



12.1 PRELIMINARY RISK ASSESSMENT



West Sussex County Council (WSCC)

A29 PHASE 1

Contaminated Land Preliminary Risk Assessment Report





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WSP



Mountbatten House
Basing View
Basingstoke, Hampshire
RG21 4HJ

Phone: +44 1256 318 800

Fax: +44 1256 318 700

WSP.com

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Prepared by	A. Jeffery	T. Russell
Signature		Russell, Tom (UKTDR001) <small>Russell, Tom (UKTDR001) I am the author of this document 2020.10.20 15:00:55 +01'00'</small>
Checked by	R. Gohel	R. Gohel
Signature		 <small>Gohel, Reena (UKRXG006) 2020.10.20 15:21:59 +01'00'</small>
Authorised by	Dr R. Hares	Dr R. Hares
Signature		 <small>rob.hares@emeia.wspgroup.com Digitally signed by rob.hares@emeia.wspgroup.com DN: cn=rob.hares@emeia.wspgroup.com, email=rob.hares@emeia.wspgroup.com Date: 2020.10.20 15:49:03 +01'00'</small>
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1 INTRODUCTION

1.1 TERMS OF REFERENCE

WSP UK Limited (WSP) was instructed by West Sussex County Council (WSCC, the Client) to undertake an assessment of contaminated land liabilities and constraints to support the proposed development of the land in Eastergate, West Sussex (the Site) as part of the A29 road project.

The proposed development includes a new single two-lane carriageway road tying into the existing road network. The A29 Phase 1 section of the project is on a 1.55 kilometres (km) section of road starting on Fontwell Avenue (A29) in Eastergate running south east, tying in with Barnham Road (B2233) and carrying on south towards the village of Lidsey.

The wider A29 Realignment scheme is for a proposed new bypass route is approximately 3.90 km long, however, this report only focuses on the Phase 1 section of the route.

The Site location and Site boundary plans of the A29 Phase 1 are presented as **Figure 1**, **Figure 2** and **Figure 3** in **Appendix A**. It should be noted that the Site boundary shown in the aforementioned figures was reflective of the information provided to WSP at the time of writing this report.

1.2 AIMS

The overall project aim is to undertake a desk-based assessment of the Site with respect to ground contamination.

The key objectives of this assessment are to:

- Develop a preliminary Conceptual Site Model (CSM) to identify potential ground contamination associated with the proposed route alignment; and,
- Evaluate likely exposure and its potential significance on identified receptors and provide risk management advice to support redevelopment.

1.3 DEVELOPMENT PROPOSALS

The scope of the scheme is to provide a new road alignment which seeks to improve the transportation links between the towns of Bognor Regis, Littlehampton and Arundel located within the Arun District of West Sussex. The proposed new bypass route is approximately 3.9 km long and its alignment is located east of the existing A29. The Phase 1 section of the route is approximately 1.55 km and is the subject of this report.

It should be noted that this report has been compiled based on the proposed alignment provided (included in **Appendix A**). This report would require a revision if there any changes the scheme.

1.4 PROJECT SCOPE

To assist in meeting the aims as stated in **Section 1.2**, the scope of this assessment comprised:

- Site walkover;
- A review of relevant previous reports pertaining to the Site, where available;
- A review of publicly available historical maps and site plans (where available) to identify former land uses and potential contaminative activities on and surrounding the Site;

- A review of relevant regulatory databases;
- A 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;
- Outline the environmental risks and / or opportunities, with respect to ground, groundwater and ground gas conditions, which may potentially arise as liabilities or constraints associated with the future use of the Site; and
- Preparation of a Contaminated Land Preliminary Risk Assessment Report.

1.5 LEGISLATIVE CONTEXT AND GUIDANCE

The assessment was undertaken in the legislative context of:

- Part 2A of The Environmental Protection Act (1990); and,
- The National Planning Policy Framework (2019).

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

- Environment Agency 'Model Procedures for the Management of Land Contamination', CLR11 (2004); and,
- CIRIA C552 'Contaminated Land Risk Assessment. A guide to good practice' (2001).

