as the result of firing practice ranges, bombardment and anti-aircraft defence, the latter often positioned to defend Major cities and Strategic installations and ports from German Bombing. Anti Aircraft Shells and projectiles are generally smaller (Up to 4.7" inch diameter) than the airdropped bombs and as a consequence were more easily missed amongst the bomb rubble. However, coastal bombardment guns could fire a shell weighing 1000kg, (larger than most common airdropped bombs) and capable of significant ground penetration. The generic layout of a projectile can be found at Figure 7. It should be noted that the fatal incident on the German autobahn in 2006 was thought to be the result of a shell or projectile detonating, not an airdropped bomb as first reported.

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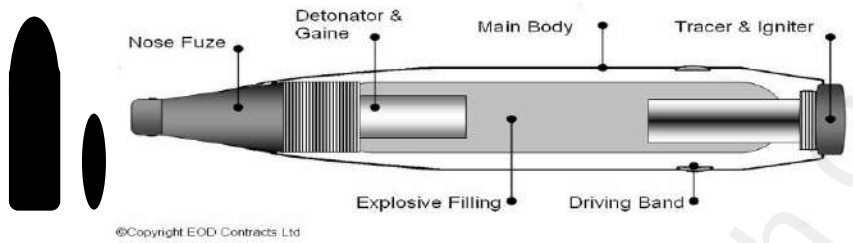
The Fuzes used in Anti-Aircraft Ammunition were designed to ensure the projectile would detonate in contact with the target, or at a pre-set altitude, or in close proximity to the target. The fuzes employed different means to achieve this, including; direct impact, or indirect impact, Barometric, Delay and Electro-magnetic influence. Some were fitted with more than one fuze, which served to reduce the chance of the projectile falling to earth and detonating. Artillery fuzes are activated during the firing process, using the projectile's acceleration or spin within the gun barrel to switch off the safety mechanisms. For this reason, fired projectiles are considered more dangerous than unfired ones.

Figure 7**:** Generic Shell Design

Scale & Graphic Cross Section of a typical High Explosive (HE) Shell



Approximate size of a large shell used by battleships and coastal bombardment guns (Left) and Anti-aircraft shell (Right)

Other Types of Ordnance.

The following additional sources of ordnance types have been considered, and inherent risks taken account of:

Flares and Pyrotechnics. Flares and pyrotechnics were used for a variety of reasons throughout the war and continue to be found today in the most unlikely places. However, due to the thin casings of these weapons a high level of corrosion is likely to have occurred since manufacture. Depending on the specific nature of the weapon, this effectively renders them inert with the exception of any white phosphorous content or explosive gaine.

Land Service Ammunition (LSA). While as the name implies this type of ammunition was designed for use on land, it was also issued to naval personnel for close protection of vessels and their crew and to provide a limited offensive capability even to relatively small craft. This type of ammunition includes some shells and projectiles such as those covered previously. Other natures of LSA range from Small Arms Ammunition (SAA), having little or no high explosive content to Grenades, Mortars and Rockets which may pose a risk of detonation due to their explosive content and the design of their fuzes (impact) which; if subjected to sufficient shock or friction may result in the weapon functioning. (See Figure 8)

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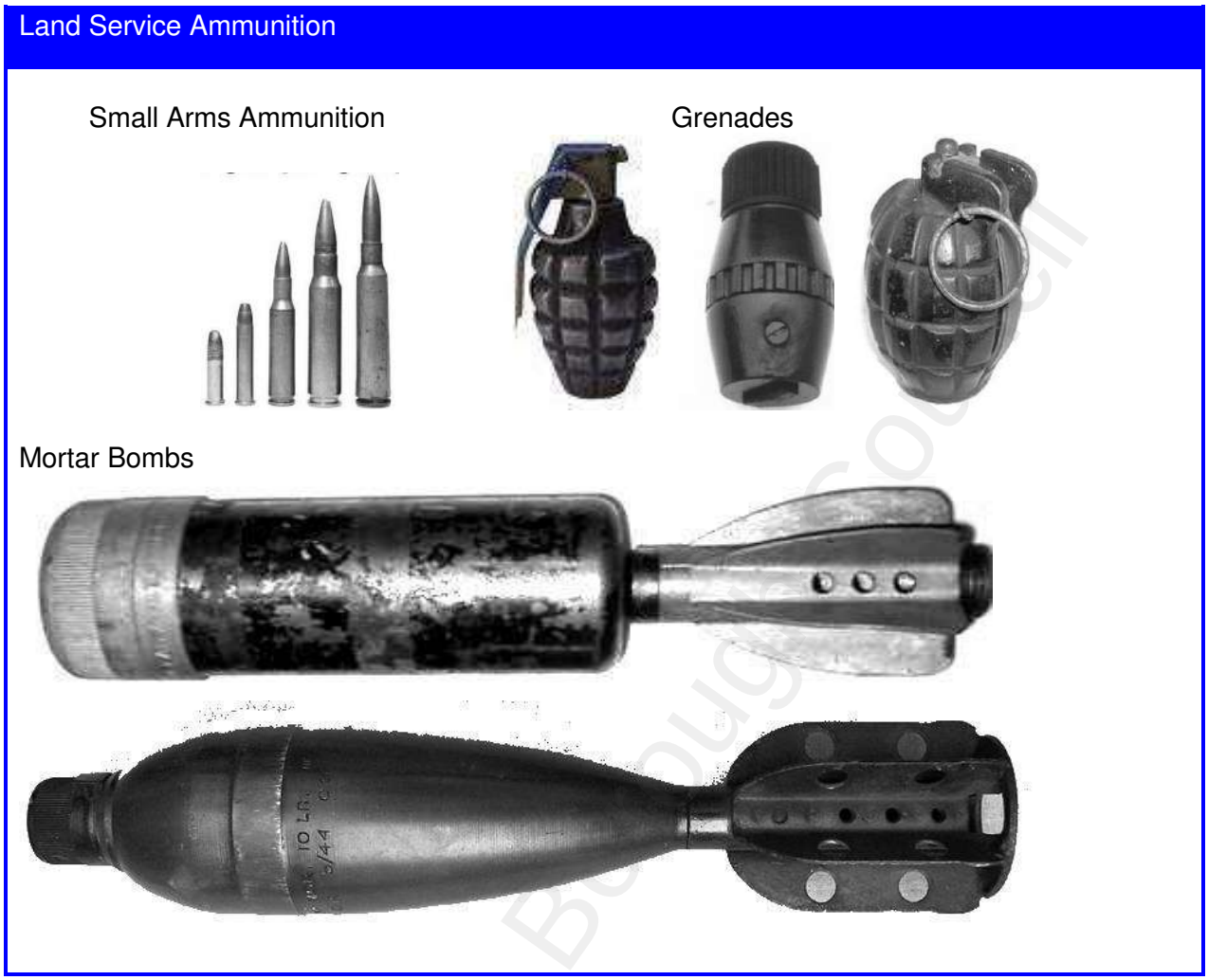
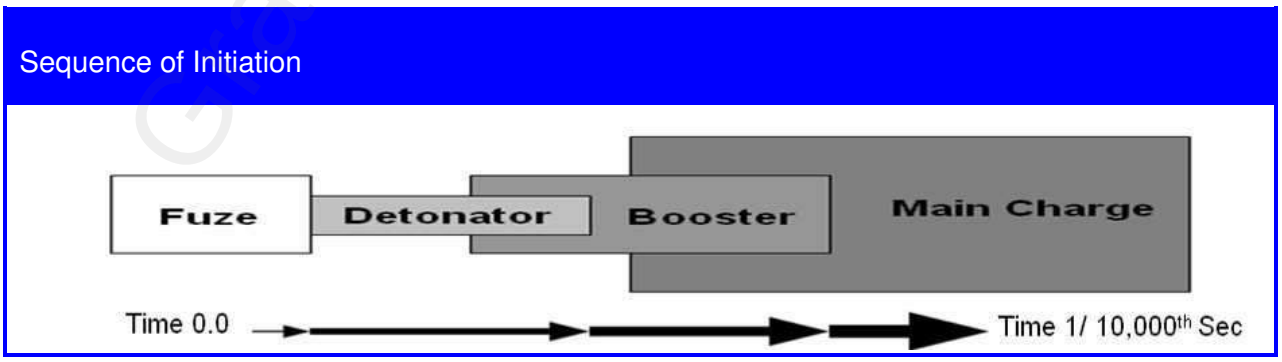
Figure 8: Common Categories of Land Service Ammunition



Initiation of Unexploded Ordnance. Explosive Ordnance is highly unlikely to spontaneously explode. The energetic chemical compounds, (Explosives) used in weapon manufacture are chosen to be as stable as possible and they all require a significant application of additional energy to create the right conditions for detonation to occur. If stored correctly, most explosive materials are designed to remain stable for the duration of their expected lifespan (typically 20 years). During this time, the correct functioning of the weapon is achieved by means of the 'Initiation Train' (See Figure 9).

Figure 9: Explosive Ordnance Initiation Train.



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Initiation Train. This is a means by which, once the safety features have been switched off or removed, a chain reaction occurs through the weapon. Starting within the fusing system as a small ignition or spark, causing a detonator to explode, which in turn causes the booster charge to detonate with a greater energy and ending in the full detonation of the main explosive filling. Each part of the process has in-built safety features to prevent an unintended detonation. A failure in any of the components within the Initiation Train can result in a UXO. In the case of a UXB; the chain reaction has broken down and the Initiation Train is brought to a halt, albeit, a temporary one. There are a number of ways that sufficient energy could be introduced to the otherwise stable UXB / UXO that may allow the Initiation Train to set off once more, overcoming the initial reason for failure. In addition to subjecting the weapon to excessive heat, such as a fire, the most common methods to bring about an explosive detonation in such items are considered to be:

Direct impact onto the main body of the bomb by mechanical excavation or pile driving: Such an occurrence can cause the bomb to detonate, should the point of impact be on the bomb fuze; less force would be required to bring about a full or partial explosive detonation.

Re-starting the clock timer in the bomb fuze. Only a small percentage of bombs were fitted with clockwork fuzes. It is likely that corrosion has taken place within the fuze that may prevent the clockwork mechanism from functioning. However, the restarting of the clock is by no means a scenario that can be completely ruled out. This is considered to be one of the two most credible mechanisms by which sufficient energy could be introduced to the bomb and result in a detonation.

Induction of a static charge or exposure to an external power source (Electrical Services), causing a current in an electrical fuze. The majority of German bombs employed an electrical component within the fuzes, it is likely that corrosion would have taken place within the fuze mechanism and that it would no longer contain, or conduct sufficient electrical charge to initiate the bomb.

Friction initiating the sensitive fuze explosive. Some chemical constituents may have deteriorated, due to oxidisation. Components designed with a high degree of stability at the time of manufacture may no longer be as safe. **This is considered to be the most likely mechanism by which sufficient energy could be introduced to the bomb and result in a detonation.**

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Annex F

Risk Assessment Tables

Table 1: Summary of Potential Contamination Sources

Source	Applicable	Not Applicable
Enemy Attack & Counter Measures		
Bombing WW1		☒
Manned Aircraft Bombing WW2	☒	
Unmanned V1 & V2 Rocket Attack		☒
Shelling		☒
Anti-Shipping Mines & Depth Charges		☒
Anti-Aircraft Shells & Rockets		☒
Beach Mines & Coastal Defences.		☒
Airfield/Key Point Defensive Mines/Charges		☒
Abandoned Unexploded Bomb (A/UXB)		☒
Migration of UXO		
UXO Migration in Rubble & Infill	☒	
UXO Migration by Tide & River Current		☒
UXO Migration by Marine Dredging		☒
Ship Wrecks		☒
Dispersal by Explosion, Fire & Accident		☒
Aeroplane Crash		☒
Private Collections		☒
MOD Facilities		
Bombing Range		☒
Artillery, Mortar & Tank Range		☒
Grenade Range		☒
Small Arms Firing Range		☒
Weapon Research & Development Facilities		☒
Ammunition Burial Grounds		☒
Docks & Harbour Facilities		☒
Offshore Ammunition Dumping Grounds		☒
Ammunition Storage & Manufacture Sites		☒
Airfields & Air Stations		☒
Bombing Decoy Site		☒
Army Barracks & Camps		☒
MOD Training / Concentration Areas		☒
Home Guard & SOE Weapon Caches		☒

Table 2: Baseline Bomb Penetration Assessment

	Bomb Weights			
Sub Soil Type	50kg	250kg	500kg	1000kg
Soft Rock	2.442	5.016	6.006	7.062
Gravel	2.442	5.016	6.006	7.062
Sand	2.442	5.016	6.006	7.062
Chalk	**3.7**	**7.6**	**9.1**	**10.7**
Shingle	3.7	7.6	9.1	10.7
Dry Clay	3.7	7.6	9.1	10.7
Wet Sand	5.55	11.4	13.65	16.05
Wet Clay	5.55	11.4	13.65	16.05
Average Offset (m)	0.8-1.6	1.6-3.7	3-4.5	3.4-5.3

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Table 3: Site Specific Bomb Penetration Assessment

Input Figures			
Bomb Weight	Release Height	Velocity on Impact	Angle of Strike
500 kg	5000 m	340 $m.s^{-1}$	10º to vertical

Geological Unit Description	Anticipated Thickness (m)	Anticipated Depth (m bgl)
Made Ground	5	5
Chalk	20	25

Output Figures	
Maximum Penetration Depth	Maximum Offset
12m	**5.3m**

The maximum threat depth from airdropped weapons is considered to be:	**Bombs 12m**
The maximum threat depth for smaller shells is considered to be:	**AA Shells 5m**

Input figures based on the most common bombing methods and largest common bomb type Figures derived from computer simulation. All depths based on 1939 levels.

Table 4: Airdropped Weapon Strike Indicators (UK)

Item	Increasing Potential level ⇨			
Site Location	Rural	Small Town	Brown Field Large Towns	**Cities**
Site Description and Use	Greenfield or Agricultural Land	Near Strategic Target	**Adjacent to Strategic Target**	Strategic Target
Site History	No history of Attack	Near area of Attack	**Immediate Area Attacked**	Direct Attack

Strategic Target: Military Installation, Industrial or Munitions Manufacturer, Power Station, Gas or Water Works, Port, Dock, Railway Yard, Decoy Site.

Table 5: Weapon Strike Records (UK)

Source	Availability			
Archive	None	**Non specific**	Specific	Extensive
In-house	None	**Non specific**	Specific	Extensive
Anecdotal	None	**Non specific**	Specific	Confirmed

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Table 6: Anti-Aircraft Weapon Strike Indicators (UK)

Item	Increasing Potential level ⇨			
Site Location	Rural	Town	**City**	Military Site
Fixed Battery Location	None	General Area	**Nearby**	Onsite
Mobile Battery	Rural	Town	**City**	Military Site
Military Site: Airfield, Port, Radar, Barracks, Depots, Arsenal or Similar.				

Table 7: Abandoned Bomb Records (UK)

Item	Increasing Potential level ⇨		
In-house	**None**	Yes	On-site
Other	**None**	Yes	On-site

Table 8: Bomb Strike Density Assessment

Bombs & Mines	**Bomb density placed at Medium .**

Table 9: Opportunity to have detected Bomb or Shell Strikes (UK)

Increasing Potential level
No recorded bombs or damage
Good ARP cover
Significant development
No significant ground cover
Light bombing or damage
Moderate ARP cover
Moderate development
Frequent public access
Little ground cover
Significant bombing or damage
Poor ARP cover
Minimal development limited to shallow excavations
Infrequent public access
Moderate ground cover
Heavy bombing or damage
No ARP cover
Development limited to site clearance
Controlled private access
Heavy ground cover, vegetation, ploughing or body of water

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Table 10: Post Contamination Development Indicators (UK)

	Increasing Potential level ⇨
Nature of Post Contamination Development	100% excavations of the entire site to below contamination depth.
	Significant development
	Moderate development
	Minimal development
	No development

Table 11: Construction Activities Encounter Indicators

	Increasing Potential level ⇨
Activities	Borehole Drilling
	Dynamic Sampling
	Shallow Trial Pit
	Services Trenching
	Bored (CFA) Piling
	Sheet Piling
	Shallow Excavations over extended area
	Deep Excavations over a limited area
	High Density Piles
	Deep Excavations over extended area
	Bulk Excavations

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Annex G

Source:	**BBC News**
Date:	**13th February 2018**
Description:	**London City Airport has reopened after an unexploded 500kg World War Two bomb was safely moved from the area.** The device was discovered at the King George V Dock on Sunday during planned work at the east London airport. All flights were cancelled on Monday after an exclusion zone was put in place, **with the closure affecting up to 16,000 passengers and nearby residents being evacuated from their homes.** The bomb is due to be detonated in a controlled explosion in Shoeburyness. Royal Navy divers worked through the night to move the 1.5m-long German bomb down the Thames. Divers took the device - which was found in a bed of silt, 15m underwater - along with military explosives out to sea. Commander Del McKnight said it had been taken to the sea bed, a mile away from the coast, before military explosives were placed on it. He added the bomb would be exploded in due course, weather permitting.

