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REMEDIAL STRATEGY
AND
VERIFICATION PLAN

FOR

PROPOSED DEVELOPMENT AT
RAGLAN HOUSE, 1 RAGLAN STREET,
KENTISH TOWN, LONDON

JOMAS ASSOCIATES LTD
6-9 The Square, Stockley Park, Uxbridge, UB11 1FW
www.jomasassociates.com 0843-289-2187 info@jomasassociates.com

Report Title: **Remedial Strategy & Verification Plan for Raglan House, 1 Raglan Street, Kentish Town, London NW5 3DB**

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Prepared by: JOMAS ASSOCIATES LTD **For:** MEAD BUILDING CONTRACTORS

Prepared by
Marc Williams BSc (Hons), FGS
Geo-environmental Engineer

.....

Approved by
Suneel Law BSc (Hons) MSc FGS
Principal Geo-environmental Engineer

.....

Should you have any queries relating to this report, please contact

JOMAS ASSOCIATES LTD

www.jomasassociates.com

0843 289 2187

info@jomasassociates.com

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1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Mead Building Contractors ("The Client"), has commissioned Jomas Associates Ltd ('Jomas') to produce a remedial strategy prior to the development of Raglan House, 1 Raglan Street, Kentish Town, NW5 3DB.

1.2 Site Information

1.2.1 The site currently comprises a disused former daycare centre, comprising a 2 No. storey building of brick construction, with associated conservatory to the rear.

1.3 Proposed Development

1.3.1 The proposed development is to comprise of the alteration and extension of the former daycare centre to provide residential apartments.

1.4 Background

1.4.1 Development permission is being granted by London Borough of Camden with a number of conditions relating to various requirements.

1.4.2 Planning Condition 9 of application ref 2019/4825/P relates to land contamination matters.

1.4.3 Condition 9 consists of 4 No. parts and states that prior to the commencement of work for each section of the development or stage in the development as may be agreed in writing by the Local Planning Authority, a scheme including the following components to address the risk associated with site contamination shall be submitted to and approved in writing by the Local Planning Authority.

(A) A site investigation scheme based on the Desk Study / Preliminary Risk Assessment Report (Ref P2385J1779/SRC) by Jomas Associates td to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site;

(B) The results of the investigation and detailed risk assessment referred to in (A) and, based on these, in the event that remediation measures are deemed necessary, a remediation strategy giving full details of the remediation measures required and how they are to be undertaken;

(C) A verification report providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy are complete and if applicable identifying requirements for the longer monitoring of pollutant linkages, maintenance and arrangements for contingency action.

This report concerns Section B of Condition 9.

1.5 Objectives

1.5.1 The primary objectives of this document are as follows:

- To provide information on the site setting; identify ground conditions and potential environmental risks associated with the development.
- To provide an assessment of various options for remediation.

- To set out the remediation strategy that will provide a site that is suitable for the intended use and addresses any identified unacceptable risks.
- To provide relevant information to address anticipated planning conditions relating to contaminated land. A separate verification report will be required following the implementation of the remediation strategy.

1.5.2 This document provides an assessment of potential remedial strategies and describes the methodology for the proposed remedial action.

1.5.3 The remediation strategy and associated remediation criteria have been developed with reference to previous works carried out at the site. The remediation criteria used to develop the proposed remediation strategy will be used for the proposed verification works.

1.5.4 The Principal Contractor will be responsible for implementing the appropriate methodology and site management procedures to achieve the required outcome and comply with these principles.

1.5.5 The works will be undertaken by experienced personnel and will be managed in accordance with the Contractor's Construction Environmental Management Plan. Detailed construction method statements will be prepared for the impacted soil removal works. An Environmental Specialist will supervise the works and undertake soil sampling and analysis as part of the validation process.

1.6 Previous Reports

The previous reports that have been utilised by Jomas for the purposes of this document comprise:

- Desk Study/Preliminary Risk Assessment Report for Raglan House, 1 Raglan Street, Kentish Town, London, NW5 3DB, P2385J1779, 18th September 2019, Jomas Associates Ltd.
- Geo-environmental & Geotechnical Assessment Ground Investigation Report for Raglan House, 1 Raglan Street, Kentish Town, London, NW5 3DB, P2385J1779b, 25th February 2021, Jomas Associates Ltd.