1.6 SOURCES OF INFORMATION

The following relevant sources of information were used in the production of this report:

- Envirocheck Report, Site Sensitivity Report and Historical Mapping Reports dated 19 February 2018, Order Number: 157366589_1_1;
- WSP (2018) A29 Realignment Project, Preliminary Sources Study Report, West Sussex County Council, 70031782/GEO/002, July 2018;
- British Geological Survey (BGS) Online Viewer (<https://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>) accessed 4 June 2020;
- BGS map – Chichester & Bognor, England and Wales Sheet 317/332, Solid and Drift Geology, 1:50 000 (1996) accessed 4 June 2020;
- Flood Maps for Planning Service (<https://flood-map-for-planning.service.gov.uk/>) accessed 4 June 2020;
- MAGIC (<https://magic.defra.gov.uk/MagicMap.aspx>) accessed 4 June 2020;
- Environment Agency Catchment Data Explorer, (<https://environment.data.gov.uk/catchment-planning/>) accessed 4 June 2020;
- Arun District Council Planning Portal (<https://www.arun.gov.uk/planning>) , accessed 5 June 2020; and,



- Zetica UXO Risk Maps (<https://zeticauxo.com/downloads-and-resources/risk-maps/>), accessed 5 June 2020

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1.7 LIMITATIONS

This report is addressed to and may be relied upon by West Sussex County Council and may not be relied upon or transferred to any other parties without the express written agreement of WSP.

This report should be read and used in full. No responsibility will be accepted where this report is used, in its entirety or in part, by any other party. WSP cannot be held liable for third party information. Full details of the limitations are provided as **Appendix B**.

1.8 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**.

2 SUMMARY OF THE SITE AND SURROUNDING AREA

2.1 SITE DESCRIPTION AND CURRENT USE

Site location and Site boundary plans are presented as **Figure 1**, **Figure 2** and **Figure 3** in **Appendix A**.

A Site walkover of the entire route of the proposed A29 realignment was undertaken by WSP on the 21 February 2020. Unfortunately, due to access constraints, the A29 Phase 1 section was not accessible at the time, with the exception of the southern portion in the area of Springfield plant nursery.

A summary of relevant Site details is provided below in **Table 2-1**.

Table 2-1 – Summary of Site Details

Detail	Comment
Name and Address of Site	Land located in Eastergate between Fontwell Avenue (A29) and Barnham Road (B2233)
National Grid Reference	Start of A29 Phase 1 – 494617, 105959 End of A29 Phase 1 – 495083, 104936
Site Description and Current Use	<p>The Site is situated to the north, north east and east of the Eastergate Village in West Sussex.</p> <p>The Site generally comprises undeveloped land for the majority of the Site including a mix of agricultural land and undeveloped grass land and sparsely wooded areas.</p> <p>The one part of developed land on the current route is located to the south of Barnham Road (B2233). The route runs through the middle of a plant nursery and the Phase 1 route ends in the agricultural land to the south. An electrical substation is located in the very southern part of the Site to the south of the Springfield plant nursery.</p> <p>An electrical substation is also present in the north west corner of the Site on the existing A29 road.</p>
Area	Approximately 10.8 hectares (Ha)
Site Setting and Surrounding Area	<p>The Site is surrounded by a mixture of undeveloped land, agricultural land, residential properties and commercial units.</p> <p>North - The Site is generally bounded by agricultural land and undeveloped land to the north</p> <p>South - The Site is bound to the south by commercial units associated with a plant nursery and agricultural land.</p> <p>East - The Site is bound to the east by a mix of agricultural land, residential housing and a plant nursery.</p> <p>West - The western part of the route (Figure 2) is bounded by a mixture of undeveloped land and agricultural land to the north, with small farms and residential properties beyond and a road (Eastergate Lane). The south-western part of the route is bound by a mix of agricultural land and commercial units of plant nursery's and a car repair garage (Figure 3).</p>

Detail	Comment
Topography and Ground Cover	<p>The topography of the Site is relatively flat with the start of the route at approximately 15 metres above ordnance datum (m AOD) and at the end of the Phase 1 route at approximately 10 m AOD.</p> <p>The ground cover is predominantly covered with vegetation of grassland and wooded areas. The very southern part of the Site is covered with a gravel as part of an access road.</p>
Summary of utilities on Site	<p>There is no evidence of any utilities being on the majority of the Site, however there is expected to be domestic water, gas, electricity, internet cables and drainage and the start of the route at the A29 and in the southern part of the Site in the plant nursery.</p>
Asbestos	<p>Asbestos is not anticipated to be present in areas of the Site that have not yet been developed but may be present in the southern area of the Site within buildings in the existing plant nursery.</p>

