Blenheim Estates

37-41 BRIGHTON ROAD, SHOREHAM-BY-SEA

Preliminary Risk Assessment

70118838-PRA REV.01
MAY 2025

PUBLIC

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PROJECT NO. 70118838

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1 INTRODUCTION

1.1 TERMS OF REFERENCE

WSP UK Limited (WSP) was instructed by Blenheim Estates to undertake a Preliminary Risk Assessment (PRA) at 37-41 Brighton Road, Shoreham-by-Sea, BN43 6RE (the 'Site').

The Site location and current layout are presented in Figure 1 and Figure 2 in **Appendix A**.

1.2 DEVELOPMENT PLANS

A copy of the proposed development plans is presented in **Appendix A**. The scheme includes a nine-storey block encompassing forty-nine residential units and one commercial unit on the ground floor plus undercroft and external car parking spaces. The residential units comprise a mix of studios and one, two and three bed apartments. A retail unit, reception area, bicycle, bin and plant stores will be on the ground floor. Small strips / areas of soft landscaping will be placed along the northern and southern boundaries, as well as within the east of the car park.

1.3 ASSESSMENT AIMS AND OBJECTIVES

The aim of this assessment is to support planning and consenting activities for the future development.

To address the identified aim, the key objectives include:

- Developing a preliminary Conceptual Site Model (CSM) to identify potential contamination risks associated with the proposed development of the Site; and,
- Evaluate likely contaminated land exposure pathways and their potential significance to identified receptors to support the proposed development.

1.4 SCOPE OF WORKS

To meet the aims and objectives identified in **Section 1.3**, the following scope of works has been undertaken:

- Review of a Groundsure report;
- Review of publicly available historical maps and plans to understand former land uses and potential contaminative activities on, and surrounding the Site;
- Review of relevant regulatory databases;
- Review of relevant publicly available information relating to hydrological features, hydrogeology, neighbouring land use, ecologically sensitive uses and geology in order to establish the environmental setting of the Site;
- Develop a preliminary conceptual site model via the source-pathway-receptor contaminant linkage approach;
- Describe the environmental risks and or opportunities surrounding ground, groundwater and ground gas conditions, which have the potential to arise associated with the future uses of the Site; and,
- Production of a Preliminary Risk Assessment (PRA) report.

1.5 LEGISLATIVE CONTEXT

The assessment was undertaken in the legislative and planning context of:

- Part 2A of The Environmental Protection Act (1990); and,
- The National Planning Policy Framework (2024).

The following good practice and statutory guidance was considered, and the assessment was undertaken in general accordance with:

- Environment Agency 'Land Contamination Risk Management' (LCRM) (2023);
- NHBC 'Guidance for the Safe Development of Housing on Land Affected by Contamination', R&D66 (2008); and,
- CIRIA C552 'Contaminated Land Risk Assessment. A guide to good practice' (2001).

1.6 SOURCES OF INFORMATION

The relevant sources of information used in the production of this report are listed in **Table 1-1**.

Table 1-1 - Sources of Information

Source	Report
Third Party Reports	Groundsure Report (Ref: WSP-F84-MQL-1BH-J5Z)
Public Information	Google Earth, available [https://www.google.com/earth/index.html], accessed 01/08/2024; OS Maps, available [https://www.google.com/earth/index.html], accessed 01/08/2024; Google Maps, available [https://www.google.com/maps], accessed 01/08/2024; Geoindex Onshore, available [https://www.bgs.ac.uk/map-viewers/geoindex-onshore/], accessed 01/08/2024; BGS Lexicon, available [https://www.bgs.ac.uk/technologies/the-bgs-lexicon-of-named-rock-units/], accessed 01/08/2024; Magic Maps, available [https://magic.defra.gov.uk/magicmap.aspx], accessed 01/08/2024; Coal Authority Interactive Map, available [https://mapapps2.bgs.ac.uk/coalauthority/home.html], accessed 01/08/2024; GOV.uk flood map for planning, available [https://flood-map-for-planning.service.gov.uk/], accessed 01/08/2024; GOV.uk long term flood risk map, available [https://www.gov.uk/check-long-term-flood-risk], accessed 01/08/2024; Environment Agency Catchment Data Explorer, available [https://environment.data.gov.uk/catchment-planning/], accessed 01/08/2024; Enhanced Future Flows and Groundwater (eFLaG) Portal, available [https://eip.ceh.ac.uk/hydrology/eflag], accessed 01/08/2024; UK Health Security Agency Map of Radon, available [https://www.ukradon.org/information/ukmaps], accessed 01/08/2024; and Met Office Marine Climate change projections, available [https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/summaries/marine-climate-change-projections], accessed 01/08/2024.
Notes:	The report contains British Geological Survey materials ©NERC 2023 and Environment Agency information ©Environment Agency and database right.

1.7 UNDERSTANDING RISK

It is important to understand that any risks identified during a preliminary assessment, such as the one presented in this document, are perceived risks based on the information reviewed. A more detailed assessment of the actual risks can only be assessed following further intrusive investigations.

The preliminary assessments presented herein are qualitative based on professional judgements following the review of available data and within the context of the existing/proposed use. Those risk categories presented (very low, low, low to moderate, moderate, high and very high) follow guidance presented in CIRIA Publication C552, Contaminated Land Risk Assessment – A Guide to Good Practice. CIRIA states that the risk levels should be based on an understanding of both the probability (likelihood) of a risk occurring and the magnitude of the potential consequence (severity) of a risk.

CIRIA defines four levels of probability and four levels of severity with relation to contaminated land, as presented in **Appendix C.**

1.8 CONFIDENTIALITY AND LIMITATIONS

This report is addressed to and may be relied upon by Blenheim Estates. The report may not be relied upon or transferred to any other parties without the express written authorisation of WSP. This report should be read in full. No responsibility will be accepted where this report is used, either in its entirety or in part by any other party.

Third party information used in the production of this report has been taken in good faith as being accurate. WSP cannot and will not accept any liability for errors and/or omissions in data provided by others and WSP cannot warrant the work of others.

General limitations of the assessment are included in **Appendix B**.

2 SITE BACKGROUND INFORMATION AND SETTING

2.1 SITE DESCRIPTION AND CURRENT USE

Site location and current layout plans are provided as Figures 1 and 2, presented in **Appendix A**. **Table 2-1** provides a summary of Site details.

Table 2-1 - Summary of Site Details

Detail	Comment
Name and Address of Site	37-41 Brighton Road, Shoreham-by-Sea, BN43 6RE
National Grid reference	TQ 22211 05104
Site Description and Current Use	The Site is currently occupied by a Kwik-Fit garage with a right of access to a neighbouring car wash. The majority of the Site is covered in hard standing with some soft landscaping present at the northern boundary.
Area	Approximately 0.3 hectares (Ha)
Site Setting and Surrounding Land Uses	The Site as a whole is surrounded by industrial land with some new build residential developments present to the east of the Site. The land immediately to the south of the site is currently a construction site with a residential development being built. A stretch of the River Adur runs approximately 100 m south of the Site and the A259 runs parallel to the northern Site boundary.
Topography and Ground Cover	The Site sits at approximately 3 metres above ordnance datum (m AOD) and is approximately flat.

