

PROJECT REFERENCE: 15.8909

January 2016

PHASE 1: ENVIRONMENTAL RISK ASSESSMENT

Station Road, Hayling Island

FOR



CONSTRUCTIVE EVALUATION
UNIT 15/16 FORD LANE INDUSTRIAL ESTATE
FORD LANE
ARUNDEL
BN18 0UZ

T: 01243 533499

E: info@theconstructivegroup.com

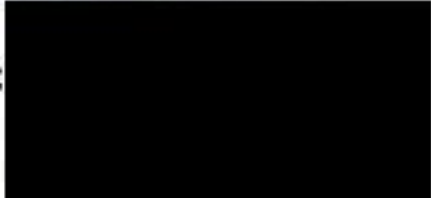


Document Approval

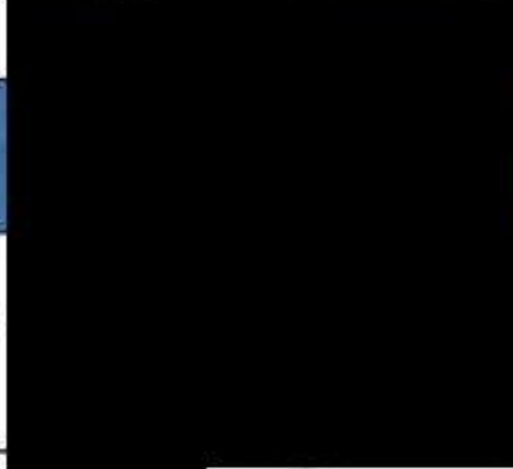
Report Authors

Max Smeeth BSc MSc (Geo-Environmental Scientist)	Signature: 	Date: 13/01/2016
---	--	---------------------

Report Checked by

PP Graham Carter BSc FGS (Engineering Geologist)	Signature: 	Date: 13/01/2016
---	--	---------------------

Report Approved

Paul Moore (Director)	Signature: 	Date: 13/01/2016
--------------------------	---	---------------------

REPORT REVISED (response to significant changes in client requirements, methods of work etc).

Name:	Signature:	Date:	Nature of revision:
Name:	Signature:	Date:	Nature of revision:
Name:	Signature:	Date:	Nature of revision:

Contents

1 INTRODUCTION.....	5
2 PHYSICAL SETTING	5
3 SITE CONDITIONS	7
4 SITE HISTORY AND HISTORICAL CONTAMINATIVE SOURCES.....	8
5 INFORMATION ON PUBLIC RECORD	10
6 PRELIMINARY CONCEPTUAL SITE MODEL & RISK ASSESSMENT	11
7 CONCLUSIONS AND RECOMMENDATIONS.....	17

Appendices

Appendix A – Site Plan

Appendix B – Centre Maps Report

Appendix C – Photographic Log

Trading Terms

Unless specifically stated within the tender/quotation or unless identified within the introduction to this report it is confirmed that this report has been compiled wholly in accord with Constructive Evaluation Limited's terms of engagement. This report is provided for sole use by the Client and is confidential to them. No responsibility whatsoever for the contents of the report will be accepted to anyone other than the Client.

Copyright

Copyright of this report subsists with the originator. Prior written permission must be obtained for any third party to reproduce, store in a retrieval system or transmit in any form of by any means whatsoever, all or part of this report. The copyright of written materials supplied shall remain the property of Constructive Evaluation Limited but with a royalty-free perpetual licence, granted to the Client on payment in full of any outstanding monies.

Context

This report is written in the context of an agreed scope of work between Constructive Evaluation Limited and the Client and should not be used in a different context. In light of additional information becoming available, improved practices and changes in legislation amendment or re-interpretation of the report in whole or part may be necessary after its original submission.

Professional Interpretation

The recommendations made and opinions expressed in the report are based on the conditions revealed by the site works together with an assessment of the data from the insitu and laboratory testing or in respect of the desktop reports. No responsibility can be accepted for conditions that have not been revealed by the research, site works and testing.

The Client is advised that the conditions observed on site by Constructive Evaluation Limited at the time of any site survey may be subject to change. Certain indicators of the presence of hazardous substances may have been latent at the time of the most recent site reconnaissance and they may subsequently have become evident. It is not possible to assess areas which are inaccessible or where access is not granted and CE accept no liability for risks subsequently identified therein.