3 SITE HISTORY

3.1 HISTORICAL MAPS

Historical maps were obtained as part of the Envirocheck Report (**Appendix D**) and were reviewed to identify potentially contaminative former land uses on Site and within 250 metres (m) perpendicular to the proposed road.

The Envirocheck was originally purchased on the entire proposed A29 realignment route as part of the WSP’s Preliminary Sources Study Report dated July 2018. The information of the Envirocheck and historical maps has been re-used as part of the Phase 1 part of the A29 realignment with relevant information used where appropriate. It should be noted that the alignment of the proposed A29 Phase 1 Realignment has since been altered on parts of the Site and that the boundary shown within the Envirocheck report is for search purposes only and not reflective of the proposed development.

3.1.1 ON-SITE

Reference to the earliest available maps from 1875 to 1887 show the majority of the Site is undeveloped land or agricultural land. The Site in the north west meets the existing A29 and the route crosses Barnham Road in the southern part of the Site.

By 1897 an old gravel pit is shown in the north west corner of the Site adjacent the existing A29 road.

By 1912 some of the buildings associated with the plant nursery in the southern part of the Site have been constructed and named The Brooks (renamed Springfield plant nursery at unknown time).

By 1937 the old gravel pit in the north west of the Site is no longer listed and has presumably been infilled.

By 1974 additional buildings have been built in the southern part of the Site associated with the Springfield plant nursery. Two tanks are also shown on the alignment of the route and an electrical substation at the end of the route in the southern part of the Site.

By 1994 the land in central northern part of the Site is listed as being an orchard.

By 2018 a manmade below ground water reservoir is listed in the southern part of the Site associated with the Springfield plant nursery.

3.1.2 OFF-SITE

A summary of the off-site features relevant to contaminated land within 250 m of the proposed road is presented below in **Table 3-1**. As the Site is split over several maps, the historical map segment on the 1:2500 scale maps are listed (i.e. A1).

Table 3-1 – Summary of Pertinent History in the Surrounding Area

Off-Site Features	Date(s)	Approximate Distance from Site (m) and Historical Map Segment (1:2500)
Northfield Farm	1876 to present	150 m north west (B13)
Gravel Pit	1876 to 1897	250 m north (B13)
Eastergate Lane (Road)	1875 to present	100 m north (B13 & B14)

Off-Site Features	Date(s)	Approximate Distance from Site (m) and Historical Map Segment (1:2500)
Tile Barn	1875 to present	200 m west (B9)
Pond	1875 to present	150 m south east (B4)
Plant Nursery (expanded in 1937)	1912 to 1974	110 m south (B13)
Unlisted pit (listed as old gravel pit by 1937)	1912 to 1974	50 m north (B14)
Warwick plant nursery (relocated further west)	1912 to 1979	200 m west (B9)
Brick field (expanded in 1937) (Residential houses now occupy the land)	1912 to 1961	250 m south east (B4)
Residential housing and outbuildings (additional properties built South West of Site in 1961)	1937 to present	50 m south (B13)
Residential housing (additional properties built North of Site in 1974)	1937 to present	175 north east (B14)
Unnamed buildings (listed as engineering works from 1974 and building layout slightly modified. Listed as works from 1978. Listed as Fordingbridge Industrial Site from 1994)	1937 to present	Adjacent western boundary of the Site (B9)
Residential properties	1937 to present	Adjacent eastern boundary of the Site (B9)
Folly Fruit Farm	1974 to present	75 m south (B13)
Unnamed farm	1974 to present	50 m north (B13)
Grinstead Plant Nursery (expanded in 1994)	1974 to present	175 m north (B14)
Plant Nursery (building layout changed in 1979)	1974 to present	100 m east (B14)
Ryburn Farm	1974 to present	100 m north east (B14)
Electrical substation	1974 to present	250 m west (B9)
Residential properties (in place of the brick field)	1974 to present	250 m south east (B4)

