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The Oracle, Reading

Preliminary Risk Assessment - Desk Study Report

Turley

Report No. K1451-ENV-R001

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1 Introduction

1.1 Overview

ByrneLooby Partners UK Limited (ByrneLooby) was commissioned by Turley (the client) to carry out a Contaminated Land Preliminary Risk Assessment (PRA) in the form of a desktop review of site information, for the site known as The Oracle, Reading. A number of previous ground investigation reports have been provided by the client and these will form the basis of this PRA.

1.2 Purpose of the Report

The purpose of this report is to provide a preliminary review of geo-environmental information available on the site, for the proposed redevelopment of the former Debenhams and Vue Cinema sites at the Oracle Shopping Centre in Reading.

This report is intended to summarise the findings of ByrneLooby's review of the existing relevant geo-environmental information for the site which the client has made available.

The findings of this desk study are intended to inform a planning application for the redevelopment.

The scope of this report includes:

- A summary of the site conditions including its location and surroundings and a description of historic and current land uses;
- A review of the findings of previous ground investigation reports undertaken at the site;
- The development of a Conceptual Site Model (CSM) to establish the contaminant-pathway-receptor linkages from the human health, ecological and controlled water risk perspectives;
- The preliminary identification of the likely geo-environmental risk items of relevance to the proposed development; and
- Recommendations for further investigations, if deemed necessary.

This report is reliant only on the review of data presented in the reports provided to ByrneLooby by the client, and relevant and widely-used sources of publicly available information on the internet.

1.3 Regulatory Standards

This report has been devised to comply with the relevant principles and requirements of a range of guidance with regards to potentially contaminated land, including but not limited to:

- Part IIA of the Environment Protection Act, 1990;
- Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, April 2012);

- BS5930:2015: “Code of Practice for Site Investigations”;
- BS10175: 2011 +A2:2017 “Investigation of Potentially Contaminated Sites – Code of Practice”;
- Environment Agency Guidance (October 2020) Land Contamination Risk Management Land Contamination (LCRM);
- Environment Agency (2011) Report GPLC1 “Guiding Principles for Land Contamination”; and
- Environment Agency (2017) “The Environment Agency’s Approach to Groundwater Protection” November 2017 Version 1.1

The ‘Service Constraints Report Limitations & Planning Requirements’ are presented as **Appendix A.**

2 The Site

2.1 Site Location

The site location is summarised in **Table 2.1** below.

Table 2.1 – Summary of Site Location

Site Location	
Location	Approximately 550m east of the A329/A33 ring road in Reading town centre. The site is divided in to two areas by the River Kennet, with the Debenhams site north of the river and the Vue Cinema site south of the river.
Site Access	Via Yield Hall Place, from London Street.
Grid Reference	SU716732
Eastings, Northings	471665 , 173232
Postcode	RG1 2AG
Site Shape	Two roughly rectangular area, connected by a bridge on Yield Hall Place over the River Kennet.

2.2 Site Description

The site comprises two areas, either side of the River Kennet, at the eastern edge of the existing Oracle development. The site to the south of the river is known as the Vue Cinema site and is bounded by the River Kennet, London Street and the A329. The site to the north of the river currently a Debenhams store, is bounded by the River Kennet, Yield Hall Place and the Oracle shopping mall.



Figure 2.2 – Site Areas

3 Development Proposals & Additional Information

The proposal is to redevelop the two areas to provide mixed commercial and residential use. It is understood this will comprise the following:

- Full demolition of the Vue site buildings with construction of a new mixed-use residential development (south development area);
- At the Debenhams site: partial new build, partial re-purpose existing building for mixed retail and residential use (north development area).

The development proposals are laid out within a feasibility report undertaken by CallisonRTKL, dated October 2021.

3.1 Planning Status & Requirements

ByrneLooby understands this report is designed to support the requirements of The National Planning Policy Framework (NPPF, 2019) in relation to the site and will accompany planning application submissions.

3.2 Previous Investigations

ByrneLooby have been provided with a number of factual reports on previous investigations at the wider Oracle site. These reports and their findings relevant to the Debenhams and Vue sites are discussed further in the following sections.