This document should be read in conjunction with the above reports.

1.7 Limitations

1.7.1 Jomas Associates Ltd ('Jomas') has prepared this report for the sole use of Mead Building Contractors, in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

1.7.2 This report provides an overview of conclusions drawn from previous investigations, some of which has been conducted by others. Third party information used is assumed to be correct, and Jomas has not validated any of the data provided. Jomas is unable to guarantee the accuracy of the information provided by others.

2 LAND CONTAMINATION OVERVIEW

2.1 Desk Study Findings

2.1.1 A desk study was produced for the site (Jomas, September 2019), and issued separately. A brief overview of the findings is presented below;

- A review of earliest available historical maps dated 1873-74 shows the site as comprising terraced housing. By the map dated 1952, the site is shown to have been redeveloped into a single larger building labelled as a welfare centre. Few significant changes then occur to the site until the present day..
- Historically, the surrounding area has comprised mainly residential and retail buildings. Historical industrial uses include a saw mill immediately north of site; a blacking works 10m north of site; a dental products factory (and later electrical works) 30m south of site; and a piano factory 50m north of site.
- The site is reported to be underlain by solid deposits of the London Clay Formation, which is identified as an Unproductive aquifer.
- The site is not reported to lie within a Source Protection Zone. The nearest groundwater abstraction is reported 186m south west of the site, for potable water abstraction. The nearest surface water abstraction is reported 921m south west of the site.
- According to the information provided by Groundsure, there are no surface water features or Ordnance Survey water networks reported within 250m of the site.

2.2 Intrusive Investigation

2.2.1 The ground investigation was undertaken on 11th February 2021, and consisted of the following:

- 6 No. hand held window sampling boreholes (WS1-WS6), drilled up to 2.5m below ground level (bgl), with associated in situ testing and sampling;
- Laboratory analysis for chemical and geotechnical purposes.

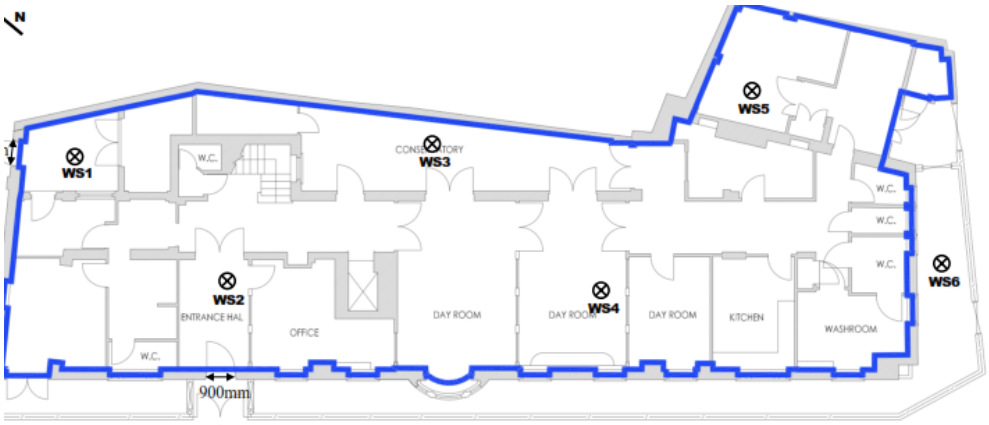
2.2.2 The results of the ground investigation revealed a ground profile comprising a variable thickness of Made Ground (up to 1.5m bgl depth), overlying a brown slightly gravelly Clay with selenite crystals (considered to represent the London Clay Formation), encountered to the base of the boreholes (up to 2.5m bgl).

2.2.3 Groundwater was not reported during the drilling process.

2.2.4 Following generic risk assessments and statistical analysis, elevated concentrations of Lead were reported within 3 No. samples obtained from the site (WS1 @0.35m WS2 @0.5m and WS5 @0.25m). Additionally, elevated concentrations of a number of polyaromatic hydrocarbons (Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenz(ah)anthracene) were reported within an individual sample (WS5 @0.25m).

