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UNITS 1A & 1-5 BLOCK 3 CHALEX INDUSTRIAL ESTATE 214 MANOR HALL ROAD SOUTHWICK, WEST SUSSEX

PHASE 1 CONTAMINATION ASSESSMENT REPORT

Report No. LW24115/ds May 2013

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ASHDOWN SITE INVESTIGATION LIMITED

UNITS 1A & 1-5 BLOCK 3
CHALEX INDUSTRIAL ESTATE
214 MANOR HALL ROAD
SOUTHWICK, WEST SUSSEX

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UNITS 1A & 1-5 BLOCK 3
CHALEX INDUSTRIAL ESTATE
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PHASE 1 CONTAMINATION ASSESSMENT REPORT

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UNITS 1A & 1-5 BLOCK 3
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PHASE 1 CONTAMINATION ASSESSMENT REPORT

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APPENDIX A

Site Walkover Photographs

1. INTRODUCTION

It is proposed to develop the site at Units 1a & 1-5 Block 3, Chalex Industrial Estate, Manor Hall Road, Southwick, West Sussex for new industrial units. The proposed development will result in the entire site being covered by either buildings or permanent hardstanding, no soft landscaping is proposed.

Ashdown Site Investigation Limited was commissioned to carry out a phase 1 contamination assessment of the site by Mr D Hutchinson of:

Hutchinson Design Associates
45 Portland Road
Hove
BN3 5DQ

The instruction to proceed was received on behalf of the client, Downsview Developments Ltd, by email dated 24th April 2013.

The purpose of the phase 1 contamination assessment is to develop an initial conceptual model of the site and establish whether or not there are any potentially unacceptable risks present. The assessment provides information on:

a) the expected geology and hydrogeology underlying the site;
b) the development history and most recent site use;
c) potential sources of on site and off site contamination;
d) the potential for on site migration of contamination from off site sources; and
e) sensitive receptors that may be at risk from any contamination migrating from the site.

This assessment has been based on the findings of a walkover survey, reference to historical Ordnance Survey maps and published geological and environmental information from various sources; the latter having been obtained from interrogation of database information compiled by GroundSure Limited.

Copies of the historical maps and environmental data referred to in this report are included in a separate bound volume, entitled Geo-Environmental Data and Historical Maps (Ashdown Site Investigation Limited, Report Number LW24115/map, dated April 2013).

It is noted that the assessment was undertaken and the report prepared specifically for the Client's project and the recommendations given may not be appropriate to alternative schemes. The copyright for the report and licence for its use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned.

The risk assessment presented in this report follows 'source-pathway-receptor' techniques for the determination of whether a site is contaminated. This is standard practice in the UK, being intrinsic to the Contaminated Land (England) Regulations 2000 as amended- Part 2A of the Environmental Protection Act 1990.

The report considers end users as the most sensitive human health receptors. If significant risks to construction workers are identified by the preliminary assessment attention is drawn to this. No assessment of risk from acute exposure has been undertaken in this connection.

This report is not intended to be either an ecological or archaeological assessment. An appropriate specialist should be consulted about any concerns that may arise in this regard.

2. SITE LOCATION AND WALKOVER SURVEY

The site comprises an irregular shaped plot of land located at Units 1a & 1-5 Block 3, Chalex Industrial Estate, 214 Manor Hall Road, Southwick, West Sussex, and is centred on the approximate Ordnance Survey national grid reference TQ 2545 0543. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively. Photographs taken during the walkover survey are included in Appendix A.

The existing building is mostly demolished with only the eastern and western external walls remaining together with a wall which divides the building. The concrete floor slab of the building was still present although trenches had been made through the slab for new foundations. The surfacing around the building footprint comprised a mixture of asphalt and gravel of crushed hardcore. Heras fencing had been placed around the partly demolished building and a skip was present to the west of the building.

Anecdotal evidence obtained during the walkover survey suggests the northern part of this former industrial unit was occupied by a car sales company and the southern part occupied by a door installation company.

To the north of the former building the area comprised an asphalt surfaced car parking area with access road leading from the north eastern corner. Along the access road was an electricity substation.