The conceptual model, Risk assessment and sampling regime has been formulated in accordance with current UK guidance at time of production based upon the relevant information gained from Phase 1 and Phase 2 investigations. While the model and assessment offer opinions and interpretations of these guidelines, the comments made are for guidance only and no liability can be accepted for their accuracy. It is possible that aspects of desktop study may need to be altered to conform to the requirements of the statutory regulatory bodies.

Intrusive Field Operations

The data collected through direct operations in the production of this report has been so obtained, unless directly otherwise stated, in accordance with current UK guidance, law or accepted industry practice, including but not limited to: BS.5930: 1990 Code of Practice for Site Investigations (Amendment 2: 2010), & BS.10175: 2011 + A1: 2013 Investigations into Potentially Contaminated Sites. Exact exploratory locations will depend upon access conditions, site use and plant capability, CE do not accept liability for issues arising from material identified between or outside of the area of exploratory locations.

Laboratory Testing

Unless stated otherwise within the text, all geotechnical and material laboratory tests have been performed in accordance with the relevant British Standard Documents. Laboratory testing for contaminated land assessment is completed under the UKAS / MCERTS accreditation schemes, unless identified as otherwise in the report.

Human Health Risk Assessment Criteria

The Environment Agency has recently undertaken revision of the Soil Guideline Values (SGVs) which are partially complete. Where standards are available using the "new" approach, these have been utilised for correlative purposes. Where standards have not yet been revised, guidance following the "old" approach has been utilised. Please note that upon release of the remaining guidelines, the standards contained within this report may be subject to change. In addition, the second edition of the LQM CIEH guidance has now been released and will be utilised in favour of previously published guideline values.

Third Parties

The findings and opinions conveyed in this report are based on information obtained from a variety of sources, including that from previous Site investigations and chemical testing laboratories. Constructive Evaluation Limited has assumed that such information is correct. Constructive Evaluation Limited cannot and does not guarantee the authenticity or reliability of the information it has relied upon and can accept no responsibility for inaccuracies with the data supplied by other parties.

The accuracy of the historical map extracts supplied can not be guaranteed and it should be noted that different conditions may have existed between mapping sheet editions. Therefore, there can be no certainty that all areas of contamination have been identified during the Phase 1 investigation.

Definitions

Reference to the word "contamination" in this report does not relate to the statutory definition of contaminated land under 1990 Environmental Protection Act unless otherwise stated. The definition used in this report is: "Land that contains substances that, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, to the environment, or on occasion to other targets" (NATO CCMS, 1985).

1.0 INTRODUCTION

Constructive Evaluation (CE) Limited was instructed by Studio Four Architects Ltd (EQ10662) to carry out a 'Phase 1: Environmental Risk Assessment' at the property known as 36 Station Road, Hayling Island, Hampshire, PO11 0EQ (hereafter referred to as the "site").

The site presently comprises a carpet and flooring specialist shop to the east, with associated storage buildings and external areas to the north, and two currently vacant residential houses to the west.

Proposed plans indicate the site will be developed into shops and 18no. flats over three storeys with associated parking and new public realm area. Three or four of the ground floor flats will have private gardens. Detailed development plans can be viewed in **Appendix A**.

The client instructed CE to undertake an environmental risk assessment to enable determination of the potential source – pathway – receptor linkages associated with the site and the surrounding environs in the current and historical context. This aids in the formulation of a suitable targeted Site Investigation in the future.

The purpose of this Environmental Risk Assessment was to provide information on:

- The expected geology and hydrogeology;
- The development history and most recent uses of the site;
- Potential sources of contamination; and
- To enable the development of a Conceptual Site Model (CSM) and risk assessment.

This report presents assessment of historical Ordnance Survey maps and published geological and hydrogeological maps, as well as information from various sources such as CentreMaps.

The report has been formulated in accordance with BS10175:2011:2013+A1 *Investigations into Potentially Contaminated Sites – Code of Practice* and CLR11 – *Model Procedures for the Management of Land Contamination*, and from Planning Policy Statement (PPS) 23 – *Planning & Pollution Control*.

2.0 PHYSICAL SETTING

The following observations are taken from the CentreMaps report (**Appendix B**) and the British Geological Survey (BGS).

The site is located in West Town in the southern part of Hayling Island on National Grid Reference (NGR) 471252, 099641, with an area of approximately 0.16 hectares (Ha).