2.2 WALKOVER DETAILS

The walkover of the Site was completed on 19th August 2024.

The Site is currently in use as a Kwik fit car garage. The Site's surfacing is mostly tarmacadam hardstanding. Concrete hardstanding is present around the car wash. No visual evidence of surface staining was noticed.

No surface water features were noted on the Site.

A radio mast was identified in the corner of the Site. Chemicals used on Site were found to be related to the use of the Site as a Kwik fit garage and car wash, including car servicing chemicals, ad blue and solvents.

An underground sewage storage tank was identified in the north of the Site. No other underground storage tanks were identified.

No above ground storage tanks were identified. No oil / water interceptor was identified on the Site.

No evidence of invasive species was observed during the walkover.

2.3 PREVIOUS GROUND INVESTIGATIONS

Planning permission searches uncovered previous ground investigation and remediation details for a parcel of land located immediately south, east and west of the Site. It is understood that the western portion of this land was historically occupied by a Vauxhall Dealership and the eastern portion by Minelco Ltd, a wholesale importer, processor and distributor of decorative stone aggregates and scallop shells for processing into other by-products. This land is also referred to as 'Free Wharf', Shoreham-by-Sea. The location of the 'Free Wharf' land in relation to the study Site is provided in Figure 1.

Figure 1: Location of 'Free Wharf' land relative to the study Site

Several contaminated land assessment reports have been produced by others and their information incorporated for use to support planning conditions related to planning permission that was granted in 2018, for (in summary) the redevelopment of the 'Free Wharf' land for mixed use residential and commercial buildings including 540 new homes and 2,207sqm of commercial floor space.

WSP has reviewed the following reports that are located on the Adur & Worthing publicly accessibly planning portal webpage.

Geodyne Limited (Geodyne) had been commissioned by other third parties to complete the following reports:

- GeoDyne Report – 'Brighton Road, Shoreham - Combined Phase I Desk Study and Initial Phase II Exploratory Investigation For Optimisation Developments Ltd', referenced 31149, dated 28th September 2012.
- GeoDyne Report – 'Ground Anchor Investigation at Tarmac Wharf/Minelco Site, Brighton Road, Shoreham - Combined Ground Investigation and Geophysical Survey Report For BSCP Ltd and WM Morrisons', referenced 31149, dated 9th July 2013.
- GeoDyne Project No. 31149 - Brighton Road, Shoreham – Review of Previous Reports and Supplementary Phase II Exploratory Investigation For The Newbridge Group/Southern Housing Group, dated June 2015

The further phase of ground investigation completed between the 19th and 21st June 2015, was used to supplement the earlier listed works and comprised the following:

- Utility avoidance scan of exploratory hole locations;
- Advancement of 16 No window sample boreholes (designated WS20 to WS35 – the numbering was continued from previous works where 19 No. boreholes were advanced in external areas) across accessible internal, and external areas of the Site to depths ranging between 0.85 m and 5.00 m below existing ground level (bgl). Boreholes were terminated in hard strata, or upon achieving nominally competent strata;
- Advancement of 1 No. mechanically excavated trial pit (designated TP1) to a depth of 2.00 m bgl; and,
- Analysis of samples for geo-environmental and geo-technical purposes.

Ground conditions were found to be as follows:

- Hardstanding of thicknesses between 0.13 m to 0.85 m;
- Made Ground encountered to depths of between 1.45 m bgl to 3.85 m bgl, typically comprising reclaimed land materials; and,
- Natural strata comprising:
  - Tidal River Deposits found to depths of 2.0 m bgl and 3.95 m bgl;
  - Storm beach deposits found to depths of 1.90 m bgl and 4.90 m bgl;
  - Head Deposits found to depths in excess of 4.00 m bgl; and,
  - Tarrant Chalk Member found but base depth not proven.

During the drilling work, groundwater was encountered within the majority of the exploratory boreholes across the Site at depths ranging between 1.80 m and 3.80 m bgl. Groundwater depths were recorded within the boreholes over the 6 No. monitoring visits undertaken, ranging between 1.49 m and 4.90 m bgl.

Several exploratory hole locations encountered remains of timber ponds, railway timbers, mooring chains and concrete slab fragments.

Within one borehole hydrocarbon odours were noted, with free product and staining recorded at 2.20 m bgl. Hydrocarbon odours and staining were also revealed in trial pit TP1 at approximately 2.00 m bgl, particularly within the perched water ingress (approximately 15 m from the Site).

Trenching works were completed to identify ground anchors on the Site. Multiple ground anchors were uncovered, all of which were located approximately 15 m from the sea wall, connected to the wall with steel cabling.

The samples taken in this ground investigation and results from previous investigations on the same area were analysed against Residential Public Open Space (POS1) CIEH/LQM [1]'Suitable 4 Use Levels' assessment criteria. This screening assessment found exceedances for human health screening criteria in the Made Ground as follows:

- Arsenic - Within boreholes WS17 and WS24;
- Lead – Within boreholes WS17, WS24 and WS33;
- Benzo(a)anthracene – Within borehole WS28;
- Benzo(a)pyrene – Within boreholes WS1, WS17, WS23, WS28 and WS33;
- Benzo(b)fluoranthene – Within boreholes WS1, WS8, WS17, WS28 and WS33;
- Chrysene – Within boreholes WS17 and WS28; and,
- Dibenzo(ah)anthracene – Within boreholes WS1, WS8, WS17, WS23, WS28, WS32 and WS33.

Asbestos was also identified in multiple locations across the area within the Made Ground.

This information is summarised on the contamination map present within the previous reports in Appendix D.

A controlled water screening assessment was also undertaken on samples taken from monitoring wells installed within five locations across the Site (three shallow, two deep). The shallow wells targeted Made Ground and superficial deposits and the deep wells targeted the underlying chalk. Samples from all wells were screened against UK Drinking Water Standards and Environmental Quality Standards.

The shallow samples (WS10, WS15, WS17) found exceedances in regard to two of the samples with respect to Arsenic, Selenium and a slight exceedance with respect to Nickel when compared to the Drinking Water Standards. In addition, exceedances were revealed with respect to total PAH, individual PAH compounds and total TPH within boreholes WS10 and WS17.

The deep well samples (BH1, BH2B) found exceedances in regard to Arsenic and Selenium when compared to the Drinking Water Standards.

Based on the results of ground gas monitoring (6 No. visits previously undertaken at the Site), Geodyne determined that the site fell within Characteristic Situation 2 (CS2) in accordance with CIRIA

[1] Land Quality Management (LQM) and the Chartered Institute for Environmental Health (CIEH)

report C665 by virtue of the presence of methane in excess of 1% and carbon dioxide in excess of 5% and relatively high positive gas flow rates (potentially due to tidal effects).

