LUSTRE
CONSULTING

RINGERS ROAD - BROMLEY

PHASE 1 DESK STUDY

NON-TECHNICAL SUMMARY

	SUMMARY
Site	2 – 4 Ringers Road and 5 Ethelbert Road, Bromley
Proposed Development	It is understood that proposals involve the clearance of the site and construction of a residential development. The proposed development will comprise the construction of two residential apartment blocks with communal open space at ground level, between the two blocks.
Current Use	The site currently comprises a restaurant and bar, and a photographic studio housed within a commercial building which fronts onto Ringers Road and studio apartments with a communal garden within the property which fronts onto Ethelbert Road.
Site History	The site comprised three residential properties from the late 1800s until the early 1950s, when the residential property fronting Ringers Road was demolished and replaced by a commercial building. The commercial building was extended in the 1960s and replaced the second residential dwelling, which fronted Ethelbert Road. Planning records suggest that this building has been used for retail and a restaurant / bar. Number 5 Ethelbert Road has remained in residential use since its construction in the late 1800s.
Key Sources of Potential Contamination	Limited onsite potential sources of contamination have been identified. Historical mapping records show that the site has undergone periods of construction and subsequent demolition, therefore any waste demolition materials may have been retained and spread on site. These waste materials, which may contain asbestos and other contaminants, may be present in the shallow soils on site.
Geology, Hydrogeology and Hydrology	Historical mapping records show that the site has undergone periods of construction and subsequent demolition. Any waste demolition materials may have been retained and spread on site; a layer of Made Ground is therefore anticipated. BGS mapping records show the site to be underlain by bedrock geology of the Harwich Formation (Secondary A aquifer). The site lies within a groundwater source protection zone - Zone 1 (Inner Zone) and groundwater abstractions are recorded within the local area. The nearest surface water feature is located 137m south-west and relates to the Ravensbourne River.
Land Quality Conclusions and Recommendations	Due to the historical demolition works previously undertaken to facilitate the construction of the current commercial building, there is the potential for a layer of Made Ground to be present beneath the site which may contain contaminants including asbestos, heavy metals, PAHs and TPH . This has been assessed as posing a Moderate/low risk to future residents and site visitors. In noted that this pathway is only considered to be active within proposed areas of soft landscaping and communal open space.
Geotechnical Recommendations	A geotechnical investigation will be required to inform foundation design. Due to the presence of mining activities, further assessment of the risk from mining features and mine sites should be undertaken.

PROJECT RECORD	
PROJECT NAME	RINGERS ROAD - BROMLEY
CLIENT	RINGERS ROAD PROPERTIES LTD

REPORT DETAILS		
TYPE	PHASE 1 DESK STUDY	
REFERENCE	3606 - 201020 - MD	
ISSUE DATE	JULY 2021 (Original issue date: OCTOBER 2020)	
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REGISTRATION OF AMENDMENTS

REVISION	DATE	AMENDMENT DETAILS	REVISION AUTHOR	REVISION REVIEWER

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CONTENTS

RISK TABLE

APPENDICES

1.0 INTRODUCTION

1.1 This Phase 1 Desk Study has been prepared for the site clearance and development of a site located off Ringers Road, in Bromley, Kent, BR1 1HT by Lustre Consulting Limited (Lustre) for Ringers Road Properties Ltd (the Client). The assessment has been undertaken in accordance with our fee proposal dated 08/10/2020, which was formally approved by Ringers Road Properties Ltd on 13/10/2020.

1.2 The site, irregular in plan, is centered at National Grid Reference 540241, 168909, and occupies an approximate area of 0.11ha as shown in Figure 1. The site currently comprises two buildings, one fronting onto Ringers Road and the other fronting onto Ethelbert Road. The Ethelbert Road property comprises residential studio apartments with a communal garden, and the Ringers Road property comprises a restaurant and bar, with the upper levels leased to a photographic studio. The site is located within a mixed commercial and residential land use area. The Client requires this Phase 1 Desk Study to support re-development works at the site. It is understood that proposals involve the clearance of the site and construction of a residential development. The proposed development will comprise two blocks of residential apartments with communal open space. Figure 2 illustrates the proposed development scheme.