2.1 Geology and Hydrogeology

The Geology of Britain Viewer (BGS, 2016) indicates the site is underlain by Superficial Geology of River Terrace Deposits over bedrock geology of the London Clay Formation in the northern portion of the site, and the Portsmouth Sand Member and Whitecliff Sand Member in the southern portion of the site. The table overleaf identifies the expected composition of the published strata and the associated Aquifer classification.

Superficial / Drift Geology	
Unit Name	River Terrace Deposits
Geology Description	Sand and gravel, locally with lenses of silt, clay or peat.
Aquifer Class	Secondary (A) Aquifer
Aquifer Description	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Bedrock / Solid Geology – North of Site	
Unit Name	London Clay Formation
Geology Description	Mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.
Aquifer Class	Unproductive
Aquifer Description	N/A
Bedrock / Solid Geology – South of Site	
Unit Name	Portsmouth Sand Member and Whitecliff Sand Member
Geology Description	Sand. Sedimentary Bedrock formed approximately 23 to 66 million years ago in the Palaeogene Road.
Aquifer Class	Secondary (A) Aquifer
Aquifer Description	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Geological Hazards

The British Geological Survey (BGS) has provided the available published Geological Hazard directory information for the study site. The information returned is displayed in the table below.

Process	Risk Level	BGS Description
Shrink Swell Clays	Low	Ground conditions predominantly medium plasticity.
Collapseable Rocks	Low	Slight possibility for collapseable deposit problems after major changes in loading or groundwater conditions.
Running Sands	Low	Possibility of running sand problems after major changes in ground conditions.
Landslides	Very Low	Slope instability problems are unlikely to be present.
Soluble Rocks	Negligible	Soluble rocks are present but unlikely to cause problems except under exceptional circumstances.
Compressible Deposits	Negligible	No indicators for compressible ground identified.

2.2 Hydrology

Surface Water Features – There are no surface water features within 250m of the site. The closest feature is situated approximately 280m northwest and appears to be an unnamed field drain.

Detailed River Network – There are no river features within 500m of the site.

Flooding – The site is not located within 250m of an Environmental Agency Zone 2 or Zone 3 floodplain. RoFRaS (Risk of Flooding from Rivers and the Sea) data for the study site indicates the property is in an area with a Very Low (less than 1 in 1000) chance of flooding in any given year.

2.3 Controlled Waters

Groundwater Abstraction Licences – Within 2000m there is one record, situated approximately 1200m west of the site for active spray irrigation, operated by Hayling Island Golf Club.

Surface Water Abstraction Licences – There is one record within 2000m of the site, situated approximately 1800m east, for active spray irrigation, operated by AG Phillips and Son Ltd.

Potable Water Abstraction Licences – There are no records within 2000m of the site.

Source Protection Zones – There are no Source Protection Zones within 500m of the study site.

Groundwater Vulnerability and Soil Leaching Potential – On site is classified as having high leaching potential: soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.

3.0 SITE CONDITIONS

3.1 Site Description

An Environmental Scientist from CE completed a walkover survey of the site on December 17th 2015.

The site presently comprises a carpet and flooring specialist shop to the east, with associated storage buildings to the north, and two currently vacant residential houses to the west. Anecdotal evidence received from the shop manager suggests the vacant properties and shops have mains energy supplies.

The external and northern part of the site appears to have been used for waste storage and dumping, with the possibility of asbestos containing materials (ACMs) identified as roof sheets/tiles, noted during the walkover.

One of the internal storage areas contains neatly stacked and well labelled chemicals, assumed to be flooring adhesive or similar.

3.2 Surroundings

The site is situated within a residential area of West Town on Hayling Island. Langstone Harbour is situated approximately 750m north west, while the English Channel is located approximately 900m south. Hayling Island is predominantly made up of agricultural land, residential areas and coastline.

Immediate Surroundings:

North – Residential properties.

East – Immediately east of the site is West Lane and the following: car park (approximately 16 spaces), residential properties, and commercial premises.

South – Immediately Station Road then mixed commercial and residential two and three storey including: bakery, restaurant, grocery shop, launderette and tiling supplier.

West – Residential and beyond a water sports supplier.

Photographs relating to the observations made during the walkover can be viewed within **Appendix C**.

3.3 Potential Sources of Contamination – Walkover Survey

Potential Sources of Contamination Considered a Risk to the Site	
Feature	Location
External waste storage and possible ACMs	Northern external part of site
Activities associated with launderette	Approximately 10m south of site

4.0 SITE HISTORY AND HISTORICAL CONTAMINATIVE SOURCES

The following observations are made based on the available historic map extracts presented in **Appendix B** of which the most significant points have been discussed in relation to the site and surrounding environs.