Table 3.3 – Previous Investigations Reviewed

Document	Report Reference	Author
Factual report on Ground Investigation, Volume 1 Geotechnical – Oracle Centre, Reading (North) (1996)	146090/G	Exploration Associates Limited
Review of Geotechnical Information, Holybrook Restaurant – The Oracle, Reading (2014)	A10527/VBJ/GEO/R1/RevA	Pell Frischmann
Factual Report on Ground Investigation – The Oracle, Reading (2014)	729475R	Structural Soils Limited
Factual Ground Investigation Report – The Oracle Shopping Centre, Reading (2016)	G160513	Van Elle

A review of borehole and window sample data included within the reports mentioned in **Table 3.1** indicated the following intrusive positions are in the vicinity of the site:

- From the 1996 Exploration Associates ground investigation: BH5, BH5A, BH6, BH7, BH8, BH11, S7, S8, S9, W1, W2, W4, W5, W6

- From the 1990 Soil Mechanics Limited investigation (mentioned within the Pell Frischmann 2014 report ref. A10527/VBJ/GEO/R1/RevA): BH5, BH6, BH7, BH8

The strata encountered within these exploratory holes are discussed further in **Section 5.1**.

4 Site History

4.1 Historical Mapping

A selection of publicly available historical Ordnance Survey (OS) maps for the site area have been reviewed. These date from the 1879 OS County Series to the 1947 OS County Series Plans. Also reviewed is online satellite imagery. The key points of the historical development of the site and surrounding area are summarised in **Table 4.1**.

Table 4.4 – Key Points of Site Development and Surrounding Area

OS Map Edition	On-site	Off-site
1879 Country Series Plan 1:2,500	The northern area (Debenhams) is labelled as 'The Island'. A number of buildings are present on the site. The southern area (Vue) is labelled 'Manufactory (Kitchen Range & C)' and has a number of buildings present. The 'Mill Tail' water body (dock?) is present in the west of the Vue site and 'Gunter's Brook' extends from the southwest corner in to the centre of the Vue site.	London Street bounds the sites to the east. Mill Lane bounds the Vue site to the south. The River Kennet separates the north and south areas. Yield Hall Foundry (Iron & Brass) and a Gas Works are present directly west of the north area. A brook separates the gas works site from the north area. Bridge Street brewery is present further to the west, as is Castle Street Brewery, a number of churches and chapels and other buildings likely of mixed commercial and residential use. A Graveyard is present adjacent St Mary's Church on Gun Street to the northwest. Immediately to the southwest of the south area is St Gile's Corn Mill and 'Old Water Works' with a sluice beyond. To the south, Militia Stores are present and a Malthouse. East of the south area, a police station is present on London Street. Buildings of various use are present surrounding the wider site area.

1900 Country Series Plan 1:2,500	No significant change from previous mapping.	St Gile's Mill is labelled as disused.
1913 Country Series Plan 1:10,560	The Mill Tail water body is no longer visible on the mapping and appears to have been infilled. Some buildings on the south area are no longer present	Redevelopment has taken place on the St Gile's Mill site. Unknown use.
1934 Country Series Plan 1:2,500 ca. 1947 Country Series Plan 1:10,560	A tram & bus depot is present on the south area, extending west to the former St Gile's Mill site.	The gas works are no longer present to the west. The malthouse to the south is now a printing works.
Google Earth imagery, December 2003	Satellite imagery shows the present-day site layout.	Satellite imagery shows the present-day site layout.

5 Environmental Setting

5.1 Geology

The 1:50,000 scale British Geological Survey (BGS) GeoIndex website mapping, shows the site is underlain by superficial deposits of Alluvium (clay, silt, sand and gravel) and the Kempton Park Gravel Member (sand and gravel). The superficial deposits are underlain by bedrock of the Seaford Chalk Formation and Newhaven Chalk Formation (chalk).

Historical borehole records from previous site investigations in 1990 and 1996 are publicly available on the BGS GeoIndex mapping website. Logs for the 1996 boreholes in the northern site; BH5, BH5A, BH6, BH7, BH8, S7, S8 and S9 are also provided within the Exploration Associates report ref. 146090/G. A summary of the encountered geology in these exploratory locations is summarised in the following tables. These are generally consistent with what is shown on the BGS GeoIndex Viewer.