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Source:	**Herald**
Date:	**11th October 2017**
Description:	An unexploded WWII bomb has been found at a Dartmoor farm - after being used as a DOOR STOP for years. The bomb was found in Ullacombe Farm in Bovey Tracey on Wednesday morning. The manager of the farm and café said it had once been used as a doorstop. Ullacombe Farm began as an honesty box, selling fresh eggs at the side of the road, and grew into a family-run venture. The farm is located on the Dartmoor border. Manager Debbie Coles said: “We have bomb disposal teams on site at the moment. There’s quite a history behind this bomb, apparently the grandparents of the owners used to use the bomb as a door stop!”

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Source:	**The Guardian**
Date:	**3 March 2017**
Description:	A second world war bomb that forced schools and homes in London to be evacuated has been defused. The device, weighing 500lb (227kg), was found by builders working on a development in Brondesbury Park, north-west London, late on Thursday morning, on The Avenue, near the junction of Willesden Lane. The Metropolitan police, London fire brigade and an army bomb-disposal team were scrambled to the scene, where a cordon was erected and homes were evacuated.

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Source:	**BBC**
Date:	**16th May 2017**
Description:	**Bomb disposal experts in Birmingham are taking part in a "major, delicate operation" to make a wartime bomb safe.** A major route into the city remains closed for a second day, rail services are affected and people have been evacuated from their homes. The bomb disposal team said 13 lorry loads of sand had been brought in to create a "sizeable igloo" around the 250kg (551lb) bomb. Junctions four to seven of the M6 have been closed ahead of detonation. West Midlands Police, who has praised the bravery of the team at the scene, said the motorway between junction four near Coleshill and seven at Great Barr will shut in both directions while a controlled explosion is carried out.

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Discovery: the unexploded German SD 50kg bomb was dropped by an aircraft during the second world war.

Source:	**Evening Standard**
Date:	20th January 2017
Description:	**This is the World War Two bomb which caused chaos after it was found in the Thames near the Houses of Parliament on Thursday evening.** Waterloo and Westminster bridges were both closed for several hours, Westminster underground station was closed and river traffic was halted after the device was dredged up near the Victoria Embankment. Scores of police carried out safety checks in the area and the riverfront remained closed until around 3am on Friday morning. The Royal Navy operation to dispose of the unexploded bomb involved towing it along the river to Tilbury where a controlled detonation was carried out.

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The device was destroyed in a controlled explosion at about 15:00 BST

Source:	**BBC**
Date:	**8th August 2017**
Description:	**A bomb believed to be from World War Two has been found in the Bristol Channel near Hinkley Point nuclear power station.** The 500lb device was discovered 2.5 nautical miles from the coast, about 8m below the surface. Divers conducting a survey for the construction of the new power station found the ordnance on Monday. It was destroyed in a controlled explosion at about 15:00 BST on Tuesday. The "unusual" ordnance was found off Lilstock Range, just west from Steart point and Bridgwater in Somerset.

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Source:	**The Telegraph**
Date:	**31st March 2017**
Description:	**A World War Two bouncing bomb which was trailed prior to the Dambusters raid has been discovered on a beach in Kent.** The May 1943 raid is one of the most memorable British war victories - and now a piece of one of the iconic explosives washed ashore on a picturesque beach. Beach cafe owner Lisa Clayton has owned her business on Reculver Beach near Herne Bay, Kent, for 11 years, and spotted the bomb on Wednesday morning around 10am. The 49-year-old said: "We saw the police, coastguard and bomb disposal people on the beach so we went to have a look. "We were really surprised - we've been here 11 years and had never seen a bomb here before. "It's only one end of it but it's quite big, it's a lot bigger than I thought. "There have been other little mine-type things on the beach before, but nothing like this. "It's right by the sea wall, it's a busy area, but at that time it's really quiet and there was this sudden commotion.

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APPENDIX C

Exploratory Hole Logs

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **BH1** Sheet 1 of 2

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562815E - 173612N	Hole Type CP
Location:	NORTHFLEET		Level:	Scale 1:50
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES					MADE GROUND: Dark grey sandy angular to subangular fine to coarse gravel with low cobble content. Sand is medium to coarse. Gravel is of mixed lithologies, predominantly of asphalt, with occasional brick and concrete fragments. Cobbles are angular of brick. Assessed as medium dense to dense as difficult (occasionally very difficult) to penetrate with a crowbar.	
		0.60	ES		0.50			MADE GROUND: Soft friable light greyish brown slightly sandy gravelly clay with low cobble content. Sand is fine to medium. Gravel is angular to subangular fine to coarse of mixed lithologies including brick fragments and quartz. Cobbles are angular of brick. 1% matrix of discrete metal fragments comprising defunct pipework and sheeting.	
		1.00 1.00	D ES						1
		1.50		N=29 (4,7/5,4,9,11)					
		2.00	D						2
		2.50		N=20 (3,5/7,4,3,6)					
		3.00	D						3
		3.50 - 3.95 3.50	SPTL S	N=13 (2,3/4,3,3,3)					
		4.00	D						4
		4.50 - 4.95 4.50	SPTL S	N=6 (3,2/2,2,1,1)					
		5.00	D						5
		5.50 - 5.95 5.50	SPTL S	N=12 (2,2/3,2,3,4)					
									6
		6.50	D						
		7.00 - 7.45 7.00	SPTL S	N=20 (5,6/6,6,5,3)	7.10				7
								MADE GROUND Structureless chalk composed of slightly sandy gravelly silt. Gravel is angular to subrounded fine to coarse predominantly of chalk, flint and brick fragments.	
		8.00	D						8
		8.50 - 8.95 8.50	SPTL S	N=21 (3,3/4,5,6,6)	8.50			Structureless CHALK composed of slightly sandy gravelly SILT. Gravel is very weak to weak, low to medium density, white with occasional black specks. (Grade Dm)	9
		9.50	D						
								Continued on Next Sheet	10

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Installation to 12.0m bgl; 9.0m plain pipe, 3.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **BH1** Sheet 2 of 2

Project Name:	VALE ROAD	Project No. C3476	Co-ords:	562815E - 173612N	Hole Type CP
Location:	NORTHFLEET		Level:		Scale 1:50
Client:	BRT PROPERTIES (KENT) LTD		Dates:	12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.00 - 10.45 10.00	SPTL S	N=21 (1,3/4,5,5,7)				Structureless CHALK composed of slightly sandy gravelly SILT. Gravel is very weak to weak, low to medium density, white with occasional black specks. (Grade Dm)	
		11.00	D						11
		11.50 - 11.95 11.50	SPTL S	N=21 (3,5/5,6,5,5)					
		12.00 - 12.45	U						12
		12.50	D						
		13.00 - 13.45 13.00	SPTL S	N=21 (1,4/5,4,6,6)					13
					13.45			End of Borehole at 13.45m	
									14
									15
									16
									17
									18
									19
									20

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Installation to 12.0m bgl; 9.0m plain pipe, 3.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **BH2** Sheet 1 of 2

Project Name:	VALE ROAD	Project No. C3476	Co-ords:	562801E - 173627N	Hole Type CP
Location:	NORTHFLEET		Level:		Scale 1:50
Client:	BRT PROPERTIES (KENT) LTD		Dates:	12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES					MADE GROUND: Dark grey sandy angular to subangular fine to coarse gravel with low cobble content. Sand is medium to coarse. Gravel is of mixed lithologies, predominantly of asphalt, with occasional brick and concrete fragments. Cobbles are angular of brick. Assessed as medium dense to dense as difficult (occasionally very difficult) to penetrate with a crowbar.	
		0.60	ES		0.60				
		1.00	D						1
		1.00	ES					MADE GROUND: Loose dark brownish grey slightly clayey sandy gravel with low cobble content. Sand is fine to medium. Gravel is angular to subangular fine to coarse of mixed lithologies including brick fragments and quartz. Cobbles are angular of brick. 1% matrix of discrete metal fragments comprising defunct pipework and sheeting.	
		1.50 - 1.95	SPTL						
		1.50	S	N=2 (1,0/0,0,1,1)					
		2.00	D						2
		2.50	ES						
		2.50 - 2.95	SPTL						
		2.50	S	N=4 (1,2/1,1,1,1)					
		3.00	D						3
		3.50 - 3.95	SPTL						
		3.50	S	N=6 (1,2/2,1,1,2)					
		4.00	D						4
		4.50 - 4.95	SPTL		4.50				
		4.50	S	N=4 (1,0/1,0,1,2)				MADE GROUND: Soft friable light greyish brown slightly sandy gravelly clay with low cobble content. Sand is fine to medium. Gravel is angular to subangular fine to coarse of mixed lithologies including brick fragments and quartz. Cobbles are angular of brick.	
		5.00	D						5
		5.50 - 5.95	SPTL						
		5.50	S	N=5 (1,2/2,1,1,1)					
									6
		6.50	D						
		6.50	ES						
		7.00 - 7.45	SPTL						7
		7.00	S	N=5 (1,2/2,1,1,1)					
		8.00	D						8
		8.50 - 8.95	SPTL						
		8.50	S	N=6 (1,2/2,2,1,1)					
									9
		9.50	D						
					9.80			Structureless CHALK composed of slightly sandy	
		10.00	ES						10

Continued on Next Sheet

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Installation to 9.0m bgl; 3.0m plain pipe, 6.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **BH2** Sheet 2 of 2

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562801E - 173627N	Hole Type CP
Location:	NORTHFLEET		Level:	Scale 1:50
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.00 - 10.45 10.00 10.50 11.00 - 11.45 11.50 11.50 - 11.95 11.50	SPTL S D U D SPTL S	 N=16 (1,0/2,3,4,7) N=20 (3,3/4,5,5,6)	11.95			Structureless CHALK composed of slightly sandy gravelly SILT. Gravel is very weak to weak, low to medium density, white with occasional black specks. (Grade Dm) End of Borehole at 11.95m	11 12 13 14 15 16 17 18 19 20

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Installation to 9.0m bgl; 3.0m plain pipe, 6.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **BH3** Sheet 1 of 1

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562823E - 173592N	Hole Type CP
Location:	NORTHFLEET		Level:	Scale 1:50
Client:	BRT PROPERTIES (KENT) LTD		Dates: 13/02/2019	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15	ES		0.27			MADE GROUND: Dark grey sandy angular to subangular fine to coarse gravel with low cobble content. Sand is medium to coarse. Gravel is of mixed lithologies, predominantly of asphalt, with occasional quartz, limestone, brick and concrete fragments. Cobbles are angular of brick. Assessed as medium dense to dense as difficult (occasionally very difficult) to penetrate with a crowbar.
		0.50	ES					MADE GROUND: Light brownish grey slightly gravelly sandy gravel with low to medium cobble content. Sand is fine to coarse. Gravel is angular to subangular of mixed lithologies including brick and concrete. Cobbles are angular of brick and concrete.
					1.70			MADE GROUND: Soft friable slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick fragments. 1% matrix of discrete metal fragments comprising defunct pipework and sheeting.
		2.50	ES					
					4.30			Structureless CHALK composed of slightly sandy gravelly SILT. Gravel is very weak to weak, low to medium density, white with occasional black specks. (Grade Dm)
		4.50	D					
		5.50 - 5.95 5.50	SPTL S	N=17 (2,4/3,4,5,5)				
		6.00 - 6.45	U					
		7.00 - 7.45 7.00	SPTL S	N=17 (2,3/4,3,5,5)				
		8.00 - 8.45 8.00	SPTL S	N=18 (3,3/3,4,5,6)				
					8.45			End of Borehole at 8.45m

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Backfilled with arisings.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **WS1** Sheet 1 of 1

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562794E - 173602N	Hole Type WS
Location:	NORTHFLEET		Level:	Scale 1:25
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Asphalt.	
		0.20	ES					MADE GROUND: Dark grey sandy angular to subangular fine to coarse gravel with low cobble content. Sand is medium to coarse. Gravel is of mixed lithologies, predominantly of asphalt, with occasional quartz, limestone, brick and concrete fragments. Cobbles are angular of brick. Assessed as medium dense to dense as difficult (occasionally very difficult) to penetrate with a crowbar.	
		1.00	ES						1
		1.20	S	N=13 (6,5/3,2,3,5)	1.23			MADE GROUND: Soft to firm greyish brown slightly gravelly silty clay of low strength and low cobble content. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick fragments and quartz.	
		1.30	HSV	HSV =35					
		1.35	D						
					1.48				
					1.60			MADE GROUND: Grey sandy angular to subrounded fine to medium gravel of mixed lithologies including clinker and brick fragments.	
		1.70	HSV	HSV =30					
					1.79			MADE GROUND: Soft light brown slightly sandy gravelly clay of low strength. Gravel is angular to subangular fine to coarse of mixed lithologies including limestone and quartz.	
		1.90	ES						
		2.00	C	N=8 (2,2/2,3,2,1)					2
					2.20			MADE GROUND: Loose brown mottled grey ashy gravelly medium to coarse sand with low cobble content. Gravel is angular fine to coarse of brick fragments. Cobbles are angular of brick.	
		2.50	D					MADE GROUND: Soft to firm brown slightly gravelly sandy clay. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and rare coal fragments.	
		2.95 - 3.00	D		2.95 3.00			MADE GROUND: White mottled brown angular to subangular fine to coarse gravel predominantly of chalk with rare brick fragments. Chalk is weak and of medium density.	3
								End of Borehole at 3.00m	
									4
									5

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Terminated at 3.0m bgl due to a ferrous anomaly within the underlying strata.
4. Installation to 3.0m bgl; 1.0m plain pipe, 2.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **WS2** Sheet 1 of 1

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562813E - 173613N	Hole Type WS
Location:	NORTHFLEET		Level:	Scale 1:25
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES					MADE GROUND: Dark grey sandy angular to subangular fine to coarse gravel with low cobble content. Sand is medium to coarse. Gravel is of mixed lithologies, predominantly of asphalt, with occasional quartz, limestone, brick and concrete fragments. Cobbles are angular of brick. Assessed as medium dense to dense as difficult (occasionally very difficult) to penetrate with a crowbar.	1
		1.20 1.20	ES C	N=46 (6,7/16,15,10,5)	1.10			MADE GROUND: Dark brownish grey slightly clayey sandy angular to subangular fine to coarse gravel with low cobble content. Sand is fine to coarse. Gravel is of mixed lithologies including yellow and reddish brown brick fragments. Cobbles are angular of brick.	
		1.65	D		1.60			MADE GROUND: Soft friable light brown slightly sandy silty clay of low strength with low cobble content. Cobbles are angular of slate and brick.	
		1.80 1.80	ES HSV	HSV =32					
		2.00	C	N=7 (1,1/2,1,3,1)					2
		3.00	C	N=4 (2,1/2,0,1,1)					3
		3.70	ES		3.60			MADE GROUND: Very soft to soft dark grey slightly organic slightly gravelly silty clay. Gravel is angular fine to medium of glass fragments.	
		4.00	C	N=6 (1,0/1,0,3,2)	3.90			MADE GROUND: Soft friable light brown slightly sandy silty clay with low cobble content. Cobbles are angular of brick.	4
		5.00	C	N=5 (1,0/0,1,2,2)	5.00			End of Borehole at 5.00m	5