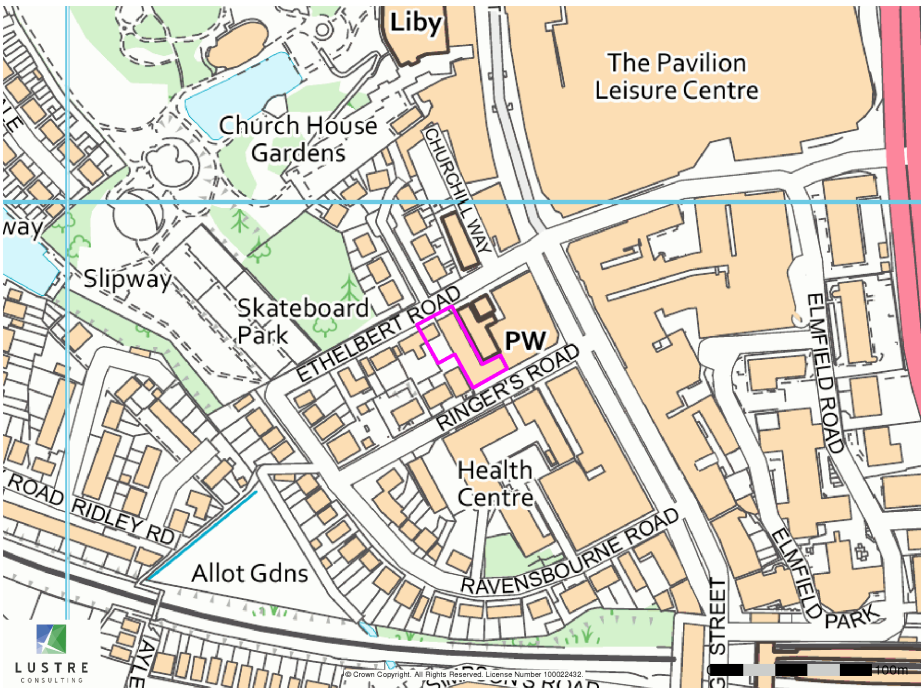

Figure 1: Site Location Plan

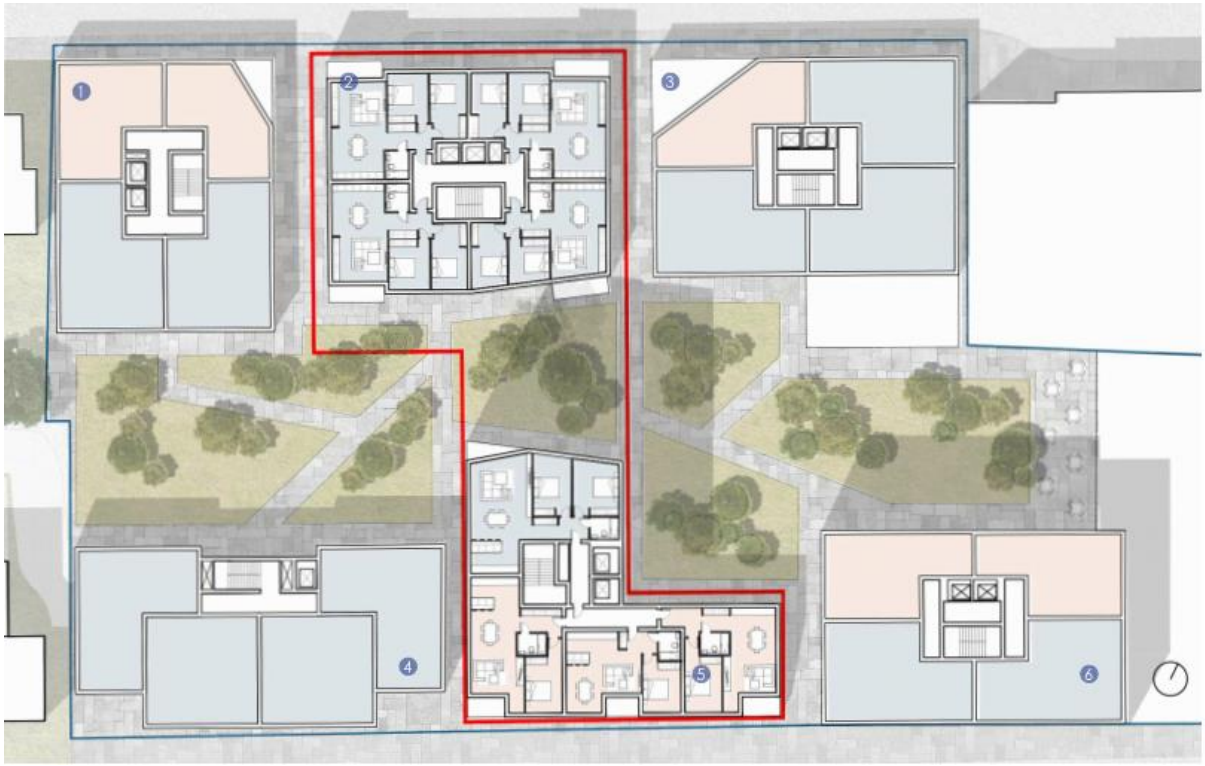

Figure 2: Proposed Site Layout

Objective

1.3 The objective of this Phase 1 Desk Study (also known as a Contaminated Land Assessment) is to determine the contaminative status of the site and to provide a general indication of the likely geoenvironmental issues which may be present on site or affect the site, as well as to provide guidance on any resultant liabilities. Information on likely geotechnical conditions and hazards is also to be assessed.

Scope of Works

1.4 The scope of works for the desk study is summarised below:

- Review of available historical Ordnance Survey maps (dating back to the mid-1800s) of the site and surrounding areas to identify current or former potential sources of contamination both on-site and within the immediate surrounds;
- Review of published geological, hydrogeological and hydrological records to assess the environmental setting of the site and surrounding areas;

- Review of available public information and up-to-date regulatory information from relevant authorities to identify any potentially significant environmental issues at the site and surrounding areas;
- Review of any existing information and reports relating to the site and surrounding area, including any available plans, development layouts etc; and
- Development of a conceptual site model and risk assessment following the source-pathway-receptor pollution linkage.

1.5 The Phase 1 Desk Study has been prepared in keeping with best practice and current planning guidance. *The National Planning Policy Framework (NPPF)*[1] advises regulatory consultees to ensure that adequate site investigation information is provided at the initial planning stage, whilst the Environment Agency's *Model Procedures for the Management of Land Contamination (CLR11*[2]*)* requires a phased, risk-based approach when dealing with land affected by contamination in the UK.

1.6 This Phase 1 Desk Study forms the first stage of an iterative contaminated land assessment, to identify any potential sources of contamination before undertaking any further intrusive Phase 2 investigation works or remedial action, if required. The methodology adopted in this Phase 1 Desk Study is based on the source-pathway-receptor model as set out in *CLR11*[2]. More information on Lustre's approach to such assessments can be found at the following link: www.lustreconsulting.com/Services/ContaminatedLandAssessment.aspx.

Asbestos Containing Materials (ACM)

1.7 Under Regulation 4 of the Control of Asbestos Regulations 2012[3], those parties ("duty holders") who have control over the maintenance or repair of non-domestic premises are required to identify and manage any asbestos or presumed asbestos found in their premises. Where asbestos is or is liable to be present, the duty holder(s) shall ensure that they have an adequate management plan, undertake and review risk assessments and maintain an Asbestos Register detailing the probable exposure to all employees and site users. The duty holder may be the business owner, landlord, tenant, or others by virtue of a contract.

[1] Department for Communities and Local Government, National Planning Policy Framework, February 2019.
[2] DEFRA/Environment Agency, Model Procedures for the Management of Land Contamination, CLR11, September 2004.
[3] Control of Asbestos Regulations (CAR) 2012

1.8 Regulation 5 requires duty holder(s) to identify asbestos prior to maintenance or any other work which exposes or is liable to expose employees to asbestos unless there has been a sufficient assessment. There is always a risk that asbestos will be present in soils, under hardstanding and below ground structures, and that it may spread particularly during clearance and demolition works. It is therefore essential that any asbestos or presumed asbestos is identified, managed, removed and disposed by a licensed remover (if licensable work) in accordance with relevant HSE guidance. It is the responsibility of the duty holder under Regulation 16 to ensure measures are put in place to prevent the 'spread' of asbestos.

1.9 Where ACM in existing structures (i.e. within the building fabric) is observed during the site walkover, a brief description will be included in this report in order to inform our assessment of Asbestos Containing Soils (ACS) (presented in Chapter 2.0). It must be noted however, that this Phase 1 Desk Study does not include detailed identification and assessment of ACM within existing structures both above and below ground (i.e. basements, services). This should be carried out by an appropriately experienced and qualified asbestos surveyor and is outside of our agreed scope of works.

1.10 Where ACM is present on proposed development sites, there is always a risk of impacting the underlying soils, particularly during clearance and demolition works. It is therefore essential that any ACM identified by the asbestos surveyor is appropriately managed, removed and disposed offsite by specialist contractors in accordance with good practise and current guidance. It is the responsibility of the duty holder and / or client to ensure measures are put in place to prevent contamination of the soils during such works.