Mapping Date	Observations
1866 - 1867	The earliest available map shows the site is part of West Town Farm. Three distinct building structures are present with an orchard to the north. Roads bound the site to the east and south, with an unknown building to the south of the aforementioned road.
1898	Three residential properties with associated gardens are situated on site. The area surrounding the site has been developed further and a number of residences are now present. At its closest point, a gas works is situated 100m west of the site.
1908-1910	The site and surroundings remain unchanged.
1932	No changes on site. Remnants of the aforementioned gas works remain (tanks) although the label 'gas works' has been removed. An engine house is located approximately 150m west of the site. There has been further residential development surrounding the site.
1937-1940	Additional buildings have been developed in the northern part of the site. The surroundings remain unchanged.
1968	Site buildings have been modified in that their footprint has changed slightly. A coal yard is situated approximately 75m northwest of the site boundary. A weaving works is situated 200m west. A builder's yard is situated approximately 50m south.
1987	No changes on site.

	The coal yard has been developed into a garage and builders yard. The weaving works appears to have been removed. The builders yard south has been developed into an unspecified works. There has been further residential and light commercial development surrounding the site.
1989-1993	The site and surroundings remain unchanged.
2002	The site and surroundings remain unchanged.

4.1 Potential Contamination Sources - Historical

Potential Sources of Contamination Considered a Risk to the Site		
Feature	Distance, Direction	Dates Present
Possible Made Ground associated with development of site – initial farm development and subsequent residential development.	On site	1866 to last development approximately 1968.
Gas Works	100m west	1898 - 1932
Unspecified Works	50m south	1987 – unknown but does not exist present day
Coal Yard	75m northwest	1968 - 1987
Garage	75m northwest	1987 – present day
Builders Yard	50m south	1968 - 1987
Builders Yard	75m northwest	1987 – present day
Potential Sources Not Considered Further		
Feature	Justification	
Weaving Works	Situated 200m from site and likely low contamination potential.	
Engine House	Situated 150m from site and most likely a low contaminant potential.	

5.0 INFORMATION ON PUBLIC RECORD

5.1 CentreMaps Public Record Search

The following information has been obtained from public archive via the data supplier CentreMaps or by direct application. The full CentreMaps report is presented in **Appendix B**.

National Incident Recording System, List 2 and List 1 – There are no records within 500m of the site.

Environment Agency Historic Landfill Sites – There is one record within 1500m of the study site – The facility was situated approximately 1470m east and detailed as accepting inert waste from 1991 to unknown date.

Coal Mining/ Non-Coal Mining – There are no records within 50m of the study site.

Ancient Woodland – There are no records of ancient woodland within 2000m of the study site.

Area of Outstanding Natural Beauty (AONB) – There is one record of AONB within 2000m of the study site: Chichester Harbour is located approximately 1350m east of the site at its nearest point.

Nitrate Vulnerable Zones (NVZ) – On site is detailed as a NVZ.

Historical Surface Ground Working Features – There are no historical ground workings within 1000m of the site boundary.

Current Ground Workings – There are no current ground workings within 1000m of the site boundary.

Historical Tanks – There are twelve records within 500m, the closest of which is detailed as an Unspecified Tank 83m west. There are two records of 'Gas Works' tanks dated 1898 and 1908 approximately 100m west of the site.

Historical Energy Features – There are 42no. records within 500m, many of which are associated with the Gas Works situated approximately 100m west.

Licensed Discharge Consents – There is one record within 500m of the study site, detailed 320m north, effective from 1965 to 1997.

Potentially Infilled Land – There are five records of potentially infilled land within 500m: the closest is a pond approximately 100m west of the site.

Historical Industrial Sites – There are 29 sites within 500m, the most pertinent of which are detailed below:

- Gas works, 60m west – dated 1907
- Engine House, 120m west – dated 1931

Current Land Use – There are 13 records of current potentially contaminative industrial sites within 250m, the most pertinent of which are detailed below:

- Heron's Autos (vehicle repair, testing and servicing), 200m southeast

Petrol and Fuel Sites – There is one obsolete license, detailed as approximately 200m southeast of the site.