Off-Site Features	Date(s)	Approximate Distance from Site (m) and Historical Map Segment (1:2500)
Car breakers yard / scrap yard (SRC Recycling)	1979 to present	175 m south west (B13)
Builders yard	1984 to present	80 m south west (B13)
Sewage pumping station and tank	2018 to present	175 m east (B4)

4 ENVIRONMENTAL SETTING

4.1 GEOLOGY

Reference to the British Geological Survey (BGS) Map No. 317/332 (Chichester and Bognor) (1:50,000 Series) and the 'Geology of Britain' online viewer indicates that the geological sequence beneath the Site is anticipated to be as shown in **Table 4-1** below.

Table 4-1 – Geological Descriptions

Stratum	Typical Thickness*	Typical Strata Description**	Aquifer
Made Ground / Topsoil	Unknown	Unknown	Not Classified
Head	1 to 2 m	Gravelly silty clay. Gravels are comprised of flint	Secondary Undifferentiated
River Terrace Deposits (undifferentiated)	3 to 5 m	Typically comprised of sand, gravel and clay	Secondary A Aquifer
London Clay Formation	20 to 25 m	Stiff grey silty clay	Unclassified
Lambeth Group	25 to 30 m	Stiff multi-coloured silty clay	Secondary A Aquifer
Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated) – (Chalk Group)	+400 m	White chalk	Principal Aquifer

*Typical thickness from BGS logs with 250 m

**BGS Description

4.2 HYDROGEOLOGY AND HYDROLOGY

The Environment Agency (EA) aquifer classifications are as shown in **Table 4-1** above.

The Site is situated within an Environment Agency designated Source Protection Zone (SPZ) Outer Zone 2C – subsurface activity only. These zones are extended where the aquifer is confined any may be impacted by deep drilling.

The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction. This is part of an initial screening process in assessing impacts to groundwater resources. Zones around location sites are defined by groundwater travel time to an abstraction.

The Groundwater Vulnerability Map for the area classifies the Site as having a high vulnerability to a 'minor aquifer', which is associated with the presence of the River Terrace Deposits (Undifferentiated) Secondary A Aquifer.

A summary of operational groundwater abstraction licenses reported within 1 kilometre (km) of the Site is summarised in **Table 4-2**.

Table 4-2 – Summary of Groundwater Abstraction Licenses within 1 km

Operator	Abstraction Type	Distance and Direction from Site	Details
Farm operator	General agriculture	316 m North East	Direct spray irrigation
Farm operator	General agriculture	358 m North West	Direct spray irrigation
Portsmouth Water	Public water supply	528 m North	Eastergate Pumping Station, multiple abstraction points

A summary of operational surface water abstraction licenses reported within 1 kilometre (km) of the Site is summarised in **Table 4-3**.

Table 4-3 - Summary of Surface Water Abstraction Licenses within 1 km

Operator	Abstraction Type	Distance and Direction from Site	Details
Ashmarden Ltd	General agriculture	1000 m South West	Direct spray irrigation

A summary of operational discharge consents licenses reported within 1 km of the Site is summarised in **Table 4-4**.

Table 4-4 – Summary of Discharge Consent Licenses within 1 km

Operator	Discharge Type	Distance and Direction from Site	Details
BDW Trading Limited	Sewage discharges – final treated effluent	41 m South	Discharge into freshwater stream / river
Farm operator	Trade discharge – process water	257 m North	Discharge into land
Fleurie Nurseries	Sewage discharges – final treated effluent	365 m south west	Discharge onto land / into watercourse

The Envirocheck report states that the nearest surface water feature is the Lidsey Rife located on Site. This surface water feature appears to be a small tributary which feeds into the main part of the Lidsey Rife to the west of the Site. The Site intersects the river at the very southern part of the Site.

The Lidsey Rife river has a GQA Grade of River Quality E and is listed as having a flow rate of less than 0.31 cumecs.

4.3 ENVIRONMENTALLY SENSITIVE SITES

The Site is situated within a Nitrate Vulnerable Zone (NVZ) associated with a surface water receptor Aldingbourne Rife. A NVS associated with groundwater receptor of the Sussex Chalk is located 156 m north west of the Site.