The industrial units to the east of the building comprised car servicing and MOT centres (denoted Autofit and Car & Van MOT services Ltd) with the surrounding areas mainly used for car parking. To the south of the eastern industrial units was a stockpile of potential asbestos containing corrugated sheeting. To the west of the site were further industrial units used for car part sales, metal working/engineering and a flooring company. Beyond the western industrial units was a large electricity substation with gantry's, pylons and tanks.

To the south of the site was a soft landscaped area with the railway line and concrete platform of Fishergate Station present beyond.

The site and surrounding area was generally level. Residential development surrounded the Chalex Industrial Estate.

2.1 Potential Contamination Sources Identified by Walkover Survey

The walkover survey identified the following potential sources of contamination:

On Site

- No significant sources of contamination have been identified from the walkover survey.

Off Site

- Potential petroleum hydrocarbon contamination from vehicle servicing industries to the east of the site.
- Potential PCB contamination from electric substation located adjacent to the north eastern part of the site.
- Potential PCB and petroleum hydrocarbon contamination from large electric substation and fuel tanks located to the west of the site.
- Potential metal, PAH, asbestos and petroleum hydrocarbon contamination from adjacent railway to the south of the site.

For the purposes of this assessment it has been assumed that the suspected asbestos containing sheeting noted in the south eastern part of the site will be removed prior to commencing the redevelopment works. The materials should be disposed of by suitably qualified personnel in accordance with the Hazardous Waste Regulations 2005 and the Care of Asbestos Regulations 2012. Providing these precautions are followed the asbestos containing materials are not considered to pose an on-going risk to the end users of the proposed development.

3. GEOLOGICAL DATA REVIEW

3.1 Expected Geology

The stratigraphic succession that may be anticipated to underlie the site is presented in the following table. In preparing the table reference has been made to the British Geological Survey 1:50,000 series scale map Sheet 318, the British Geological Survey lexicon of named rock units and the maps included within Appendix A (Section 1) of the accompanying Geo-Environmental Data and Historical Maps Volume.

Table 1. Anticipated Geological Strata

Type	Stratum	Age
Superficial Deposits	Brickearth	Quaternary
Bedrock Geology	White Chalk Subgroup – Tarrant Chalk Member	Campanian

3.1.1 Brickearth

The Brickearth in this area comprises brown sandy (fine) silt or clay largely originating from the solution weathering of the previously existing chalk. The material will have been reworked by water flow to produce some lateral variability in the grain size of the soil. The Brickearth can be expected to contain a variable content of flint. It may be regarded as normally or very lightly overconsolidated.

3.1.2 White Chalk Subgroup (Tarrant Chalk Member)

The White Chalk Subgroup (Tarrant Chalk Member) comprises a weak, white chalk locally with flint bands together with scattered nodular flints. It may be expected to have a deeply convoluted upper surface as a result of solution weathering. The presence of cavities in the chalk is very rare and solution features, if present, can be expected to be infilled with Quaternary deposits such as the Brickearth. The infill material may be significantly weaker than the surrounding chalk. Solution features can comprise pipes extending to several metres deep into the chalk or conical depressions and basin shaped structures.

3.2 Ground Stability & Geological Features

A review of the data presented within the Geo-Environmental Data and Historical Maps Volume report has been undertaken. The following summarises the data and the assessment of potential risk that the ground hazard/feature may pose to the site. Ashdown Site Investigation Ltd (ASI Ltd) has commented, where appropriate, on the potential risk to the site from the ground hazard/feature reported by the GroundSure data.

Table 2. Ground Workings, Mining, Extraction & Natural Cavities

Section	Remarks	ASI Ltd Assessment
Ground workings	One historic ground working entry along the southern part of the site refers to a cutting associated with the railway line. Three further historic entries refer to brickfields located between 64m and 211m to the west and south east of the site. The nearest current ground working entry refers to a ceased clay and shale surface working pit (denoted Southern Cross Brick Field) located 95m to the west of the site.	The cutting on site is not considered to pose a significant risk to the site. The brick fields and clay and shale surface ground workings are located in areas which are now developed and therefore some historical backfilling works are likely to have occurred. These are considered to represent a potential source of ground gases.