Reliance and Limitations

1.11 This report has been prepared using published information and information provided by the Client made available at the time of writing only. Lustre Consulting accepts no liability for any information which has become available since this time.

1.12 Lustre Consulting owes no duty of care and has no liability to any Third Party who is not authorised by Lustre Consulting to use this report. Any unauthorised Third parties using information contained in this report do so at their own risk.

1.13 Whilst this report references observations made regarding the presence of features/ issues such as invasive species, ACM, site drainage and evidence of structural abnormalities, this report does not constitute specialist surveys on these matters. Should further specialist surveys be carried out in this regard, the findings of these should be reported to Lustre so that we may determine if this has any discernible impact on the findings of this report.

1.14 Third party information which has been reviewed and used to inform the assessments presented herein, including public records held by various regulatory authorities and environmental database data has been assumed to be true and accurate.

1.15 This assessment has been carried out to determine the potential risks posed to future end users, along with other key receptors, based on the current development. Should revisions in the development proposals result in a change any assessment parameters detailed in this report, a re-assessment of the risk should be carried out.

Report Structure

1.16 The report structure generally follows the pollution linkage approach described above. Chapter 2 of the report provides information relating to the **"source(s)"** of potential contamination through a study of current and historical land uses, whilst the sensitivity and anthropology information in Chapter 3 relates to the **"receptor**" and **"pathway"** components. Report conclusions and recommendations, including a summary of the conceptual site model and risk assessment Appendix, are set out in Chapter 4.

2.0 LAND USE

Introduction

2.1 This chapter identifies and provides information on any potential on-site and off-site **"sources"** of contamination within the source-pathway-receptor model. The chapter includes a review of information obtained from photographic records, publicly recorded information on environmental issues and controls within relevant distances of the site (which may indicate the presence of potential source(s) of contamination, such as licensed landfills), available planning records obtained from regulatory websites and OS historical mapping. A summary of the identified sources and potential contaminants are given at the end of the chapter.

Site Description

2.2 A site walkover was undertaken by a qualified consultant from Lustre on the 22nd October 2020. Access was granted to part of the commercial building on Ringers Road and all external areas.

Figure 3: Aerial Photograph

2.3 At the time of the site walkover the site comprised two buildings, one fronting onto Ringers Road (occupying the eastern section of the site) and the other fronting onto Ethelbert Road (occupying the western section of the site).

2.4 The Ethelbert Road property comprised a four storey residential property, split into studio apartments, including a basement level. The building was of brick construction with tiled roofing and a small strip of landscaping fronting onto Ethelbert Road, which comprised AstroTurf. An alleyway was present on the northern elevation of the property, which provided access to the rear communal garden area. Rubbish bins for domestic waste were stored on this access path, which was laid to hardstanding. The rear communal garden area comprised a patio adjacent to the residential property and an area laid to grass, with a raised plant bed present adjacent to the southern boundary. No off-street parking was included within the property footprint.

Restaurant fronting onto Ringers Road

Rear access to the restaurant from Ethelbert Road

2.5 A larger commercial property occupied the remainder of the site and is accessed via Ringers Road, adjacent to the south eastern site boundary, This property extends the full length of the site, between Ringers Road to the south and Ethelbert Road to the north and comprises a part 2 storey part 3 storey brick building, with both a pitched and flat roof.

2.6 A restaurant, kitchen, food storage area, including refrigerators, and bar occupied the ground floor of the property. Access across this area of the site was limited during the site walkover due to health and safety reasons. The restaurant also occupied part of the second floor of the building, with the remainder of the building understood to be let to a photographic studio.

2.7 Roller doors were present to the rear of the commercial property (fronting Ethelbert Road), with this area used for receiving deliveries. A small paved area was also present, which was

used for vehicle parking and for storing waste bins. Hardstanding within this area was noted to be in good condition, with no evidence of cracking or staining.

2.8 The site was noted to slope to the south west, which was in keeping with the topography of the surrounding area, with the residential property, situated at a slightly low elevation than the commercial property.

Rear communal garden of the Ethelbert Road property

Front garden and access to the Ethelbert Road Property

Observations on Ground Stability and Structural Damage

2.9 No evidence of ground stability hazards or structural damage was observed on site. However, this report does not constitute a structural survey or similar survey.

Bulk Storage of Fuels and Hazardous Material

2.10 Lustre has not been made aware of, or observed, any current or former bulk above ground fuel storage areas/ hazardous material storage on site. No evidence of any current underground fuel tanks (e.g. unexplained manhole covers, vents, fill points etc) was noted during the site walkover.

2.11 Small-scale hazardous material storage was not observed during the walkover.

Asbestos Containing Soils (ACS)

2.12 ACM was commonly used in construction and refurbishment projects until their use was prohibited in 1999. Given the age of the building(s) present on site (including any refurbishment works), the potential for ACM to be present within the building fabric and curtilage is possible. No obvious asbestos containing materials (ACM) were observed during the site walkover. However, the inspection does not constitute an asbestos survey.

2.13 Soil contamination from asbestos can be caused through inappropriate use and poor care of ACM in the building fabric and curtilage causing cross contamination during historical demolition or renovation works. ACS can also be encountered within infilled land and/or imported sub-base / fill materials associated with previous construction or renovation works (such as the construction of a new hardstanding). The potential for ACS to be present underlying the hardstanding should be considered.

Waste

2.14 Based on the site use, potentially contaminative waste streams are not considered likely. The following waste types were observed on site: domestic and commercial. Wastes generated on site are likely removed by a licensed waste carrier. From the observations made on site, housekeeping appears to be generally good.

Drainage

2.15 Only sanitary wastewater, surface water run-off (from roof areas and hardstanding) is generated on site. No evidence of activities that would require a Discharge Consent was observed. Lustre has not been made aware of any oil / water interceptors within the site drainage system by the Client. Existing drainage plans were not made available for viewing.

2.16 No surface water features were observed on site. A formal drainage network was observed on site within hardstanding areas as evidenced by drainage covers. No interceptors were identified during the site inspection.

Persistent Organic Pollutants (POPs, inc. Polychlorinated Biphenyls (PCBs))

2.17 No sub-stations, high voltage cables (in excess of 100kV) or other potential sources of PCB were identified at the site.

2.18 No other specific POP point sources were identified during the site inspection that could have adversely impacted soils on site.

Invasive Species

2.19 No invasive species (e.g. Japanese knotweed, Giant Hogweed, Himalayan Balsam) were identified during the site walkover, however the site visit conducted does not constitute a full 'injurious weeds and invasive plants' survey.