5.2 Information from Local Authority

Havant Borough Council were contacted by CE on 11th January 2016 for environmental information relating to the site. At the time of writing, there had been no response from Havant Borough Council.

5.3 Potential Sources of Contamination – Public Records

Potential Sources of Contamination Considered a Risk to the Site		
Feature	Distance, Direction	Dates Present
Historical tanks and energy feature records associated with Gasworks	100m, west	1898 - 1932
Petrol and Fuel Facility	200m, southeast	Unknown
Potential Sources Not Considered Further		
Feature	Justification	
Historic Landfill, approximately 1470m from site	The historic landfill is recorded as accepting inert waste and is too far from site to have an impact.	
Discharge Consent, approximately 320m north	Distance from site.	
Engine House, situated 150m from site	Most likely a low contaminant potential and distance from site area.	
Vehicle Repair, approximately 200m from site.	Probable low contaminant potential and distance from site.	
Possible Made Ground associated with infilled Pond approximately 100m west.	Likely lost its contamination potential since infill (1896).	

6.0 PRELIMINARY CONCEPTUAL SITE MODEL & RISK ASSESSMENT

The Conceptual Site Model (CSM) has been formulated in accordance with BS10175:2011:2013+A1. It is used to assess the significance of the environmental hazards identified at the site, the potential receptors and the pathway between them.

6.1 Sources

6.1.1 On Site

1. Possible Made Ground associated with development of site, on site external waste storage and possible ACMs. Contaminants of concern include those typical of Made Ground make-up i.e. heavy metals, petroleum hydrocarbons and asbestos.

6.1.2 Off Site

2. Historical gas works 100m west of the site. Contaminants of concern include sulphide, cyanide, coal tar, heavy metals, petroleum hydrocarbons.
3. General industrial off site land uses including: unspecified works 50m west, coal yard 75m northwest, garage 75m northwest, builders yard 50m south and 75m northwest, and

petrol facility 200m southeast. Contaminants of concern include heavy metals, petroleum hydrocarbons, asbestos.

4. Activities associated with launderette approximately 10m south of the site. Contaminants of concern include common solvents such as benzene, trichloroethene, tetrachloroethene and perchloroethylene.

6.2 Receptors

- End Users – Residents, staff and visitors.
- Site Workers – There is the potential of exposure to contaminated soils and vapour especially during groundworks.
- Proposed Development – Vapour from impacted soils and soil gas that may accumulate in confined, poorly ventilated areas of the proposed buildings.
- Services – Any buried services installed for the proposed development.
- Groundwater – Considered due to the superficial and bedrock secondary A aquifers below the site. It is acknowledged that there are no potable abstraction licenses within 2000m of the site, and that there are no Source Protection Zones within 500m.
- Surface Water has not been considered as a receptor due to there being no surface water features within 250m of the site.

6.3 Preliminary Conceptual Site Model

The CSM has been formulated to provide information regarding the possible sources of contamination that may impact the site, the pathway in which the contamination can migrate, and any vulnerable receptors, all of which need to be present for there to be a risk.

Source	Pathway	Receptor	Likelihood	Potential Risk	Proposed Action
Possible Made Ground associated with development of site, on site external waste storage and possible ACMs. Contaminants of concern include those typical of Made Ground make-up i.e. heavy metals, petroleum hydrocarbons and asbestos.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users	Likely	Low to Moderate. The on site location increases the strength of this pathway, but the low contaminant potential reduces the overall risk slightly. The risk rating is slightly reduced due to the fact that much of the development will be covered in hard standing and/or buildings.	Soil samples will be obtained from the proposed garden areas.
		Site workers (during development)	Likely	Moderate. The on site location and likelihood of exposure are acknowledged but the low contaminant potential reduces this risk.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers.
	Impacted soils.	Services	Likely	Low to Moderate. It is acknowledged that it is possible for contaminated soils to have an impact on services but contamination potential is low.	Soil samples will be obtained from across the site in order to refine the risk level to Services.
	Volatilisation of hydrocarbons underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development	Unlikely	Low. Possibility of impact from hydrocarbons is low based on historical site uses.	Soil samples will be obtained from across the site in order to refine the risk level. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
		Site workers	Unlikely	Low. Possibility of impact from hydrocarbons is low based on historical site uses.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
	Migration of soil contaminants to groundwater.	Secondary A Aquifers beneath the site	Unlikely	Low. There is a good chance that Secondary A Aquifers will be impacted if soils are heavily contaminated.	At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.