The report recommended localised remediation. Remediation measures included soft landscaping capping and a watching brief during works involving removal of above ground storage tanks due to the potential for hydrocarbon impaction.

A document named Discharge of planning condition 10 – Contamination planning ref: AWDM/1497/17, ref. 14576-HOP-EN-XX-RP-S-5003, January 2019, by HOP Consulting Civil and Structural Engineers, available on the council's planning portal, provided a summary of the contaminated land assessments completed to date and future remediation work to be completed.

An interim Materials Management Plan (MMP) verification report had been prepared for the enabling works and proposed developed associated with planning application AWDM/1497/17. The report includes records of the works undertaken between 28th August 2019 to 3rd July 2020 at 'Free Wharf'. The work was undertaken to demonstrate that the risk mitigation measures were implemented and that works undertaken were in line with the MMP.

Further remediation work may be ongoing; however, the planning records reviewed to date indicate that the Free Wharf land is being remediated as necessary to make it suitable for its intended use.

While the Free Wharf site may have historically posed an offsite source of contamination, the remediation work completed to date means that it is unlikely to do so in the future with ongoing contaminant source removal.

3 HISTORICAL LAND USE

The development of the Site and surrounding area (in relation to potentially contaminative uses and sensitive receptors) has been reviewed by reference to historical maps supplied within the Environmental Database Reports and Google earth Imagery.

3.1 ON-SITE HISTORY

From the earliest mapping dated circa 1873-1874, the Site is unoccupied land, beneath the high-water mark of the River Adur. A series of timber ponds are located adjacent to the northern bank of the River Adur and the southern half of the Site falls within one of these ponds.

By 1898, development of a wharf has occurred to the south of the Site, with associated infrastructure present that extends through the Site from the adjacent road at its north. Part of the Site still falls within a timber pond.

Mapping from 1912 shows the timber ponds are no longer apparent within the Site's boundary and along the riverbank. The wharf has expanded in area and a small building resides in the north of the Site. The south-west quarter of the Site is occupied by 'Sand & Mud' of the River Adur.

Mapping from 1930-1933, indicates that another three buildings have been constructed at the Site. In addition, the western building line of a property situated on a neighbouring plot of land to the east, extends within the Site's eastern boundary. A further smaller building appears to be located across the Site's eastern boundary, in the south of the Site.

Mapping from 1950-1951 shows that the Site's layout has completely changed and all previous buildings within its boundary demolished. A number of properties are located in the northern half of the Site. It is possible that one or more of these buildings accommodate a petrol forecourt based on what appears to be a dropped kerb at the Site's north, allowing vehicular access from Brighton Road. An access road appears to extend from Brighton Road at its north, though the eastern area of the Site, to industrial land at its south.

Mapping from 1969-1974 shows the Site to be occupied by a scrap metal depot. Most of the properties from the 1950's, situated within the north of the Site, remain.

Mapping from 1980-1984 and 1985-1986 shows the Site to be occupied by a depot, with an electrical substation located in the north of the Site. A weigh station appears to be located to the east of the central depot building.

Mapping from 1991, 1994 and 2003 shows the Site matching the modern-day layout.

Satellite imagery from 1999 shows the Site matching the current day layout. The Groundsure report and Google maps indicate that the Site is currently occupied by a Kwik Fit Garage, with car parking.

3.2 HISTORY OF SURROUNDING LAND USE

A summary of historical activities located within the surrounding land, up to 500 m from the Site, is presented in **Table 3-1**.

Table 3-1 - Summary of Surrounding Land Uses Within 500 m

Date	Details
1873-1874 (1:2,500) 1873 (1:10,560)	A rail line is present 90m north of the Site. The River Adur is present immediately south of the Site (the high-water mark for the River follows the northern boundary of the Site). Wharf Coal Yard is present 120 m west of the Site. A well is present approximately 240 m east of the Site. A mouth of a sewer is present 75 m south-west of the Site. The area around the Site is mostly comprised of unoccupied land with terraced residential housing.
1898 (1:2,500) 1896 (1:10,560)	A Free wharf has been constructed immediately south of the Site with five buildings located on it. A gridiron is present in the 'Sand & Mud' of the River. More residential housing has been constructed to the north-west of the Site. A chemical works is present 500 m south-east of the Site.
1912 (1:2,500) 1909 (1:10,560) 1909-1912	Railway Sidings have been constructed 50 m north of the Site with a Goods Yard now present approximately 110 m north-west. Saltings are now present approximately 50 m south-east of the Site. A brick field is present approximately 400 m north-east of the Site. A soapworks is present 500 m west of the Site.
1931 (1:10,560) 1930-1933 (1:2,500)	Buildings have been constructed over the saltings to the east of the Site. More buildings have been built on the free wharf to the south of the Site. The terraces of residential houses have been extended. A crane is now present in the goods yard. Another wharf has been constructed 100m west of the Site.
1950-1951 (1:2,500) 1947-1948 (1:10,560) 1952 (1:1,250)	The Site is now surrounded by warehouses to the east, south and west. The wharfs have been extended on either side of the Site so that no sand and mud remains visible within 100 m of the Site. A coal yard is present 100 m east of the Site. A timber store is now present 100 m west of the Site.
1962-1966 (1:2,500) 1969-1974 (1963 (1:10,560) 1962 (1:1,250) 1963 (1:1,250)	A ship building works is now present 150 m south of the Site on the other side of the River. The chemical works has been replaced with a new set of wharfs. The wharfs immediately south of the Site have been expanded, with more warehouses constructed immediately south of the Site. The warehouses to the east of the Site are now a mill and timber depot. A haulage contractor's yard is present 100 m east of the Site with a series of tanks and oil storage depots on the yard.

Date	Details
	A tarmacadam works is present 100 m west of the Site. An electric substation is present approximately 90m west. A second substation is present approximately 13 0m east. The railway sidings and goods yard are no longer present.
1980-1984 (1:1,250) 1985-1986 (1:1,250) 1972 (1:10,000) 1982 (1:10,000)	The tarmacadam works is no longer present. A civic centre has been constructed 100 m north-west. Works are now present immediately east and west of the Site. Depots are now present replacing the haulage contractor's yard.
1989-1991 (1:1,250)	A superstore is now present approximately 50 m north of the Site.
1991 (1:1,250)	Tanks and silos are now present 10 m south of the Site relating to use of the Free Wharf as a depot.
2003 (1:1,250) 2001 (1:10,000) 2010 (1:10,000)	The works on the southern side of the River have seemingly been replaced with residential housing.
2024 (1:10,000)	The majority of buildings to the east of the Site have been removed - likely the works and depots. The civic centre is no longer present.

4 ENVIRONMENTAL SETTING

4.1 GEOLOGICAL INFORMATION

The following published geological information was obtained from a review of the British Geological Survey (BGS) Online Map Viewer and Geological Survey of England and Wales, Sheet 318/333 Brighton and Worthing, 1:50,000, 1996 and from the Environmental Database Reports (**Appendix E**).