Table 5.5 – Summary of encountered geology in 1996 Exploratory Associates BH5 (BGS Reference: SU77SW331) (Northern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground		1.2	1.2
Alluvium	Organic odour	3.1	1.9
Sand and Gravel		4.8	1.7
Reworked/completely weathered chalk		5.4	0.6
Chalk		12.5	Not proven

Table 5.2 – Summary of encountered geology in 1996 Exploratory Associates BH5A (Northern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground	Ash was noted from 0.25-1.80m Strong organic odour from 3m	4.1	4.1
Silty sandy flint gravel with some flint cobbles and little chalk gravel		5.7	1.6
Chalk	Grade IV at 14m	25	Not proven

Table 5.3 – Summary of encountered geology in 1996 Exploratory Associates BH6 (BGS Reference: SU77SW332) (Northern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground	Ash present from 0.10-0.70m Organic odour from 0.70m	2.80	2.80

Strata	Comments	Depth (m)	Thickness (m)
Silty sandy gravel with rare bone fragments		4.75	1.95
Very sandy clay with chalk and flint gravel		5.10	0.35
Chalk	Grade V below 7m Grade IV from 13m Possibly becoming Grade III below 20m	25	Not proven

Table 5.4 – Summary of encountered geology in 1996 Exploratory Associates BH7 (BGS Reference: SU77SW333) (Northern site – adjacent River Kennet)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground	Coal and clinker present 0.10-1.40m	2.0	2.0
Very silty sandy clay with flint gravel and occasional shell and carbonaceous wood fragments (Possible made ground)	Below 3m: local black speckling, possibly high organic content	4.2	2.2
Sand and Gravel		9.8	5.6
Chalk	Grade V at 12m Grade IV at 15m	20.45	Not proven

Table 5.5 – Summary of encountered geology in 1996 Exploratory Associates BH8 (BGS Reference: SU77SW334) (Northern site – adjacent River Kennet)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground	Occasional coal fragments 1.00-1.70m Organic odour 1.70-3.10m	3.1	3.1
Very silty clay with rare flint gravel	At 3.70m: Possibly high organic content & fibrous wood fragments with slight petroleum odour	4.2	1.1
Sand and Gravel	Strong pungent odour at 4.20m	9.7	5.5
Chalk	Grade VI to V	19.45	Not proven

Table 5.6 – Summary of encountered geology in 1996 Exploratory Associates S7 (Northern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground	Very silty fine to coarse mixed sand with some to much fine to medium mixed gravel locally with many brick fragments.	2.25	2.25

Strata		Depth (m)	Thickness (m)
	Very silty sandy clay with wood fragments and rootlets and a little fine gravel.	3.00	0.75
	Very silty clayey fine to medium angular to subangular mixed gravel with some fine to coarse sand and many brick fragments.	4.50	1.50
Sand and Gravel	Grey brown fine to coarse very silty clayey SAND with much flint gravel.	5.00	Not proven

Table 5.7 – Summary of encountered geology in 1996 Exploratory Associates S8 (Northern site)

Strata		Depth (m)	Thickness (m)
Made Ground	Silty sand with some to much fine to medium subangular brick and chert gravel.	1.75	1.75
Possible Made Ground	Silty slightly sandy CLAY with rare shell fragments and fine chalk gravel.	2.50	0.75
	Silty sandy locally very sandy CLAY.	4.00	1.50
Possible Alluvium	Soft dark brown organic CLAY.	4.50	0.5
	Grey brown fine to coarse very silty SAND with a little fine flint gravel.	5.00	Not proven

Table 5.8 – Summary of encountered geology in 1990 Soil Mechanics BH5 (BGS Reference: SU77SW340) (Southern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground		1.95	1.95
Reworked Alluvial Deposits		2.80	0.85
Alluvial Deposits	Plant matter present	6.00	3.20
Valley Gravel		8.00	2.00
Possible Upper Chalk	Grade V	12.00	4.00
Upper Chalk		25.00	Not proven

Table 5.9 – Summary of encountered geology in 1990 Soil Mechanics BH6 (BGS Reference: SU77SW341) (Southern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground		2.90	2.90
Alluvial Deposits	Plant matter present	3.50	0.60
Valley Gravel		6.50	3.00
Reworked Chalk		9.00	2.50

Strata	Comments	Depth (m)	Thickness (m)
Upper Chalk		25.00	Not proven

Table 5.10 – Summary of encountered geology in 1990 Soil Mechanics BH7 (BGS Reference: SU77SW342) (Southern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground		3.20	3.20
Alluvial Deposits	Plant matter present	4.60	1.40
Valley Gravel	Plant stems present 6.00-6.70m	6.70	2.10
Upper Chalk		30.00	Not proven