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Installation to 5.0m bgl; 1.1m plain pipe, 3.9m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **WS3** Sheet 1 of 1

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562805E - 173608N	Hole Type WS
Location:	NORTHFLEET		Level:	Scale 1:25
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES					MADE GROUND: Dark grey sandy angular to subangular fine to coarse gravel with low cobble content. Sand is medium to coarse. Gravel is of mixed lithologies, predominantly of asphalt, with occasional quartz, limestone, brick and concrete fragments. Cobbles are angular of brick. Assessed as medium dense to dense as difficult (occasionally very difficult) to penetrate with a crowbar.	
					0.60				
		0.70	ES					MADE GROUND: Soft friable orangish brown slightly gravelly sandy clay with low cobble content. Gravel is angular to subangular fine to coarse of brick fragments. Cobbles are angular of brick.	1
					1.10				
		1.20	C	N=8 (1,2/2,2,2,2)				MADE GROUND: Soft brownish grey mottled white slightly gravelly silty clay of very low to low strength. Gravel is angular to subangular fine to coarse of chalk, brick fragments and rare angular coal fragments.	
		1.50 1.50	D HSV	HSV =30					
		2.00	C	N=2 (1,0/1,0,1,0)					2
		2.50 2.50	ES HSV	HSV =12					
					3.00			End of Borehole at 3.00m	3
									4
									5

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Terminated at 3.0m bgl due to a ferrous anomaly within the underlying strata.
4. Installation to 3.0m bgl; 1.0m plain pipe, 2.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **WS4** Sheet 1 of 1

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562802E - 173620N	Hole Type WS
Location:	NORTHFLEET		Level:	Scale 1:25
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								MADE GROUND: Concrete.	
		0.40	ES		0.35			MADE GROUND: Loose greyish brown slightly clayey gravelly fine to medium sand with low to medium cobble content. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and concrete. Cobbles are angular of brick.	1
		1.20	C	N=4 (4,1/2,1,1,0)					
		1.60	ES		1.55			MADE GROUND: Structureless chalk composed of slightly silty sandy angular to subrounded gravel. Clasts are weak, low to medium density, white with occasional black specks.	
		2.00	C	N=6 (4,1/2,2,1,1)					2
		2.30	D		2.20			MADE GROUND: Soft to firm brown slightly gravelly silty clay with slight organic odour and rare fibrous material.	
		3.00	C	N=5 (1,0/1,1,1,2)					3
		3.20	ES						
		4.00	C	N=2 (1,0/1,0,1,0)					4
		4.70	D		4.55			MADE GROUND: Soft brown mottled grey slightly gravelly clay. Gravel is angular fine of rare brick fragments.	
		5.00	C	N=2 (0,1/0,1,0,1)	5.00			End of Borehole at 5.00m	5

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Installation to 5.0m bgl; 2.0m plain pipe, 3.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **WS5** Sheet 1 of 1

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562805E - 173646N	Hole Type WS
Location:	NORTHFLEET		Level:	Scale 1:25
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.08			MADE GROUND: Concrete.	
		0.30	ES					MADE GROUND: Soft dark greyish brown mottled grey sandy silty clay.	
		0.50	ES		0.40			Soft friable orangish brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to medium of chalk.	
		0.90	ES		0.85			Structureless CHALK composed of slightly silty sandy angular to subrounded GRAVEL. Clasts are weak, low to medium density, white with occasional black specks. (Grade Dc)	1
		1.20	C	N=15 (5,6/5,4,3,3)					
		1.50	D						
		2.00	C	N=18 (4,5/5,4,5,4)					2
		3.00	C	N=24 (6,5/4,6,7,7)					3
		4.00	C	N=35 (6,6/7,8,9,11)					4
		5.00	C	N=35 (5,6/5,8,10,12)	5.00			End of Borehole at 5.00m	5

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Installation to 5.0m bgl; 1.0m plain pipe, 4.0m slotted pipe.

Gravesham Borough Council

Brownfield Solutions Limited Unit 5, Alfred Court, Saxon Business Park, Stoke Prior, Worcestershire, B60 4AD	# Borehole Log	Borehole No. **WS6** Sheet 1 of 1

Project Name:	VALE ROAD	Project No. C3476	Co-ords: 562811E - 173630N	Hole Type WS
Location:	NORTHFLEET		Level:	Scale 1:25
Client:	BRT PROPERTIES (KENT) LTD		Dates: 12/02/2019	Logged By PD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Concrete.	
								MADE GROUND: Soft dark greyish brown mottled grey sandy silty clay.	
		0.50	ES		0.45			Soft friable orangish brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to medium of chalk.	
					0.90			Structureless CHALK composed of slightly sandy gravelly SILT. Gravel is very weak to weak, low to medium density, white with occasional black specks. (Grade Dm)	1
		1.20	C	N=18 (6,7/5,6,3,4)					
		1.50	D						
		2.00	C	N=24 (5,7/8,7,4,5)					2
		2.50	D						
		3.00	C	N=24 (4,5/5,6,6,7)					3
		4.00	C	N=27 (8,8/6,7,7,7)					4
		5.00	C	N=32 (6,6/5,7,9,11)	5.00			End of Borehole at 5.00m	5

Remarks

1. Hand excavated inspection pit to 1.2m bgl.
2. No groundwater encountered.
3. Backfilled with arisings.

Gravesham Borough Council

APPENDIX D

Chemical Laboratory Test Certificates

Gravesham Borough Council

Peter Dickinson
Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

e: p.dickinson@brownfield-solutions.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Combined Report Nos : 19-29633 & 19-30633

Project / Site name:	Vale Road. Northfleet	**Samples received on:**	19/02/1600
Your job number:	C3476	**Samples instructed on:**	19/02/2019
Your order number:	PD-6285-C3476	**Analysis completed by:**	05/03/2019
Report Issue Number:	1	**Report issued on:**	05/03/2019
Samples Analysed:	20 soil samples		

Signed:

Rexona Rahman
Head of Customer Services
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Gravesham Borough Council

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159710	1159711	1159712	1159713	1159714
Sample Reference				BH1	BH1	BH2	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.20	0.60-0.60	0.20-0.20	6.50-6.50	10.00-10.00
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	4.9	11	5.7	15	21
Total mass of sample received	kg	0.001	NONE	1.5	0.49	1.5	0.41	0.48

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	-	Detected	Not-detected	Detected	-
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.002	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	0.002	-	< 0.001	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.3	8.4	10.7	8.9	8.5
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	460	810	3900	670
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.094	0.23	0.41	2.0	0.33
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	232	407	1960	334
Organic Matter	%	0.1	MCERTS	-	1.6	7.0	4.4	0.4
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	-	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	0.42	4.5	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	0.34	6.7	< 0.05	0.25
Acenaphthene	mg/kg	0.05	MCERTS	-	0.37	21	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	0.54	26	< 0.05	0.15
Phenanthrene	mg/kg	0.05	MCERTS	-	4.6	240	1.1	0.54
Anthracene	mg/kg	0.05	MCERTS	-	1.1	63	0.35	0.23
Fluoranthene	mg/kg	0.05	MCERTS	-	6.9	320	2.9	1.2
Pyrene	mg/kg	0.05	MCERTS	-	5.5	250	2.7	1.1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	3.1	130	1.7	0.71
Chrysene	mg/kg	0.05	MCERTS	-	2.3	110	1.4	0.51
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	3.6	130	2.8	0.97
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	1.2	57	0.84	0.45
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	2.8	110	2.0	0.83
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	1.4	52	1.1	0.46
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.41	17	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	1.4	56	1.5	0.48

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	35.9	1590	18.3	7.86

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	12	6.9	26	< 1.0
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	0.3	< 0.2	1.7	0.4
Chromium (hexavalent)	mg/kg	1.2	MCERTS	-	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	-	28	72	34	4.6
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	28	72	34	4.7
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	28	32	2100	20
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	260	34	2200	36
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	19	15	53	4.2
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	140	51	1900	51

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159710	1159711	1159712	1159713	1159714
Sample Reference				BH1	BH1	BH2	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.20	0.60-0.60	0.20-0.20	6.50-6.50	10.00-10.00
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	ug/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	-	72	3900	420	64
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

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Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159710	1159711	1159712	1159713	1159714
Sample Reference				BH1	BH1	BH2	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.20	0.60-0.60	0.20-0.20	6.50-6.50	10.00-10.00
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

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Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159710	1159711	1159712	1159713	1159714
Sample Reference				BH1	BH1	BH2	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.20	0.60-0.60	0.20-0.20	6.50-6.50	10.00-10.00
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159710	1159711	1159712	1159713	1159714
Sample Reference				BH1	BH1	BH2	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.20	0.60-0.60	0.20-0.20	6.50-6.50	10.00-10.00
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Miscellaneous Organics								
Coal Tar	mg/kg	10	NONE	219	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159715	1159716	1159717	1159718	1159719
Sample Reference				BH3	BH3	WS1	WS2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.15-0.15	2.50-2.50	1.90-1.90	0.50-0.50	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.0	14	15	4.3	6.4
Total mass of sample received	kg	0.001	NONE	0.48	0.48	0.42	0.45	0.50

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	Chrysotile	-	-
Asbestos in Soil	Type	N/A	ISO 17025	-	-	Detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	< 0.001	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	< 0.001	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	10.3	8.5	8.8	10.1
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	320	92	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	1.2	0.16	0.046	0.18
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	161	46.2	-
Organic Matter	%	0.1	MCERTS	-	-	2.4	8.3	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	-	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	-	< 0.05	530	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	< 0.05	550	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	< 0.05	740	-
Fluorene	mg/kg	0.05	MCERTS	-	-	< 0.05	1300	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	2.2	7600	-
Anthracene	mg/kg	0.05	MCERTS	-	-	0.52	2100	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	4.1	9000	-
Pyrene	mg/kg	0.05	MCERTS	-	-	3.4	8200	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	1.8	4400	-
Chrysene	mg/kg	0.05	MCERTS	-	-	1.9	3200	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	2.6	5400	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	0.95	2200	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	2.0	4500	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	1.1	1700	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	0.22	550	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	1.3	1800	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	-	21.9	53800	-

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	17	5.9	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	1.0	0.7	-
Chromium (hexavalent)	mg/kg	1.2	MCERTS	-	-	< 1.2	< 1.2	-
Chromium (III)	mg/kg	1	NONE	-	-	22	29	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	22	29	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	110	150	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	190	70	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	< 0.3	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	38	15	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	200	110	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159715	1159716	1159717	1159718	1159719
Sample Reference				BH3	BH3	WS1	WS2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.15-0.15	2.50-2.50	1.90-1.90	0.50-0.50	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	ug/kg	1	MCERTS	-	-	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
o-xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	-	-	-	6000	-
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	1.3	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	6.2	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	26	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	100	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	130	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	1.5	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	4.0	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	20	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	43	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	69	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159715	1159716	1159717	1159718	1159719
Sample Reference				BH3	BH3	WS1	WS2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.15-0.15	2.50-2.50	1.90-1.90	0.50-0.50	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159715	1159716	1159717	1159718	1159719
Sample Reference				BH3	BH3	WS1	WS2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.15-0.15	2.50-2.50	1.90-1.90	0.50-0.50	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159715	1159716	1159717	1159718	1159719
Sample Reference				BH3	BH3	WS1	WS2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.15-0.15	2.50-2.50	1.90-1.90	0.50-0.50	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Miscellaneous Organics								
Coal Tar	mg/kg	10	NONE	201	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159720	1159721	1159722	1159723	1159724
Sample Reference				WS2	WS2	WS3	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-1.80	3.70-3.70	0.70-0.70	2.50-2.50	1.60-1.60
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	-
Moisture Content	%	N/A	NONE	15	19	14	20	-
Total mass of sample received	kg	0.001	NONE	0.50	0.42	0.53	0.55	-
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	-	-	Not-detected	-	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.4	8.2	10.0	8.4	-
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	3200	240	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.13	1.6	0.12	0.23	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	1620	120	-	-
Organic Matter	%	0.1	MCERTS	-	3.6	1.0	-	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	2.1	-	-	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-	0.27	< 0.05	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	0.64	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	-	-
Fluorene	mg/kg	0.05	MCERTS	-	0.31	< 0.05	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	0.88	0.40	-	-
Anthracene	mg/kg	0.05	MCERTS	-	0.34	0.14	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	1.6	1.1	-	-
Pyrene	mg/kg	0.05	MCERTS	-	1.6	1.1	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	0.80	0.53	-	-
Chrysene	mg/kg	0.05	MCERTS	-	0.93	0.51	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	1.3	0.82	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	0.47	0.36	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	0.95	0.59	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.51	0.33	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.17	< 0.05	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.63	0.34	-	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	11.4	6.21	-	-
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	13	9.8	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	17	0.3	-	-
Chromium (hexavalent)	mg/kg	1.2	MCERTS	-	< 1.2	< 1.2	-	-
Chromium (III)	mg/kg	1	NONE	-	31	25	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	31	25	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	270	30	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	650	94	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	25	18	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	1000	130	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159720	1159721	1159722	1159723	1159724
Sample Reference				WS2	WS2	WS3	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-1.80	3.70-3.70	0.70-0.70	2.50-2.50	1.60-1.60
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	ug/kg	1	MCERTS	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	-	-	20	-	-
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	14	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	14	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	< 10	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	39	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	45	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159720	1159721	1159722	1159723	1159724
Sample Reference				WS2	WS2	WS3	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-1.80	3.70-3.70	0.70-0.70	2.50-2.50	1.60-1.60
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159720	1159721	1159722	1159723	1159724
Sample Reference				WS2	WS2	WS3	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-1.80	3.70-3.70	0.70-0.70	2.50-2.50	1.60-1.60
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	0.27	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	0.64	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	0.31	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	0.88	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	0.34	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	1.6	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	1.6	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	0.80	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	0.93	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	1.3	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	0.47	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	0.95	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.51	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.17	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.63	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159720	1159721	1159722	1159723	1159724
Sample Reference				WS2	WS2	WS3	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-1.80	3.70-3.70	0.70-0.70	2.50-2.50	1.60-1.60
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Miscellaneous Organics								
Coal Tar	mg/kg	10	NONE	-	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159725	1159726	1165102	1165103	1165104
Sample Reference				WS4	WS5	WS2	BH2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.20-3.20	0.90-0.90	0.50-0.50	0.20-0.20	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	17	13	4.3	5.7	6.4
Total mass of sample received	kg	0.001	NONE	0.48	0.41	0.45	1.5	0.50
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.6	8.6	-	-	10.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	90	34	-	-	410
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.045	0.017	-	-	0.21
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	45.0	17.0	-	-	207
Organic Matter	%	0.1	MCERTS	2.5	0.3	-	-	4.8
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.4	-	-	-	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	1.9
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	4.9
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	2.9
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	6.0
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	40
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	14
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	66
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	56
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	34
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	23
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	32
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	18
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	29
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	16
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	4.6
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	18
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	-	-	364
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.4	4.0	-	-	26
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	0.4	-	-	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	-	-	< 1.2
Chromium (III)	mg/kg	1	NONE	16	14	-	-	39
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16	14	-	-	39
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	5.5	-	-	74
Lead (aqua regia extractable)	mg/kg	1	MCERTS	33	4.1	-	-	91
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11	12	-	-	30
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	22	-	-	160

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159725	1159726	1165102	1165103	1165104
Sample Reference				WS4	WS5	WS2	BH2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.20-3.20	0.90-0.90	0.50-0.50	0.20-0.20	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	2.2	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	30	15	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	81	51	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	640	250	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	760	320	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	51	< 1.0	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	300	140	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	1900	1100	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	4000	2500	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	6200	3800	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159725	1159726	1165102	1165103	1165104
Sample Reference				WS4	WS5	WS2	BH2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.20-3.20	0.90-0.90	0.50-0.50	0.20-0.20	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Chloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Styrene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159725	1159726	1165102	1165103	1165104
Sample Reference				WS4	WS5	WS2	BH2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.20-3.20	0.90-0.90	0.50-0.50	0.20-0.20	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet
Your Order No: PD-6285-C3476