MADE GROUND

Available records indicate the entire Site is covered by Made Ground (undivided) - artificial deposit. These deposits follow the northern bank of the River Adur. The deposits are likely from the construction of the wharf and infilling of the timber ponds, given that the Site comprised open sand and mud flats in the earliest historical mapping.

SUPERFICIAL DEPOSITS

The Site is indicated by the BGS to be underlain by superficial deposits comprising Head-Diamicton, consisting of “gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material.” Mapping also indicates the presence of Beach and Tidal Flat Deposits- Undifferentiated; these deposits comprise “Clay, Silt, Sand and Gravel”.

BEDROCK

The bedrock beneath the Site is indicated by the BGS to comprise the Tarrant Chalk Member. This is reported to consist of “Soft white chalk with relatively widely spaced but large flint seams”.

STRUCTURAL GEOLOGY

No faults are present on or within 500 m of the Site.

4.2 BGS EXPLORATORY HOLE RECORDS

There are no historical borehole records available for the Site on the BGS webpage. However, three borehole records are available within 50 m of the Site. **Table 4-1** presents a summary of the ground conditions encountered.

Full copies of the borehole log records are presented in **Appendix F**.

Table 4-1 - Summary of BGS Borehole Logs

Geological Strata	Depth to top (m BGL)	Typical thickness (m)	Borehole ID
Topsoil	Ground level	0.31	TQ20NW37, TQ20NW39, TQ20NW38
Made Ground	Ground level to 0.31	0.91 to 1.21	TQ20NW37, TQ20NW39, TQ20NW38
Stiff Clay with chalk and flints	0.91 to 1.52	1.53 to 2.14	TQ20NW37, TQ20NW39, TQ20NW38

Geological Strata	Depth to top (m BGL)	Typical thickness (m)	Borehole ID
Putty chalk with rock chalk and flints	3.05 to 3.96	Base not found	TQ20NW37, TQ20NW39, TQ20NW38

Groundwater levels were not present in the on-Site records.

4.3 HYDROGEOLOGY

AQUIFER STATUS

The Head (Diamicton) Deposits are classified by the Environment Agency (EA) as a Secondary Undifferentiated Aquifer defined as 'Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.'

The Tidal Flat Deposits are classified by the Environment Agency (EA) as a Secondary A Aquifer defined as '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 aquifer'

The bedrock is classified by the EA as a Principal aquifer defined as 'Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers'.

The Groundsure Report indicates that groundwater residing in the superficial aquifers is of medium vulnerability. Groundwater held within the underlying bedrock is of medium vulnerability due to the classification as a principal aquifer with superficial deposits above.

Groundwater beneath the Site is part of the Brighton Chalk Block groundwater body (WBID: GB40701G502500). The water quality of the groundwater body was recorded as Poor in Cycle 3 (2019) due to the Poor chemical status of the body.

No areas of the Site are located within a published Source Protection Zone (SPZ). The nearest source protection zone is located 482 m north-west of the Site.

GROUNDWATER ABSTRACTIONS

There are no active groundwater abstractions within 2 km of the Site recorded within the Environmental Database Report. A groundwater abstraction borehole was historically located at the Site, associated with Free Wharf, Shoreham-by-Sea. The license is recorded as being expired since the end of March 2021.

4.4 HYDROLOGY

SURFACE WATER FEATURES

There is no surface water feature noted in both the Groundsure Report and OS mapping for the Site.

The closest off-Site water feature comprises the River Adur, located approximately 100m to the south of the Site. The river is noted to be under tidal influence. No other surface water features are present within 500m of the Site.

The Site lies in a coastal catchment (Water body ID: 196).

The River Adur is the nearest Water Framework Directive Surface Water Body (Water body ID GB540704116000) which has historically been assessed with a 'Moderate' ecological rating and 'in (Cycle 3, 2019) the water body had a failing chemical quality. Overall the River was given a 'Moderate' rating in 2019.

SURFACE WATER ABSTRACTIONS AND DISCHARGES

There is no active licensed surface water abstraction recorded within approximately 2km of the Site.

The Groundsure Report lists no surface water discharges on-Site, one within 50 m and three within 50 to 250 m of the Site.

The off-Site discharges that are still active are associated with the use of bulk cement. The other off-Site discharges have licenses recorded as having been revoked.

4.5 FLOODING

The Flood Map for Planning indicates that the Site is mostly within Flood Zone 2 with the eastern end of the Site in Flood Zone 3. The western edge of the Site is in Flood Zone 1.

A review of the long-term flood risk mapping indicates that the Site is at negligible risk of surface water flooding.

Upon review of the Groundsure Report the Site appears to mostly be at moderate risk of groundwater flooding with the areas in Flood Zone 2. Areas in Flood Zone 3 are at moderate to high risk of flooding.

The Site is at low to medium risk of river and coastal flooding due to the proximity of the River Adur.

A full flood risk assessment is advised.

4.6 PRELIMINARY HYDROGEOLOGICAL MODEL

The hydrogeological regime on the Site is likely to comprise a perched aquifer in the Head deposits and/or Made Ground on the Site, with the superficial aquifer in the tidal flat deposits in continuity with the River Adur and possibly in continuity with the groundwater of the principal aquifer below Site.

The groundwater on the Site is likely flowing south into the River Adur and could be tidally influenced.

4.7 ECOLOGY & ARCHAEOLOGY

Ecologically or archaeologically sensitive land uses that have been identified within 500 m of the Site are noted below:

- The Site is within an biosphere reserve- Brighton and Lewes Downs;
- The Site is within a nitrate vulnerable zone for the Sussex Chalk Groundwater; and,
- The Site is within a SSSI impact Risk Zone.

The National Planning Policy Framework (NPPF) indicates that consideration should be given to ecology and archaeology as part of planning policies and decisions. In this instance, it is assumed that these elements will be covered by others under separate reports.

4.8 CLIMATE CHANGE

FUTURE CLIMATE CHANGE UNDER RCP8.5 SCENARIO

Sea Level Rise/Flood Risk

The Site is currently located approximately 0.7 km from the English Channel and is at an elevation approximately 3 m AOD. Under RCP8.5, sea level along the coast in proximity to the Site is projected to rise by 1.15 m by 2100 which could bring the sea within approximately 1.85 m of the Site during spring tides or storm surges.

The Site is located within Flood Zone 2 and 3 indicating it is at a high risk of flooding from rivers. Note that climate change may result in changes to the frequency of extreme weather events and associated flooding.

Projected Changes to Groundwater Level

The Site is not located within a Groundwater catchment.

Far-future median projections for the nearest monitored borehole indicates no significant groundwater level changes for this bedrock aquifer.

4.9 UNEXPLODED ORDNANCE (UXO)

A review of the Zetica UXO Risk Map available online indicated that the Site is in an area of Moderate unexploded ordnance (UXO) risk defined as “Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre” during WWII.

A copy of the Zetica UXO risk map is presented in **Appendix G**.