4.4 FLOODING

A review of the flood map for planning website indicates that the Site is located within Flood Zone 3 (with a high probability of flooding) along the eastern boundary of the Site. This is most likely associated with a drainage ditch adjacent the Site boundary and the residential housing. The remainder of the Site is located within Flood Zone 1 and therefore at a Low risk of flooding.

A copy of the flooding map is presented in **Appendix E**.

4.5 RADON

Radon is not considered a risk as development plans currently have no requirement for the construction of any buildings.

4.6 PRELIMINARY HYDROGEOLOGICAL MODEL

Groundwater is likely to be present within the River Terrace Deposits (Undifferentiated) with direction of flow likely to the west towards the Lidsey Rife river. The cohesive nature of the bedrock of the London Clay Formation will likely act as an aquitard of the overlying Secondary A Aquifer.

Made Ground may be present in some areas of the Site due to historical redevelopment. Perched groundwater may exist as isolated pockets of water associated with permeable lenses within the Made Ground.

5 REGULATORY INFORMATION AND CONSULTATION

5.1 REGULATORY DATABASE

The Envirocheck report includes information and data collected from several organisations including the Environment Agency (EA), the Local Authority, the British Geological Survey (BGS), Department for Environment, Food & Rural Affairs (Defra) and Health & Safety Executive (HSE).

It is considered that the information listed in **Table 5-1** represents those of potential concern in relation to contamination at the site. The full Envirocheck report is provided in **Appendix D**.

Table 5-1 – Summary of Database Searches (all distances are approximate)

Descriptor	On-Site	0-250 m	251-500 m	Details
Local Authority Pollution Prevention and Controls (LAPPC)	0	1	0	The nearest LAPPC is located 50 m west of the Site and is related to the respraying of road vehicles. The LAPPC was permitted in September 1993.
Historical Landfill Sites	0	1	1	The nearest historical landfill Site is located 26 m north of the Site and relates to the former gravel pits which were infilled with inert, commercial and household waste. The landfill was indicated to be active between December 1949 and December 1963.
Licensed Waste Management Facilities	0	1	0	The nearest licensed waste management facility is located 42 m north of the Site and is a metal recycling site for vehicle dismantling. It's licence was issued in March 1994 and was last modified in March 2009.
Local Authority Recorded Landfill Sites	1	0	1	A Local Authority Landfill Site is listed on Site and is related to the historical landfill of the infilled gravel pits to the north of the Site. Historical maps do not indicate that these gravel pits extended onto the Site.
Potentially Infilled Land (non-water)	1	2	1	Potentially infilled land (non-water) is located in the north-western part of the Site adjacent the A29 associated with former infilled gravel pits. The date of potential infilling was indicated from historical mapping to have taken place prior to 1937.
Potentially Infilled Land (water)	0	4	10	The nearest infilled land (water) is recorded 14 m west of the Site. The date of potential infilling was recorded as prior to 1899. The water feature

Descriptor	On-Site	0-250 m	251-500 m	Details
				was not labelled on the available historical mapping.
Registered Waste Treatment or Disposal Sites	0	0	1	The nearest Registered Waste Treatment or Disposal Site is located 352 m south west of the Site and is a scrapyards for dismantling motor vehicles. The license was granted in March 1994 and is understood to be still in operation at the time of writing this report.
Contemporary Trade Directory Entries	0	7	11	The nearest active trade directory is a pet food store located 22 m north west of the Site. Other trades include car body repair centre, salvage dealers, marine engineering equipment and cladding suppliers.
Points of Interest – Commercial Services	0	3	5	The nearest commercial service is a vehicle repair and servicing centre located 86 m west of the Site. Other commercial services include a scrap yard and recycling centres.
Points of Interest – Manufacturing and Production	0	4	2	The nearest Manufacturing and Production is a tank producer located on Site. Other Manufacturing and Production services include an industrial site, farming and works.

5.2 PLANNING HISTORY

A search of the Arun District Council Planning Portal was undertaken on the 5 June 2020. To date no significant planning applications have been submitted for the land located within the Site boundary.