Lab Sample Number				1159725	1159726	1165102	1165103	1165104
Sample Reference				WS4	WS5	WS2	BH2	WS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.20-3.20	0.90-0.90	0.50-0.50	0.20-0.20	1.20-1.20
Date Sampled				12/02/2019	12/02/2019	12/02/2019	12/02/2019	12/02/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Miscellaneous Organics								
Coal Tar	mg/kg	10	NONE	-	-	2350	1350	-

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Combined Report Nos	**19-29633 & 19-30633**
Project / Site name:	**Vale Road. Northfleet**
Your Order No:	**PD-6285-C3476**

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1159711	BH1	0.60-0.60	151	Loose Fibres	**Chrysotile**	0.002	**0.002**
1159713	BH2	6.50-6.50	141	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**
1159717	WS1	1.90-1.90	102	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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Project / Site name: Vale Road. Northfleet

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1159710	BH1	None Supplied	0.20-0.20	Brown loam and sand with gravel and vegetation.
1159711	BH1	None Supplied	0.60-0.60	Brown loam and clay with gravel and vegetation.
1159712	BH2	None Supplied	0.20-0.20	Brown loam and sand with gravel and vegetation.
1159713	BH2	None Supplied	6.50-6.50	Brown clay and sand with gravel.
1159714	BH2	None Supplied	10.00-10.00	Beige clay with chalk.
1159715	BH3	None Supplied	0.15-0.15	Brown loam and sand with gravel and rubble.
1159716	BH3	None Supplied	2.50-2.50	Brown clay and sand with gravel and rubble.
1159717	WS1	None Supplied	1.90-1.90	Brown clay and sand with gravel.
1159718	WS2	None Supplied	0.50-0.50	Brown loam and sand with gravel.
1159719	WS2	None Supplied	1.20-1.20	Brown loam and sand with gravel.
1159720	WS2	None Supplied	1.80-1.80	Brown clay.
1159721	WS2	None Supplied	3.70-3.70	Brown clay and sand with gravel.
1159722	WS3	None Supplied	0.70-0.70	Brown clay and sand with gravel and brick.
1159723	WS3	None Supplied	2.50-2.50	Brown clay and sand with gravel.
1159724	WS4	None Supplied	1.60-1.60	-
1159725	WS4	None Supplied	3.20-3.20	Brown clay.
1159726	WS5	None Supplied	0.90-0.90	Light brown clay and sand with chalk and gravel.
1165102	WS2	None Supplied	0.50-0.50	Brown loam and sand with gravel.
1165103	BH2	None Supplied	0.20-0.20	Brown loam and sand with gravel and vegetation.
1165104	WS2	None Supplied	1.20-1.20	Brown loam and sand with gravel.

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Coal Tar in Soil	In-house method by GC-MS, by calculation of discrete polyaromatic content.	In-house method by calculation	L064-UK	D	NONE
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

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Combined Report Nos : 19-29633 & 19-30633

Project / Site name: Vale Road. Northfleet

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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APPENDIX E

Geotechnical Laboratory Test Certificates

Gravesham Borough Council

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

4041

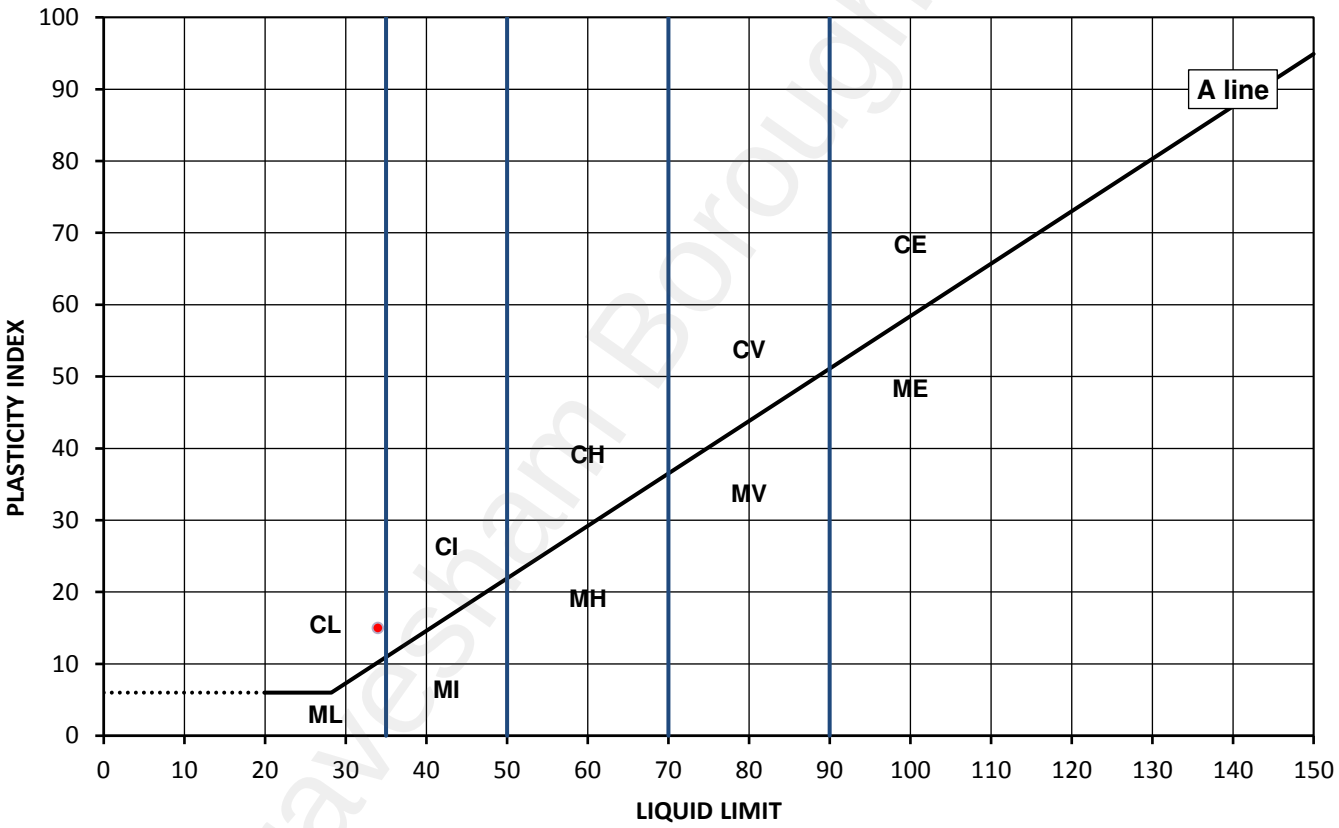
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3476
Client Address:	Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD	Job Number:	19-29664
		Date Sampled:	12/02/2019
		Date Received:	19/02/2019
Contact:	Peter Dickinson	Date Tested:	27/02/2019
Site Name:	Vale Road, Northfleet	Sampled By:	PD
Site Address:	Not Given		

Test Results

Laboratory Reference:	1159981	Depth Top [m]:	1.00
Hole No.:	BH1	Depth Base [m]:	1.00
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
15	34	19	15	81



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 232.3

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The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

4041

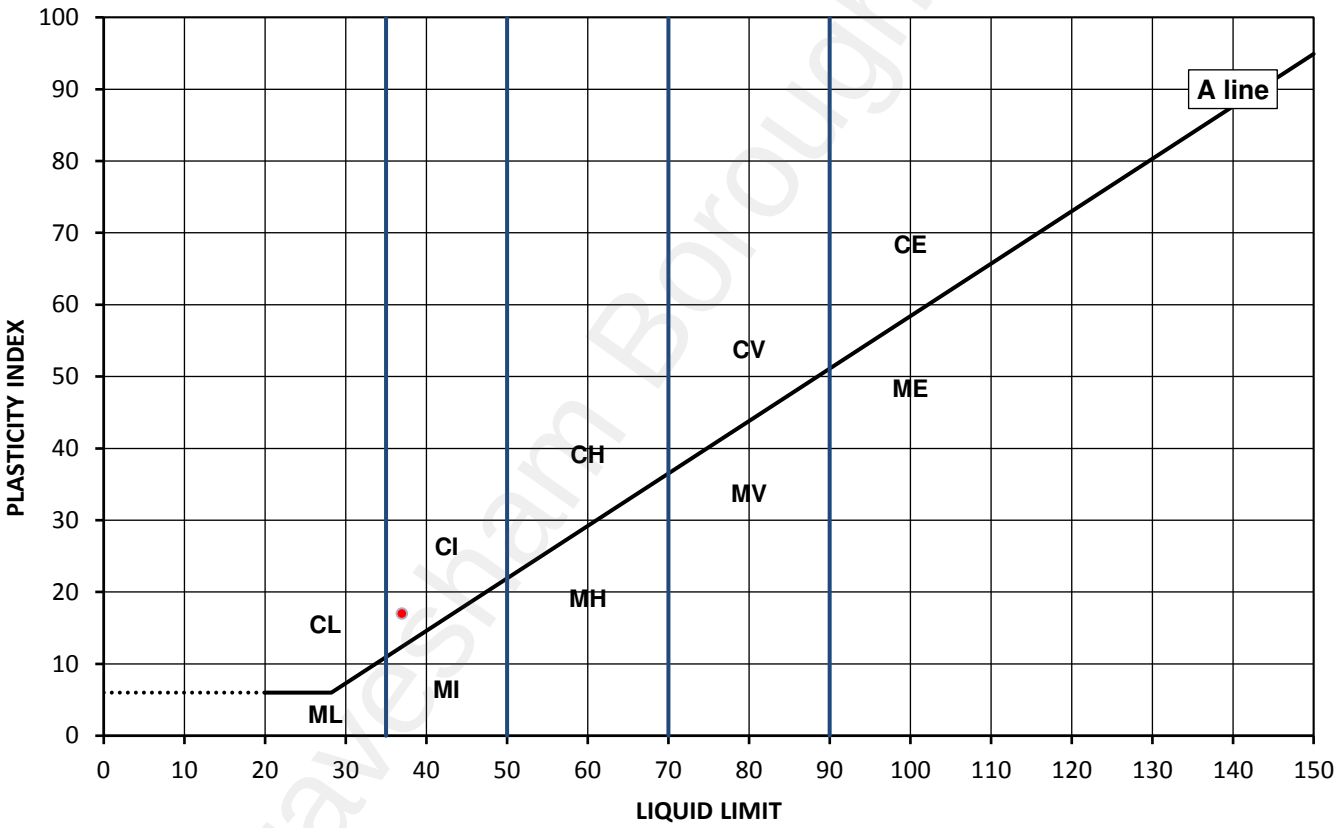
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3476
Client Address:	Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD	Job Number:	19-29664
		Date Sampled:	12/02/2019
		Date Received:	19/02/2019
Contact:	Peter Dickinson	Date Tested:	27/02/2019
Site Name:	Vale Road, Northfleet	Sampled By:	PD
Site Address:	Not Given		

Test Results

Laboratory Reference:	1159985	Depth Top [m]:	1.65
Hole No.:	WS2	Depth Base [m]:	1.65
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Mottled brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
20	37	20	17	96



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 232.3

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for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

4041

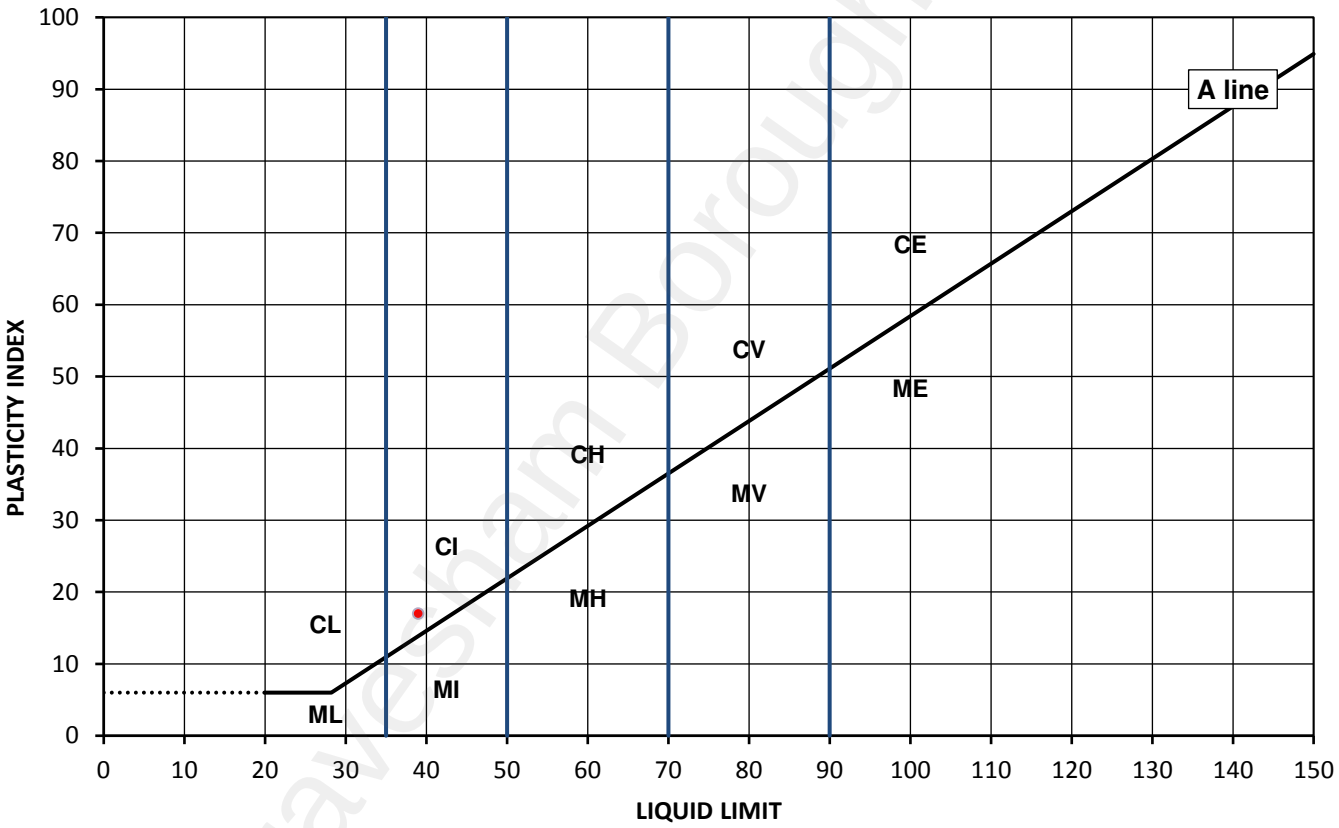
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3476
Client Address:	Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD	Job Number:	19-29664
		Date Sampled:	12/02/2019
		Date Received:	19/02/2019
Contact:	Peter Dickinson	Date Tested:	27/02/2019
Site Name:	Vale Road, Northfleet	Sampled By:	PD
Site Address:	Not Given		

Test Results

Laboratory Reference:	1159986	Depth Top [m]:	1.50
Hole No.:	WS3	Depth Base [m]:	1.50
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown slightly gravelly sandy CLAY with fragments of chalk		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
29	39	22	17	85



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 232.3

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for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