A PDSA was requested from Zetica (within Appendix G) which identified the following:

- WWII transport infrastructure and public utilities and Military barracks, camps, and training areas within 5 km of the Site;
- No identified WWI Bombing on the Site;
- No Interwar Military Activity on or Affecting the Site;
- No WWII Military Activity on or Affecting the Site;
- Post-WWII Military Activity on or Affecting the Site including several items of UXO were discovered adjacent to the Site; and,
- During WWII the Site was located in the Urban District (UD) of Shoreham-by-Sea, which officially recorded 90 No. High Explosive (HE) bombs with a bombing density of 29.1 bombs per 405 hectares (ha).

It is recommended that a detailed UXO threat assessment desk study is commissioned to assess and potentially zone, the UXO hazard level on the Site.

4.10 RADON

Review of both the Groundsure Report and UK Health Security Agency (UKHSA) indicates that the Site is located within an area where between 5% and 10% of properties would exceed the Radon Action Level. If required, then the design of appropriate radon mitigation measures for the development would be subject to agreement with the Local Authority.

4.11 MINING / NATURAL CAVITIES

The Coal Authority interactive map viewer indicates that the Site is not located within a coal mining reporting area.

The Groundsure Report indicates that no natural cavities or mining cavities, have been reported on-Site or within 500 m of the Site.

The Groundsure Report indicates three Brit Pits are present within 500 m of the Site. The closest is located 110 m south-east and comprises a wharf where mineral commodities are unloaded and stored.

The Groundsure Report lists four historical surface workings on the Site relating to timber ponds and an unspecified wharf from between 1873 and 1909. An additional three features are located within 50 m of the Site, identified as unspecified wharfs. There are a further six features located between 63 m south- east and 224 m east comprising timber ponds, unspecified wharfs and brick fields.

The Site is not located within a historical mineral planning area.

4.12 GROUND STABILITY

Information on potential ground stability hazards assessed by the BGS are included in the Groundsure Report and are summarised in Table 4-2.

Ground stability hazards at the Site, range from negligible to very low.

Table 4-2 – Summary of Ground Stability Hazards

Feature	Hazard Rating
Shrink swell properties of clays	Negligible to Very Low
Running sands	Very Low
Compressible deposits	Negligible to Very Low
Collapsible deposits	Negligible to Very Low
Landslides	Very Low
Ground dissolution of soluble rocks	Negligible to Very Low

5 REGULATORY INFORMATION AND CONSULTATION

5.1 REGULATORY DATABASE

The Groundsure Report (**Appendix E**) includes information and data collected from several organisations including the Environment Agency, the Local Authority, the British Geological Survey, Department for Environment, Food and Rural Affairs (DEFRA) and Health and Safety Executives (HSE). **Table 5-1** summarises this information.

Table 5-1 - Summary of Database Searches

Descriptor	On-Site	0-50 m	50-250 m	Details
Past Industrial Land Uses	10	8	19	On-Site land uses relate to unspecified works, timber ponds, unspecified wharfs, unspecified depots and goods yards. Off-Site land uses are present between 1 m south-west and 224 m east of the Site. These records relate to unspecified wharfs, goods yard, railway sidings, timber ponds, railway buildings, brick fields, depots, tramway sidings, coastguard station and workhouse
Historical Tanks	0	4	15	The off-Site tanks were present between 13 m south and 157 m east of the Site and related to tanks and unspecified tanks dating from 1951 to 1994.
Historical Energy Features	1	0	12	On-Site feature relates to electricity sub-station present from 1980 to 1985. Off-Site features all relate to other electricity substations present from 1969 to 1994.
Historical waste Sites	1	0	0	The record relates to a scrap metal depot from 1969, no further details are provided.
Waste exemptions	0	1	2	Off-Site exemptions are present between 23 m south and 149 m north-east and relate to using waste in construction and storage of waste in a secure place.
Control of Major Accident Hazards (COMAH)	0	0	1	One record off-Site located 214 m east relating to Calor gas Ltd, a historical Notification of Installations Handling Hazardous Substances Regulations Site
Licenced pollutant release (Part A(2)/B)	0	1	3	Off-Site records present between 25 m south-west and 198 m south-west of the Site. These records relate to other mineral processes (historical), use of bulk cement (current), quarry processes (historical), and petrol vapour recovery (historical).
Pollution incidents	0	0	4	The off-Site records are present between 76 m west and 165 m south and had minor impacts on air and water.

5.2 PLANNING HISTORY

A review of the Adur and Worthing Councils planning portal identified the following planning applications relating to the Site. Due to the age of the planning records, no associated planning documents were available on the planning portal for review.

- REDEVELOPMENT OF SITE WITH NEW WAREHOUSE, OFFICES AND PARKING FACILITIES | Ref. No: SU/64/86/TP/11567 | Status: Application permitted (8 July 1986);
- OUTLINE APPLICATION FOR INDUSTRIAL BUILDING | Ref. No: SU/139/85/TP/8964 | Status: Withdrawn application (15 August 1985);
- INTERNALLY-ILLUMINATED FREESTANDING SIGN ON FRONTAGE (RETROSPECTIVE) Ref. No: SU/170/93/TP/8322 | Status: Application permitted (5 November 1993);
- INTERNALLY-ILLUMINATED DOUBLE-SIDED POLE SIGN | Ref. No: SU/167/93/TP/8108 | Status: Application permitted (15 November 1993);
- INTERNALLY-ILLUMINATED POLE SIGN ON FRONTAGE (RETROSPECTIVE) | Ref. No: SU/166/93/TP/8107 | Status: Application permitted (5 November 1993);
- OUTLINE APPLICATION FOR INDUSTRIAL UNITS | Ref. No: SU/202/85/TP/2778 | Status: Application permitted (7 January 1986);
- AUTO CENTRE (SALE AND FITTING OF PARTS AND OTHER VEHICLE REPAIRS) AND ASSOCIATED CAR PARKING | Ref. No: SU/227/87/TP/1620 | Status: Application permitted (19 January 1988); and,
- OUTLINE APPLICATION FOR AUTO CENTRE (SALE & FITTING OF PARTS & OTHER VEHICLE REPAIRS) AND CAR WASH WITH ASSOCIATED PARKING AREA | Ref. No: SU/171/87/TP/1472 | Status: Application permitted (7 January 1986).

5.3 LOCAL AUTHORITY ENQUIRY

An enquiry to the local authority was submitted to the Adur and Worthing Council on 13th August 2024. No response has been received as of writing of this report.

5.4 ENVIRONMENT AGENCY ENQUIRY

An enquiry to the Environment Agency was submitted on the 13th August 2024. A response was received on the 5th September 2024, a copy of which is presented in **Appendix H**.

The only pertinent information identified is that the nearest historic landfill Site is approximately 879 m away at Ropetackle Road. This Site was last tipped in 1949 and no specific information is held by the EA.