5.3 UNEXPLODED ORDNANCE (UXO)

The Zetica online bomb map indicates that there is a low risk from UXO. The map is included in **Appendix F**. A detailed UXO desk study and risk assessment would not be required for the Site based on a Low risk.

6 PRELIMINARY CONCEPTUAL SITE MODEL

6.1 INTRODUCTION

The preliminary CSM is based upon the environmental conditions of the Site as described in the previous sections and was developed in the context of a potential commercial redevelopment of the site.

The assessment followed a risk-based approach; with the potential environmental risk assessed qualitatively using the ‘source-pathway-receptor’ contaminant linkage concept introduced in the guidance documents (principally the EA’s CLR 11) 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 existence of a contaminant linkage is primarily dependant on site usage and environmental conditions.

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

- **Potential sources of contamination:** these include actual or potentially contaminating materials and activities, located either on or in the vicinity of the site;
- **Potential receptors of contamination:** these include site users, groundwater and surface waters; and,
- **Potential pathways for contamination migration:** these are the routes or mechanisms by which contaminants may migrate from the source to the receptor.

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 nature of such sources.

Table 6-1 – Potential Sources of Contamination

Potential Source	Potential Contaminants of Concern	Likely / Anticipated Distribution
ON-SITE		
Made Ground / engineering fill Landfill	Inorganics including cyanides and sulphates and heavy metal, phenols, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and asbestos.	Made Ground is likely to be encountered in the north-west corner of the Site in the area of the infilled gravel pit and in the southern part of the Site associated with Springfield plant nursery. A limited amount of Made Ground will also likely be encountered where the route intersects with Barnham Road (B2233).
Landfill	Inorganics including cyanides and sulphates and heavy metal, phenols, petroleum hydrocarbons, polycyclic	The route also intersects a Local Authority Landfill Site along the northern part of the Site. This is associated with former gravel pits that

Potential Source	Potential Contaminants of Concern	Likely / Anticipated Distribution
	<p>aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and asbestos.</p> <p>Landfill leachate comprising simple organic compounds and ammonia. Organics including phenols and PAHs.</p> <p>Ground gas comprising methane and carbon dioxide.</p>	<p>were infilled with landfill materials. Although historical mapping indicates the gravel pits did not extend into the area of the Site, there is a possibility landfill material may be encountered.</p>
Electrical substations	<p>Petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), heavy metals, solvents, inorganics, VOCs, polychlorinated biphenyls (PCBs) and asbestos.</p>	<p>Electrical substations are present in both the north western and southern parts of the Site. The extent of contamination is likely to be limited to these two areas.</p>
Agricultural and rural dwellings	<p>Asbestos within buildings and agricultural products containing nitrates and phosphates; herbicides and pesticides; hydrocarbon fuels, oils, and lubricants; sewage sludge and sewage liquid effluent containing heavy metals and organic and inorganic compounds.</p>	<p>Agricultural products likely to be widespread across the majority of the Site including the Springfield plant nursery in the southern part of the Site. A large proportion of the northern part of the Site has historically been used as orchards.</p> <p>Asbestos, if present, would likely be restricted to in and directly surrounding the buildings within the nursery in the south of the Site.</p>
Tanks – Springfield Plant Nursery	<p>Herbicides and pesticides; hydrocarbon fuels, oils, and lubricants.</p>	<p>There are two unknown tanks listed on Site at the Springfield Plant Nursery. These tanks are assumed to be above ground; however, the contents are unknown.</p>
OFF-SITE		
Made Ground / engineering fill	<p>Inorganics including cyanides and sulphates and heavy metal, phenols, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and asbestos.</p>	<p>Various developments near the Site and infilled of former excavations in areas near the Site</p>
Landfill	<p>Inorganics including cyanides and sulphates and heavy metal, phenols, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and asbestos.</p> <p>Landfill leachate comprising simple organic compounds and ammonia. Organics including phenols and PAHs.</p>	<p>A historical landfill is situated just north of the Site. Potential for migration of contaminants on via groundwater and also impact of the Secondary A Aquifer.</p> <p>Potential for migration ground gas vapours.</p>

Potential Source	Potential Contaminants of Concern	Likely / Anticipated Distribution
	Ground gas comprising methane and carbon dioxide.	
Fordingbridge Industrial Site	Inorganics including cyanides and sulphates and heavy metal, phenols, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and asbestos.	Adjacent the western boundary of the Site. Has been present since 1937 and previously listed as engineering works. Potential impact to the ground and groundwater based on historical uses.
Scrap metal recycling site	Heavy metal, phenols, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and asbestos.	Scrap metal recycling site located 42 m north of the Site. Predominantly deals in scrapping motor vehicles. Potential for contaminants to have leached into the ground and potentially the groundwater.