The GroundSure data indicates the absence of any significant landslips or faults within 500m of the site.

The site is in an area where between 1% and 3% of properties are above the action level requiring protective measures to be included within new buildings in respect of radon gas. However, no radon protective measures are reported by the BGS to be necessary in the construction of new dwellings. It is recommended that discussions with building control are undertaken in connection with any requirements they may have.

No significant risks from mining, natural cavities or extractions are reported influencing the site.

The maximum hazard rating of natural subsidence within the site boundary (including a 50m buffer zone) is low. This hazard rating is based on the interrogation of the six British Geological Survey (BGS) natural ground stability datasets (GeoSure). These are reviewed individually in the following table.

Table 3. Natural Ground Subsidence Hazards

Section	Risk Assessment (GroundSure)	Remarks & ASI Ltd Assessment
Soil Volume Change Potential (Shrink-Swell)	Very Low	No significant risk has been identified.
Landslides	Very Low	
Ground Dissolution of Soluble Rocks	Negligible	
Compressible Deposits	Negligible	
Collapsible Deposits	Low	
Running Sands	Low	

3.3 Background Soil Chemistry

The GroundSure GeoInsight report provides information on background soil chemistry. The following estimated mean concentrations of metals are reported.

Table 4. Background Mean Soil Concentrations of Metals

Metal	Mean Soil Concentration (mg/kg)	Remarks & ASI Ltd Assessment
Arsenic	15-25	The mean soil concentrations indicated are not considered to be significantly elevated for the proposed use.
Cadmium	<1.8	
Chromium	60-90	
Nickel	15-30	
Lead	<150	

3.4 Potential Contamination Sources identified by Geological Data Review

The following potential sources of contamination have been identified from the geological data review:

On Site

- No significant sources of contamination have been identified from the geological data review.

Off Site

- Potential ground gas migration from historically backfilled brick fields to the west of the site.

4. ENVIRONMENTAL DATA REVIEW

Records of potentially contaminative activities, authorisations, pollution incidents and land uses recorded by the regulatory authorities and compiled by GroundSure in their EnviroInsight Report have been reviewed. Data are supplied by the British Geological Survey (BGS), Environment Agency, Health Protection Agency, The Coal Authority and Local Authorities.

Locations of registered potentially hazardous industrial or other land uses, records of pollution incidents affecting controlled water, water abstraction licences and waste water discharge licences are shown on the maps presented in the accompanying Geo-Environmental Data and Historical Maps Volume report.

The information and potential risks to or from the various sources is assessed below.

Table 5. Authorisation, Incidents and Registers

Section	Remarks	ASI Ltd Assessment
Records of Part A(2) and Part B Activities and Enforcements	The closest entry refers to a Part B permit for Premier Hardware located 9m to the east of the site. Part B permits refer to air pollution regulations though no other details on the nature of the activity are given.	Given that the activity is being carried out under permit and must be of relatively small scale given the nature of the industrial estate, the presence of a permitted activity is not considered to pose a significant risk to the site.
Environment Agency Recorded Pollution Incidents – National Incidents Recording System, List 2	Two entries refer to inert materials and waste pollutant incidents occurring some 189m to the south west and 221m to the south east of the site. Both incidents were recorded to have a minor impact on the land and no impact on the air or water.	Given the distance and nature of both entries, neither is considered to pose a significant risk to the site.

Table 6. Landfill and Other Waste Sites

Section	Remarks	ASI Ltd Assessment
Environment Agency Historic Landfill Sites	The nearest entry refers to a historic landfill located some 32m to the east of the site.	There is the potential for ground gas migration from the historic landfill to pose a risk to the site.