6 PRELIMINARY CONCEPTUAL SITE MODEL

6.1 INTRODUCTION

The Conceptual Site Model (CSM) is based upon the environmental conditions of the Site as described in the previous sections. The methods used in this assessment followed a risk-based approach with the potential environmental risk assessed qualitatively using the 'source-pathway-receptor' contaminant linkages concept introduced in the guidance document (principally the Environment Agencies LCRM Guidance) on the practical implementation of the Environmental Protection Act 1990.

Environmental risk can be defined as the combination of the consequence of a harmful effect and the probability of its occurrence. The existing of a contaminant linkage is primarily dependant on Site usage and environmental conditions.

The environmental risk assessment has been carried out identifying and evaluating the significance of the following:

- **Potential Sources of Contamination:** these include any actual or activities of concern, located either on or in the vicinity of the Site;
- **Potential Pathways:** these are the routes or mechanisms by which CoC may migrate from the source to the receptor; and,
- **Potential Receptors:** these include current or future land users, activities or persons at the Site that could be harmed by CoC.

6.2 POTENTIAL SOURCES OF CONTAMINATION

Table 6-1 provides a summary of the potential sources of contamination that may be present at the Site, as well as the likely distribution of such sources.

Table 6-1 - Potential Sources of Contamination

Potential Source	Potential Contaminants of Concern	Likely / Anticipated Distribution
ON-SITE		
Made Ground from industrial use of the Site as a scrap metal depot and unspecified depot.	Metals, inorganics, Poly Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons, Benzene Toluene Ethylbenzene Xylene (BTEX), volatile organic compounds (VOCs).	Across the entire Site area
Made Ground from land reclamation/ wharf construction	Unknown but may comprise a range of organic and inorganic contaminants such as: Asbestos, metals, inorganics, PAHs, TPHs, BTEX compounds, VOCs, fuel oils and vapours.	Across the entire Site area
Made Ground from on-Site electrical substation	PCBs	North centre of the Site

Potential Source	Potential Contaminants of Concern	Likely / Anticipated Distribution
Structurally bound asbestos within the fabric of remaining buildings.	Asbestos Containing Materials (ACMs)	On-Site buildings
Radon	Radon gas	Across Site area
OFF-SITE		
Made ground from historical land usage around the Site including: Car wash adjacent to Site Saltings tom south-east Use of wharfs to the south of the Site Timber depot/ store immediately east of the Site Mill immediately east of the Site; Haulage contractor's yard 100 m east of the Site with a series of tanks and oil storage depots in the yard Tarmacadam works located 100 m west Railway sidings 90 m north of the Site	Asbestos fibres, metals, PAH, TPH, BTEX, VOCs, fuel oils, ground gases (methane and carbon dioxide).	Every direction
Tanks 13 m south of the Site	Asbestos fibres, metals, PAH, TPH, BTEX, VOCs, fuel oils, ground gases (methane and carbon dioxide).	13m south of the Site

6.3 POTENTIAL PATHWAYS

In the context of the proposed development of the Site as a mixed use commercial and residential complex, the following potential exposure or migration pathways associated with the identified potential source(s) have been identified:

- Pathways to Human Health receptors:
  - Dermal contact with soils and groundwater;
  - Ingestion of dusts/soil particles;
  - Inhalation of dusts and fibres (on and off-Site receptors); and,
  - Inhalation of hazardous ground gases/vapours (on and off-Site receptors).
- Pathways to Controlled Water receptors:

- Overland flow to on-Site and off-Site surface water features;
- Leaching of contaminants through the unsaturated zone and subsequent impact to groundwater within the underlying aquifers; and,
- Lateral migration of contaminants within groundwater and subsequent impact of surface water receptors.

- Pathways applicable to Site infrastructure:
  - Direct contact with contaminants (e.g., sulphates and hydrocarbons) in the soil and groundwater with below ground structures (underground potable water pipes and buried concrete); and,
  - Accumulation of hazardous gases within below ground structures in the future development (explosive risk).
- Pathways applicable to future flora within soft landscaping:
  - Direct contact with contaminants in the soil and groundwater

6.4 POTENTIAL RECEPTORS

In the context of the future proposed commercial / residential development, the following potential receptors were identified:

HUMAN HEALTH

- Future Site residents;
- Future Site workers;
- Construction workers and future maintenance workers; and,
- Third party neighbours.

CONTROLLED WATERS

- Superficial Head deposits (Secondary Undifferentiated Aquifer);
- Superficial Tidal Flat deposits (Secondary A Aquifer);
- Bedrock Aquifer of the Tarrant Chalk (Principal Aquifer); and,
- The River Adur 50 m south of the Site.

SERVICES AND BUILDING FABRIC

- Future below ground services (e.g. potable water supply pipes); and,
- Future building structures.

FLORA

- Plant life in landscaped areas.

6.5 PRELIMINARY CONCEPTUAL SITE MODEL

The CSM identifies the potential contamination sources, receptors, and the exposure pathways by which they may be linked. A Source-Pathway-Receptor linkage (SPRL) is present if a viable pathway exists between a potential source and an identified receptor.

The CSM includes potential risks which may exist to the Site during its construction and maintenance. However, it is assumed that mitigation procedures during construction will be implemented in accordance with the Code of Construction Practice (CoCP) and relevant health and safety legislation.

The preliminary CSM and explanation of the risk characterisation process is presented as **Appendix C**. A summary of potential contaminant linkages identified in the preliminary CSM is provided in **Table 6-2**.