2.2.5 No asbestos fibres were detected within the samples analysed in the laboratory.

2.2.6 The figure presented below, shows location of exploratory holes, WS1- WS6



2.3 Soil Gas Risk Assessment

2.3.1 No significant potential sources of vapour or soil gas generation were identified from desk based research or during the intrusive investigation. Therefore, no formal soil gas protection measures are considered to be required.

2.4 Controlled Waters Risk Assessment

2.4.1 The ground investigation has confirmed that site is directly underlain by solid deposits of the London Clay Formation, identified as unproductive. There are no source protection zones within 500m of the site. The nearest potable abstraction is located 186m south west of the site assumed to be abstracting from the chalk. No evidence of potentially mobile contamination was encountered and therefore the sensitivity to controlled waters remains low, and no formal remedial measures are considered to be required in respect of controlled waters.

2.5 Human Health Risk Assessment

2.5.1 Following a review of the Site Investigation reports, the following factors are noted:

- The proposed development comprises conversion of the existing building to provide residential apartments. Only limited soft landscaping is understood to be proposed.
- Following generic risk assessments and statistical analysis, elevated concentrations of Lead and a number of Polyaromatic hydrocarbons were reported within the site.
- Health and Safety measures will be required for the protection of construction workers.

2.6 Impact to Neighbouring Properties and Buried Services

- Upgraded potable pipework may be required due to elevated hydrocarbon fractions C_{10}-C_{16} and C_{16}-C_{40}. The water supply pipe requirements should be discussed at an early stage with the relevant Utility provider.

2.7 Conceptual Site Model (CSM)

The CSM is presented in Table 2.1:

Table 2.1: Plausible Pollutants Linkages Summary (Pre-Remediation, as updated for Remediation Strategy)

Source	Pathway	Receptor	Relevant Pollutant Linkage?	Comment
• Potential for Made Ground associated with previous development operations – on site (S1) • Potential for contaminated ground associated with previous land uses off-site (S2): ○ Saw Mill (1m N) ○ Blacking works (10m N) ○ Dental products factory and electrical works (30m S) ○ Piano factory (50m N)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	**Y**	Remedial measures considered necessary. The findings of the ground investigation report should be included in the construction health and safety file, with adequate measures put in place for the protection of construction and maintenance workers.
	• Accumulation and migration of soil gases (P5)		**X**	Gas Protection measures not considered necessary.
	• Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3) Horizontal and vertical migration of contaminants within groundwater (P4)	• Neighbouring site users (R3) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	**X**	Remedial measures not considered necessary. Contact should be made with relevant utility providers to confirm if upgraded materials are required. A pollutant linkage to controlled waters is not considered to exist.

3 REMEDIAL OPTIONS APPRAISAL

3.1.1 Soil Screening

- A possible remedial option would be to undertake soil screening, comprising excavation of impacted soils, screening within the site to remove likely contaminative materials, and re-deposition of materials on site. Such an operation may include a variety of screening methodologies, including soil washing etc.

- Such an operation may be successful at removing materials responsible for elevated concentrations of polyaromatic hydrocarbons. Any visual asbestos materials may be removed by hand, with extensive dust control measures required during the soil screening operations for the protection of site workers and nearby residents. Asbestos fibres in soil will however, not be visible for removal.

3.1.2 Excavation and disposal

- Made Ground displaying elevated concentrations of contaminants may be excavated for disposal off site. From a review of chemical testing data, excavations to a depth of the order of 1.5m bgl minimum would be required, with the importation of a respective thickness of certified clean material to restore site level.

- The costs and vehicle movements required for such an operation may render the costs associated with this method prohibitive.

3.1.3 Encapsulation

- In order to sever the identified pathways to the most sensitive receptors (human health), encapsulation of impacted materials below building footprints or areas of hard surfacing may be undertaken. This would have the effect of removing the potential pathways of direct contact and inhalation.

- It is understood that only limited soft landscaping / amenity space will be present as part of the final development. Should such features be proposed, the impacted soils will be encapsulated by the use of a capping layer. This should comprise a minimum 450mm thickness of clean cover layer, laid over a geotextile membrane.