Table 7. Current Land Uses

Section	Remarks	ASI Ltd Assessment
Current Industrial Data	The nearest significant entries refer to vehicle servicing industries, construction services, industrial products and transport and storage services located between 0m and 15m of the site. An electrical substation is recorded 1m to the south of the north eastern most part of the site. Further entries refer to the large electricity substation with associated pylons, gantry's and tank features located between 28m and 64m to the north west and west. Another entry refers to Fishergate railway station located 22m to the east.	Potential petroleum hydrocarbon contamination from vehicle servicing industries to the east of the site. Potential PCB contamination from electricity substation located adjacent to the north eastern part of the site. Potential PCB and petroleum hydrocarbon contamination from large electricity substation and fuel tanks located to the west of the site. Potential for metal, PAH, petroleum hydrocarbon and asbestos contamination from adjacent railway to the south of the site.

Table 8. Designated Environmentally Sensitive Sites

Section	Remarks	ASI Ltd Assessment
Designated Environmentally Sensitive Sites	The site lies within a Nitrate Vulnerable Zone (NVZ).	The proposed development is not considered to pose a significant risk in this regard.

4.1 Potential Contamination Sources Identified by Environmental Data Review

The following potential sources of significant contamination have been identified by the Environmental Data Review.

On Site

- No significant sources of contamination have been identified by the environmental data review.

Off Site

- Potential ground gas migration from historic landfill located to the east of the site.
- Potential petroleum hydrocarbon contamination from vehicle servicing industries to the east of the site.

- Potential PCB contamination from electric substation located adjacent to the north eastern part of the site.
- Potential PCB and petroleum hydrocarbon contamination from large electric substation and fuel tanks located to the west of the site.
- Potential metal, PAH, asbestos and petroleum hydrocarbon contamination from adjacent railway to the south of the site.

5. HYDROGEOLOGY AND HYDROLOGY

5.1 Groundwater Vulnerability & Soil Classification

The Environment Agency designates aquifers in accordance with the Water Framework Directive. These designations reflect not only the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The Brickearth expected beneath the site is classified as a Secondary B Aquifer. Secondary B Aquifers are typically lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water bearing parts of the former non-aquifers.

The White Chalk Subgroup expected beneath the site is classed as a Principal Aquifer. Principal Aquifers comprise deposits that have high intergranular and/or fracture permeability, usually providing a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifers.

5.2 Abstraction Licences

No groundwater or surface water abstraction licences are indicated within 1km of the site.

5.3 Potable Water Abstraction Licences and Source Protection Zones (SPZ)

No potable water abstraction licences are indicated within 1km of the site.

The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.

5.4 Surface Water

The data indicates that there are no significant surface water features within 250m of the site.

There is no Environment Agency information on river quality within 250m of the site.

5.5 Flooding

The site does not lie within an Environment Agency Zone 2 or Zone 3 floodplain. There are no flood defences, areas benefiting from flood defences or areas used for flood storage within 250m of the site.

The British Geological Survey reports a low susceptibility to groundwater flooding within 50m of the site. The BGS consider the confidence rating of their data in this area to be high.

6. SITE HISTORY

Historical Ordnance Survey maps covering the area of the site have been reviewed. It is noted that each map presents information applicable at the time of the survey (or revision date) and is subject to surveying and cartographic errors and/or advances. Revisions to maps are made at irregular intervals and it is possible that significant developments may have taken place on or within the vicinity of the site that have not been revealed by the maps.

In the following table 'In Vicinity of Site' generally considers features of relevance within approximately 250m of the site boundary, but may also include more distant features if considered to be pertinent to the assessment of the development history.

Significant details depicted on the maps are identified in the following table.

Table 9. Summary of Significant Features Identified on Historical Maps

Map Details	On-site	In Vicinity of Site	Significant Potential Contamination Sources
1873 1:2,500	The site comprises part of an open field.	The railway line is shown immediately to the south of the site.	Potential metal, PAH, asbestos and petroleum hydrocarbon contamination from railway line located adjacent to the south of the site.
1898 1:2,500	No significant changes.	Some 130m to the west of the site a large brickfield is marked which appears to contain some excavation. Residential development is shown to the north east and south of the site.	
1909 1:10,560	No significant changes.	A second smaller brickfield is now shown some 70m to the west of the site.	