4041

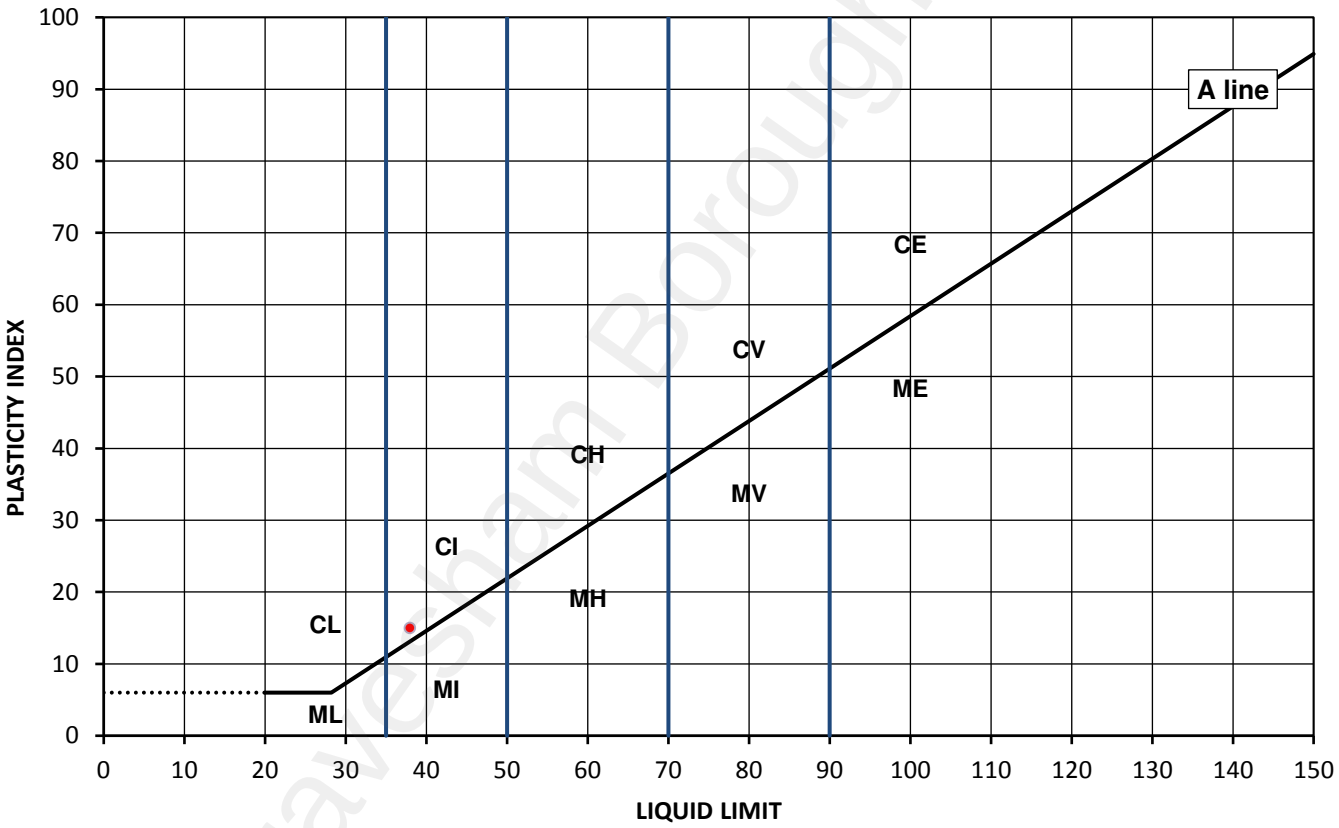
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3476
Client Address:	Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD	Job Number:	19-29664
		Date Sampled:	12/02/2019
		Date Received:	19/02/2019
Contact:	Peter Dickinson	Date Tested:	27/02/2019
Site Name:	Vale Road, Northfleet	Sampled By:	PD
Site Address:	Not Given		

Test Results

Laboratory Reference:	1159987	Depth Top [m]:	2.50
Hole No.:	WS3	Depth Base [m]:	2.50
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown slightly gravelly sandy CLAY with fragments of chalk		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
26	38	23	15	87



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 232.3

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for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

Environmental Science

UKAS TESTING 4041

Tested in Accordance with:

MC by BS 1377-2: 1990: Clause 3.2; Atterberg by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: Brownfield Solutions Ltd
Client Address: Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD
Contact: Peter Dickinson
Site Name: Vale Road, Northfleet
Site Address: Not Given

Client Reference: C3476
Job Number: 19-29664
Date Sampled: 12/02/2019
Date Received: 19/02/2019
Date Tested: 27/02/2019
Sampled By: PD

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC#	Atterberg#				Density		Total Porosity				
		Reference	Depth Top	Depth Base	Type				% Passing 425um	LL	PL	PI	bulk	PD					
			m	m				%	%	%	%	%	Mg/m3	Mg/m3	%				
1159981	BH1	Not Given	1.00	1.00	D	Dark brown slightly gravelly very sandy CLAY	Atterberg 1 Point	15	81	34	19	15							
1159982	BH1	Not Given	9.50	9.50	D	White CHALK		30											
1159988	BH1	Not Given	12.00	12.45	U	White clayey CHALK		31											
1159983	BH2	Not Given	10.50	10.50	D	White CHALK		30											
1159989	BH2	Not Given	11.00	11.45	U	White clayey CHALK		31											
1159984	BH3	Not Given	4.50	4.50	D	White CHALK		28											
1159990	BH3	Not Given	6.00	6.45	U	White chalky CLAY		29											
1159985	WS2	Not Given	1.65	1.65	D	Mottled brown slightly gravelly sandy CLAY	Atterberg 1 Point	20	96	37	20	17							
1159986	WS3	Not Given	1.50	1.50	D	Dark brown slightly gravelly sandy CLAY with fragments of chalk	Atterberg 1 Point	29	85	39	22	17							
1159987	WS3	Not Given	2.50	2.50	D	Dark brown slightly gravelly sandy CLAY with fragments of chalk	Atterberg 1 Point	26	87	38	23	15							

Note: # UKAS accredited; NP - Non plastic

Comments:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 234.5

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for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

SUMMARY REPORT

Summary of Saturation Moisture Content Test Results

Tested in Accordance with: BS 1377-2: 1990: Clause 3.3

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Environmental Science

Client:	Brownfield Solutions Ltd
Client Address:	Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD
Contact:	Peter Dickinson
Site Name:	Vale Road, Northfleet
Site Address:	Not Given

Client Reference:	C3476
Job Number:	19-29664
Date Sampled:	12/02/2019
Date Received:	19/02/2019
Date Tested:	27/02/2019
Sampled By:	PD

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	SMC	Bulk density	Dry density	MC
		Reference	Depth Top m	Depth Base m	Type			%	Mg/m3	Mg/m3	%
1159982	BH1	Not Given	9.50	9.50	D	White CHALK	Supplied lump of chalk fails to comply with volume requirements as per BS1377:2 Clause 3.3.5.1	32	1.89	1.45	30
1159983	BH2	Not Given	10.50	10.50	D	White CHALK	Supplied lump of chalk fails to comply with volume requirements as per BS1377:2 Clause 3.3.5.1	31	1.91	1.47	30
1159984	BH3	Not Given	4.50	4.50	D	White CHALK		31	1.87	1.46	28

Note: SMC - Saturation Moisture Content; MC - Moisture Content

Comments:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 132.8

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for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

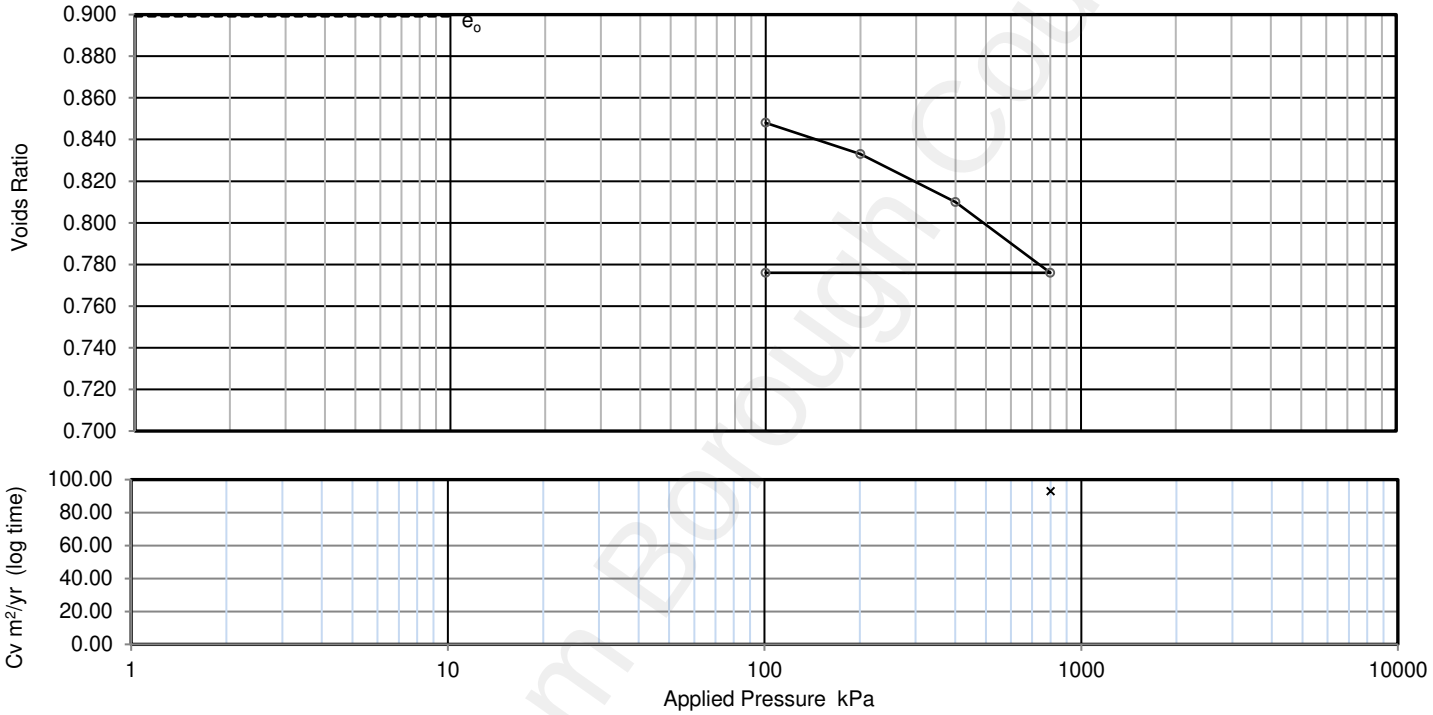
4041

Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Brownfield Solutions Ltd	Client Reference:	C3476
Client Address:	Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD	Job Number:	19-29664
		Date Sampled:	12/02/2019
		Date Received:	19/02/2019
Contact:	Peter Dickinson	Date Tested:	22/02/2019
Site Name:	Vale Road, Northfleet	Sampled By:	PD
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1159989	Depth Top [m]:	11.00
Hole No.:	BH2	Depth Base [m]:	11.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	White clayey CHALK		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.899	-	-	-	-
100	0.848	0.27	N/A	N/A	0.00064
200	0.833	0.08	N/A	54	0.0009
400	0.810	0.063	N/A	57	0.0014
800	0.776	0.046	93	70	0.0021
100	0.776	7.6E-08			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.00	18.71	mm
Moisture Content	31	32	%
Bulk density	1.83	1.97	Mg/m3
Dry density	1.40	1.49	Mg/m3
Voids Ratio	0.899	0.775	
Saturation	92	108	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 172.10

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for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

Environmental Science

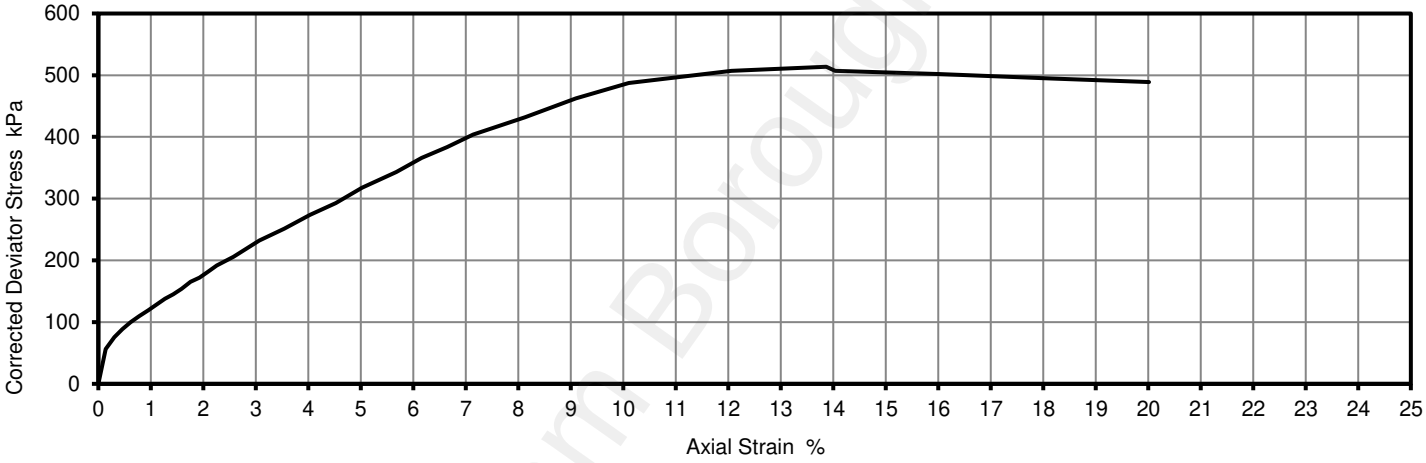
Client:	Brownfield Solutions Ltd	Client Reference:	C3476
Client Address:	Unit 5 Alfred Court, Saxon Business Park, Stoke Prior, Bromsgrove, B60 4AD	Job Number:	19-29664
		Date Sampled:	12/02/2019
		Date Received:	19/02/2019
Contact:	Peter Dickinson	Date Tested:	26/02/2019
Site Name:	Vale Road, Northfleet	Sampled By:	PD
Site Address:	Not Given		

Test Result

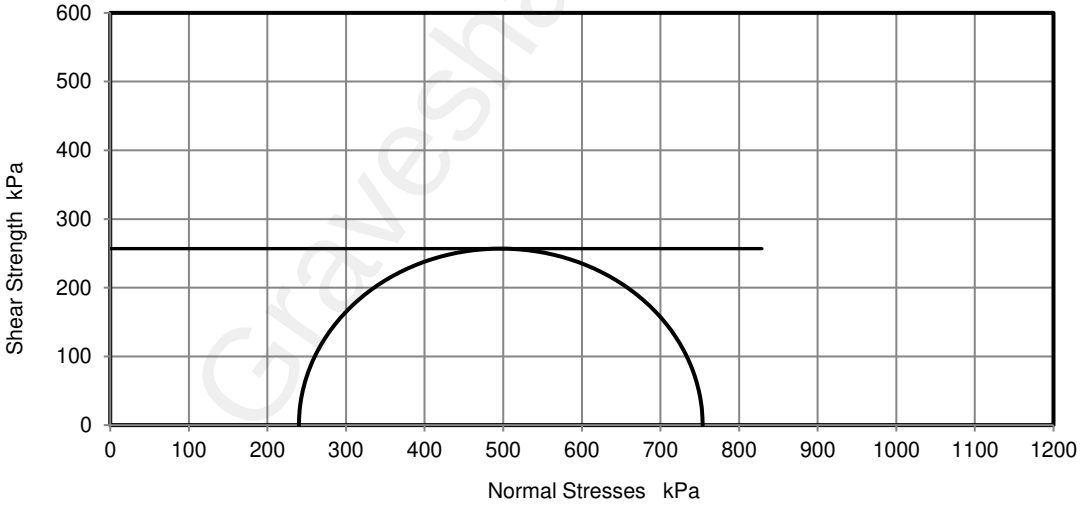
Laboratory Reference:	1159988	Depth Top [m]:	12.00
Hole No.:	BH1	Depth Base [m]:	12.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	White clayey CHALK		

Test Number	1		Rate of Strain	2.00	%/min
Length	191.68	mm	Cell Pressure	240	kPa
Diameter	103.67	mm	Axial Strain at failure	13.9	%
Bulk Density	1.92	Mg/m3	Deviator Stress, (σ1 - σ3)f	514	kPa
Moisture Content	31	%	Undrained Shear Strength, cu	257	kPa ½(σ1 - σ3)f
Dry Density	1.46	Mg/m3	Mode of Failure	Plastic	
Membrane Correction	0.69	kPa	Membrane thickness	0.25	mm

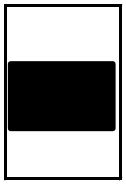
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/03/2019

Signed: Darren Berrill
Geotechnical General Manager

GF 184.6

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for and on behalf of i2 Analytical Ltd