Table 6-2 - SPRLs Based on Proposed End Use

SPRL	Potential Source	Pathway	Receptor	Probability	Severity	Preliminary Risk Rating	Comments
ON-SITE							
SPRL1	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Dermal contact with soils and groundwater; Ingestion of dusts/soil particles; and Inhalation of dusts and fibres.	HH1 HH2 HH3	Unlikely Unlikely Likely	Medium Medium Medium	Low Risk Low Risk Moderate Risk	Based on the nature of the proposed development, it is likely that risks to human health by direct contact pathways would be limited to future areas of soft landscaping or unsealed ground. The proposed development design suggests that the majority of the Site will be surfaced in hard landscaping. As such, a **Low** risk rating is considered to be appropriate for future Site workers and residents. Construction and maintenance workers are considered to be at a greater risk of direct exposure with ground contamination during groundwork related activities. Site investigation on the adjacent Site detected asbestos in several of the Made Ground samples as well as other contaminants that required remediation. As such, a **Moderate** risk rating is considered to be appropriate for construction and maintenance workers. This risk should reduce to Low based on Construction Design Management (CDM) and H&S at work regulations being followed.
SPRL2	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Inhalation of dusts and fibres.	HH4	Low likelihood	Medium	Moderate / Low Risk	The generation and mobilisation of dusts/fibres is most likely to occur during the construction phase. During the construction phase, potential risks posed to receptors should be managed by the Principal Contractor by applying appropriate health and safety control measures as per CDM Regulations. As such, the risk posed to future off-Site human health receptors is considered to be **Low to Moderate**.
SPRL3	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Inhalation of hazardous ground gases/vapours	HH1 HH2 HH3 HH4	Low likelihood	Severe	Moderate Risk	Ground gas and vapours have the potential to accumulate in confined spaces and may pose a risk of asphyxiation or explosion. Low levels of methane and carbon dioxide were reported within previous Site investigations on the adjacent Site. Made Ground may exist beneath the Site, which can pose a source of ground gas. Being close to a tidal waterbody can also influence ground gas movements. The risk to construction and maintenance workers is considered to pose a short-term risk. The risk to future Site users is longer term from accumulation of gases and vapours that could migrate via new service pipes and adversely impact indoor air. With regard to third-party neighbours, the Site will remain predominantly surfaced in hardstanding post development and thus the ground gas regime is not expected to be changed from the current situation. The risk from ground gas and vapours to future Site users, construction / maintenance workers and third-party neighbours is considered to be **Moderate**.
SPRL4	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Overland flow to on-Site and off-Site surface water features; Leaching of contaminants through the unsaturated zone and subsequent impact to groundwater within the underlying aquifers; and	CW1 CW2 CW3 CW4	Low	Medium	Moderate / Low Risk	Historical investigations of the adjacent Site indicate that groundwater contamination is present in the adjacent Site within the superficial and bedrock aquifers of the Site, the adjacent area shared similar Site uses to this Site. However, most of the Site is surfaced in hardstanding and this will be the case post redevelopment. Infiltration of precipitation and consequently mobilisation of contaminants within the underlying aquifers will be restricted. The risk to groundwater and surface water is considered to be **Moderate / Low** from infiltration and overland flow pathways.
	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Lateral migration of contaminants within groundwater and subsequent impact of surface water receptors.	CW1 CW2 CW3 CW4	Likely	Medium	Moderate Risk	The underlying groundwater is likely to be under tidal influence and if contamination exists below the Site, then, contaminants could laterally migrate via the aquifers and potentially impact on the wider groundwater body and or the River Adur. The risk to groundwater and surface water is considered to be **Moderate** from lateral migration pathways.
SPRL5	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Direct contact with contaminants (e.g., sulphates and hydrocarbons) in the soil and groundwater with below ground	B1 B2	Low likelihood	Medium	Moderate / Low Risk	The potential presence of Made Ground deposits can impact on the durability of buried services / utilities due to aggressive ground conditions. An assessment of the aggressive ground conditions is required to determine the level of mitigation required.

SPRL	Potential Source	Pathway	Receptor	Probability	Severity	Preliminary Risk Rating	Comments
		structures (underground potable water pipes and buried concrete)					Based on the nature of the artificial deposits anticipated at the Site and the limited severity of this potential contaminant linkage, a **Moderate** / Low level of risk is considered to be appropriate.
SPRL6	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Accumulation of hazardous gases within below ground structures in the future development (explosive risk).	B1 B2	Low Likelihood	Severe	Moderate Risk	Contaminant impact and the presence of Made Ground may pose a gas and vapour risk to any future enclosed spaces or structures developed across the Site. As such, the risk to the proposed development is considered to be **Moderate**. Completion of a ground investigation with follow-up monitoring to determine the Site's ground gas regime is required to further assess risks posed to future structures/enclosed spaces.
SPRL7	Made Ground from industrial usage of the Site and land reclamation/ wharf construction	Direct contact with contaminants in the soil and groundwater	F1	Low	Minor	Very Low Risk	Direct contact with contaminants can be harmful to plant life. It is presumed that a suitable certified clean growing medium (topsoil and subsoil) will be provided for new areas of soft landscaping. As such, the risk to new areas of soft landscaping is considered to be **Very Low**.
SPRL8	Structurally bound asbestos within the fabric of existing buildings.	Inhalation of dusts and fibres.	HH1 HH2 HH3 HH4	Low likelihood	Severe	Moderate Risk	The generation and mobilisation of dusts/fibres is most likely to occur during the construction phase. Prior to the construction phase a pre-demolition survey will be required as per CAR 2012 regulations, to help identify and design appropriate risk mitigation measures. During the construction phase, potential risks posed to receptors should be managed by the Principal Contractor by applying appropriate health and safety control measures as per CDM Regulations. As such, the risk posed to future human health receptors is considered to be **Moderate**.
SPRL9	Made Ground from on-Site electrical substation	Dermal contact with soils and groundwater; Ingestion of dusts/soil particles; and Inhalation of dusts and fibres.	HH1 HH2 HH3	Low likelihood	Medium	Moderate / Low Risk	An electrical substation has been present on the Site since at least 1980, a year before the ban on PCBs was introduced in the UK. Therefore, a risk of PCB contamination is present on the Site However, it is considered unlikely that these contaminants will pose a significant threat to human health receptors given their low degree of mobility and the presence of hardstanding across the Site. Furthermore, given the proposed end use of the Site and likely cover of hard landscaping, the duration and frequency of exposure to future human health receptors from potential sources of contamination is considered to be limited.
SPRL10	Made Ground from on-Site electrical substation	Inhalation of dusts.	HH4	Low likelihood	Medium	Moderate / Low Risk	The generation and mobilisation of dusts/fibres is most likely to occur during the construction phase. During the construction phase, potential risks posed to off-Site receptors should be managed by the Principal Contractor by applying appropriate health and safety control measures as per CDM Regulations.
SPRL11	Made Ground from on-Site electrical substation	Leaching of contaminants through the unsaturated zone and subsequent impact to groundwater within the underlying aquifers; and Lateral migration of contaminants within groundwater and subsequent impact of surface water receptors.	CW1 CW2 CW3 CW4	Low likelihood	Medium	Moderate / Low Risk	Any earth movement associated with the scheme could act to mobilise associated contaminants held within shallow soils which could have an impact on underlying groundwater and/or nearby surface water features however only residual levels of source material is expected (if any). PCBs are a low mobility contaminant and this slow migration is supported by the lack of PCB detections in the Site investigation in the adjacent (downstream Site). Therefore, the risk is considered to be Moderate / Low.
SPRL12	Radon	Accumulation of hazardous gases within below ground structures in the future development with subsequent inhalation	HH1 HH2 HH3	Low likelihood	Severe	Moderate Risk	To protect future residents, the potential radon gas hazard posed to the Site will need to be confirmed with the Local Authority and radon gas protection measures installed, if required, for the redevelopment. With regards to future commercial workers, under UK regulations all employers must review the potential radon hazard in their premises. Without any radon gas assessment, the risk is considered to be **Moderate**.
OFF-SITE							
SPRL13	Off-Site sources of contamination identified within 250 m including:	Migration of hazardous gases/ vapours in the unsaturated zone with subsequent inhalation.	HH1 HH2	Low likelihood	Medium	Low/ Moderate Risk	Contaminant impact and the presence of artificial deposits may pose a gas and vapour risk to any future enclosed spaces or structures developed across the Site.

SPRL	Potential Source	Pathway	Receptor	Probability	Severity	Preliminary Risk Rating	Comments
	Saltings to the south-east Use of wharfs to the south of the Site; Timber depot/ store immediately east of the Site; Mill immediately east of the Site; Haulage contractor's yard 100m east of the Site with a series of tanks and oil storage depots in the yard; and Tarmacadam works located 100m west Railway sidings 90m north of the Site Tanks 13m south of the Site		HH3				Completion of a ground investigation with follow-up monitoring of the ground gas regime is required to further assess risks posed to future structures/enclosed spaces.
SPRL14		Migration of hazardous gases/ vapours in the unsaturated zone with subsequent accumulation of hazardous gases within below ground structures in the future development (explosive risk).	HH1 HH2 HH3 B1 B2	Unlikely	Severe	Low/ Moderate Risk	The adjacent Site was found to be a Characteristic situation 2 according to a gas risk assessment completed by others. However, further assessment is recommended.
SPRL15		Lateral migration of contaminants within groundwater to Site	CW1 CW2 CW3	Likely	Medium	Moderate Risk	Based on the industrial history of the local area, it is considered likely that off-Site sources of groundwater contamination are present and have the potential to present an unacceptable risk to groundwater at the Site. Further assessment of the groundwater quality at the Site is recommended via an intrusive investigation.

Key

HH1 – Future Site residents

HH2 – Future Site Workers

HH3 – Construction workers and future maintenance workers

HH4 – Third party neighbours

CW1 – Secondary Undifferentiated Aquifer in Head Deposits

CW2 – Secondary A Aquifer in Tidal Flat deposits

CW3 – Principal Aquifer Bedrock Aquifer of the Tarrant Chalk

CW4 – The River Adur

B1- Future below ground services

B2 – Future building structures

F1 – plant life in landscaped areas

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

WSP was instructed by Blenheim Estates to produce a Preliminary Risk Assessment (PRA) for 37-41 Brighton Road, Shoreham-by-Sea, BN43 6RE (the 'Site'). The aim of the report is to support the redevelopment of the Site into a mixed use (commercial and residential) apartment complex.

The Site is occupied by a Kwik-Fit garage with a right of access to an adjacent car wash. The majority of the Site is covered in hard standing with some soft landscaping present at the northern boundary.

A series of contaminated land reports including site investigations, remedial and verification works, were previously undertaken on an adjacent parcel of land known as 'Free Wharf'. The assessments date from 2012 onwards, with the collated site information used to support the discharge of relevant planning conditions for planning permission that was granted in 2018, to enable a commercial and residential use. Evidence of contamination, including several exceedances of generic acceptance criteria and category 4 screening levels for residential land use as well as environmental quality standards for surface and groundwaters, was reported. Subsequently, some remediation of the land with associated verification work has been completed allowing partial discharge of relevant planning conditions. The eastern extent of the proposed development has been constructed and the land to the south appears to be undergoing construction.

The earliest historical mapping circa 1873 shows the Site as part of a tidal flat. Between 1898 and 1930 mapping shows the Site being built up to provide access to a wharf (later becoming Free Wharf), with a variety of small buildings present in the north of the Site. Mapping from 1969 to modern day shows a variety of industrial usages.

Off-Site historical mapping shows a similar trend with the area to the south of the Site being built into Free Wharf. The Site was used for a variety of industrial functions until planning permission was granted in 2018, when apartment blocks began to be built there.

Made Ground is anticipated to underly the entire Site. The majority of the Site will be underlain by superficial deposits of Head Deposits and Tidal Flat Deposits (Secondary Undifferentiated Aquifer and Secondary A Aquifer), which in turn sit above the Tarrant Chalk Member (Principal Aquifer).

Shallow groundwater is anticipated within the superficial deposits across the Site. Previous ground investigation monitoring undertaken on the Free Wharf land to the south of the Site, found groundwater to be between 1.49 m bgl and 4.90 m bgl. No on-site surface water features were identified, with the only off-site feature within 500 m being the River Adur. However, the groundwater is likely to be under tidal influence from the River Adur.

The Site is not located in a Source Protection Zone (SPZ) and no potable water abstractions are recorded within 500 m of the Site. The Site is mostly situated within Flood Zone 2 with the eastern edge of the Site in Flood Zone 3 and the western edge of the Site in Flood Zone 1. A review of the long-term flood risk mapping indicates that the Site is at negligible of surface water flooding. Upon review of the Groundsure Report the Site appears to mostly be at moderate risk of groundwater flooding for those areas in Flood Zone 2. Areas located within Flood Zone 3 are at a moderate to high risk.

The Site is within an SSSI impact risk zone and a nitrate vulnerable zone as well as a biosphere reserve.

The Site may require radon mitigation measures, the design of which would be subject to agreement with the Local Authority.

It is recommended that a detailed UXO threat assessment desk study is commissioned to assess and potentially zone, the UXO hazard level on the Site.

The following potentially contaminative sources have been identified on-Site:

- Structurally bound asbestos within existing on-Site buildings;
- Made Ground from industrial use of the Site as a scrap metal depot, unspecified depot and car maintenance garage;
- Made Ground from land reclamation/ wharf construction;
- Made Ground from on-Site electrical substation;
- Potential UXO and,
- Radon.

The following potentially contaminative sources have been identified off-Site:

- Made Ground from historical land usage around the Site including:

  - Saltings tom south-east;
  - Use of wharfs to the south of the Site (noted that the Free Wharf land has been subject to remediation work in accordance with planning requirements);
  - Timber depot/ store immediately east of the Site;
  - Mill immediately east of the Site;
  - Haulage contractor's yard 100 m east of the Site with a series of tanks and oil storage depots in the yard;
  - Tarmacadam works located 100 m west;
  - Railway sidings 90 m north of the Site; and,
  - Tanks 13 m south of the Site.

Risks posed to human health, controlled waters receptors and future infrastructure from the potential sources of contamination identified are predominantly considered to be **Moderate**.

7.2 RECOMMENDATIONS

Based on the findings of this report WSP recommends the completion of an intrusive investigation at the Site, to allow:

- Refinement of the Conceptual Site Model (CSM) presented by completion of both human health and controlled waters generic quantitative risk assessments (GQRA's);
- Development of a better understanding of the underlying hydrogeological regime; and,
- Determine the ground gas regime at the Site and if any ground gas protection measures are likely to be required in future buildings.

The ground investigation could also be used to collect ground data to provide input for preliminary geotechnical design.

Following completion of the ground investigation the following supplementary assessments may also be required subject to finalisation of design details and establishment of baseline ground conditions:

- Preparation of a Remediation Strategy with follow-up verification works and validation assessment to ensure the Site is suitable for the proposed end use;
- Preparation of a Material Management Plan (MMP) to control the movement of any material during construction works for re-use in-line with the CL:AIRE Definition of Wate Code of Practice;
- Given the proximity of the proposed Scheme to potentially sensitive surface water features and third party neighbours, preparation of a Construction phase Environmental Management Plan (CEMP) will be a likely requirement; and,
- The preparation of a Construction Phase Plan (CPP) by the appointed Principal Contractor will be required to identify and mitigate risks posed to human health receptors for the duration of the construction phase of the project.