Map Details	On-site	In Vicinity of Site	Significant Potential Contamination Sources
1932 1:2,500	A spur of the railway line is now shown crossing the southernmost part of the site	The brickfields to the west are no longer marked and the areas are now shown to be occupied by a sports ground and some buildings. Significant residential development is shown to the east and south.	Potential metal, PAH, asbestos and petroleum hydrocarbon contamination from former railway line located in the southern part of the site. Potential ground gas migration from backfilled brickfield pits to the west of the site.
1937 1:2,500	A large building, together with several smaller structures, denoted as the Chalex Sheet Metal Works are now shown partly on the western part of the site.	Residential properties are shown to the north of the site.	Potential metal, PAH and petroleum hydrocarbon contamination from sheet metal works on site.
1951 1:2,500	No significant changes.	To the east of the site is a building denoted as Engineering Works. A large grid substation with gantry's and pylons is shown to the west of the site on the footprint of the existing substation.	Potential PCB contamination from large electric substation located to the west of the site.
1966 1:1,250	The Chalex Sheet Metal Works building appears to have expanded further to the east and a smaller building is shown in the south western corner of the site. The railway line spur is no longer shown in the southern part of the site.	A building denoted as a depot is marked to the east of the engineering works building.	Potential metal, PAH and petroleum hydrocarbon contamination from sheet metal works on site.
1975-1980 1:1,250		An electric substation is shown adjacent to the north east corner of the site.	Potential PCB contamination from electric substation located adjacent to the north eastern part of the site.
2012 1:1,250	The large building and associated smaller structures (denoted as Chalex Works) are no longer shown on site.	Immediately to the west of the site are the existing industrial units denoted as Chalex Industrial Estate.	Potential metal, PAH and asbestos contamination from demolition of former Chalex Works located partly on site.

6.1 Potential Contamination Sources identified by Historical Map Review

The following potential sources of contamination have been identified from the historical map review:

On Site

- Potential metal, PAH, petroleum hydrocarbon and asbestos contamination from former railway line located in the southern part of the site.
- Potential metal, PAH and petroleum hydrocarbon contamination from the former sheet metal works on site.
- Potential metal, PAH and asbestos contamination from demolition of former Chalex Works located partly on site.

Off Site

- Potential ground gas migration from backfilled brickfields to the west of the site.
- Potential metal, PAH, petroleum hydrocarbon and asbestos contamination from railway line adjacent to the south of the site.
- Potential PCB contamination from electric substation located adjacent to the north eastern part of the site.
- Potential PCB contamination from large electric substation located to the west of the site.

7. PRELIMINARY CONTAMINATION RISK ASSESSMENT

7.1 Basis of Preliminary Contamination Risk Assessment

An appropriate contamination risk assessment of a site considers the potential sources of contamination, the potential receptors and how the sources and receptors may be linked (the pathways).

A significant risk is only deemed to exist where a significant pollutant linkage has been identified i.e. where a potentially significant source is linked to the receptor via a significant pollutant pathway. A site is considered suitable for use where no significant pollutant linkages are present.

This preliminary risk assessment takes into account the proposals for the site, key features noted from the walkover survey, information from the database search and any potential risks identified from the review of historical Ordnance Survey maps and other data.

The assessment of risk has been carried out in line with guidance published within "Contaminated Land Risk Assessment: A guide to good practice" published by CIRIA (C552, 2001). The level of risk is determined using the risk matrix presented in the following table. Classifications of likelihood, severity and risk are provided in subsequent tables.

Table 10. Risk Assessment Matrix – Comparison of Consequence and Probability

		Likelihood of significant impact			
Severity of potential impact		Very Low Likelihood	Low Likelihood	Moderate Likelihood	High likelihood
	Very Minor	Negligible	Very Low	Low	Low/Moderate
	Minor	Very Low	Low	Low/Moderate	Moderate
	Moderate	Low	Low/Moderate	Moderate	High
	Severe	Low/Moderate	Moderate	High	Very High

Table 11. Classification of Likelihood

Likelihood Classification	Definition
High	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Moderate	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Very Low	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 12. Classification of Severity

Severity Classification	Definition
Severe	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short term risk to a particular ecosystem or organisation forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).
Moderate	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Aot contains no scope for considering significance of pollution). A significant change in a particular ecosystem or organism forming part of such ecosystem, (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).
Minor	Pollution of non sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the Draft Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures/services or the environment.
Very Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.