Gravesham Borough Council

APPENDIX F

Ground Gas Monitoring Results

Gravesham Borough Council

BRT PROPERTIES LTD

VALE ROAD, NORTHFLEET

C3467

15/03/2019

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb				
Ambient	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH4)	LEL	Hydrogen Sulphide (H2S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.2	0.1	ND	ND	NA	NA	1004	GP	GA5000	Overcast	Falling
Finish	21.6	0.1	ND	ND	NA	NA	1004				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH_4)	LEL	Hydrogen Sulphide (H_2S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q_{hg} CO_2	Q_{hg} CH_4	Notes
BH1	Peak	18.2	3.0	ND	ND	NA	NA	NGW	-0.1	0.0	No	0.00	ND	
	Steady	21.4	0.1	ND	ND	NA	NA							
BH2	Peak	17.8	3.0	ND	ND	NA	NA	NGW	0.1	0.0	No	0.00	ND	
	Steady	21.1	0.1	ND	ND	NA	NA							
WS1	Peak	15.4	1.3	ND	ND	NA	NA	NGW	0.0	0.0	No	0.00	ND	
	Steady	17.4	1.4	ND	ND	NA	NA							
WS2	Peak	21.0	0.1	ND	ND	NA	NA	NGW	-0.1	0.0	No	0.00	ND	
	Steady	21.4	0.1	ND	ND	NA	NA							
WS3	Peak	19.7	1.9	ND	ND	NA	NA	NGW	0.0	0.0	No	0.00	ND	
	Steady	21.4	0.1	ND	ND	NA	NA							
WS4	Peak	21.0	0.6	ND	ND	NA	NA	NGW	0.0	0.1	No	0.00	ND	
	Steady	21.1	0.5	ND	ND	NA	NA							

Gravesham Borough Council

BRT PROPERTIES LTD

VALE ROAD, NORTHFLEET

C3467

03/04/2019

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb					
Ambient	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH4)	LEL	Hydrogen Sulphide (H2S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.5	0.1	ND	ND	NA	ND	998	CG	GA5000	Overcast	Falling
Finish	21.5	0.1	ND	ND	NA	ND	998				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH_4)	LEL	Hydrogen Sulphide (H_2S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q_{hg} CO_2	Q_{hg} CH_4	Notes
BH1	Peak	18.8	2.1	ND	ND	ND	3.0	NGW	0.1	0.1	No	0.00	ND	
	Steady	21.6	0.2	ND	ND	ND	ND							
BH2	Peak	18.5	2.6	ND	ND	ND	2.0	NGW	0.3	-0.2	No	0.01	ND	
	Steady	21.3	0.3	ND	ND	ND	ND							
WS1	Peak	19.4	1.8	ND	ND	ND	2.0	NGW	0.3	0.1	No	0.01	ND	
	Steady	21.7	0.2	ND	ND	ND	ND							
WS2	Peak	16.5	1.8	ND	ND	ND	2.0	NGW	0.1	0.0	No	0.00	ND	
	Steady	21.8	0.1	ND	ND	ND	ND							
WS3	Peak	17.5	2.6	ND	ND	ND	1.0	NGW	0.1	0.1	No	0.00	ND	
	Steady	21.9	0.1	ND	ND	ND	ND							
WS4	Peak	18.9	1.1	ND	ND	ND	1.0	NGW	0.2	0.1	No	0.00	ND	
	Steady	19.3	0.8	ND	ND	ND	ND							
WS5	Peak	18.9	1.1	ND	ND	ND	1.0	NGW	0.1	0.1	No	0.00	ND	
	Steady	19.3	0.9	ND	ND	ND	ND							

Gravesham Borough Council

BRT PROPERTIES LTD

VALE ROAD, NORTHFLEET

C3467

25/04/2019

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb				
Ambient	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH4)	LEL	Hydrogen Sulphide (H2S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.8	ND	ND	ND	NA	NA	996	TM	GA2000	Partial cloud	Rising
Finish	21.8	ND	ND	ND	NA	NA	996				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH_4)	LEL	Hydrogen Sulphide (H_2S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q_{hg} CO_2	Q_{hg} CH_4	Notes
BH1	Peak	19.9	1.0	ND	ND	NA	NA	NGW	0.2	0.3	No	0.00	ND	
	Steady	21.8	ND	ND	ND	NA	NA							
BH2	Peak	20.2	0.8	ND	ND	NA	NA	NGW	0.0	0.1	No	0.00	ND	
	Steady	21.3	ND	ND	ND	NA	NA							
WS1	Peak	20.5	0.6	ND	ND	NA	NA	NGW	0.1	0.2	No	0.00	ND	
	Steady	20.7	0.5	ND	ND	NA	NA							
WS2	Peak	19.7	0.9	ND	ND	NA	NA	NGW	0.1	0.3	No	0.00	ND	
	Steady	21.1	0.4	ND	ND	NA	NA							
WS3	Peak	20.8	0.7	ND	ND	NA	NA	NGW	-0.1	0.3	No	0.00	ND	
	Steady	21.0	0.6	ND	ND	NA	NA							
WS4	Peak	21.3	0.2	ND	ND	NA	NA	NGW	0.0	0.3	No	0.00	ND	
	Steady	21.8	ND	ND	ND	NA	NA							
WS5	Peak	21.6	0.1	ND	ND	NA	NA	NGW	0.2	0.0	No	0.00	ND	
	Steady	21.5	ND	ND	ND	NA	NA							

Gravesham Borough Council

BRT PROPERTIES LTD

VALE ROAD, NORTHFLEET

C3467

08/05/2019

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb				
Ambient	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH4)	LEL	Hydrogen Sulphide (H2S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.5	0.1	ND	ND	NA	NA	991	MS	GA2000	Raining	Steady
Finish	21.5	0.1	ND	ND	NA	NA	991				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH_4)	LEL	Hydrogen Sulphide (H_2S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q_{hg} CO_2	Q_{hg} CH_4	Notes
BH1	Peak	20.3	0.9	ND	ND	NA	NA	NGW	0.1	0.2	No	0.00	ND	
	Steady	21.3	0.2	ND	ND	NA	NA							
BH2	Peak	19.8	1.3	ND	ND	NA	NA	NGW	0.0	-0.1	No	0.00	ND	
	Steady	21.2	0.2	ND	ND	NA	NA							
WS1	Peak	20.1	0.9	ND	ND	NA	NA	NGW	0.1	0.1	No	0.00	ND	
	Steady	21.2	0.2	ND	ND	NA	NA							
WS2	Peak	19.3	1.2	ND	ND	NA	NA	NGW	0.1	0.2	No	0.00	ND	
	Steady	21.1	0.3	ND	ND	NA	NA							
WS3	Peak	20.3	0.8	ND	ND	NA	NA	NGW	0.1	0.1	No	0.00	ND	
	Steady	20.6	0.5	ND	ND	NA	NA							
WS4	Peak	19.4	0.8	ND	ND	NA	NA	NGW	0.1	0.1	No	0.00	ND	
	Steady	21.5	0.1	ND	ND	NA	NA							
WS5	Peak	20.0	0.7	ND	ND	NA	NA	NGW	0.2	0.1	No	0.00	ND	
	Steady	21.3	0.1	ND	ND	NA	NA							

Gravesham Borough Council

BRT PROPERTIES LTD

VALE ROAD, NORTHFLEET

C3467

22/05/2019

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb					
Ambient	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH4)	LEL	Hydrogen Sulphide (H2S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	20.8	0.0	ND	ND	NA	NA	1017	GP	GFM426	Sunny	Steady
Finish	20.8	0.0	ND	ND	NA	NA	1017				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH_4)	LEL	Hydrogen Sulphide (H_2S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q_{hg} CO_2	Q_{hg} CH_4	Notes
BH1	Peak	19.6	0.9	ND	ND	ND	NA	NGW	0.0	0.0	No	0.00	ND	
	Steady	20.2	0.2	ND	ND	ND	NA							
BH2	Peak	17.8	1.8	ND	ND	ND	NA	NGW	0.0	0.3	No	0.00	ND	
	Steady	19.6	0.5	ND	ND	ND	NA							
WS1	Peak	21.1	0.2	ND	ND	ND	NA	NGW	0.0	0.0	No	0.00	ND	
	Steady	21.1	0.2	ND	ND	ND	NA							
WS2	Peak	20.3	0.6	ND	ND	ND	NA	NGW	0.0	0.0	No	0.00	ND	
	Steady	20.9	0.1	ND	ND	ND	NA							
WS3	Peak	17.6	1.0	ND	ND	ND	NA	NGW	0.0	0.5	No	0.00	ND	
	Steady	20.8	0.1	ND	ND	ND	NA							
WS4	Peak	19.1	0.5	ND	ND	ND	NA	NGW	0.0	0.1	No	0.00	ND	
	Steady	20.0	0.1	ND	ND	ND	NA							
WS5	Peak	20.6	0.3	ND	ND	ND	NA	NGW	0.0	0.6	No	0.00	ND	
	Steady	20.9	ND	ND	ND	ND	NA							

Gravesham Borough Council

BRT PROPERTIES LTD

VALE ROAD, NORTHFLEET

C3467

12/06/2019

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb				
Ambient	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH4)	LEL	Hydrogen Sulphide (H2S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.9	0.1	ND	ND	ND	ND	1001	CG	GA2000	Light Rain	Steady
Finish	21.9	ND	ND	ND	ND	ND	1001				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O_2)	Carbon Dioxide (CO_2)	Methane (CH_4)	LEL	Hydrogen Sulphide (H_2S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q_{hg} CO_2	Q_{hg} CH_4	Notes
BH1	Peak	18.8	0.8	ND	ND	ND	ND	NGW	0.1	0.0	No	0.00	ND	
	Steady	19.3	0.2	ND	ND	ND	ND							
BH2	Peak	19.2	0.8	ND	ND	ND	ND	NGW	0.0	0.0	No	0.00	ND	
	Steady	19.9	0.3	ND	ND	ND	ND							
WS1	Peak	20.3	0.5	ND	ND	ND	ND	NGW	0.1	0.2	No	0.00	ND	
	Steady	20.6	0.2	ND	ND	ND	ND							
WS2	Peak	19.4	1.0	ND	ND	ND	ND	NGW	0.1	0.0	No	0.00	ND	
	Steady	20.3	0.3	ND	ND	ND	ND							
WS3	Peak	20.6	0.9	ND	ND	ND	ND	NGW	0.0	0.0	No	0.00	ND	
	Steady	21.0	0.7	ND	ND	ND	ND							
WS4	Peak	20.8	0.1	ND	ND	ND	ND	NGW	0.1	0.0	No	0.00	ND	
	Steady	20.7	0.1	ND	ND	ND	ND							
WS5	Peak	20.7	0.4	ND	ND	ND	ND	NGW	0.0	0.0	No	0.00	ND	
	Steady	20.3	0.2	ND	ND	ND	ND							

Gravesham Borough Council

APPENDIX G

Waste Classification Report

Gravesham Borough Council

BROWNFIELD SOLUTIONS LTD

HazWasteOnline™

Waste Classification Report

L5Y4A-DP64L-G6JBB

Job name

Vale Road, Northfleet

Description/Comments

Project

C3476

Site

Vale Road, Northfleet

Related Documents

#	Name	Description
None		

Waste Stream Template

BSL Suite with Coal Tar (no asbestos)

Classified by

Name:
Nicola Swallow
Date:
13 Mar 2019 12:48 GMT
Telephone:
01606 334 844

Company:
Brownfield Solutions Ltd
William Smith House
173 – 183 Witton Street
Northwich
CW9 5LP

Report

Created by: Nicola Swallow
Created date: 13 Mar 2019 12:48 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	BH1	0.2	Non Hazardous		3
2	BH1[2]	0.6	Non Hazardous		4
3	BH2	0.2	Hazardous	HP 3(i), HP 7, HP 11	6
4	BH2[2]	6.5	Hazardous	HP 7, HP 14	9
5	BH2[3]	10	Non Hazardous		12
6	BH3	0.15	Non Hazardous		14
7	WS1	1.9	Non Hazardous		15
8	WS2	0.5	Hazardous	HP 3(i), HP 7, HP 10, HP 11, HP 14	18
9	WS2[2]	1.2	Non Hazardous		21
10	WS2[3]	3.7	Non Hazardous		23

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#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
11	WS3	0.7	Non Hazardous		26
12	WS4	3.2	Non Hazardous		28
13	WS5	0.9	Non Hazardous		30

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	32
Appendix B: Rationale for selection of metal species	33
Appendix C: Version	34

Gravesham Borough Council

Classification of sample: BH1

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH1
Sample Depth:
0.2 m
Moisture content:
4.9%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 4.9% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	•	pH			PH		9.3 pH		9.3 pH	9.3 pH		
2		Tar, coal; Coal tar; [The by-product from the destructive distillation of coal. Almost black semisolid. A complex combination of aromatic hydro-carbons, phenolic compounds, nitrogen bases and thiophene.]	648-081-00-7	232-361-7	8007-45-2	H	219 mg/kg		208.269 mg/kg	0.0208 %	✓	
									Total:	0.0208 %		

Key

	User supplied data
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
CLP: Note H	Known incomplete entry, should not be used as is

Gravesham Borough Council

Classification of sample: BH1[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH1[2]
Sample Depth:
0.6 m
Moisture content:
11%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12	mg/kg	1.32	14.101	mg/kg	0.00141 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.3	mg/kg	1.285	0.343	mg/kg	0.0000267 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		28	mg/kg	1.462	36.422	mg/kg	0.00364 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		28	mg/kg	1.126	28.057	mg/kg	0.00281 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	260	mg/kg		231.4	mg/kg	0.0231 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		19	mg/kg	1.579	26.709	mg/kg	0.00267 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		140	mg/kg	1.245	155.091	mg/kg	0.0155 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		0.42	mg/kg		0.374	mg/kg	0.0000374 %	✓	
11		acenaphthylene		205-917-1	208-96-8		0.34	mg/kg		0.303	mg/kg	0.0000303 %	✓	
12		acenaphthene		201-469-6	83-32-9		0.37	mg/kg		0.329	mg/kg	0.0000329 %	✓	
13		fluorene		201-695-5	86-73-7		0.54	mg/kg		0.481	mg/kg	0.0000481 %	✓	

Gravesham Borough Council

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14	●	phenanthrene				4.6	mg/kg		4.094	mg/kg	0.000409 %	✓	
			201-581-5	85-01-8									
15	●	anthracene				1.1	mg/kg		0.979	mg/kg	0.0000979 %	✓	
			204-371-1	120-12-7									
16	●	fluoranthene				6.9	mg/kg		6.141	mg/kg	0.000614 %	✓	
			205-912-4	206-44-0									
17	●	pyrene				5.5	mg/kg		4.895	mg/kg	0.000489 %	✓	
			204-927-3	129-00-0									
18		benzo[a]anthracene				3.1	mg/kg		2.759	mg/kg	0.000276 %	✓	
		601-033-00-9	200-280-6	56-55-3									
19		chrysene				2.3	mg/kg		2.047	mg/kg	0.000205 %	✓	
		601-048-00-0	205-923-4	218-01-9									
20		benzo[a]pyrene; benzo[def]chrysene				2.8	mg/kg		2.492	mg/kg	0.000249 %	✓	
		601-032-00-3	200-028-5	50-32-8									
21	●	indeno[123-cd]pyrene				1.4	mg/kg		1.246	mg/kg	0.000125 %	✓	
			205-893-2	193-39-5									
22		dibenz[a,h]anthracene				0.41	mg/kg		0.365	mg/kg	0.0000365 %	✓	
		601-041-00-2	200-181-8	53-70-3									
23	●	benzo[ghi]perylene				1.4	mg/kg		1.246	mg/kg	0.000125 %	✓	
			205-883-8	191-24-2									
24		benzo[b]fluoranthene				3.6	mg/kg		3.204	mg/kg	0.00032 %	✓	
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				1.2	mg/kg		1.068	mg/kg	0.000107 %	✓	
		601-036-00-5	205-916-6	207-08-9									
26	●	TPH (C6 to C40) petroleum group				72	mg/kg		64.08	mg/kg	0.00641 %	✓	
				TPH									
27		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0									
28	●	pH				8.4	pH		8.4	pH	8.4 pH		
				PH									
										Total:	0.0593 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because The absence of a free draining liquid from the majority of the samples and the relatively low concentration of short-chain hydrocarbons reported indicate that this hazard property is not applicable to this waste.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00641%)