6.3 POTENTIAL RECEPTORS

The following potential land contamination receptors have been identified:

- Human health including of construction workers and end users;
- Surface waters including Lidsey Rife and associated feeder tributaries; and,
- Groundwater including within the bedrock (Principal & Secondary A) and superficial (Secondary A) aquifers.

6.4 PRELIMINARY CONCEPTUAL SITE MODEL

Table 6-2 provides an evaluation of the potential contaminant linkages that are considered to be plausible on the basis of the information currently available for the Site and the proposed end use.

Table 6-2 – Plausible Contaminant Linkages

Potential Contaminants	Potential Pathways	Potential Receptors	Probability	Consequences	Risk
Made Ground / engineering fill	Ingestion, inhalation and dermal contact with contaminated soil and ground gases. Inhalation of windblown dust. Soil vapour inhalation.	Construction workers and End Users	Unlikely	Medium	Low Risk
	Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Surface water (Lidsey Rife)	Low likelihood	Medium	Moderate / Low Risk

Potential Contaminants	Potential Pathways	Potential Receptors	Probability	Consequences	Risk
	Vertical migration of aqueous and dissolved contaminants through made ground strata or via preferential pathways	Groundwater	Low likelihood	Medium	Moderate / Low Risk
	Chemical attack and degradation. Soil vapour accumulation.	Buildings	Low likelihood	Minor	Very Low Risk
Agriculture and rural dwellings	Inhalation of wind-blown asbestos fibres	Construction workers	Unlikely	Medium	Low Risk
	Ingestion, inhalation and dermal contact with contaminated soil and ground gases. Inhalation of windblown dust. Soil vapour inhalation.	Construction workers and End Users	Unlikely	Medium	Low Risk
	Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Surface water (Lidsey Rife)	Unlikely	Medium	Low Risk
	Vertical migration of aqueous and dissolved contaminants through made ground strata or via preferential pathways	Groundwater	Unlikely	Medium	Low Risk
	Chemical attack and degradation Soil vapour accumulation.	Buildings	Unlikely	Minor	Very Low Risk
Landfill	Ingestion, inhalation and dermal contact with contaminated soil and ground gases. Inhalation of windblown dust. Soil vapour inhalation.	Construction workers and End Users	Unlikely	Medium	Low Risk
	Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Surface water (Lidsey Rife)	Unlikely	Medium	Low Risk
	Vertical migration of aqueous and dissolved contaminants through made	Groundwater	Unlikely	Medium	Low Risk

Potential Contaminants	Potential Pathways	Potential Receptors	Probability	Consequences	Risk
	ground strata or via preferential pathways				
	Chemical attack and degradation. Soil vapour accumulation.	Buildings	Unlikely	Minor	Very Low Risk
Electrical Substations	Ingestion, inhalation and dermal contact with contaminated soil and ground gases. Inhalation of windblown dust. Soil vapour inhalation.	Construction workers and End Users	Unlikely	Medium	Low Risk
	Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Surface water (Lidsey Rife)	Unlikely	Medium	Low Risk
	Vertical migration of aqueous and dissolved contaminants through made ground strata or via preferential pathways	Groundwater	Unlikely	Medium	Low Risk
	Chemical attack and degradation. Soil vapour accumulation.	Buildings	Unlikely	Mild	Very Low Risk
Springfield Nursery, Barnham Road	Ingestion, inhalation and dermal contact with contaminated soil and ground gases. Inhalation of windblown dust. Soil vapour inhalation.	Construction workers and End Users	Unlikely	Medium	Low Risk
	Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Surface water (Lidsey Rife)	Unlikely	Medium	Low Risk
	Vertical migration of aqueous and dissolved contaminants through made ground strata or via preferential pathways	Groundwater	Low Likelihood	Medium	Moderate / Low Risk
	Chemical attack and degradation. Soil vapour accumulation.	Buildings	Unlikely	Minor	Very Low Risk