Table 13. Classification of Risk

Risk Classification	Definition
Very High	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. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

The risk assessment has been carried out based on the site being developed for commercial purposes. It is understood that the proposed development will comprise the total hard cover of the site with buildings or permanent hard standing and that there is no provision for soft landscaping. Should the proposed end use be altered, a revised risk assessment may be required.

7.2 Preliminary Risk Assessment for Human Health

The following potential sources of contamination that may pose a risk to end users have been identified by the assessment of the site:

1) Potential petroleum hydrocarbon contamination from vehicle servicing industries to the east of the site.
2) Potential PCB contamination from electric substation located adjacent to the north eastern part of the site.
3) Potential PCB and petroleum hydrocarbon contamination from large electric substation and fuel tanks located to the west of the site.
4) Potential metal, PAH, asbestos and petroleum hydrocarbon contamination from railway adjacent to the south of the site.
5) Potential ground gas migration from historically backfilled brick fields to the west of the site.
6) Potential ground gas migration from historic landfill located to the east of the site.
7) Potential metal, PAH, petroleum hydrocarbon and asbestos contamination from former railway line located in the southern part of the site.
8) Potential metal, PAH and petroleum hydrocarbon contamination from the former sheet metal works on site.
9) Potential metal, PAH and asbestos contamination from demolition of former Chalex Works located partly on site.

As the proposed development will comprise the total hard cover of the site with buildings and permanent hardstanding, the potential pathways of dermal contact with soil, direct soil and dust ingestion and inhalation of soil dust will be severed. The only pathways that are considered to exist are inhalation of ground gases and inhalation of soil vapours from more volatile contaminants. It is therefore considered that there is no significant pollutant linkage from metal, PAH, PCB and asbestos contamination as due to their low volatility these are not considered likely to be present at concentrations such that they could pose a risk purely through the soil vapour pathway.

A preliminary human health risk assessment conceptual model is presented in the following table of this report and is presented diagrammatically as Figure 3.

Table 14. Preliminary Human Health (End Users) Conceptual Model – Potential Pollutant Linkages and Initial Assessment of Risk

Contaminant Source	Potential Pathway(s)	Likelihood	Severity	Initial Assessment of Risk to Human Health
Potential petroleum hydrocarbon contamination from vehicle servicing industries to the east of the site.	• Inhalation of soil vapours (petroleum hydrocarbons only) – All other pathways severed.	Very Low	Moderate	Low
Potential PCB contamination from electric substation located adjacent to the north eastern part of the site.	None Identified – Pathways severed by hard standing	Not Applicable	Not Applicable	No Significant Pollutant Linkage Identified
Potential PCB and petroleum hydrocarbon contamination from large electric substation and fuel tanks located to the west of the site.	• Inhalation of soil vapours (petroleum hydrocarbons only) – All other pathways severed.	Very Low	Moderate	Low
Potential metal, PAH, asbestos and petroleum hydrocarbon contamination from railway adjacent to the south of the site.	• Inhalation of soil vapours (petroleum hydrocarbons only) – All other pathways severed.	Very Low	Moderate	Low
Potential ground gas migration from historically backfilled brick fields to the west of the site.	• Inhalation of soil gases.	Low	Moderate	Low/Moderate
Potential ground gas migration from historic landfill located to the east of the site.	• Inhalation of soil gases.	Low	Moderate	Low/Moderate
Potential metal, PAH, petroleum hydrocarbon and asbestos contamination from former railway line located in the southern part of the site.	• Inhalation of soil vapours (petroleum hydrocarbons only) – All other pathways severed.	Very Low	Moderate	Low

Contaminant Source	Potential Pathway(s)	Likelihood	Severity	Initial Assessment of Risk to Human Health
Potential metal, PAH and petroleum hydrocarbon contamination from the former sheet metal works on site.	• Inhalation of soil vapours (petroleum hydrocarbons only) – All other pathways severed.	Very Low	Moderate	Low
Potential metal, PAH and asbestos contamination from demolition of former Chalex Works located partly on site.	None Identified – Pathways severed by hard standing	Not Applicable	Not Applicable	No Significant Pollutant Linkage Identified

7.3 Preliminary Risk Assessment for Controlled Water

The following potential sources of on site contamination that have the potential to pose a significant risk to controlled waters have been identified by the assessment of the site:

1) Potential metal, PAH and petroleum hydrocarbon contamination from former railway line located in the southern part of the site.
2) Potential metal, PAH and petroleum hydrocarbon contamination from the former sheet metal works on site.
3) Potential metal and PAH contamination from demolition of former Chalex Works located partly on site.