Gravesham Borough Council

Classification of sample: BH2

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:	LoW Code:	
BH2	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.2 m	Entry:	17 05 03 * (Soil and stones containing hazardous substances)
Moisture content:		
5.7% (wet weight correction)		

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

Tar, coal; Coal tar; [The by-product from the destructive distillation of coal. Almost black semisolid. A complex combination of aromatic hydro-carbons, phenolic compounds, nitrogen bases and thiophene.]: (conc.: 0.127%)

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.389%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.389%)

Hazard properties (substances considered hazardous until shown otherwise)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.389%)

Determinands

Moisture content: 5.7% Wet Weight Moisture Correction applied (MC)

Gravesham Borough Council

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6.9	mg/kg	1.32	8.591	mg/kg	0.000859 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		**<LOD**
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		72	mg/kg	1.462	99.234	mg/kg	0.00992 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		32	mg/kg	1.126	33.975	mg/kg	0.0034 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	34	mg/kg		32.062	mg/kg	0.00321 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		15	mg/kg	1.579	22.342	mg/kg	0.00223 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		51	mg/kg	1.245	59.862	mg/kg	0.00599 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		4.5	mg/kg		4.244	mg/kg	0.000424 %	✓	
11		acenaphthylene		205-917-1	208-96-8		6.7	mg/kg		6.318	mg/kg	0.000632 %	✓	
12		acenaphthene		201-469-6	83-32-9		21	mg/kg		19.803	mg/kg	0.00198 %	✓	
13		fluorene		201-695-5	86-73-7		26	mg/kg		24.518	mg/kg	0.00245 %	✓	
14		phenanthrene		201-581-5	85-01-8		240	mg/kg		226.32	mg/kg	0.0226 %	✓	
15		anthracene		204-371-1	120-12-7		63	mg/kg		59.409	mg/kg	0.00594 %	✓	
16		fluoranthene		205-912-4	206-44-0		320	mg/kg		301.76	mg/kg	0.0302 %	✓	
17		pyrene		204-927-3	129-00-0		250	mg/kg		235.75	mg/kg	0.0236 %	✓	
18		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		130	mg/kg		122.59	mg/kg	0.0123 %	✓	
19		chrysene	601-048-00-0	205-923-4	218-01-9		110	mg/kg		103.73	mg/kg	0.0104 %	✓	
20		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		110	mg/kg		103.73	mg/kg	0.0104 %	✓	
21		indeno[123-cd]pyrene		205-893-2	193-39-5		52	mg/kg		49.036	mg/kg	0.0049 %	✓	
22		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		17	mg/kg		16.031	mg/kg	0.0016 %	✓	
23		benzo[ghi]perylene		205-883-8	191-24-2		56	mg/kg		52.808	mg/kg	0.00528 %	✓	
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		130	mg/kg		122.59	mg/kg	0.0123 %	✓	
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		57	mg/kg		53.751	mg/kg	0.00538 %	✓	
26		TPH (C6 to C40) petroleum group			TPH		4120	mg/kg		3885.16	mg/kg	0.389 %	✓	
27		benzene	601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**

Chesham Borough Council

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
28		toluene	601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
29	●	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
30		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<1	mg/kg		<1	mg/kg	<0.0001 %		**<LOD**
31		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
32	●	pH			PH		10.7	pH		10.7	pH	10.7 pH		
33		Tar, coal; Coal tar; [The by-product from the destructive distillation of coal. Almost black semisolid. A complex combination of aromatic hydro-carbons, phenolic compounds, nitrogen bases and thiophene.]	648-081-00-7	232-361-7	8007-45-2	H	1350	mg/kg		1273.05	mg/kg	0.127 %	✓	
											Total:	0.692 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification
CLP: Note H	Known incomplete entry, should not be used as is

Gravesham Borough Council

Classification of sample: BH2[2]

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
BH2[2]
Sample Depth:
6.5 m
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

lead compounds with the exception of those specified elsewhere in this Annex (worst case): (Note 1 conc.: 0.187%)

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Because of determinands:

dicopper oxide; copper (I) oxide: (compound conc.: 0.201%)
lead compounds with the exception of those specified elsewhere in this Annex (worst case): (Note 1 conc.: 0.187%)
zinc oxide: (compound conc.: 0.201%)

Determinands

Moisture content: 15% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		26	mg/kg	1.32	29.179	mg/kg	0.00292 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.7	mg/kg	1.285	1.857	mg/kg	0.000145 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		34	mg/kg	1.462	42.239	mg/kg	0.00422 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		2100	mg/kg	1.126	2009.711	mg/kg	0.201 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	2200	mg/kg		1870	mg/kg	0.187 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**

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#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		53	mg/kg	1.579	71.156	mg/kg	0.00712 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		1900	mg/kg	1.245	2010.213	mg/kg	0.201 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
11	•	acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
12	•	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
13	•	fluorene		201-695-5	86-73-7		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
14	•	phenanthrene		201-581-5	85-01-8		1.1	mg/kg		0.935	mg/kg	0.0000935 %	✓	
15	•	anthracene		204-371-1	120-12-7		0.35	mg/kg		0.298	mg/kg	0.0000298 %	✓	
16	•	fluoranthene		205-912-4	206-44-0		2.9	mg/kg		2.465	mg/kg	0.000246 %	✓	
17	•	pyrene		204-927-3	129-00-0		2.7	mg/kg		2.295	mg/kg	0.00023 %	✓	
18		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		1.7	mg/kg		1.445	mg/kg	0.000145 %	✓	
19		chrysene	601-048-00-0	205-923-4	218-01-9		1.4	mg/kg		1.19	mg/kg	0.000119 %	✓	
20		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		2	mg/kg		1.7	mg/kg	0.00017 %	✓	
21	•	indeno[123-cd]pyrene		205-893-2	193-39-5		1.1	mg/kg		0.935	mg/kg	0.0000935 %	✓	
22		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
23	•	benzo[ghi]perylene		205-883-8	191-24-2		1.5	mg/kg		1.275	mg/kg	0.000127 %	✓	
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		2.8	mg/kg		2.38	mg/kg	0.000238 %	✓	
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.84	mg/kg		0.714	mg/kg	0.0000714 %	✓	
26	•	TPH (C6 to C40) petroleum group			TPH		420	mg/kg		357	mg/kg	0.0357 %	✓	
27		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
28	•	pH			PH		8.9	pH		8.9	pH	8.9 pH		
											Total:	0.641 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

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Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because The absence of a free draining liquid from the majority of the samples and the relatively low concentration of short-chain hydrocarbons reported indicate that this hazard property is not applicable to this waste.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0357%)

Gravesham Borough Council

Classification of sample: BH2[3]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH2[3]
Sample Depth:
10 m
Moisture content:
21%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 21% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<1	mg/kg	1.32	<1.32	mg/kg	<0.000132 %		**<LOD**
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.4	mg/kg	1.285	0.406	mg/kg	0.0000316 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		4.6	mg/kg	1.462	5.311	mg/kg	0.000531 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		20	mg/kg	1.126	17.789	mg/kg	0.00178 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	36	mg/kg		28.44	mg/kg	0.00284 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		4.2	mg/kg	1.579	5.241	mg/kg	0.000524 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		51	mg/kg	1.245	50.15	mg/kg	0.00501 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
11		acenaphthylene		205-917-1	208-96-8		0.25	mg/kg		0.198	mg/kg	0.0000198 %	✓	
12		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
13		fluorene		201-695-5	86-73-7		0.15	mg/kg		0.119	mg/kg	0.0000119 %	✓	

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#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14	●	phenanthrene				0.54	mg/kg		0.427	mg/kg	0.0000427 %	✓	
			201-581-5	85-01-8									
15	●	anthracene				0.23	mg/kg		0.182	mg/kg	0.0000182 %	✓	
			204-371-1	120-12-7									
16	●	fluoranthene				1.2	mg/kg		0.948	mg/kg	0.0000948 %	✓	
			205-912-4	206-44-0									
17	●	pyrene				1.1	mg/kg		0.869	mg/kg	0.0000869 %	✓	
			204-927-3	129-00-0									
18		benzo[a]anthracene				0.71	mg/kg		0.561	mg/kg	0.0000561 %	✓	
		601-033-00-9	200-280-6	56-55-3									
19		chrysene				0.51	mg/kg		0.403	mg/kg	0.0000403 %	✓	
		601-048-00-0	205-923-4	218-01-9									
20		benzo[a]pyrene; benzo[def]chrysene				0.83	mg/kg		0.656	mg/kg	0.0000656 %	✓	
		601-032-00-3	200-028-5	50-32-8									
21	●	indeno[123-cd]pyrene				0.46	mg/kg		0.363	mg/kg	0.0000363 %	✓	
			205-893-2	193-39-5									
22		dibenz[a,h]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
23	●	benzo[ghi]perylene				0.48	mg/kg		0.379	mg/kg	0.0000379 %	✓	
			205-883-8	191-24-2									
24		benzo[b]fluoranthene				0.97	mg/kg		0.766	mg/kg	0.0000766 %	✓	
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.45	mg/kg		0.356	mg/kg	0.0000356 %	✓	
		601-036-00-5	205-916-6	207-08-9									
26	●	TPH (C6 to C40) petroleum group				64	mg/kg		50.56	mg/kg	0.00506 %	✓	
				TPH									
27		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0									
28	●	pH				8.5	pH		8.5	pH	8.5 pH		
				PH									
										Total:	0.0171 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because The absence of a free draining liquid from the majority of the samples and the relatively low concentration of short-chain hydrocarbons reported indicate that this hazard property is not applicable to this waste.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00506%)

Gravesham Borough Council

Classification of sample: BH3

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH3
Sample Depth:
0.15 m
Moisture content:
5%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 5% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		Tar, coal; Coal tar; [The by-product from the destructive distillation of coal. Almost black semisolid. A complex combination of aromatic hydro-carbons, phenolic compounds, nitrogen bases and thiophene.]			H	201 mg/kg		190.95 mg/kg	0.0191 %	✓	
		648-081-00-7	232-361-7	8007-45-2							
								Total:	0.0191 %		

Key

User supplied data

CLP: Note H Known incomplete entry, should not be used as is

Gravesham Borough Council

Classification of sample: WS1

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS1
Sample Depth:
1.9 m
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		17	mg/kg	1.32	19.079	mg/kg	0.00191 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1	mg/kg	1.285	1.092	mg/kg	0.000085 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		22	mg/kg	1.462	27.331	mg/kg	0.00273 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		110	mg/kg	1.126	105.271	mg/kg	0.0105 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	190	mg/kg		161.5	mg/kg	0.0162 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		38	mg/kg	1.579	51.018	mg/kg	0.0051 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		200	mg/kg	1.245	211.601	mg/kg	0.0212 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
11		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
12		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
13		fluorene		201-695-5	86-73-7		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**

Gravesham Borough Council

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14	•	phenanthrene		201-581-5	85-01-8		2.2	mg/kg		1.87	mg/kg	0.000187 %	✓	
15	•	anthracene		204-371-1	120-12-7		0.52	mg/kg		0.442	mg/kg	0.0000442 %	✓	
16	•	fluoranthene		205-912-4	206-44-0		4.1	mg/kg		3.485	mg/kg	0.000349 %	✓	
17	•	pyrene		204-927-3	129-00-0		3.4	mg/kg		2.89	mg/kg	0.000289 %	✓	
18		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		1.8	mg/kg		1.53	mg/kg	0.000153 %	✓	
19		chrysene	601-048-00-0	205-923-4	218-01-9		1.9	mg/kg		1.615	mg/kg	0.000162 %	✓	
20		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		2	mg/kg		1.7	mg/kg	0.00017 %	✓	
21	•	indeno[123-cd]pyrene		205-893-2	193-39-5		1.1	mg/kg		0.935	mg/kg	0.0000935 %	✓	
22		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.22	mg/kg		0.187	mg/kg	0.0000187 %	✓	
23	•	benzo[ghi]perylene		205-883-8	191-24-2		1.3	mg/kg		1.105	mg/kg	0.000111 %	✓	
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		2.6	mg/kg		2.21	mg/kg	0.000221 %	✓	
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.95	mg/kg		0.808	mg/kg	0.0000807 %	✓	
26	•	TPH (C6 to C40) petroleum group			TPH		199	mg/kg		169.15	mg/kg	0.0169 %	✓	
27		benzene	601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
28		toluene	601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
29	•	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
30		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		**<LOD**
31		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
32	•	pH			PH		8.5	pH		8.5	pH	8.5 pH		
											Total:	0.077 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because The absence of a free draining liquid from the majority of the samples and the relatively low concentration of short-chain hydrocarbons reported indicate that this hazard property is not applicable to this waste.

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Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0169%)

Gravesham Borough Council

Classification of sample: WS2

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:	LoW Code:	
WS2	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.5 m	Entry:	17 05 03 * (Soil and stones containing hazardous substances)
Moisture content:		
4.3% (wet weight correction)		

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

Tar, coal; Coal tar; [The by-product from the destructive distillation of coal. Almost black semisolid. A complex combination of aromatic hydro-carbons, phenolic compounds, nitrogen bases and thiophene.]: (conc.: 0.225%)

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinands:

benzo[a]anthracene: (conc.: 0.421%)
chrysene: (conc.: 0.306%)
benzo[a]pyrene; benzo[def]chrysene: (conc.: 0.431%)
benzo[b]fluoranthene: (conc.: 0.517%)
benzo[k]fluoranthene: (conc.: 0.211%)
TPH (C6 to C40) petroleum group: (conc.: 0.666%)

HP 10: Toxic for reproduction "waste which has adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring"

Hazard Statements hit:

Repr. 1B; H360FD "May damage fertility. May damage the unborn child."

