
REMEDIATION METHOD STATEMENT

Royal Heights
57 Queen's Road
Reading
RG1 4BN

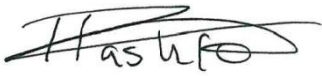
for Reading Heights Ltd

17 July 2018

J18003A



Document control

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This report is intended as a Ground Investigation Report (GIR) as defined in BS EN1997-2, unless specifically noted otherwise. The report is not a Geotechnical Design Report (GDR) as defined in EN1997-2 and recommendations made within this report are for guidance only.

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1.0 INTRODUCTION

Consideration is being given to the redevelopment of this site through the conversion of the existing office building into residential units, which will include the addition of two extra storeys and a ten-storey extension on the eastern half of the car park. Some landscaped areas are to be incorporated into the scheme.

A desk study and ground investigation has previously been carried out by GEA (Report Ref J18003, dated 9 March 2018). The previous investigation found concentrations of lead and benzo(a)pyrene that were elevated relative to guidelines for a residential end use with plant uptake.

This report sets out a formalised Remedial Method Statement and should be read in conjunction with the previous report.

1.1 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigations carried out. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

2.0 THE SITE

The site is located about 900 m to the southeast of Reading railway station and fronts onto Queen's Road to the south. It is bounded to the east by Watlington Street, located at a higher level and supported by a retaining wall, to the north by Grantley Heights, a six-storey apartment block, and to the west by Queen's Wharf, a seven-storey apartment block.

The site is irregular in shape and measures roughly 40 m north-south by 50 m east-west. It is essentially on a level plot and is currently occupied by Clarendon House, which fronts onto Queen's Road to the south. Clarendon House is a four-storey building with partial basement, formerly used as offices and currently vacant apart from live-in security personnel. A tarmac car park is present to the north of the office building, with an area of soft landscaping in the southeastern corner, planted with bushes. The car park can be accessed via Kennet Side.

2.1 Site History

The desk study indicated that the site was developed by terraced housing prior to 1879. A print works was present in the central western part of the site from some time between 1931 and 1957. The site was redeveloped by 1989 with the existing office building and car park.

Off-site there have been saw mills, a timber yard, gas works, factories, breweries, wharves, works and warehouses, which have all been redeveloped. A tank of unknown contents has been located from 1991 until the present day within the grounds of Queen's Wharf.

3.0 GROUND MODEL

The desk study indicated a low risk of contamination at the site. On the basis of the fieldwork, the ground conditions at this site can be characterised as follows,

- ❑ beneath a nominal thickness of made ground, Superficial Deposits overlie the Seaford Chalk Formation, proved to the maximum depth investigated of 30.00 m;
- ❑ the made ground extends to depths of between 0.80 m and 2.60 m; the greatest thickness being in the east of the site;
- ❑ Superficial Deposits, consisting of soft brown clayey silt with occasional flint and chalk gravel, were found to extend to depths of between 1.75 m and 4.40 m;
- ❑ the underlying chalk was highly weathered to a depth of about 6 m;
- ❑ groundwater was encountered during drilling at a depth of approximately 4.00 m from within the chalk, rising to 2.00 m;
- ❑ subsequent groundwater monitoring has measured water to be standing in the standpipes at a depth of about 2.00 m; and
- ❑ contamination testing has measured elevated lead and benzo(a)pyrene above the screening values for a residential end use with plant uptake.

4.0 RISK ASSESSMENT

The table below sets out the risk pathways that could potentially be present following the redevelopment of the site, which will continue to be used as a commercial end use. This Conceptual model is based upon the findings of the ground model developed in the light of the investigation findings and highlights areas where remedial work should be considered.

Source	Receptor	Pathway	Comment
Lead and benzo(a)pyrene contamination	End users	Direct contact	At the concentrations measured, these hydrocarbons are unlikely to pose a risk to human health.
	Ground workers and future site workers	Accidental ingestion of soil and inhalation and ingestion of soil derived dust	Skin contact with the soil should be minimized through the use of PPE and washing facilities will be provided

Remedial measures in the form of imported clean soil will be required where any areas of soft landscaping are proposed, to protect end users from lead and benzo(a)pyrene contamination. Site workers will also need to be protected.

6.0 REMEDIAL OBJECTIVES

Based on the above risk assessment the following remedial objectives have been established for this development;

- ❑ to protect end users and provide a suitable growing medium for plant growth; and
- ❑ protect ground workers who will be exposed to the soil.

7.0 REMEDIAL RECOMMENDATIONS

The site investigation and above risk assessment have identified potential risks to end users of the site and as such remedial measures will be implemented to ensure the safe development of the site. To address the remedial objectives the remedial measures will include;

- ❑ installation of clean imported soil in planters

The details of these remedial measures are set out below:

7.1 Planters

Verified clean soils will be installed in planters and soft landscaped areas.

7.2 Site Workers

Site workers will be made aware of the potential for contamination in the soils and a programme of working will be identified to protect workers handling any soil. The method of site working will be in accordance with guidelines set out by HSE and CIRIA. Washing facilities will be provided and site workers will be encouraged to wash prior to eating and to use appropriate PPE when on site to minimise skin contact with the soil.