Table 5.11 – Summary of encountered geology in 1990 Soil Mechanics BH8 (BGS Reference: SU77SW343) (Southern site)

Strata	Comments	Depth (m)	Thickness (m)
Made Ground		2.40	2.40
Alluvial Clay	Pockets of decaying vegetation	3.50	1.10
Valley Gravel		7.00	3.50
Upper Chalk		>20.25	Not proven

5.2 Hydrogeology

The site lies within a Secondary A Superficial Aquifer. Below this, the bedrock is classified as a Principal Aquifer.

Groundwater strikes were recorded between 3.80m bgl and 4.00m bgl in the northern site during the 1996 ground investigation, rising to between 1.32m bgl and 2.27m bgl.

In the southern site, groundwater strikes were encountered within the Alluvium at depths between 2.80m bgl in BH8 (SU77SW343) and 3.00m bgl in BH6 (SU77SW341). Groundwater strikes were recorded in the Valley Gravel stratum at 6.90m bgl in BH5 (SU77SW340), and in the Chalk at depths of 8.90m bgl and 20.10m bgl in BH5 (SU77SW340).

5.3 Mining, Quarrying and Other Potential Voids

There is potentially a risk that Made Ground used to infill areas of the site, in particular former water body features (eg 'Mill Tail' in the south area), which may include potential site gas, soil and water contaminants.

The depth to the bedrock chalk is estimated at approximately 5.0 to 10.0m bgl. The potential geotechnical risk posed by potential solution features and/or voids within the chalk to the proposed redevelopment should be considered in a geotechnical risk assessment for new building development.

6 Hazard Assessment & Preliminary Conceptual Site Model

6.1 Introduction

Risk from site impacts is determined based on the inter-relationship of the following three components:

1. **Source Term Hazard** - These are potential or known sources of contamination that may relate to a former land use or present site feature or process (e.g. fuel storage tanks, gas works, infilled ground).
2. **Receptor** - Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures, and utilities that could be adversely affected by contaminant(s).
3. **Pathway linkages from source to receptor** - A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development.

This enables an assessment of the potential contaminants (source of impact), transport mechanisms (pathway from source to receptor) and receptors in order to evaluate the risk. A Preliminary Conceptual Site Model (CSM) is then formed based on the site assessment information obtained. This is discussed within the text in **Sections 6.2-6.6** and the potential risks for the future land use are qualitatively presented in **Table 6.1**.

6.2 Assumptions of Hazards Identified with the Proposed Development

The hazard identification is based on the assumptions presented below:

- The development consists of the redevelopment of the existing Debenhams and Vue Cinema sites in to mixed commercial and residential use; and
- Land use classification for the purpose of human health assessment is 'residential without home-grown produce'.

6.3 Potential Sources of Contamination

For the purpose of this assessment the potential contaminants of concern have been considered according to whether they are likely to have originated from on-site or off-site sources.

Potential On-site Sources of Contamination

- Presence of infilled ground including that in reclaimed former waterbodies such as 'Mill Tail', shown on historical maps to be present on the southern (Vue) part of the site;
- Historical use as a bus & tram depot;
- Risk from man-made sources of ground gases (carbon dioxide, methane, hydrogen sulphide, oxygen, carbon monoxide) originating within Made Ground and infilled deposits expected to be present on site, as indicated by the historical maps and historic borehole logs; and
- Ground gases from naturally occurring peat deposits underlying the site.

Potential Off-site Sources of Contamination

- Historic Yield Hall Foundry, west (potential source of contamination from groundwater or gas migrating east towards the site);
- Historic Gas Works, immediately west of the northern (Debenhams) area (groundwater and gas); and
- Local industrial/trade activities (gas and groundwater migration).

6.4 Potential Receptors of Contamination

Based on the data previously discussed, the following potential receptors to contamination have been identified:

Table 6.6 – Summary of Identified Receptors

Identified Potential Receptors	
Sensitive Receptors	
A	Humans – Predevelopment completion, i.e. working on site during construction.
B	End-users: Residents and workers on the site post construction.
C	Controlled waters – Surface Waters (rivers and streams).
D	Principal Bedrock aquifer and Secondary A Superficial Aquifer.
E	Building structure and services (both new development and pre-existing structures).