Source	Pathway	Receptor	Likelihood	Potential Risk	Proposed Action
Historical gas works 100m west of the site. Contaminants of concern include sulphide, cyanide, coal tar, heavy metals, petroleum hydrocarbons.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users	Possible	Low. The distance from the source to the site is acknowledged, but the contamination potential of the source is high. The risk rating is slightly reduced due to the fact that much of the development will be covered in hard standing and/ or buildings.	Soil samples will be obtained from the proposed garden areas.
		Site workers (during development)	Possible	Low to Moderate. The distance from the source to the site is acknowledged, but the contamination potential of the source is high. Due to the nature of work site workers will likely be exposed to soils.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers.
	Impacted soils.	Services	Possible	Low to Moderate. It is acknowledged that it is possible for contaminated soils to have an impact on services but distance from the site to the source reduces this risk slightly.	Soil samples will be obtained from across the site in order to refine the risk level to Services.
	Volatilisation of hydrocarbons underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development	Unlikely	Low. Possibility of impact from hydrocarbons is moderate based on nature of source, but distance from site reduces this risk.	Soil samples will be obtained from across the site in order to refine the risk level. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
		Site workers	Possible	Low. Possibility of impact from hydrocarbons is moderate based on nature of source, but distance from site reduces this risk.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
	Migration of soil contaminants to groundwater.	Secondary A Aquifers beneath the site	Possible	Moderate. There is a good chance that Secondary A Aquifers will be impacted if gas works soils are heavily contaminated but the distance from site reduces this risk.	At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.

Source	Pathway	Receptor	Likelihood	Potential Risk	Proposed Action
General industrial off site land uses including: unspecified works 50m west, coal yard 75m northwest, garage 75m northwest, builders yard 50m south and 75m northwest, and petrol facility 200m southeast. Contaminants of concern include but are not limited to heavy metals, petroleum hydrocarbons, asbestos.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users	Possible	Low to Moderate. The distance from the sources to the site is acknowledged, but the combined contamination potential of the sources is high. The risk rating is slightly reduced due to the fact that much of the development will be covered in hard standing and/or buildings.	Soil samples will be obtained from the proposed garden areas.
		Site workers (during development)	Possible	Low to Moderate. The distance from the combined sources to the site is acknowledged, but the combined contamination potential of the source is high. Due to the nature of work site workers will likely be exposed to soils.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers.
	Impacted soils.	Services	Possible	Low to Moderate. It is acknowledged that it is possible for contaminated soils to have an impact on services but distance from the site to the sources reduces this risk slightly.	Soil samples will be obtained from across the site in order to refine the risk level to Services.
	Volatilisation of hydrocarbons underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development	Unlikely	Low. Possibility of impact from hydrocarbons is moderate based on nature of source, but distance from site reduces this risk.	Soil samples will be obtained from across the site in order to refine the risk level. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
		Site workers	Unlikely	Low. Possibility of impact from hydrocarbons is moderate based on nature of source, but distance from site reduces this risk.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
	Migration of soil contaminants to groundwater.	Secondary A Aquifers beneath the site	Possible	Low. There is a good chance that Secondary A Aquifers will be impacted but the distance from site reduces this risk.	At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.

Source	Pathway	Receptor	Likelihood	Potential Risk	Proposed Action
Activities associated with laundrette approximately 10m south of the site. Contaminants of concern include solvents such as benzene, trichloroethene, tetrachloroethene and perchloroethylene.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users	Possible	Low. The distance from the source to the site is acknowledged, and the contamination potential of the source is moderate. The risk rating is slightly reduced due to the fact that much of the development will be covered in hard standing and/ or buildings.	Soil samples will be obtained from the proposed garden areas.
	Impacted soils.	Site workers (during development)	Possible	Low. The distance from the source to the site is acknowledged, and the contamination potential of the source is moderate.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers.
		Services	Possible	Low. It is acknowledged that it is possible for contaminated soils to have an impact on services but distance from the site to the source reduces this risk.	Soil samples will be obtained from across the site in order to refine the risk level to Services.
	Volatilisation of hydrocarbons underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development	Unlikely	Low. Possibility of impact from hydrocarbons is moderate based on contaminant potential. The, albeit short, distance from source to site is acknowledged.	Soil samples will be obtained from across the site in order to refine the risk level. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
		Site workers	Unlikely	Low. Possibility of impact from hydrocarbons is moderate based on contaminant potential. The, albeit short, distance from source to site is acknowledged.	Soil samples will be obtained from across the site in order to refine the risk level to Site Workers. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
	Migration of soil contaminants to groundwater.	Secondary A Aquifers beneath the site	Possible	Low. There is a good chance that Secondary A Aquifers will be impacted if soils are heavily contaminated but heavy impact to soils is unlikely.	At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.