3.1.4 Dust control measures will be required during the undertaking of all the remedial options identified above for the protection of site workers.

3.1.5 When issues of cost effectiveness, requirements for vehicle movements etc. are taken into account, it is recommended that encapsulation of impacted soils is adopted as the preferred remedial methodology.

3.1.6 The requirements for the remedial methodology are presented within Section 5 of this report.

4 PROPOSED REMEDIATION STRATEGY

4.1 Introduction

4.1.1 The proposed remediation scheme serves to address the potential unacceptable risks identified in the context of the proposed redevelopment of the site.

4.1.2 The remedial measures comprise;

- The encapsulation of impacted soils below areas of building footprint or hardstanding,
- A watching brief during enabling works,
- Within areas of proposed soft landscaped amenity space, a capping layer comprising a minimum 450mm thickness of certified clean, imported topsoil is to be laid over a geotextile membrane.
- Where Made Ground is removed and the base of the Made Ground is encountered at shallower depth than the depth of the proposed clean cover, the depth of clean cover can be limited to the thickness of made ground removed, or thickness required for finished levels.
- Validation testing will be undertaken upon soils imported to site to confirm their suitability for use as a clean capping layer.

4.2 Remediation Strategy

Impacted Soils Encapsulation

4.2.1 Where buildings or hardstanding are proposed, no formal remedial works are considered necessary, beyond the hand picking discussed above, and the construction of the building/hardstanding, as this should provide an appropriate barrier to impacted soils. External hardstanding within private areas should be of a construction that discourages possible removal by future occupiers.

4.2.2 Within areas of soft landscaping, soils will be encapsulated below a cover layer of imported clean subsoil/topsoil. This should comprise a minimum of 450mm of soils, laid over a geotextile membrane/marker layer.

4.2.3 Where topsoil and sub-soil is imported to the site, the soil should be chemically suitable for use. All imported soil should conform to the following chemical specification:

Table 4.1: Imported Clean Cover System Requirements

Determinand	Unit	Screening Criteria	
Arsenic	mg/kg	S4UL	37
Boron	mg/kg	S4UL	290
Cadmium	mg/kg	S4UL	11
Chromium	mg/kg	S4UL	910
Lead	mg/kg	C4SL	200
Mercury	mg/kg	S4UL	40

Determinand	Unit	Screening Criteria	
Nickel	mg/kg	BS3882	110
Selenium	mg/kg	S4UL	250
Copper	mg/kg	BS3882	200
Zinc	mg/kg	BS3882	300
Asbestos	%	S4UL	None Detected
pH	-	S4UL	5-9
Naphthalene	mg/kg	S4UL	2.3
Acenaphthylene	mg/kg	S4UL	170
Acenaphthene	mg/kg	S4UL	210
Fluorene	mg/kg	S4UL	170
Phenanthrene	mg/kg	S4UL	95
Anthracene	mg/kg	S4UL	2400
Fluoranthene	mg/kg	S4UL	280
Pyrene	mg/kg	S4UL	620
Benzo(a)anthracene	mg/kg	S4UL	7.2
Chrysene	mg/kg	S4UL	15
Benzo(b)fluoranthene	mg/kg	S4UL	2.6
Benzo(k)fluoranthene	mg/kg	S4UL	77
Benzo(a)pyrene	mg/kg	S4UL	2.2
Indeno(123-cd)pyrene	mg/kg	S4UL	27
Dibenzo(ah)anthracene	mg/kg	S4UL	0.24
Benzo(ghi)perylene	mg/kg	S4UL	320
TPH C_5-C_6	mg/kg	S4UL	42
TPH C_6-C_8	mg/kg	S4UL	100
TPH C_8-C_{10}	mg/kg	S4UL	27
TPH C_{10}-C_{12}	mg/kg	S4UL	74
TPH C_{12}-C_{16}	mg/kg	S4UL	140
TPH C_{16}-C_{21}	mg/kg	S4UL	260
TPH C_{21}-C_{35}	mg/kg	S4UL	1100

4.3 Health and Safety / PPE

Excavations will have suitable barriers and access points, with pedestrian routes clearly marked. Appropriate safety signage and instructions will be clearly visible, with accesses to be kept clear of debris, materials and cables.