The preliminary assessment of risks undertaken for the development considers potential risks to receptors A to E in **Table 6.1**. The receptors A to F incorporate each of the receptors that may be required by the Local Authority to be considered in their planning conditions relating to land contamination;

- Human Health (A & B)
- Property (including buildings, service lines) (E)

- Adjoining land (D & E)
- Groundwater and surface water (C & D)
- Ecological systems (D)
- Buildings and structures (E)

The possible contaminant linkages are discussed below. Not all linkages may be formed between all sources and receptors.

6.5 Identification of Pathways

Pathways to Human Health

There are various routes by which a potential contaminant may reach a receptor. For example, in areas where contaminated material is exposed, dermal contact with the material, inhalation or ingestion of dust may occur.

The site is currently used as commercial/retail units and covered by hardstanding. Any contaminants present are likely to be in the sub-surface materials located below the hardstanding and currently there are limited pathways to human receptors. Post development the presence of hardstanding will also restrict pathways to human receptors.

Once the hardstanding is broken up during site demolition and construction works then there is a risk to construction site workers by inhalation or ingestion of dust and water, and to off-site human receptors. Pathways from dermal contact with soil and groundwater may also arise.

Pathways to Controlled Waters

Groundwater levels at the site are anticipated to be at approximately 2.8 - 3.0 m bgl within the Alluvial deposits. Therefore, the lateral migration of potentially contaminated groundwater both offsite and to other areas within the site (either via permeable Made Ground/topsoil or the underlying superficial and bedrock aquifers) must be considered.

The vertical leaching of contaminants from the Ground Surface/Made Ground into the groundwater is a potential pathway for contaminants to impact upon groundwater, the superficial Alluvium and the Kempton Park Gravel Member (Secondary A Aquifer), which overly a Principal Aquifer (within the chalk formation).

Surface run off from contaminated areas into surface watercourses must also be considered, particularly during the proposed redevelopment works which may mobilise contaminants into the aquatic system.

Ground Gases

The primary potential on-site source of ground gases is the Made Ground used to infill the site historically, in particular to reclaim former water body structures such as the large Mill Tail water feature now under the southern part of the site. Smaller infilled waterbodies are likely to be present on or adjacent to the northern part of the site.

Offsite sources are the nearby historic gas works, and the historic Yield Hall Foundry which has been illustrated to have partially underlain the north area of the site. Gas migration into the site is unlikely however should be considered.

Enclosed spaces will be constructed as part of this development, therefore there is a viable receptor of ground gases.

Other Pathways

Other potential pathways that are possibly less significant to the site but still require consideration are; chemical attack on foundations and services and permeation of contaminants through domestic and industrial water pipes.

6.6 Conceptual Site Model

In accordance with BS 10175, a schematic section has been developed for the site based on the previously presented data and contaminant linkage assessment:

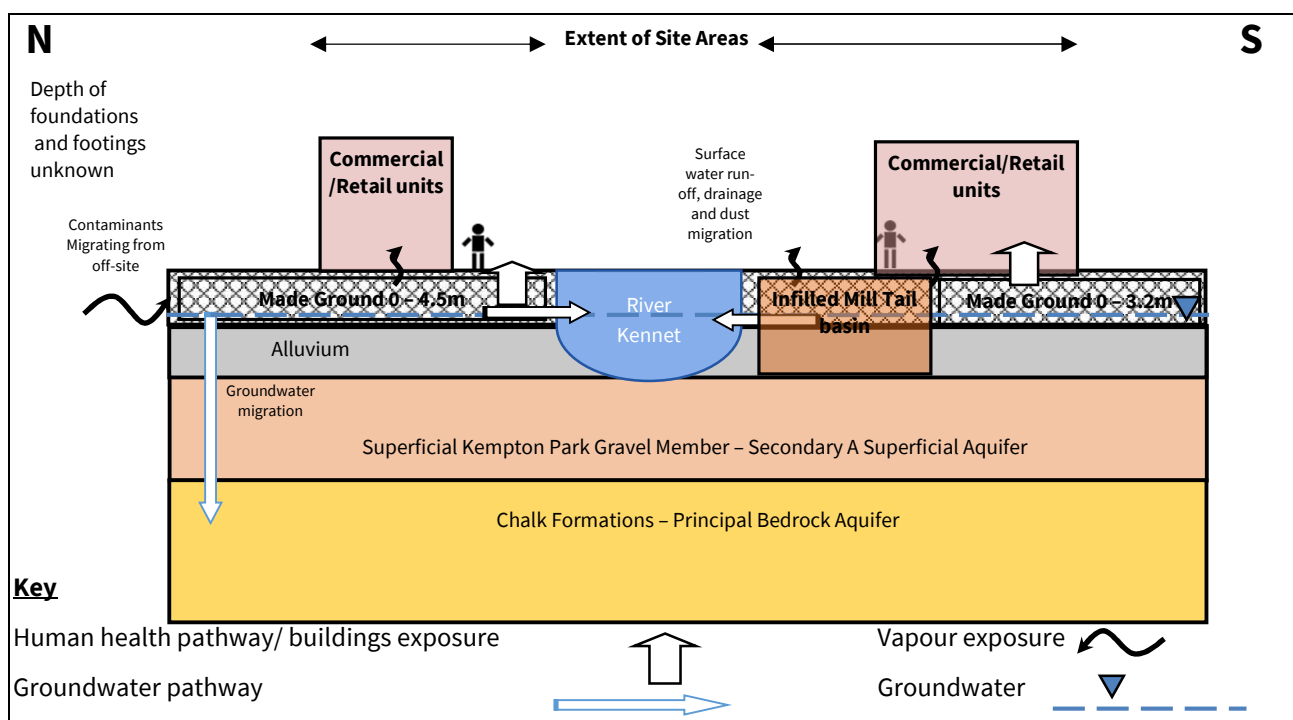


Figure 6.1 – Preliminary Conceptual Site Model

The model shows the predicted geology and topography, the major on-site potential contamination sources and vulnerable receptors.

The information presented above represents the preliminary conceptual ground model that may need to be revised based on information obtained as part of any future intrusive investigation. A number of sensitive receptors and potential pathways and sources (in association with a list of likely contaminants) have been identified. A preliminary assessment of these sources, pathways and receptors has been detailed in **Section 6.7** below.

6.7 Preliminary CSM Hazard Assessment

The preliminary hazard assessment is based on current available guidance published by a number of sources and is summarised in **Table 6.2**.

Table 6.2 Summary of main CSM links and hazard assessment

Source	Pathway	Receptor	Risk	Comments
On-site Made Ground associated with recent and historical activities on-site. - Metals; - Polycyclic aromatic hydrocarbons (PAHs); - Total petroleum hydrocarbons (TPHs); - Total organic carbon (TOCs); - Volatile organic carbons (VOCs); and - Ground gases (carbon dioxide, methane, hydrogen sulphide, oxygen, carbon monoxide associated with the hydrocarbons). Historic infilled Mill Tail in south area. - Ground gases (carbon dioxide, methane, hydrogen sulphide, oxygen, carbon monoxide). - Metals, total petroleum hydrocarbons, TOC, VOC associated with possible uncontrolled filling with Made Ground.	Dermal contact, ingestion, inhalation.	Human Health: Construction workers, current / future site users, adjacent site users.	Low	The risk to human health is considered low . As a precaution, construction workers should employ appropriate PPE and standard site safety measures during construction, a watch and brief should be employed by the contractor to observe any potentially unknown contamination and stop work/seek further advice if any are encountered.
	Migration of contaminated groundwater (vertical/lateral).	Controlled Waters: Underlying Principal Bedrock Aquifer and secondary A superficial aquifer	Low	Further investigation will be required to fully characterise the groundwater below the site. Previous investigations have not identified contamination therefore there is a Low risk to groundwater receptors.
		Controlled Waters: Surface waters: River Kennet	Low	Further investigation will be required to fully characterise the surface water routes (drainage lines) off site. Previous investigations have not identified contamination therefore there is a Low risk to surface water receptors.
	Direct contact	Water Supply Pipes	Low	Contamination through water supply pipes is currently considered a Low Risk from potential on site contaminants. Protective measures such as the use of trenches, lined with clay and backfilled with clean imported fill material may be required if ground contamination is encountered.