Negligible Risk	Defined as the site should be considered suitable for the present or future use and environmental setting. Contaminants unlikely to be present, which might have unacceptable impact on key targets.
Low Risk	Defined as the site should be considered suitable for the present or future use and environmental setting. Contaminants may be present but unlikely to have unacceptable impact on key targets.
Moderate Risk	Defined as the site may not be suitable for the present or future use and environmental setting. Contaminants are probably present and might have unacceptable impact on key targets.
High Risk	Defined as the site is probably or certainly not suitable for the present or future use and environmental setting. Contaminants are probably or certainly present and likely to have unacceptable impact on key targets.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The site presently comprises a carpet and flooring specialist shop to the east, with associated storage buildings to the north, and two currently vacant residential houses to the west.

Proposed plans indicate the site will be developed into shops and 18no. flats over three storeys with associated parking and new public realm area. Three or four of the ground floor flats will have private gardens. Detailed development plans can be viewed in **Appendix A**.

The risk of exposure from heavy metals, hydrocarbons and asbestos associated with possible on site Made Ground to development site workers from possible Made Ground and ACMs is considered **Moderate** based on the on site location of the source and potential degree of contamination. It is acknowledged there is a **Low to Moderate** risk to end users from the same source. The risk rating is slightly reduced due to the fact that much of the development will be covered in hard standing and/ or buildings.

The risk of impact to the Secondary A Aquifers beneath the site from the historical gasworks situated approximately 100m west of the site is **Moderate**. Contaminants of concern include sulphide, cyanide, coal tar, heavy metals, petroleum hydrocarbons.

The following recommendations are specific to the plans received at the time of writing this report and any alterations to the plans may warrant a reassessment of the risk.

A limited site investigation is required in order to further refine potential pollutant linkages identified within the CSM. Details can be found in Section 7.1 of this report.

It is recommended that this report is submitted to the Local Authorities and the Environment Agency for comment and approval.

7.1 Proposed Site Investigation

In accordance with section 7.0, a limited intrusive Site Investigation is required to assess the potential pollution linkages identified in the Preliminary Conceptual Site Model. The investigations considered necessary to assess these potential risks are detailed below.

Targeted Investigations	
Investigation Required	Purpose(s)
Hand dug pits and subsequent handheld window sample boreholes (for depth) in areas earmarked for private gardens and in current external waste storage area.	Collect representative soil samples. Assess visual / olfactory evidence of contamination in soils. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.
Hand dug pits and subsequent handheld window sample boreholes on western boundary to target gasworks source.	Collect representative soil samples. Assess visual / olfactory evidence of contamination in soils. At least one monitoring well will be installed on site if there is evidence of impacted soils during site works.

Non-Targeted Investigations	
Investigation Required	Purpose(s)
A series of additional hand dug pits across the site.	To provide sufficient coverage of site area. Collect representative soil samples. Assess visual / olfactory evidence of contamination. At least one monitoring well will be installed on site if there is evidence of ground gas producing soils.

Recovered samples will be analysed/ assessed as part of the investigation, which will aid in refining the conceptual site model, based on identified sources and source-pathway-receptor linkages.

The testing regime has been devised in accordance with BS10175:2011:2013+A1 *Guidelines for the Code of Practice for Contaminated Land* and CLR Report No.4 *Sampling Strategies*.

7.1.1 Analysis

Analysis of soil samples will be required in order to determine the completeness of the potential pollutant linkages identified in the Preliminary Conceptual Site Model. The following testing regime is considered appropriate for a selection of recovered samples.

As previously detailed, if there is visual/ olfactory evidence of contamination in soils, a groundwater monitoring well may need to be installed. If this is the case, groundwater analysis will mirror that of soils.