Operatives will be briefed on sharps protection in order to ensure safety. Clean/dirty rooms will be provided for operatives working within contaminated areas

Standard PPE will be required at all times, namely:

- Hard hat
- Safety spectacles
- Hi-viz waistcoat or jacket

- Gloves
- Boots or shoes with steel toe and midsole protection

Other items may be required as per detailed in the specific method statement;

- Harness
- Dust protection
- Ear protection
- Other specialist equipment

A method statement will be produced by the chosen contractor.

4.4 Unexpected Contamination

4.4.1 To accord with best practice if, during the construction of the development, contamination and/or materials not previously identified are found to be present at the site, then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until Jomas' (or qualified environmental engineer) has been informed, and a suitable strategy implemented to the approval of the engineer and/or the Local Planning Authority.

4.4.2 Examples of such materials include:

- buried drums, tanks, pipework or containers
- soil or water with colour or odour
- non-natural materials and wastes
- other evidence of contamination, for example iridescent sheens (like oil or diesel) on soil or water.

4.5 Operational Standards – Summary

4.5.1 As a minimum, the following standards shall be employed during the full course of this remediation site works;

- All materials subject to excavation and disposal must be tracked throughout and evidence generated to provide an auditable trail.
- Any excavated soils will be stockpiled/stored in a designated area on site, with plastic sheeting placed at ground surface to prevent cross-contamination. The contractor shall be responsible for the removal of spoil from the site.
- Personal protective equipment shall be employed by all site remediation and ground worker personnel in accordance with site specific risk assessments. These are to be completed by all contractors following consideration of the potentially hazardous properties of contaminants within the site.
- A copy of this remediation statement together with all previous geo-environmental assessment reports shall be retained on site for reference during the full course of remediation activities.

5 VERIFICATION PLAN

5.1 Proposals for Validation & Verification

A qualified environmental engineer shall undertake the following tasks to monitor the remedial activities described in this statement.

- Following importation of subsoil/topsoil to site, representative samples will be obtained prior to laying of the material. Based on current design plans, 5 No. samples are anticipated.
- The thickness of the clean cover layer and the presence of a geotextile/marker layer will be verified by a series of hand dug pits in areas of soft landscaping, with accompanying photographs.
- These samples shall be sent directly to an MCERTS and UKAS accredited laboratory for testing.
- The results will be screened against the criteria given previously within Table 4.1, which comprise current published Environment Agency residential end-use soil guideline values (SGVs) or where unavailable, LQM or S4UL generic assessment criteria – safe for use levels for human health risk assessment. If these values become out of date, reference shall be made to industry approved superseded values.

5.2 Remediation Verification/Completion Report

The Remediation Completion Report shall include the following information:

- Summary of all works undertaken
- Photographic log of the works.
- A full chemical soil analysis results schedule.
- Full details of any further contamination reported during construction works
- Disposal documentation for any spoil or asbestos materials spoil.

5.3 Reporting

All activities will be documented (including photographs) to show compliance with the Remediation Strategy. This documentation will be kept on site at all times during the works and updated daily as part of a field record as the works progress, which would be available for regulatory inspection at any time. All documentation would be included in a final verification report to be presented to the Local Authority.

6 REFERENCES

- A possible approach for generating site specific assessment criteria for polycyclic aromatic hydrocarbons (draft internal HPA briefing note)
- CIEH & CL:AIRE (2008) *Guidance on comparing soil contamination data with a critical concentration*. London: Chartered Institute of Environmental Health (CIEH) and CL:AIRE
- Environment Agency (2004) *Model procedures for the management of land contamination*. CLR11. Bristol: Environment Agency
- Environment Agency, NHBC & CIEH (2008) *Guidance for the safe development of housing on land affected by contamination*. R & D Publication 66. London: Environment Agency
- Environment Agency Technical Report P45 "Polycyclic Aromatic Hydrocarbons (PAH): Priorities for Environment Quality Standard Development
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6-9 The Square

Stockley Park

Uxbridge

UB11 1FW

CONTACT US

Website: www.jomasassociates.com

Tel: 0843-289-2187

Fax: 0872-115-4505

Email: info@jomasassociates.com