Source	Pathway	Receptor	Risk	Comments
	Hazardous ground gases migration vertically/laterally through Made Ground or permeable (dry) routes such as ducts, drainage, voids below hardstanding.	Human Health / Property: Construction workers, future site users.	Medium	On site sources from Made Ground and infilled ground material may pose a potential ground gas risk. It is currently considered a Medium risk .
Off-site Adjacent former gas works and foundry and local industrial/trade activities. - Ground gases: Carbon dioxide, methane, hydrogen sulphide, oxygen, carbon monoxide. - Metals, PAHs, total petroleum hydrocarbons, TOC, VOC associated with possible uncontrolled filling with Made Ground (and other gas works related contamination).	Migration of contaminated groundwater (vertical/lateral).	Controlled Waters: Underlying Principal Bedrock Aquifer and secondary A superficial aquifer. Surface water: River Kennet	Low	Migration of groundwater from off site sources such as infilled ground is considered a Low risk .
	Hazardous ground gases migration vertically/laterally through Made Ground or permeable superficial/bedrock routes	Human Health / Property: Construction workers, future site users.	Medium	Migration of ground gas from off-site sources such as infilled ground or are considered a Medium risk given the distance to the nearest source to the west and permeable links to the site.

7 Conclusions

7.1 Conclusions and Recommendations

A preliminary desk top study has been undertaken with reference to available site investigation reports and historical Ordnance Survey Mapping resources. Based on this research the likely characteristic ground conditions have been described and a preliminary contaminated land risk assessment carried out.

The desk study research has not identified any significant contaminated land issues of concern at this stage. It has however identified some historical land uses which may give rise to potential on-site and off-site sources of contaminants, summarised below:

Onsite:

- Various activities associated with historic site uses such as a bus & tram depot;
- Made Ground, including the infill of old waterway features adjacent to the River Kennet (eg old Mill Tail structure). The fill is very old and is unlikely to be producing significant ground gases but may contain historical contamination not previously identified in the site investigations undertaken; and
- Natural Deposits. Thin layers of peat are present in the alluvial deposits which may produce low volumes of ground gases.

Offsite:

- Historic Yield Hall Foundry, Gas Works and other Industrial land use sites: The available site investigations undertaken previously have not reported significant contamination associated with these historic activities. However, there is currently insufficient evidence to confirm whether these adjacent land uses will pose a risk to the development.

In order to confirm the site is not adversely affected by ground contamination from these potential sources, it is recommended in the first instance additional desk-based research is undertaken to obtain more detailed information on the history of the site and its environs. Depending on the findings of this research it may be necessary to undertake some ground investigations, testing of soils, groundwater and ground gases and to complete a more detailed contamination risk assessment following the UK Government's 'Land Contamination and Remediation Management' online guidance (LCRM) (Environment Agency, 2020).

Currently the site is fully in use with retail / commercial activities that would be sensitive to intrusion by a ground investigation and access to large areas are restricted by the presence of structures. It is recommended that any future ground investigation is carried out after the site is shut and preferably during or after demolition of the existing structures on site to facilitate targeted access to potential contaminant hotspots.

Notwithstanding the low contamination risks presently identified, the designers of the demolition and construction works should be made aware of the finding of this preliminary report so that they take precautionary health & safety and environmental protection measures during the works. Any arisings from excavation areas that are to be removed from site should be tested to enable an assessment of disposal or reuse options to be carried out. The cost implications of the disposal or management of these arisings should also be taken into account.

Given the findings of this preliminary contamination assessment it is likely that any planning permission for the site would be conditioned to require the more detailed assessment following the LCRM guidance identified above. This would include the provision of an updated LCRM Stage 1 (Risk Assessment) study, which if it identified unacceptable contamination be followed by Stage 2 (Options Appraisal) and Stage 3 (Remediation and Verification) works, as required.

Appendix A

Service Constraints, Report Limitations & Planning Requirements

This consultancy contract, report, and the site investigation (together comprise the "Services") were compiled and carried out by ByrneLooby Partners UK Limited (ByrneLooby) for (the "client") on the basis of a defined programme and scope of works and the terms of a contract between ByrneLooby and the "client." The Services were performed by ByrneLooby with all reasonable skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by ByrneLooby taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between ByrneLooby and the client. ByrneLooby Partners UK Limited cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered out with the agreed scope of works.

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It is ByrneLooby's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without ByrneLooby's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of ByrneLooby Partners UK Limited.