Because of determinand:

benzo[a]pyrene; benzo[def]chrysene: (conc.: 0.431%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinands:

benzo[a]pyrene; benzo[def]chrysene: (conc.: 0.431%)
TPH (C6 to C40) petroleum group: (conc.: 0.666%)

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Gravesham Borough Council

Because of determinands:

fluorene: (conc.: 0.124%)
phenanthrene: (conc.: 0.727%)
anthracene: (conc.: 0.201%)
fluoranthene: (conc.: 0.861%)
pyrene: (conc.: 0.785%)
benzo[a]anthracene: (conc.: 0.421%)
chrysene: (conc.: 0.306%)
benzo[a]pyrene; benzo[def]chrysene: (conc.: 0.431%)
benzo[ghi]perylene: (conc.: 0.172%)
benzo[b]fluoranthene: (conc.: 0.517%)
benzo[k]fluoranthene: (conc.: 0.211%)

Hazard properties (substances considered hazardous until shown otherwise)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.666%)

Determinands

Moisture content: 4.3% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		5.9	mg/kg	1.32	7.455	mg/kg	0.000745 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.7	mg/kg	1.285	0.861	mg/kg	0.000067 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		29	mg/kg	1.462	40.563	mg/kg	0.00406 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		150	mg/kg	1.126	161.621	mg/kg	0.0162 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	70	mg/kg		66.99	mg/kg	0.0067 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		15	mg/kg	1.579	22.674	mg/kg	0.00227 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		110	mg/kg	1.245	131.031	mg/kg	0.0131 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		530	mg/kg		507.21	mg/kg	0.0507 %	✓	
11		acenaphthylene		205-917-1	208-96-8		550	mg/kg		526.35	mg/kg	0.0526 %	✓	
12		acenaphthene		201-469-6	83-32-9		740	mg/kg		708.18	mg/kg	0.0708 %	✓	
13		fluorene		201-695-5	86-73-7		1300	mg/kg		1244.1	mg/kg	0.124 %	✓	

Gateshead Borough Council

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14	•	phenanthrene		201-581-5	85-01-8		7600	mg/kg		7273.2	mg/kg	0.727 %	✓	
15	•	anthracene		204-371-1	120-12-7		2100	mg/kg		2009.7	mg/kg	0.201 %	✓	
16	•	fluoranthene		205-912-4	206-44-0		9000	mg/kg		8613	mg/kg	0.861 %	✓	
17	•	pyrene		204-927-3	129-00-0		8200	mg/kg		7847.4	mg/kg	0.785 %	✓	
18		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		4400	mg/kg		4210.8	mg/kg	0.421 %	✓	
19		chrysene	601-048-00-0	205-923-4	218-01-9		3200	mg/kg		3062.4	mg/kg	0.306 %	✓	
20		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		4500	mg/kg		4306.5	mg/kg	0.431 %	✓	
21	•	indeno[123-cd]pyrene		205-893-2	193-39-5		1700	mg/kg		1626.9	mg/kg	0.163 %	✓	
22		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		550	mg/kg		526.35	mg/kg	0.0526 %	✓	
23	•	benzo[ghi]perylene		205-883-8	191-24-2		1800	mg/kg		1722.6	mg/kg	0.172 %	✓	
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		5400	mg/kg		5167.8	mg/kg	0.517 %	✓	
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		2200	mg/kg		2105.4	mg/kg	0.211 %	✓	
26	•	TPH (C6 to C40) petroleum group			TPH		6960	mg/kg		6660.72	mg/kg	0.666 %	✓	
27		benzene	601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
28		toluene	601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
29	•	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
30		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<1	mg/kg		<1	mg/kg	<0.0001 %		**<LOD**
31		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
32	•	pH			PH		8.8	pH		8.8	pH	8.8 pH		
33		Tar, coal; Coal tar; [The by-product from the destructive distillation of coal. Almost black semisolid. A complex combination of aromatic hydro-carbons, phenolic compounds, nitrogen bases and thiophene.]	648-081-00-7	232-361-7	8007-45-2	H	2350	mg/kg		2248.95	mg/kg	0.225 %	✓	
											Total:	6.08 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification
CLP: Note H	Known incomplete entry, should not be used as is

Gloucestershire Borough Council

Classification of sample: WS2[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS2[2]
Sample Depth:
1.2 m
Moisture content:
6.4%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 6.4% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		26	mg/kg	1.32	32.131	mg/kg	0.00321 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		**<LOD**
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		39	mg/kg	1.462	53.353	mg/kg	0.00534 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		74	mg/kg	1.126	77.984	mg/kg	0.0078 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	91	mg/kg		85.176	mg/kg	0.00852 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		30	mg/kg	1.579	44.352	mg/kg	0.00444 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		160	mg/kg	1.245	186.408	mg/kg	0.0186 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		1.9	mg/kg		1.778	mg/kg	0.000178 %	✓	
11		acenaphthylene		205-917-1	208-96-8		4.9	mg/kg		4.586	mg/kg	0.000459 %	✓	
12		acenaphthene		201-469-6	83-32-9		2.9	mg/kg		2.714	mg/kg	0.000271 %	✓	
13		fluorene		201-695-5	86-73-7		6	mg/kg		5.616	mg/kg	0.000562 %	✓	

Gravesham Borough Council

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14	●	phenanthrene		201-581-5	85-01-8		40	mg/kg		37.44	mg/kg	0.00374 %	✓	
15	●	anthracene		204-371-1	120-12-7		14	mg/kg		13.104	mg/kg	0.00131 %	✓	
16	●	fluoranthene		205-912-4	206-44-0		66	mg/kg		61.776	mg/kg	0.00618 %	✓	
17	●	pyrene		204-927-3	129-00-0		56	mg/kg		52.416	mg/kg	0.00524 %	✓	
18		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		34	mg/kg		31.824	mg/kg	0.00318 %	✓	
19		chrysene	601-048-00-0	205-923-4	218-01-9		23	mg/kg		21.528	mg/kg	0.00215 %	✓	
20		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		29	mg/kg		27.144	mg/kg	0.00271 %	✓	
21	●	indeno[123-cd]pyrene		205-893-2	193-39-5		16	mg/kg		14.976	mg/kg	0.0015 %	✓	
22		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		4.6	mg/kg		4.306	mg/kg	0.000431 %	✓	
23	●	benzo[ghi]perylene		205-883-8	191-24-2		18	mg/kg		16.848	mg/kg	0.00168 %	✓	
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		32	mg/kg		29.952	mg/kg	0.003 %	✓	
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		18	mg/kg		16.848	mg/kg	0.00168 %	✓	
26		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
27	●	pH			PH		10	pH		10	pH	10pH		
											Total:	0.0828 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Gravesham Borough Council

Classification of sample: WS2[3]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS2[3]
Sample Depth:
3.7 m
Moisture content:
19%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 19% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13	mg/kg	1.32	13.903	mg/kg	0.00139 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	17	mg/kg	1.285	17.698	mg/kg	0.00138 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		31	mg/kg	1.462	36.7	mg/kg	0.00367 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		270	mg/kg	1.126	246.232	mg/kg	0.0246 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	650	mg/kg		526.5	mg/kg	0.0527 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		25	mg/kg	1.579	31.985	mg/kg	0.0032 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		1000	mg/kg	1.245	1008.218	mg/kg	0.101 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		0.27	mg/kg		0.219	mg/kg	0.0000219 %	✓	
11		acenaphthylene		205-917-1	208-96-8		0.64	mg/kg		0.518	mg/kg	0.0000518 %	✓	
12		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
13		fluorene		201-695-5	86-73-7		0.31	mg/kg		0.251	mg/kg	0.0000251 %	✓	

Gravesham Borough Council

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14	•	phenanthrene		201-581-5	85-01-8		0.88	mg/kg		0.713	mg/kg	0.0000713 %	✓	
15	•	anthracene		204-371-1	120-12-7		0.34	mg/kg		0.275	mg/kg	0.0000275 %	✓	
16	•	fluoranthene		205-912-4	206-44-0		1.6	mg/kg		1.296	mg/kg	0.00013 %	✓	
17	•	pyrene		204-927-3	129-00-0		1.6	mg/kg		1.296	mg/kg	0.00013 %	✓	
18		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.8	mg/kg		0.648	mg/kg	0.0000648 %	✓	
19		chrysene	601-048-00-0	205-923-4	218-01-9		0.93	mg/kg		0.753	mg/kg	0.0000753 %	✓	
20		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.95	mg/kg		0.77	mg/kg	0.000077 %	✓	
21	•	indeno[123-cd]pyrene		205-893-2	193-39-5		0.51	mg/kg		0.413	mg/kg	0.0000413 %	✓	
22		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.17	mg/kg		0.138	mg/kg	0.0000138 %	✓	
23	•	benzo[ghi]perylene		205-883-8	191-24-2		0.63	mg/kg		0.51	mg/kg	0.000051 %	✓	
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		1.3	mg/kg		1.053	mg/kg	0.000105 %	✓	
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.47	mg/kg		0.381	mg/kg	0.0000381 %	✓	
26	•	TPH (C6 to C40) petroleum group			TPH		59	mg/kg		47.79	mg/kg	0.00478 %	✓	
27		benzene	601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
28		toluene	601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
29	•	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
30		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		**<LOD**
31		phenol	604-001-00-2	203-632-7	108-95-2		<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
32		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
33	•	pH			PH		8.2	pH		8.2	pH	8.2 pH		
											Total:	0.194 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Gravesham Borough Council

Force this Hazardous property to non hazardous because The absence of a free draining liquid from the majority of the samples and the relatively low concentration of short-chain hydrocarbons reported indicate that this hazard property is not applicable to this waste.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00478%)

Gravesham Borough Council

Classification of sample: WS3

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS3
Sample Depth:
0.7 m
Moisture content:
14%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.8	mg/kg	1.32	11.128	mg/kg	0.00111 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.3	mg/kg	1.285	0.332	mg/kg	0.0000258 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		25	mg/kg	1.462	31.423	mg/kg	0.00314 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		30	mg/kg	1.126	29.048	mg/kg	0.0029 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	94	mg/kg		80.84	mg/kg	0.00808 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		18	mg/kg	1.579	24.451	mg/kg	0.00245 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		130	mg/kg	1.245	139.159	mg/kg	0.0139 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
11		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
12		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
13		fluorene		201-695-5	86-73-7		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD

Gravesham Borough Council

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		phenanthrene				0.4	mg/kg		0.344	mg/kg	0.0000344 %	✓	
			201-581-5	85-01-8									
15		anthracene				0.14	mg/kg		0.12	mg/kg	0.000012 %	✓	
			204-371-1	120-12-7									
16		fluoranthene				1.1	mg/kg		0.946	mg/kg	0.0000946 %	✓	
			205-912-4	206-44-0									
17		pyrene				1.1	mg/kg		0.946	mg/kg	0.0000946 %	✓	
			204-927-3	129-00-0									
18		benzo[a]anthracene				0.53	mg/kg		0.456	mg/kg	0.0000456 %	✓	
		601-033-00-9	200-280-6	56-55-3									
19		chrysene				0.51	mg/kg		0.439	mg/kg	0.0000439 %	✓	
		601-048-00-0	205-923-4	218-01-9									
20		benzo[a]pyrene; benzo[def]chrysene				0.59	mg/kg		0.507	mg/kg	0.0000507 %	✓	
		601-032-00-3	200-028-5	50-32-8									
21		indeno[123-cd]pyrene				0.33	mg/kg		0.284	mg/kg	0.0000284 %	✓	
			205-893-2	193-39-5									
22		dibenz[a,h]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
23		benzo[ghi]perylene				0.34	mg/kg		0.292	mg/kg	0.0000292 %	✓	
			205-883-8	191-24-2									
24		benzo[b]fluoranthene				0.82	mg/kg		0.705	mg/kg	0.0000705 %	✓	
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.36	mg/kg		0.31	mg/kg	0.000031 %	✓	
		601-036-00-5	205-916-6	207-08-9									
26		TPH (C6 to C40) petroleum group				20	mg/kg		17.2	mg/kg	0.00172 %	✓	
				TPH									
27		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0									
28		pH				10	pH		10	pH	10pH		
				PH									
										Total:	0.0344 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because The absence of a free draining liquid from the majority of the samples and the relatively low concentration of short-chain hydrocarbons reported indicate that this hazard property is not applicable to this waste.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00172%)

Gravesham Borough Council

Classification of sample: WS4

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS4
Sample Depth:
3.2 m
Moisture content:
17%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6.4	mg/kg	1.32	7.014	mg/kg	0.000701 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.2	mg/kg	1.285	0.213	mg/kg	0.0000166 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		16	mg/kg	1.462	19.409	mg/kg	0.00194 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		17	mg/kg	1.126	15.886	mg/kg	0.00159 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	33	mg/kg		27.39	mg/kg	0.00274 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		11	mg/kg	1.579	14.421	mg/kg	0.00144 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		43	mg/kg	1.245	44.424	mg/kg	0.00444 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
11		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
12		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
13		fluorene		201-695-5	86-73-7		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD

Gravesham Borough Council

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		phenanthrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			201-581-5	85-01-8									
15		anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			204-371-1	120-12-7									
16		fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-912-4	206-44-0									
17		pyrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			204-927-3	129-00-0									
18		benzo[a]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-033-00-9	200-280-6	56-55-3									
19		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-048-00-0	205-923-4	218-01-9									
20		benzo[a]pyrene; benzo[def]chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-032-00-3	200-028-5	50-32-8									
21		indeno[123-cd]pyrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-893-2	193-39-5									
22		dibenz[a,h]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
23		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-883-8	191-24-2									
24		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-036-00-5	205-916-6	207-08-9									
26		TPH (C6 to C40) petroleum group				<20	mg/kg		<20	mg/kg	<0.002 %		**<LOD**
				TPH									
27		benzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-020-00-8	200-753-7	71-43-2									
28		toluene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
29		ethylbenzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
30		xylene				<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
31		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
		604-001-00-2	203-632-7	108-95-2									
32		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0									
33		pH				7.6	pH		7.6	pH	7.6 pH		
				PH									
										Total:	0.0155 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Craven District Council

Classification of sample: WS5

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS5
Sample Depth:
0.9 m
Moisture content:
13%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4	mg/kg	1.32	4.595	mg/kg	0.000459 %	✓	
2		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.4	mg/kg	1.285	0.447	mg/kg	0.0000348 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		14	mg/kg	1.462	17.802	mg/kg	0.00178 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		5.5	mg/kg	1.126	5.387	mg/kg	0.000539 %	✓	
5		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	4.1	mg/kg		3.567	mg/kg	0.000357 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		**<LOD**
7		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		12	mg/kg	1.579	16.49	mg/kg	0.00165 %	✓	
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		22	mg/kg	1.245	23.824	mg/kg	0.00238 %	✓	
10		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
11		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
12		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
13		fluorene		201-695-5	86-73-7		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**

Gravesham Borough Council

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		phenanthrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			201-581-5	85-01-8									
15		anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			204-371-1	120-12-7									
16		fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-912-4	206-44-0									
17		pyrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			204-927-3	129-00-0									
18		benzo[a]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-033-00-9	200-280-6	56-55-3									
19		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-048-00-0	205-923-4	218-01-9									
20		benzo[a]pyrene; benzo[def]chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-032-00-3	200-028-5	50-32-8									
21		indeno[123-cd]pyrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-893-2	193-39-5									
22		dibenz[a,h]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
23		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-883-8	191-24-2									
24		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-036-00-5	205-916-6	207-08-9									
26		TPH (C6 to C40) petroleum group				<20	mg/kg		<20	mg/kg	<0.002 %		**<LOD**
				TPH									
27		benzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-020-00-8	200-753-7	71-43-2									
28		toluene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
29		ethylbenzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
30		xylene				<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
31		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0									
32		pH				8.6	pH		8.6	pH	8.6 pH		
				PH									
										Total:	0.00981 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

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Appendix A: Classifier defined and non CLP determinands

- **chromium(III) oxide** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Repr. 1B H360FD , Skin Sens. 1 H317 , Resp. Sens. 1 H334 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302 , Acute Tox. 4 H332

- **lead compounds with the exception of those specified elsewhere in this Annex (worst case)**

CLP index number: 082-001-00-6
Description/Comments: Worst Case: IARC considers lead compounds Group 1; Carcinogenic to humans; Lead REACH Consortium considers some lead compounds Carcinogenic category 1A
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s)/Risk Phrase(s):
03 Jun 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html (worst case lead compounds). Review date 29/09/2015

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 1 H310 , Acute Tox. 1 H330 , Acute Tox. 4 H302

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 2 H411 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Carc. 2 H351 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Acute Tox. 4 H302

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Skin Irrit. 2 H315

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- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Aquatic Chronic 2 H411 , Repr. 2 H361d , Carc. 1B H350 , Muta. 1B H340 , STOT RE 2 H373 , Asp. Tox. 1 H304 , Flam. Liq. 3 H226

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s)/Risk Phrase(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Worst case species based on hazard statements

cadmium {cadmium sulfide}

Worst case species based on hazard statements

chromium in chromium(III) compounds {chromium(III) oxide}

Worst case species based on hazard statements

copper {dicopper oxide; copper (I) oxide}

Most likely common species

lead {lead compounds with the exception of those specified elsewhere in this Annex (worst case)}

The absence of chromium VI within the soil samples indicates that lead chromate could not be present within the site soils. The samples were generally collected from areas which were not overlain with hardstanding suggesting that soluble lead form will likely have leached from the site soils. Given this, the next most conservative insoluble lead species has been selected.

mercury {mercury dichloride}

Worst case species based on hazard statements

nickel {nickel dihydroxide}

Worst case species based on hazard statements

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Worst case species based on hazard statements

zinc {zinc oxide}

The absence of chromium VI within the soil samples indicates that zinc chromate could not be present within the site soils. The samples were generally collected from areas which were not overlain with hardstanding suggesting that soluble zinc form will likely have leached from the site soils. Given this, the next most conservative insoluble zinc species has been selected.

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chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case species based on hazard statements

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2019.67.3824.7797 (09 Mar 2019)
HazWasteOnline Database: 2019.67.3824.7797 (09 Mar 2019)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

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