Potential Off-site Sources / Points of Interest

2.20 The site is bordered to the north east by retail premises and a Salvation Army building and to the south west by residential accommodations. Residential properties are also present to the north of Ethelbert Road and the south of Ringers Road.

Further Surveys

2.21 Whilst the site walkover discussion may reference observations regarding the presence of features/issues such as invasive species, ACM, site drainage and evidence of structural abnormalities, this report does not constitute specialist surveys on these matters. Should further specialist surveys be carried out in this regard, the findings of these should be reported to Lustre so that we may determine if this has any discernible impact on the findings of this report.

Public Record Information

2.22 Information on potentially significant environmental issues and controls at the site and surrounding area may be held on public records by various regulatory authorities. Information referenced in this Chapter has been sourced directly from the regulatory authorities and from the Landmark database (data summarised within relevant distances of the site centre). A copy of the Envirocheck report is attached at Appendix A. A summary of the significant environmental issues and controls in the Envirocheck report is summarised in the following table.

Public Record	Features
Environmental Permits and Controls	No Local Authority Pollution Prevention and Controls have been identified within 250m of the subject site.
Pollution Incidents to Controlled Waters	14 pollution incidents to controlled waters have been identified within 250m from the subject site. The closest incident was recorded 119m W at Glassmill Lane Reservoir and pertains to the release of oils - unknown and was assessed as a Category 2 - Significant Incident. The second closest incident was recorded 120m W and occurred on 7th May 1993 and pertains to the release of oils - unknown and was assessed as a Category 3 - Minor Incident.
Hazardous Substances	There are no hazardous substances (e.g. Control of Major Accident Hazards (COMAH), Notification of Installations Handling Hazardous Substances (NIHHS) or Planning Hazardous Substance Consents) recorded within 250m.
Landfill Sites	No BGS recorded landfill sites have been identified within 1km of the subject site. No Local Authority Recorded Landfill Sites have been identified within 1km of the subject site. No registered landfill sites have been identified within 1km of the subject site. A single historical landfill site has been identified within 1km from the subject site: 491m SE operated by Widmore under licence reference EAHLD11947 at Langdon Road. Operational in 1960.

Public Record	Features
Waste Management Facilities	No Licensed Waste Management Facilities have been identified within 250m of the subject site. No Registered Waste Transfer Sites have been identified within 250m of the subject site. No Registered Waste Treatment or Disposal Sites have been identified within 250m of the subject site.
Contemporary Trade Directory Entries	44 contemporary trade directory entries have been listed within 250m from the subject site. The closest entry is located 23m NW for a cleaning services - domestic (Ideal Cleaners Bromley), which is listed as inactive. Of the 44 entries only 9 are active. The following trade classifications are recorded within 250m: cleaning services - domestic, electrical goods sales, manufacturers & wholesalers, cleaning services - domestic, perfume suppliers, lock suppliers and manufacturers, hardware, computer manufacturers, chemical manufacturers, waste disposal services, rubbish clearance, car breakers & dismantlers, cladding suppliers & installers, carpet, curtain & upholstery cleaners, garage services, sports equipment manufacturers & distributors, office furniture & equipment, sausage manufacturers, pest & vermin control, oil fuel distributors, distribution services, food products - manufacturers, dairies, engineers - general, printers, disability equipment - manufacturers & suppliers, leather garments & products, photographic processors, painting & decorating supplies, candle manufacturers & suppliers.
Petrol Filling Stations (PFS)	No fuel station entries have been identified within 250m of the subject site.

The approximate bearing of identified features is abbreviated with the first letter(s) (e.g. south-west = SW).

Review of Regulatory Information

2.23 A review of the planning records held by London Borough of Bromley has revealed the following planning applications relating to the use of the site:

- 2/4 Ringers Road, Bromley, Change of use from retail to restaurant / bar ref: 87/03705/FUL – Permitted December 1987.
- Change of use of basement from residential to offices at 5 Ethelbert Road, Bromley ref: 91/02700/FUL – Permitted December 1991
- Henry's wine bar, part change of use of first and second floors to managers bedroom ref: 93/01999/FUL – Permitted December 1993.
- Change of use of ground floor entrance / lobby and first floor from a drinking establishment to leisure ref: 17/00004/FUL – Permitted January 2017.

2.24 In addition to the planning applications listed above relating to the current study site, it is noted that two planning permissions (ref: 06/01528 and 07/03632) relate the redevelopment of land to the south of Ringers Road as a mixed residential and commercial development, with an

upper and lower basement. Both permissions include a requirement for the phased assessment of contaminated land, however no reports are available for review online.

Site History

2.25 The site history has been assessed by reviewing historical Ordnance Survey maps provided by Landmark and aerial photographic imagery from Google Earth. Relevant maps are reproduced in Appendix B. The historical development of the site and the surrounding area are summarised in the following section. Where features are identified as having a potential impact on the proposed development, an indication of potential contaminants has been provided at the end of the Chapter.

2.26 It is noted that the mapping process adopted in generating the historical Ordnance Survey records (mapping intervals/frequency, scale, inclusion/exclusion of features etc), may result in an incomplete account of a site's history. Changes in land use between mapping dates, or small yet potentially contaminative land uses, may not be identified from the records. The following account is therefore based solely on the information provided in the mapping records and the dates listed should be considered as approximate.

On Site Land Use	Date Feature Present	Date Feature Removed
Parkland and grounds associated with Bromley House	1895	1896
Two residential dwellings are present within the northern section of the site with rear private gardens. The dwellings face onto Ethelbert Road. A third property is present within the southern section of the site, which faces onto Ringers Road, with a rear garden bordering the properties to the north	1896	1953
The residential dwelling fronting Ringers Road has been demolished and a large commercial building constructed across the southern section of the site, extending towards the residential properties on the northern site boundary.	1953	1968
The residential dwelling within the north eastern section of the site has been demolished and the commercial building present within the southern section of the site extended in its place, to full the length of the site. A single residential dwelling remains within the north western section of the site.	1968	Present

The approximate bearing of identified features is abbreviated with the first letter (e.g. south-west = SW). Approximate distances are interpreted from historical mapping and in metres.

2.27 Environmentally pertinent historical information from the immediate surrounding area (within 250m) has been summarised below.

Surrounding Land Use	Distance / Bearing	Date Feature Present	Date Feature Absent
Depository including tank	20m / S	1953	2012
Redeveloped for a mixed commercial and residential development		2012	Present
Depository	40m / SW	1953	2012
Redeveloped for a mixed commercial and residential development		2012	Present
Warehouse	50m / SW	1953	2012
Redeveloped for a mixed commercial and residential development		2012	Present
Works	65m / SW	1953	2003
Car park		2003	2012
Redeveloped for a mixed commercial and residential development		2012	Present
Infilled Pond – residential dwellings constructed across this area	65m / W	1896	Present
Garage	80m / N	1953	Present
Allotment Gardens	115m / SW	1933	Present
Railway Line	170m / S	1895	Present
Electricity Substation	200m / NE	1968	1192
Shopping Centre		1992	Present
Electricity Substation	220m / NE	1968	1992
Shopping Centre		1992	Present
Smithy	240m / S	1896	1909
Residential		1909	Present

The approximate bearing of identified features is abbreviated with the first letter (e.g. south-west = SW). Approximate distances are interpreted from historical mapping and in metres.

2.28 No potentially contaminative industries have been identified beyond 250m that could realistically impact the site.

Summary of Identified Potential Sources of Contamination

2.29 This section has assessed both the current and historical uses of the site and surrounding areas, as well as publicly available regulatory information. In accordance with *CLR11,* this assessment has allowed potential sources of contamination to be identified.

2.30 Based on our understanding, it is considered that some potential sources can be discounted at this stage of the assessment. Potential sources of contamination have only been discounted where sufficient evidence has been gathered to indicate that the particular source, for reasons

relating to the viability of its presence/significance, need not be considered further. The following off-site sources of potential contamination have not been considered further in this assessment:

- Railway land: Railway land to the south of the site has been discounted due to the relatively immobile nature of contaminants coupled with the distance to subject site (over 150m).
- Depositories, works and warehouse to the south/south west of the site and electricity substations to the north east: These sites have been recently redeveloped, therefore planning controls will have required remediation of gross /mobile contamination preventing off-site impact.
- Infilled Pond: As the pond was infilled over 100 years ago it is likely that any residual contamination associated with the infilling will have dispersed and dissipated and will no longer pose a significant risk to the study site.

2.31 Viable potential sources of contamination which have been carried forward into the conceptual model and risk assessment are set out below.

On-Site Sources - Current

2.32 The site currently comprises….Based on observations during the site walkover, no potentially contaminative activities or operations are currently undertaken at the site.

2.33 Bulk fuel storage was not observed on site.

2.34 Small scale storage of potentially hazardous materials was not recorded during the site inspection.

On-site Sources - Historical

2.35 Historical mapping records show that the site has undergone periods of construction and subsequent demolition. Any waste demolition materials may have been retained and spread on site. These waste materials, which may contain asbestos and other contaminants, may be present in the subsoil on site; a layer of Made Ground is therefore anticipated.

2.36 The site historically comprised three domestic dwellings, with one former dwelling remaining within the north western section of the site. Domestic dwellings represent a minor contaminative land use with the potential introduction of contaminants into the subsurface typically through bonfires and spreading of ash in the garden. In addition, where former

buildings/sheds have been demolished waste materials may have been spread across the site. Potential contaminants include: Asbestos, metals, inorganics, PAH and TPH.

2.37 A commercial building was constructed across the southern section of the site in the 1950s and had expanded into the north eastern section of the site by the late 1960s. Planning records suggest this building was formerly used as shop, before being converted to a restaurant and bar in the 1980s and then used as a leisure facility from 2017. Given the nature of the onsite commercial activities, as well as the widespread hardstanding, it is unlikely that any onsite activities would have resulted in significant contamination of the underlying soils. However, sporadic leakages may have occurred associated with any site vehicle parking. Potential contaminants include: Asbestos, metals, inorganics, PAH and TPH.

Off-site Sources – Historical

2.38 The following off-site land uses (taken from mapping records) have been considered further in this assessment as viable potential off-site sources of contamination: garage (vehicle servicing) present 80m to the north of the site. Potential contaminants include asbestos, metals, inorganics, PAH, TPH, phenols, VOCs and SVOCs.

Off-site Sources – Potential Sources Identified from Regulatory Information

2.39 No permitted or regulatory controlled activities require assessment as specific off-site sources of contamination.

2.40 A review of regulatory information has not identified any pollution incidents which are likely to have adversely impacted the subject site.

2.41 No off-site petrol filling stations are present within close proximity to the site that would require further consideration.

2.42 No non-landfill waste disposal sites have been identified within relevant distances which could impact the subject site.

Off-site Sources – Landfill Sites

2.43 Based on the landfill information reviewed as part of the Envirocheck database, off-site ground gas sources have not been considered further given the low likelihood for residual contaminants (gas and landfill leachate) to migrate onto site. Any ground gases or leachate would have dissipated and dispersed over the time lapsed since the landfill was operational. In addition, the landfill was present over 400m from the site and over this distance any ground gases or leachates would be been dispersed. Based on information in CIRIA C665, landfills over 60 years old do not represent significant gas generation sources.

3.0 SENSITIVITY & ANTHROPOLOGY

Introduction

3.1 This chapter provides information relating to on-site and off-site **'pathways'** and **'receptors'** and includes a review of the geology, hydrogeology, hydrology and ecological setting of the site. A general assessment and review of the site anthropology, such as identified human / built environment receptors, including current and future site occupiers, below ground structures, flora etc is also provided. A summary of identified receptors and site-specific pollutant linkages is given at the end of the chapter. Any pathways (contaminant migration, exposure pathways), which can be discounted in conceptual terms (i.e. considering the unviable nature of the pathway given the proposed development setting or local geology/hydrogeology etc), are discussed at the end of the chapter.

Geology

3.2 The 1:50,000 British Geological Survey (BGS) map (Sheet 271)[4] and the BGS website (National Geoscience Information Service)[5] show the site to be directly underlain by bedrock geology of the Harwich Formation comprising glauconitic silty or sandy clays, silts and fine- to coarse-grained glauconitic sands varying to flint gravel beds. No superficial deposits are anticipated on site.

3.3 Historical mapping records show that the site has undergone periods of construction and subsequent demolition. Any waste demolition materials may have been retained and spread on site; a layer of Made Ground is therefore anticipated.

3.4 Historical borehole records have been identified relating to boreholes drilled within the general vicinity of the site and surrounding area. The closest historical borehole was recorded approximately 100m north of the site (TQ46NW357). A summary of ground conditions encountered is provided below and a copy of the borehole log is included in Appendix C.

- Fill recorded to a depth of 1.0m bgl,

[4] BGS Solid and Drift Map Sheet 271
[5] Information from BGS website: www.bgs.ac.uk consulted in month of report issue

- Harwich Formation recorded to a depth of 13.5m comprising bands of sand and ballast, sand, sandy clay and shells and green sand,
- Thanet Sand proven to a depth of 18.0m bgl.
- No information is provided regarding groundwater depth.