The report was written in December 2022 and should be read in light of any subsequent changes in legislation, statutory requirements, and industry practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of ByrneLooby. In the absence of such written advice of ByrneLooby, reliance on the report in the future shall be at the client's own and sole risk. Should ByrneLooby be requested to review the report in the future, ByrneLooby shall be entitled to additional payment at the then existing rate, or such other terms as may be agreed between ByrneLooby and the client.

The observations and conclusions described in this report are based solely upon the Services that were provided pursuant to the agreement between the client and ByrneLooby. ByrneLooby has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. ByrneLooby is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, ByrneLooby did not seek to evaluate the presence on or off the site of electromagnetic fields or materials in buildings (i.e., materials inside or as part of the building fabric) such as asbestos, lead paint, radioactive or hazardous materials.

The Services are based upon ByrneLooby's observations of existing physical conditions at the site gained from a walkover survey of the site together with ByrneLooby's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst ByrneLooby Partners UK Limited have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. Further ByrneLooby was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. ByrneLooby is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to ByrneLooby and including the doing of any independent investigation of the information provided to ByrneLooby save as otherwise provided in the terms of the contract between the client and ByrneLooby.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to

describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation, and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017. For the geotechnical aspects of the report, the general requirements of Eurocode 7 (BS EN 1997-2:2007) are to produce a Ground Investigation Report (GIR) which shall form part of the Geotechnical Design Report (GDR). The geotechnical section of this report is intended to fulfil the general requirements of the GIR as outlined in BS EN 1997-2, Section 6. The GIR contains the factual information including geological features and relevant data, and a geotechnical evaluation of the information stating the assumptions made in the interpretation of the test results. This report shall not be considered as being a GDR.

Planning Requirements

The National Planning Policy Framework (NPPF, 2019) emphasises the presumption in favour of sustainable development. Paragraph 11, which defines the presumption in favour of sustainable development, has two similar clauses which related to potentially contaminated land and sensitive receptors:

11) Plans and decisions should apply a presumption in favour of sustainable development.

*For **plan-making** this means that:*

b) strategic policies should, as a minimum, provide for objectively assessed needs for housing and other uses, as well as any needs that cannot be met within neighbouring areas, unless:

i) the application of policies in this Framework that protect areas or assets of particular importance provides a strong reason for restricting the overall scale, type or distribution of development in the plan area;

*For **decision-taking** this means:*

d) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:

ii) the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed

In accordance with the NPPF, areas or assets of particular importance are defined as:

Habitats sites (and those sites listed in paragraph 176 – potential Special Protection Areas and Possible Areas of Conservation; listed or proposed Ramsar sites; and sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites) and/or designated as Sites of Special Scientific Interest; land designated as Green Belt, Local Green Space, an Area of Outstanding Natural Beauty, a National Park (or within the Broads Authority) or defined as Heritage Coast; irreplaceable habitats; designated heritage assets

(and other heritage assets of archaeological interest referred to in footnote 63 (Non-designated heritage assets of archaeological interest, which are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets.); and areas at risk of flooding or coastal change.

Paragraph 118 states that planning policies and decisions should:

- *give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;*

Paragraph 170 clarifies that enhancing the natural environment includes:

Planning policies and decisions should contribute to and enhance the natural and local environment by:

- *protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
- *recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*
- *maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*
- *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

Paragraph 180 of NPPF states that planning policies and decisions should ensure the following:

- *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.*

Paragraph 178 of NPPF states that planning policies and decisions for developments should also ensure that:

- a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);*
- b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.*

Paragraph 179 states that where a site is affected by contamination or land stability issues, responsibility for securing a safe development rest with the developer and/or landowner.

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

Unexploded Ordnance

Clients have a legal duty under the CDM 2015 Regulations to provide designers and contractors with project-specific health and safety information needed to identify hazards and risks. This includes the possibility of unexploded ordnance (UXO) being encountered on the site. Further details are given in CIRIA Report C681 (Stone et al 2009). A non-UXO specialist screening exercise has been carried out for the site by considering any evidence of UK defence activities on or near the site evident from the gathered desk study information and the unexploded aerial delivered bomb (UXB) regional risk maps produced by Zetica. Other data sources are available, but as a first stage screening exercise the freely available Zetica maps have been used. The level of risk stated is that determined by Zetica, a company experience in the desk study, field investigation and clearance of UXO/UXB.



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