The site is expected to be underlain by the Brickearth and White Chalk Subgroup which are classed as a Secondary B Aquifer and Principal Aquifer, respectively. However, the site does not lie within an Environment Agency Source Protection Zone with regard to the extraction of water for potable supply.

In view of the low permeability of the expected near surface Brickearth, this would be expected to offer some protection to the more vulnerable chalk aquifer at depth. In addition, given the industrial setting of the site it is likely that some contamination of the shallow groundwater in the wider area has already occurred.

Given that the proposed development will comprise total hard cover of the site, no rainwater infiltration through the potentially contaminated soils would be expected to occur and as such any metals and PAH compounds present within the soils would be expected to be relatively immobile and therefore the likelihood of these posing a significant risk is considered to be very low. The severity of any such risk would be considered to be very minor and as such no significant risk to groundwater is considered to exist from metal and PAH contamination at the site.

There is, however, the potential that any localised petroleum hydrocarbon contamination could pose a potentially significant risk to underlying groundwater,

though as there are not believed to be any on-going sources of petroleum hydrocarbons on the site any such contamination would represent a diminishing source.

A preliminary controlled water risk assessment conceptual model is presented in the following table of this report and is presented diagrammatically as Figure 3.

Table 15. Preliminary Controlled Water Conceptual Model – Potential Pollutant Linkages and Initial Assessment of Risk

Contaminant Source	Potential Pathway(s)	Likelihood	Severity	Initial Assessment of Risk to Controlled Water
Potential petroleum hydrocarbon contamination from former railway line located in the southern part of the site.	• Groundwater Flow	Very Low	Minor	Very Low
Potential petroleum hydrocarbon contamination from the former sheet metal works on site.	• Groundwater Flow	Very Low	Minor	Very Low

7.4 Recommendations

In view of the sources of contamination that have been identified that are considered to pose a potentially significant risk to end users of and controlled waters beneath the proposed development, and in line with part 2 of planning condition C.13.K which relates to the proposed development, it is recommended that an intrusive ground investigation should be undertaken to assess the risks identified.

The investigation should comprise the testing of the underlying soils for concentrations of petroleum hydrocarbons. Gas monitoring standpipes should also be installed and concentrations of carbon dioxide, methane and oxygen measured on at least three occasions to allow an assessment of the risk from ground gases to be made. A revised risk assessment should be produced on completion of the intrusive investigation.

8. CONCLUSIONS

The following conclusions present a summary of the main findings of the assessment. However, no reliance should be placed on any point of the conclusions until the whole of the report has been read as other sections of the report may put into context the information contained herein.

- The site is expected to be underlain by the Brickearth and White Chalk Subgroup.
- The Brickearth expected beneath the site is classified as a Secondary B Aquifer. The White Chalk Subgroup is classed as a Principal Aquifer.
- The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.
- The site comprised open fields at the time of the earliest historical map referenced in 1878. The Chalex Sheet Metal Works occupied part of the site from the time of the 1937 map and appears to have been demolished sometime between 2002 and 2012. A spur of the main railway line which runs across the southern edge of the site was present on the southern part of the site from 1937 and appears to have been removed sometime between 1951 and 1966.
- The proposed development comprises total hard cover with no areas of soft landscaping proposed.
- Potentially significant pollutant linkages have been identified on site relating to the proposed development. As such an intrusive ground investigation is recommended to assess risks posed to end users and controlled waters.
- Preliminary conceptual models are presented as Tables 14 and 15 of this report. A diagrammatic representation of the preliminary conceptual models is presented as Figure 3 of this report.

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