Material	Chemical Testing Required
Made Ground	Heavy metals, speciated Total Petroleum Hydrocarbons (TPH – aliphatic and aromatic C ₅ – C ₄₀), speciated PAH, BTEX, MTBE, pH, Soil Organic Matter and Asbestos Screen. Specific contaminants of concern related to the gasworks and launderette west of the site will be analysed, if required, after an initial analysis screen.
Natural Soils	Heavy metals, speciated Total Petroleum Hydrocarbons (TPH – aliphatic and aromatic C ₅ – C ₄₀), speciated PAH, BTEX, MTBE, pH and Soil Organic Matter. Specific contaminants of concern related to the gasworks and launderette west of the site will be analysed if required after an initial analysis screen.

7.1.2 Guidance

The results from the Site Investigation will be compared against relevant Generic Assessment Criteria (GAC) including Soil Guideline Values (SGVs), Provisional Category 4 Screening Levels (C4SLs) and LQM CIEH Generic Assessment Criteria using the 'Residential' classification. This is on the basis that the end users could include children.

If required, groundwater results will be compared against UK Drinking Water Standards and The New Dutch List.

7.2 Statutory Consultees

We would recommend that this report be forwarded to the relevant Statutory Consultees including the Local Council's Environmental Health and Planning Department to seek their comments and subsequent approval prior to works commencing on site.

7.3 Watching Brief

We would recommend that a watching brief is maintained on site, particularly during any planned ground works stage. This must be undertaken as part of good working practices and in case there are any areas of unidentified contamination.

During any ground works, an appraisal of the exposed soils should be made by the on-site manager. If any material is noted to show visual and/or olfactory signs of contamination this material should be stockpiled separately and tested prior to its appropriate removal off site or re-use where necessary. A suitably qualified environmental specialist should be contacted to advise what further work is required.

The on-site manager should be appointed by the contractor and it would be recommended that this person be able to display the relevant level of qualification and/or experience in managing major construction works on contaminated land.

7.4 Waste Disposal

As surplus arisings will likely be generated as part of the build programme, it is recommended that a copy of the laboratory results are given to the waste contractors and/or landfill operators involved to discuss the requirements with regards to removal of surplus subsoils from the site and the acceptance of the waste at the landfill. All surplus arisings should be appropriately classified as 'hazardous' or 'non hazardous' prior to its movement off site.

All materials must be transported in compliance with the Duty of Care Regulations by authorising movements with Carrier's individually numbered Duty of Care conveyance notes, complete with the appropriate EWC Codes. All relevant dockets will need to be kept to provide evidence of the removal.

It may be necessary depending upon the initial classification and the specific requirements of the waste carrier and the accepting landfill facility to complete Waste Acceptance Criteria (WAC) testing; it is prudent to ascertain the testing requirements of each prior to the movement of any spoil.

Contaminated soil that is, or must be disposed of, is waste. Therefore, its handling, transport, treatment and disposal is subject to waste management legislation, which includes:

- Duty of Care Regulations 1991
- Hazardous Waste (England and Wales) Regulations 2005
- Environmental Permitting (England and Wales) Regulations 2010
- The Waste (England and Wales) Regulations 2011

The client should ensure that all contaminated materials are adequately characterised both chemically and physically in line with British Standard BS EN 14899:2005 'Characterization of Waste – Sampling of Waste Materials – Framework for the Preparation and Application of a Sampling Plan' and that the permitting status of any proposed treatment or disposal activity is clear. If in doubt, the Environment Agency should be contacted for advice at an early stage to avoid any delays.

If the total quantity of waste material to be produced or taken off site as hazardous waste is 500kg or greater in any 12 month period then the developer will need to register with the EA as a hazardous waste producer.

A copy of such documentation should be retained and forwarded to CE for inclusion into a verification/validation report.

7.5 Services

We would recommend that if new services are to be included into the design of this development, the local water board are contacted to determine the type of pipework that should be used on this site.

All services and in particular potable water supply pipes should be made out of suitable materials with respect to contamination, particularly materials with respect to contamination, particularly organic contaminants, which are known to degrade polymeric materials from which services are often made.

It would be prudent to situate services within lined trenches. The trenches should be lined with a geotextile membrane and backfilled with clean fill, such as pea shingle, which will demarcate the services from the surrounding soils.

This approach is largely to ensure that the risks to future service maintenance workers are mitigated, with respect to potential dermal contact, inhalation and ingestion pathways. Upon determination of the design, agreement should be sought from the Local Authority by way of a Remediation Strategy prior to commencement of groundworks.

It is recommended that a suitably qualified Environmental Scientist attends site to validate the construction of the service trenches, to take photographic records which should be included within a Validation Report or similar documentation.