Ground Hazards

3.5 BGS data has also been reviewed to determine potential ground stability hazards which may affect the site. The table below summarises the ground stability hazards anticipated on the subject site based upon the expected ground model.

Details	On-Site Hazard Potential
Coal Mining Affected Area	None
Non-Coal Mining Affected Area	Very Low
Potential for Collapsible Ground Stability Hazards	Very Low
Potential for Compressible Ground Stability Hazards	No Hazard
Potential for Ground Dissolution Stability Hazards	No Hazard
Potential for Landslide Ground Stability Hazards	Very Low
Potential for Running Sand Ground Stability Hazards	Very Low
Potential for Shrinking or Swelling Clay Ground Stability Hazards	No Hazard

3.6 The BGS also holds data on non-coal mining areas, natural cavities and radon, and the Coal Authority holds data on coal mining affected areas for the UK. Data collated by Landmark on these matters (sites/features within 1km of the subject site) are presented below.

Category	Details
BGS Recorded Mineral Sites	Six BGS Recorded Mineral Sites have been identified within 1km from the subject site: • 543m SW at Shortlands Gravel Pits. Mineral site operated as an opencast site extracting soils from the Harwich Formation. Status is listed as ceased. • 558m SW at Shortlands Gravel Pits. Mineral site operated as an opencast site extracting soils from the Taplow Gravel Formation. Status is listed as ceased. • 568m SW at Shortlands Gravel Pits. Mineral site operated as an opencast site extracting soils from the Taplow Gravel Formation. Status is listed as ceased.

Category	Details
	• 582m SE at South Hill House Gravel Pit. Mineral site operated as an opencast site extracting soils from the Harwich Formation. Status is listed as ceased. • 597m SW at Shortlands Gravel Pits. Mineral site operated as an opencast site extracting soils from the Harwich Formation. Status is listed as ceased. • 694m S at New Farm Gravel Pit. Mineral site operated as an opencast site extracting soils from the Harwich Formation. Status is listed as ceased.
Man-Made Mining Cavities	One man-made mining cavity has been identified within 1km from the subject site: 249m SW relating to a possible shaft/crown hole collapse. Geological units associated with this cavity include the Lambeth Group, Thanet Sand Formation, Upper Chalk Formation / Kempton Park Gravels.
Natural Cavities	No natural cavities have been identified within 1km of the subject site.
Radon Potential - Radon Affected Areas	No radon protective measures are necessary in the construction of new dwellings or extensions .

Hydrogeology

3.7 The Groundwater Vulnerability Map of England and the DEFRA website[6] have been reviewed to determine the aquifer designations.

3.8 The Harwich Formation is designated as a Secondary A aquifer which is defined by the Environment Agency as an "aquifer formed of 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. These are generally aquifers formerly classified as minor aquifers." Based on the BGS information reviewed, it is considered that the bedrock is relatively permeable, and that shallow groundwater may be present.

3.9 The Environment Agency has defined Source Protection Zones (SPZs) for groundwater sources used for public drinking water supply.[7] A groundwater source protection zone is present on site: Zone 1 (Inner Zone).

[6] Information from DEFRA Website: www.magic.defra.gov.ukconsulted in month of report issue
[7] These zones show the risk of contamination from any activities that might cause pollution in the area. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest.

3.10 Five groundwater water abstractions have been listed within 1km from the subject site. All abstractions are recorded between 660m west and 740m west of the site at Shortlands Pumping Station and are operated by Thames Water Utilities Ltd for the abstraction of groundwater for public water supply: potable water supply - direct, under licence no. 28/39/43/0018.

3.11 No groundwater discharge consents are recorded within 250m of the site.

Hydrology

3.12 The nearest surface water feature is located 137m south-west and relates to a primary / secondary river. Mapping records show the river labelled as Ravensbourne River with a general south-east / north-west orientation. A flow direction to the north-west has been inferred from mapping data. Considering the underlying geology/ ground conditions and the local topography, this surface water feature is likely to be in hydraulic connectivity with the site.

3.13 No additional surface water features are present within 500m of the subject site.

3.14 River quality information is available for Ravensbourne which is located circa 144m SW and is listed as having a GQA grade of B.

3.15 No surface water abstractions are recorded within 1km of the site.

3.16 No surface water discharge consents are recorded within 250m of the site.

Environmental Statutory Designations

3.17 A review of the environmental sensitive receptors' database indicates that the site is not located within an ecologically sensitive area. There are no Special Protection Areas, Sites of Special Scientific Interest, Ramsar Sites, Local Nature Reserves, Environmentally Sensitive Areas within 250m of the site.

3.18 No Nitrate Vulnerable Zones have been identified within 1km of the subject site.

Environmental Sensitivity

3.19 The sensitivity of each of the identified receptors is rated depending upon the environmental setting of the site, the likelihood for pollutant linkages to be present and potential consequence

of those potential pollutant linkages. The assessment approach adopted is based on guidance set out in the *NHBC R&D 66*[8] document.

3.20 Groundwater within the Harwich Formation is considered to have a Very High (H1) sensitivity, which is described in the guidance as being a "highly vulnerable aquifer, actively used in vicinity of site with short travel times to sources of supply or sensitive watercourses. Likely to be within an inner or outer groundwater protection zone (Zones I or II under EA protection policy). All contaminant releases to the ground environment of concern." This sensitivity classification has been assigned given the designation of the site area as within a groundwater SPZ, the presence of groundwater abstractions nearby, but also the expected permeability and potential for groundwater storage.

3.21 Surface water is considered to have a High (H2) sensitivity, which is described in the guidance as being a "site within catchment and reasonable proximity (less than 500m) of high quality watercourse (GQA A/B) or with potential transmission of pollutants via baseflow from an aquifer with little subsurface attenuation or via an interconnected unclassified drain or stream." This sensitivity classification has been assigned given the proximity of the Ravensbourne River and the potential for baseflow in shallow groundwater.

3.22 The site is considered to have a low ecological sensitivity given the absence of any statutory designated ecological receptors either on-site or within proximity to the site.

3.23 The sensitivity classifications noted above have been taken into consideration in the development of the conceptual model presented at the rear of this report.

Anthropology

3.24 Proposed anthropological receptors at the site are considered to include future residents and visitors. In the short term, groundworkers and construction personnel will also be considered.

Summary of Identified Receptors and Site-Specific Pollutant Linkages

3.25 A review of the environmental sensitivity and proposed anthropological use of the site has identified the following **receptors**, as detailed below.

[8] Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66, NHBC, 2008

Identified receptors:

- Residents and visitors,
- Ground / construction workers,
- Perched groundwater within Made Ground,
- Deeper groundwater within the Harwich Formation (Secondary A aquifer),
- Surface water,
- Adjacent land,
- Flora,
- Below ground structures and foundations, and
- Potable water pipes.

Viable pathways and pollution linkages:

3.26 A number of **viable migration and exposure pathways** and potential pollutant linkages have been identified, whereby a receptor may be exposed to a source. The viable pollutant linkages have then been used to develop a conceptual model. The following is a summary of **viable,** site specific pathways and pollutant linkages to be considered further:

- In areas of open ground, the following exposure pathways to humans are considered to be active: inhalation of contaminated dust and dermal contact and direct ingestion of contaminated soils. It is noted that these exposure pathways are only active in soft landscaped areas; permeant hardstanding breaks the potential pathways.
- Inhalation of toxic vapours, potentially migrating into above ground structures from organic contaminants within the Made Ground, contaminated groundwater or localised spills / leaks. Potential for vapours to migrate through hardstanding and open ground.
- Hazardous ground gases, potentially generated by the Made Ground or organic-rich natural soils, may migrate into above ground structures and accumulate within building voids and enclosed spaces (resultant risk of asphyxiation and / or explosion).
- Shallow soil contamination has the potential to vertically migrate downwards into the underlying natural soils and perched or shallow groundwater by leaching and infiltration. These processes are enhanced in areas of soft landscaping due to an increased infiltration potential. Conversely, areas of hardstanding reduce infiltration potential and leaching rates, which results in a lower mobility of any shallow contamination.
- Lateral migration of site-borne contaminants to off-site areas (down hydraulic gradient), including adjacent land and surface water (via surface water runoff and baseflow).
- Ground gases generated off-site may also migrate through the Made Ground and more permeable lenses of the underlying natural soils onto site.

- Lateral migration of potentially contaminated shallow groundwater from off-site areas (up hydraulic gradient), impacting on-site groundwater.
- Flora grown within areas of soft landscaping may be exposed to contaminants through root uptake mechanisms.
- Below ground concrete structures and foundations are susceptible to chemical attack from aggressive ground conditions (pH and water-soluble sulphate).
- Potable water pipes are susceptible to chemical attack from shallow soil contamination.

Non-viable pathways and pollution linkages

3.27 The following site-specific pathways and pollutant linkages are not considered to be viable, and therefore discounted from the conceptual model and risk assessment:

- Private gardens are not included within the development proposals and therefore the following pollutant linkage has been discounted: indirect ingestion of contaminated soils sorbed to home-grown produce.

4.0 CONCLUSIONS & RECOMMENDATIONS

Geoenvironmental Considerations

4.1 A conceptual model and qualitative risk assessment have been included at the end of this report. The risk ratings assigned in the risk table, and summarised in this Chapter, are based on information obtained through desk-based research, a site walkover and on our experience in assessing risks from similar sites. The proposed end use of the site, anticipated ground conditions, environmental receptors and viable exposure pathways have been considered.

4.2 In summary, this Phase 1 Desk Study has determined that there is a potential for contamination to be present on site in a circumstance which could lead to risks to identified receptors.

4.3 As illustrated in the risk assessment tables, the majority of the risks attributable to viable pollutant linkages were considered to be low and very low. The risk ratings identified in this assessment are not considered prohibitive for the development and can be effectively managed in accordance with CLR11. The risks which require further consideration in this regard are detailed below:

- Due to the historical demolition works previously undertaken to facilitate the construction of the current commercial building, there is the potential for a layer of Made Ground to be present beneath the site which may contain contaminants including asbestos, heavy metals, PAHs and TPH . This has been assessed as posing a Moderate/low risk to future residents and site visitors. In noted that this pathway is only considered to be active within proposed areas of soft landscaping and communal open space. Risks to sensitive groundwater and nearby surface water are considered to be low given the relatively minor nature of this contamination source.

4.4 The qualitative nature of the risk assessment is not absolute. Furthermore, although very low and low risks may have been assigned to various pollutant linkages, the risk cannot be eliminated (i.e. “no risk”) at this stage of the assessment and residual risks will remain which should not be discounted on the basis that the risk is low.

4.5 Based on the above risk ratings, it is recommended that validation sampling of the shallow soils is undertaken within the proposed area of communal open space between the two apartment blocks. This would aim to validate the suitability of existing soils for use within this area or if a cover system is required. These works could be conditioned as part of a successful decision notice for the proposed development and should be undertaken following demolition of the existing onsite structures.

4.6 A suitable asbestos survey should be undertaken prior to the start of any site refurbishment/demolition works, if not already completed. If encountered, asbestos and asbestos containing materials, should be dealt with in accordance with CAR 2012.

Planning Considerations

4.7 It is understood that this report will be submitted to the local planning authority to support the application. On award of planning permission, it is expected that the requirement for a validation-type Phase 2 Site Investigation post demolition, and the potential for possible remediation and verification, will be conditioned by the environmental health officer.

Preliminary Ground Model & Ground Hazard Recommendations

4.8 The BGS information shows that the site is underlain by soils of the Harwich Formation.

4.9 Considering the information from the BGS reviewed as part of this Phase 1, shallow groundwater may be present beneath the site.

4.10 All new build properties normally require a geotechnical site investigation to inform foundation design which can be combined with any environmental investigation works that are required.

4.11 Due to the presence of mining activities, further assessment of the risk from mining features and mine sites should be undertaken.

Comments on Waste Classification

4.12 Separate to the human health and wider environmental risks from potential contamination, the presence of some contaminants can also impact the waste spoil disposal costs. Depending on the chemical composition of the Made Ground and any contaminants present and their distribution, soils may require different levels classification for waste disposal purposes. For example, the presence of asbestos within the Made Ground or any historical demolition waste can significantly change the classification of waste soils which could incur greater disposal costs. The Client should consider the impacts that this may have the overall waste disposal strategy for the site.

4.13 Should there be a need for the disposal of soils as part of the development, it is recommended that the Client consider the need for undertaking a waste spoil assessment as part of any intrusive works. This may include an assessment of the hazardous nature of the soil by virtue of any contamination (in accordance with the Waste Framework Directive and the Environment

Agency's *Technical Guidance WM3 Hazardous Waste*[9]), and Waste Acceptance Criteria (WAC) testing.

Statutory Designation

4.14 The *National Planning Policy Framework (NPPF)* states that "land should be suitable for its new use and as a minimum, after carrying out remediation (if required), the land should **not** be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990". It is our opinion that, based on the findings of this Phase 1 Desk Study, it is unlikely the site would be designated as statutory contaminated land by the Local Authority under the provision of the published Statutory Guidance. It is advisable however, that any recommendations made in this report are implemented in line with current guidance and good practice, especially where verification of the risk assessment is necessary.

[9] Technical guidance WM3: Guidance on the Classification and Assessment of Waste (1st Edition 2015). Environment Agency.

CONCEPTUAL MODEL & RISK ASSESSMENT

ENVIRONMENTAL RISK ASSESSMENT

Introduction

This section assesses the significance of the environmental issues that have been identified on the site or in the surrounding area. This is achieved by developing an initial conceptual model for the site and undertaking a qualitative risk assessment.

The objective of the conceptual model is to identify potential contaminant "source(s)", "pathways" and target "receptors" relating to the site and surrounding area. The information obtained is described in detail in the Land Use Chapter and the Sensitivity & Anthropology Chapters. This information is then collated and a qualitative risk assessment[10,11] undertaken to assess the source-pathway-receptor linkages. The potential for a pollution event to occur is evaluated using a risk classification tool[12.] The level of risk is assigned by considering the likelihood that a pollution event might occur with the consequence of its occurrence. The consequence is essentially a measurement of the severity of a hazard (or source) and sensitivity of the receptor (e.g. aquifer type or end user).

The Table presented overleaf details the various components of the site conceptual model and evaluates the risks associated with each viable potential pollution linkage. Where additional explanation is required, Justification Notes have been given at the end of the Table. The risks associated with each potential pollution linkage are also discussed within the report conclusions.

Methodology

The qualitative risk assessment firstly considers the source of contamination and potential contaminants associated with the source(s) (or hazards). As well as the type of source, the extent, concentration and availability of a contaminant is also assessed.

The effect of a hazard on an identified receptor is largely governed by the sensitivity of a receptor. Receptors may typically include people, buildings, animals, plants and local resources (such as groundwater, surface waters, mines etc). A change in the receptor should be considered if the end-use of the site changes, for example, if a commercial site is to be redeveloped into a residential housing estate as a residential occupier is considered more sensitive than a commercial occupier. The presence of contamination (as a potential hazard) does not necessary mean that there is a risk. It is the exposure pathway and the quantity of contamination that reaches the receptor which may determine the effect on a receptor (such as the integrity of a barrier between a contamination source and receptor).

The risk classifications for both likelihood and consequence is based on methodology presented in Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA C552, 2001) and has been developed from procedures outlined in the EA's CLR11 Model Procedures. The Department for the Environment Transport and the Regions (DETR), with the EA and Institute of Environment & Health, has also published guidance on risk assessment (Guidelines for Environmental Risk Assessment and Management). The guidance states that the designation of risk is based upon a consideration of both:

- The magnitude of the potential consequence (severity) of risk occurring which takes into account both the potential severity of the hazard and the sensitivity of the receptor; and
- The likelihood of an event occurring (probability) which takes into account the both the presence of the hazard and receptor and the integrity of the pathway.

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[10] Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66, NHBC, 2008.
[11] Construction Industry Research and Information Association (CIRIA). Contaminated Land Risk Assessment. A Guide to Good Practice. CIRIA C552 2001.
[12] Department of the Environment, Transport and the Regions, Environment Agency and Institute of Environmental Health. Guidelines for Environmental Risk Assessment and Management. HMSO July 2000.

The magnitude of consequence (severity) and likelihood (probability) is defined in the CIRIA guidance, together with examples. The two classifications are then compared (as shown on Table 1) to obtain an estimation of risk for each pollution linkage, ranging from "very high risk" to "very low risk". A description of the risks and likely actions required is presented in Table 2. The benefit of estimating the risk in this way is that it can be revised after each investigation phase as the conceptual model and corresponding pollution linkages are refined.

Table 1: Comparison of Consequence VS. Probability

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Likelihood	**High likelihood**	Very high risk	High risk	Moderate risk	Moderate/ low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate/ low risk	Low risk	Very low risk	Very low Risk

Table 2: Description of the Classified Risks and Likely Action Required

Level of Risk	Description of Classification
Very High Risk	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 to a designated receptor is currently happening. If this risk is realised, it is likely to result in significant environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation (if not already undertaken) and remediation is likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. If risk is realised, it is likely to present a sizeable environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation is required and remediation work may be necessary in the short term and likely over the longer term.
Moderate Risk	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 is more likely the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the potential environmental liability. Some remedial works may be required over the longer term.
Low Risk	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. Limited investigation may be recommended to clarify the risk, dependant on the sensitivity of the receptor and view point of those of interest. Any remedial works are likely to be fairly limited.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is likely to be mild or minor.

The acceptability of risk will always depend upon the view point of those of interest, whether it is an occupier of a site, a regulator or stakeholder. As a result, it could be that action will be required to deal with a level of risk even if it is classified as very low.

APPENDIX A: ENVIROCHECK REPORT

APPENDIX B: HISTORICAL MAPS

APPENDIX C: HISTORICAL BOREHOLE LOGS

APPENDIX D:

NOTES ON LIMITATIONS

LUSTRE CONSULTING, ENVIRONMENTAL AND GEOTECHNICAL CONSULTANCY SERVICES
NOTES ON LIMITATIONS

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Phase I Environmental Risk Assessments, Desk Studies and Site Audits

The work completed and utilised to provide this report comprises a study of available documentation. The opinions and results presented in this report have been arrived at by utilising the finite amount of data available at the time of writing and are relevant only to the purpose for which the report was commissioned. The data which has been reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative information pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, Lustre Consulting reserves the right to review this information and, if warranted, to modify the opinions presented in the report accordingly.

It should be noted that the risks which are identified in this report are perceived risks based on the available information at the time of writing and that the actual risks associated can only be assessed following a physical investigation of the site.

Phase II Site Investigations

The intrusive investigation has been completed to provide information concerning the type and degree of contamination present along with ground and groundwater conditions which facilitates a reasonable risk assessment to be completed. The stated objectives of the ground investigation have been limited to assessing the proven risks which are associated with potential human targets, building materials, the environment (including adjacent land), and to surface water and groundwater.

The amount of exploratory work, chemical testing and monitoring completed as part of this project has potentially been restricted by the short timescale available, and the locations of exploratory holes undertaken have potentially been restricted to areas unoccupied by buildings(s) and buried services. A more comprehensive post demolition / decommission investigation may be required if the site is to be redeveloped. For these reasons any costs included in relation to site remediation must be considered as tentative only at this time.

The exploratory holes investigate only a small volume of the ground in relation to the size of the site and therefore, can only provide a “snap shot” or general indication of ground conditions located on the site. The fact that the site has been investigated does not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.

The risk assessment and opinions provided in this report take into account currently available guidance values relating to acceptable contamination concentrates; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

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