Potential Contaminants	Potential Pathways	Potential Receptors	Probability	Consequences	Risk
Fordingbridge Industrial Site	Ingestion, inhalation and dermal contact with contaminated soil and ground gases. Inhalation of windblown dust. Soil vapour inhalation.	Construction workers and End Users	Unlikely	Medium	Low Risk
	Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Surface water (Lidsey Rife)	Unlikely	Medium	Low Risk
	Vertical migration of aqueous and dissolved contaminants through made ground strata or via preferential pathways	Groundwater	Low Likelihood	Medium	Moderate / Low Risk
	Chemical attack and degradation. Soil vapour accumulation.	Buildings	Unlikely	Minor	Very Low Risk
Scrap metal recycling site	Ingestion, inhalation and dermal contact with contaminated soil and ground gases. Inhalation of windblown dust. Soil vapour inhalation.	Construction workers and End Users	Unlikely	Medium	Low Risk
	Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Surface water (Lidsey Rife)	Unlikely	Medium	Low Risk
	Vertical migration of aqueous and dissolved contaminants through made ground strata or via preferential pathways	Groundwater	Low Likelihood	Medium	Moderate / Low Risk
	Chemical attack and degradation. Soil vapour accumulation.	Buildings	Unlikely	Minor	Very Low Risk

7 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the desk based assessment, WSP make the following conclusions and recommendations in the context of the proposed development.

7.1 CONCLUSIONS

At present the majority of the Site is undeveloped and is situated in soft landscaped areas. The southern part of the Site is currently occupied by the Springfield plant nursery which has a loose gravel surface and is occupied by several greenhouse buildings and other smaller ancillary buildings. Electrical substations are present in the north-western corner of the Site adjacent the existing A29 road and in the southern part of the Site at the rear of the Springfield plant nursery.

Historical mapping indicates that the majority of the Site has never been developed. A gravel pit was excavated in the north-west corner of the Site in 1897 and was subsequently filled in between 1937 and 1939. The Springfield plant nursery was first constructed in 1912 (originally named The Brooks). By 1974 additional buildings had been built in the plant nursery to resemble the current layout as well as two tanks. In 2018 a below ground water reservoir was built in the southern part of the plant nursery. The surrounding area of the Site has a mixed history of residential, agriculture, gravel extraction and landfilling and commercial use.

BGS maps and historical logs indicate the underlying geology at the Site is likely to comprise superficial deposits of Head (Secondary Undifferentiated Aquifer) and River Terrace Deposits (Undifferentiated) (Secondary A Aquifer) with the bedrock of the London Clay Formation (Unproductive), Lambeth Group (Secondary A Aquifer) and the Chalk Group (Principal Aquifer) at depth. The London Clay Formation provides an aquiclude between the overlying permeable drift deposits and Lambeth Group and Chalk aquifers below. Limited Made Ground may be present above the natural drift deposits.

The nearest surface water feature is located on Site and is the Lidsey Rife river. It is a tributary of the main river located to the west of the Site. Groundwater is likely to be present within the River Terrace Deposits (Undifferentiated). It may be in hydraulic continuity with the river but is unclear at present. The Site is situated within an Environment Agency designated Source Protection Zone (SPZ) Outer Zone 2C – subsurface activity only. These zones are extended where the aquifer is confined and may be impacted by deep drilling.

There is a **Low** risk to construction workers and end users, a **Low to Moderate** risk to controlled waters and a **Very Low** risk to buildings and underground structures.

The risks to workers should be managed through health and safety protocols under Construction (Design and Management) Regulations 2015.

There is a **Low** UXO risk at the Site.

7.2 RECOMMENDATIONS

Proposed recommendations are confirmed within the 2018 WSP Preliminary Sources Study Report which encompasses the entire A29 Realignment project. An initial ground investigation (GI) of the Phase 1 area was completed in May 2019 which excluded the Springfield plant nursery. The next stage of GI is scheduled for July 2020 for detailed design.