8.0 VALIDATION OF REMEDIAL MEASURES

8.1 Landscaped Areas

Prior to the importation of any topsoil for use within the planters, certification will be provided and approved by GEA. The suitability of the material will be assessed against the GEA Screening Values, which are based on C4SL or LQM/CIEH S4UL for a residential end use, a copy of which is enclosed. Photographs of the installation will be taken by the contractor along with records of the levels before and after installation, and these will be included in the validation report. In addition to the photographic evidence and the ground level records, confirmation of the correct installation of the clean cover layer will be validated by a series of trial holes and / or hand auger boreholes undertaken by GEA. In support of the visual examination, further samples of the material will be taken by GEA for laboratory testing and assessment against the adopted screening values for a commercial end use.

Confirmatory soil samples will be taken at a rate of one sample per 50m³ of certified material and a minimum of three samples per source.

8.2 Site Workers

Site work will be carried out in accordance with guidelines set out by HSE and CIRIA and all appropriate PPE will be worn.

8.3 Unknown Contamination

Where any odorous, discoloured, or suspicious material is identified during construction, work in that area will cease until GEA return to site to investigate, assess the risk posed by the material. Unless testing confirms the material to pose an acceptable level of risk, all such materials will be excavated and disposed of off-site.

9.4 Completion Report

On completion of the remedial works, a report will be prepared documenting the satisfactory compliance with the remediation proposals and of any duty of care under the waste management legislation, together with an assessment of the suitability of the soils remaining beneath the site in respect of the proposed residential development. The report will include written and photographic records of the site inspections carried out, together with the results of the validation analyses and will present an assessment of the condition of the remediated site with respect to the end use. The report will also include waste transfer documents for all exported and imported material.

Site	Royal Heights, Queen's Road, Reading, RG1 4BN	Job Number J18003
Client	Reading Heights Limited	Sheet 1 / 1
Engineer	Fluid Structures	

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 2.5

Contaminant	Screening Value mg/kg	Data Source	Contaminant	Screening Value mg/kg	Data Source
Metals			Anions		
Arsenic	37	C4SL	Soluble Sulphate	500 mg/l	Structures
Cadmium	26	C4SL	Sulphide	50	Structures
Chromium (III)	3000	LQM/CIEH	Chloride	400	Structures
Chromium (VI)	21	C4SL	Others		
Copper	2,330	LQM/CIEH	Organic Carbon (%)	6	Methanogenic potential
Lead	200	C4SL	Total Cyanide	140	WRAS
Elemental Mercury	1	SGV	Total Mono Phenols	290	SGV
Inorganic Mercury	170	SGV	PAH		
Nickel	97	LQM/CIEH	Naphthalene	5.30	C4SL exp & LQM/CIEH
Selenium	350	SGV	Acenaphthylene	400	LQM/CIEH
Zinc	3,750	LQM/CIEH	Acenaphthene	480	LQM/CIEH
Hydrocarbons			Fluorene	380	LQM/CIEH
Benzene	0.34	C4SL	Phenanthrene	200	LQM/CIEH
Toluene	320	SGV	Anthracene	4,900	LQM/CIEH
Ethyl Benzene	180	SGV	Fluoranthene	460	LQM/CIEH
Xylene	120	SGV	Pyrene	1,000	LQM/CIEH
Aliphatic C5-C6	55	LQM/CIEH	Benzo(a) Anthracene	6.7	C4SL exp & LQM/CIEH
Aliphatic C6-C8	160	LQM/CIEH	Chrysene	11	C4SL exp & LQM/CIEH
Aliphatic C8-C10	46	LQM/CIEH	Benzo(b) Fluoranthene	9.5	C4SL exp & LQM/CIEH
Aliphatic C10-C12	230	LQM/CIEH	Benzo(k) Fluoranthene	14.1	C4SL exp & LQM/CIEH
Aliphatic C12-C16	1700	LQM/CIEH	Benzo(a) pyrene	4.40	C4SL
Aliphatic C16-C35	64,000	LQM/CIEH	Indeno(1 2 3 cd) Pyrene	5.6	C4SL exp & LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH	Dibenzo(a h) Anthracene	1.27	C4SL exp & LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH	Benzo (g h i) Perylene	69	C4SL exp & LQM/CIEH
Aromatic C8-C10	65	LQM/CIEH	Screening value for PAH	62.9	B(a)P / 0.15
Aromatic C10-C12	160	LQM/CIEH	Chlorinated Solvents		
Aromatic C12-C16	310	LQM/CIEH	1,1,1 trichloroethane (TCA)	27.2	LQM/CIEH
Aromatic C16-C21	480	LQM/CIEH	tetrachloroethane (PCA)	1.25	LQM/CIEH
Aromatic C21-C35	1100	LQM/CIEH	tetrachloroethene (PCE)	2.32	LQM/CIEH
PRO (C ₅ –C ₁₀)	646	Calc	trichloroethene (TCE)	0.308	LQM/CIEH
DRO (C ₁₂ –C ₂₈)	66,490	Calc	1,2-dichloroethane (DCA)	0.008	LQM/CIEH
Lube Oil (C ₂₈ –C ₄₄)	65,100	Calc	vinyl chloride (Chloroethene)	0.000184	LQM/CIEH
TPH	1000	Trigger for speciated testing	tetrachloromethane (Carbon tetra	0.039	LQM/CIEH
			trichloromethane (Chloroform)	1.99	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which pose 'LOW' risk to human health. Concentrations measured in excess of these values indicate a potential risk which require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009) derived using CLEA 1.04 model 2009

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

C4SL exp & LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health criteria values

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experience indicates that Benzo(a) pyrene (one of the most common and most carcinogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative