

THE TRIANGLE, GREAT BARTON

Preliminary Land Quality Risk Assessment
Prepared for: Montagu Evans LLP



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CONTENTS

1.0 INTRODUCTION	1
1.1 Appointment.....	1
1.2 Proposed Development	1
1.3 Objectives	1
1.4 Scope of Work.....	1
1.5 Data Sources	2
2.0 SITE DESCRIPTION AND SETTING	1
2.1 Site Details	1
2.2 Site Setting	2
2.3 Environmental Search Data.....	4
2.4 Previous Investigations	5
3.0 SITE HISTORY.....	7
3.1 Review of Historical Maps.....	7
3.2 Summary.....	8
4.0 CONCEPTUAL SITE MODEL AND PRELIMINARY QUALITATIVE RISK ASSESSMENT.....	9
4.1 Conceptual Site Model.....	9
4.1.1 Sources.....	9
4.1.2 Pathways	9
4.1.3 Receptors	10
4.2 Qualitative Risk Assessment.....	10
5.0 CONCLUSIONS AND RECOMMENDATIONS.....	12
5.1 Conclusions	12
5.2 Recommendations	12

DOCUMENT REFERENCES

TABLES

Table 1-1: Information Sources	2
Table 2-1: Site Details.....	1
Table 2-2 Summary of Physical Site Features	2
Table 2-3 Environmental Search Data Summary	4

Table 3-1: Historical Land Use Summary.....	7
Table 4-1: Conceptual Site Model and Qualitative Risk Assessment	11

FIGURES

Figure 1-1: Site Location Plan

APPENDICES

- Appendix 01: Site Photographs
- Appendix 02: Groundsure Enviro+Geo Insight Report
- Appendix 03: Groundsure Historical Maps
- Appendix 04: Risk Assessment Methodology

1.0 Introduction

1.1 Appointment

SLR Consulting Limited (SLR) was commissioned by Montagu Evans LLP (the client), to undertake a Preliminary Land Quality Risk Assessment (PLQRA) of land known as The Triangle, Great Barton, Burys St Edmunds, IP31 2NP (the site) in connection with its proposed redevelopment for residential housing. The site boundary and current layout plan is included as Figure 2-1.

The information obtained from this assessment has been used to develop a conceptual model of potential risks to human and environmental receptors. This conceptual model examines the potential *source-pathway-target* linkages in relation to identified or potential contamination issues at the site.

1.2 Proposed Development

The 12.4 hectare (ha) site is currently owned by Suffolk County Council (SCC) and used as farmland. It benefits from an existing allocation for residential and community use within the adopted plan and that the allocation requires the capacity of the site to be determined through a Development Brief. The Development Plan will be submitted by the end of March 2021.

Thereafter separate planning applications will be submitted for a 1.9 ha plot on the western boundary and for the rest of the site (10.4 ha). Applications for planning permission will only be determined once the Development Brief has been adopted by the Local Authority.

While the final layout has not been confirmed the draft Great Barton Neighbourhood Plan includes general elements of residential housing with private gardens, public open space and children's play area, expansion of the primary school and community facilities.

1.3 Objectives

The objective of this Phase 1 PLQRA is to summarise the available relevant information to develop a preliminary conceptual model of potential risks to human and environmental receptors and establish if there is evidence of potentially significant subsurface contamination impacts from past and present activities on and adjacent to the site which may impact the proposed redevelopment.

This report is required to support the Development Plan and the subsequent planning applications. Given the current use one report has been prepared which covers the whole of the site.

Overall, this "precautionary" approach is designed to give confidence to future residents and the local authority that the development site, in the words of the National Planning Policy Framework February 2019 Clause 178a, is "suitable for its new use taking account of ground conditions".

It is also our objective to show that the proposed redevelopment will leave the site / the land in a condition where it is not capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990.

1.4 Scope of Work

The scope of work for this Phase 1 PLQRA includes:

- site walkover to observe the presence of potential sources of contamination on and adjacent to the site;
- assessment of sensitivity and environmental setting through a review of geological and hydrogeological data and records regarding the quality of nearby surface waters and underlying groundwater, as well as any data available on pollution incidents, abstractions and discharges;

- review of land use history through examination of historical Ordnance Survey maps;
- purchase and review of public register information that is available via the GroundSure database;
- review of any existing site investigation reports and investigation reports that are available and provided by the client; and
- provision of a Phase 1 Preliminary Land Quality Assessment Report including development of a conceptual site model (CSM), identification of potential pollutant linkages using a source-pathway - receptor approach and assessment of potential risks to the proposed development.

1.5 Data Sources

The report has been produced following consultation with the sources of information summarised in Table 1-1.

Table 1-1: Information Sources

Information Type	Source
General topography and site setting	Ordnance Survey (OS) mapping, accessed via Magic online mapping: https://www.magic.gov.uk
Site and background information	GroundSure Ltd Enviro+Geo Insight report dated 12/10/20 Ref EMS_639924_850173 (Supplied by eMapSite). Historical Ordnance Survey Map Extracts EMS_639924_850172 dated 12/10/20 (Supplied by eMapSite).
Geology and hydrogeology	British Geological Survey (BGS) website www.bgs.ac.uk .
Available previous environmental assessment reports	None provided

2.0 Site Description and Setting

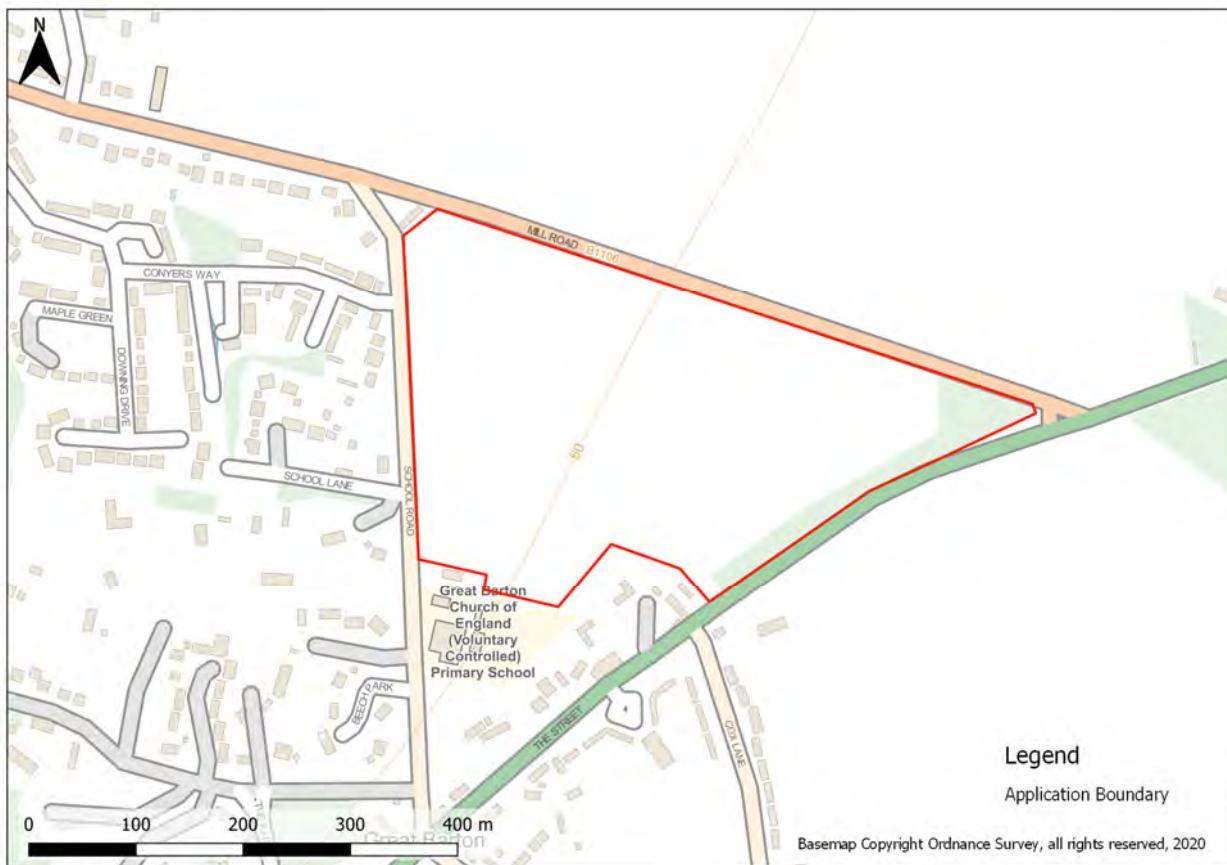
2.1 Site Details

Table 2-1 provides a summary of the site details based on a review of published information and the site walkover. Site photographs are included within Appendix 01 and key features are noted on Figure 2-1.

Table 2-1: Site Details

Detail	Description	
Location	The site is located at the following address: The Triangle, Great Barton, Bury St Edmunds, IP31 2NP. National Grid Reference 589360 267399 identifies the approximate location.	
Site Description and Use	The site is occupied by farmland. At the time of our site visit in September 2020 most the site was occupied by an arable field although no crops were obvious. A band of woodland was present along the eastern boundary and north eastern corner of the site. A line of trees were also located along the western boundary. A small stand of trees is located in the middle of the field.	
Surrounding Land Use	North	Mill Road beyond which are arable fields
	East	A413 road and arable fields and woodland
	South	Great Barton CEVC Primary School and residential housing, with a petrol filling station located approximately 60m south of the site boundary
	West	School Road and residential housing with the rest of Great Barton beyond

Figure 2-1
Site Location Plan



2.2 Site Setting

Table 2-2 provides a summary of the site details based on a review of published information and the Groundsure Enviro+Geo Insight report in Appendix 02.

Table 2-2 Summary of Physical Site Features

Geography and Geology	
Gradient	The site is level with a gentle slope towards the east at approximately 64m above Ordnance Datum (AOD) along the western boundary and 52m AOD in the east of the site.
Made Ground	There was no visual evidence of made ground or infilling during the site visit.
Superficial Drift Geology	Superficial deposits on site are recorded over the surrounding areas as Lowestoft Formation (diamictite, i.e. unsorted deposits ranging from clay to boulders). Cover sand (wind blown deposits) are shown in the east of the site with head deposits (gravel, sand, silt and clay) present in the north eastern corner.
Solid Geology	The superficial deposits are underlain by chalk, i.e. Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation and Culver Chalk Formation(undifferentiated).
BGS Borehole Logs	A borehole log from a well drilled on private land in 1934 is recorded c. 182m to the south. The log shows drift over chalk but no indication of drift thickness or composition. From a ground level of c. 190 feet (i.e. 58m AOD) groundwater was recorded with a rest water level of 92 feet (i.e. 28m) below ground level. The well was recorded as "disused, pump still on, inaccessible" in 1960.

BGS Borehole Logs	A borehole log from a well drilled on private land in 1934 is recorded c. 182m to the south. The log shows drift over chalk but no indication of drift thickness or composition. From a ground level of c. 190 feet (i.e. 58m AOD) groundwater was recorded with a rest water level of 92 feet (i.e. 28m) below ground level. The well was recorded as "disused, pump still on, inaccessible" in 1960. A second borehole log from a well drilled on private land in 1934 is recorded c. 215m to the south west. The log shows drift over chalk but no indication of drift thickness or composition. From a ground level of c. 210 feet (i.e. 64m AOD) groundwater was recorded with a rest water level of 112 feet (i.e. 34m) below ground level. The well was also recorded as "disused".
Radon Gas	The Site is not reported to be in a radon affected area as less than 1% of properties are above the Action Level. Radon protection measures are not required for new dwellings.
Hydrology¹	
Surface Water / River Network	A small pond was historically present on-site however at the time of the site visit the pond appeared to have permanently dried up and was partially overgrown by a dense stand of trees. Shallow drainage ditches are present along the western, northern and eastern boundaries. No other surface water features are present on or within 100m of the site. The nearest surface water feature is an unnamed minor stream 176m to the west which appears on mapping to be mainly culverted.
Surface Water Abstractions	No surface water abstractions are recorded within 1km of the Site. There are currently two active surface water abstractions for agricultural (spray irrigation) use 1.1km south east and 1.9km west from unnamed farm drains
Surface water Sensitivity	Surface water sensitivity is low given the lack of significant nearby surface water features and abstractive use.
Hydrogeology	
Aquifer Status	Superficial deposits have variable (low to very high) permeability. The Lowestoft Formation (diamicton) is classified as a secondary undifferentiated aquifer and the superficial deposits in the east of the site are a secondary A aquifer. Soils are considered to have an intermediate leaching potential. Superficial deposits are likely to be >10m thick although as the deposits are absent across the western part of the site so they may be locally thinner. The underlying chalk bedrock geology is classified as a principal aquifer, i.e. high permeability providing a high level of water storage and may support water supply / river base flow on a strategic scale. Groundwater flow may be through well connected fractures.
Groundwater Abstractions	There are two active groundwater abstraction licences within 2km of the Site held by the Canal and River Trust for the supply to a canal for throughflow. The abstraction points are c. 970m northeast and c. 1690m north of the site. There are two groundwater abstractions for general farming and domestic use within 2km the nearest being 742m south at Manor Farm and the second being 1.8km south west. There are two other active abstractions within 2km for spray irrigation both at 1.7km south east. All abstractions are operated by Barton Stud Partnership.
Source Protection Zones	The south western half of the site lie within a Source Protection Zone 2 associated with groundwater abstractions located over 2.5km south west of the site. The remainder of the site is within a Source Protection Zone 3 (total catchment).

¹ Flood risk is included within the Enviro+Geo Insight report within Appendix 02 but not discussed further within this report which focuses on land quality risks.

Groundwater Flow Direction	Groundwater flow is likely to be to the south west towards the abstractions.
Groundwater sensitivity	Groundwater sensitivity is considered to be moderately high given the underlying principal aquifer and source protection zone.

2.3 Environmental Search Data

The GroundSure EnviroInsight data has been reviewed to gain publicly available environmental data for the site and its immediate vicinity. A copy of the GroundSure information obtained by SLR is contained in Appendix 02 and a summary of the search information is provided in Table 2-3.

Table 2-3 Environmental Search Data Summary

Description	Distance from Site (m)	Direction	Details
Current Industrial Site uses	On Site		None
	Within 100m	Various	Electricity sub station 39m west. Telephone exchange 149m east.
Petrol and fuel Sites	Within 500m	n/a	A garage is noted 58m south east during the 1970s and 1990s and still present today.
Historical Industrial Land Uses	On Site		None recorded
	Up to 50m off site	Various	None recorded
	50m to 250m	Various	Three Smithies noted 116m, 133m and 139m south of the site between the 1880s and 1950s and a telephone exchange is noted 136m east in 1976 and 1994. There are 13 records for unspecified and disused pits, ground workings and heaps dating from the 1880s to the 1950s between 133m and 469m east of the site. Tanks are noted 284m north in 1990 to 1993. Four electrical sub stations re noted 35m west, 297m south west, 302m south and 371m west from the 1970s to 1990s.
Sites determined as Contaminated Land under Part 2A EPA 1990	Within 500	n/a	No determined sites
Discharge Consents	On-Site	n/a	None recorded
	Within 500m	E and SE	None recorded as current.

Description	Distance from Site (m)	Direction	Details
Radioactive Substances Licences	Within 500m	n/a	There are no licences recorded.
Dangerous or Hazardous Sites	Within 500m	n/a	None recorded.
Part A(2) and B Activities	Within 500m	n/a	Part B installation under the Environmental Permitting Regulations 2016 for unloading of petrol into storage at service stations approximately 84m south. Understood to be same petrol station referred elsewhere at 58m to 60m south of the site.
List 1 or List 2 Dangerous Substances Inventory Site	Within 500m	n/a	None recorded as active.
EA recorded pollution incidents	Within 100m	SW	None recorded
	Within 500m	n/a	None recorded
Landfill and Other Waste Sites	On Site	n/a	None recorded
	Within 500m	Various	No current, recent or historical landfilling activities identified. Three registered waste exemptions relating to repair or refurbishment of WEEE 251m west and burning of waste as a fuel in a small appliance (no agricultural use) 307m and 311m north.
Ecological / Environmental Designations	On Site	n/a	The site is located within an SSSI impact risk zone and all planning applications require consultation.
	Within 500m	n/a	None recorded
	500m – 2km	Various	Ancient and semi-natural woodland at Barton Shrub 1.5 to 1.7km south and an unknown location 1.6km north west.
Visual and Cultural Designations	On Site	n/a	None recorded
	Within 250m	South and south east	Four listed buildings the nearest being a farmhouse 38m south east.
Agricultural Designations	On site	Na/a	Grade 3 good to moderate quality agricultural land.

2.4 Previous Investigations

We are not aware of any previous environmental assessment or investigations having been completed at the site.

A review of the West Suffolk Council planning portal indicated the following planning applications which included information of ground conditions in the local area:

- Land Adjacent To Primary School School Road Great Barton Suffolk DC/20/1719/OUT (2020)

This site is located approximately 75m to the south of The Triangle. Documents online included "Groundsure Siteguard, Land at School Road, October 2020. The report was a summary of environmental searches (similar to that included as Appendix 02 of this report) and concluded that there was a low environmental risk associated with property ownership but did not include any ground investigation.

- Church Institute Hall The Street Great Barton IP31 2NP DCON(B)/17/1166 (2020).

This site is located approximately 75m to the south of The Triangle. Documents online included a "Report on Intrusive Investigation at The Forge, The Street, Great Barton. Prepared by Prior Associates, July 2019". Sampling of shallow soils across the site including adjacent to the off site petrol station. Topsoil was underlain by brown clay (Diamicton or Glacial Till). A small excavation presumed to be a soakaway infilled with rubble potentially including asbestos was identified. Chemical analysis of six samples did not identify any significant contamination and the report concluded the site was suitable for use. The Local Authority comments indicate that six samples were not considered sufficient for the assessment but approved the condition on the basis of receiving a remediation validation report.

3.0 Site History

3.1 Review of Historical Maps

The age and general type of activity and land use can often be determined from the type and layout of structures depicted on OS maps. Large scale (1:2,500/1:1,250) and small scale (1:10,560/1:10,000) historical map extracts were reviewed for selected years between 1883 and 2020, together with aerial photographs provided by Groundsure, Google Earth images and details provided by the Client. A summary of the site's history is presented in Table 3-1: Historical Land Use Summary below and copies of the maps are contained in Appendix 03. Note: since the historical maps were purchased the site boundary has changed slightly. The boundary shown in the appendix is therefore slightly different to that referenced within the report. All comments relate specifically to the site boundary shown in Figure 2-1.

Table 3-1: Historical Land Use Summary

Map Dates	Description
1883-1888, 1903-1905 (1:10,560) 1888, 1903 (1:2,500)	<p>On-site: Open agricultural land split between a larger northern field and a smaller southern field. A small pond is present at the boundary between the two fields in the southwest of the site. A footpath(s) cross the southern portion of the site in an approximate east-west direction to Elms Farmhouse and the small pond. A small area of vegetation is present in the northeast corner.</p> <p>Off-site: The site is situated in a generally open agricultural area with Great Barton village centre to the southwest. A school is present to the immediate northwest, and Elms Farm farmhouse buildings are immediately southeast. The site is bordered by roads to the north, east and west. A gravel pit is located c. 130m east with further pits including a chalk pit, beyond at 200m east and northeast. A smithy is marked c. 130m south.</p>
1928-1938 (1:10,560)	<p>On-site: No on-site map coverage</p> <p>Off-site: Limited off-site coverage, surrounding area to the southwest is relatively unchanged.</p>
1950, 1958 (1:10,560)	<p>On-site: The Site appears to remain unchanged</p> <p>Off-site: Surrounding area remains relatively unchanged. Some new buildings are present to the west and north on the other side of the boundary roads, and new residential buildings are present c. 100m south across the road from Elms Farm.</p>
1978 (10,000) 1971, 1972-1976, 1976-1978 (1:2,500)	<p>On-site: The site appears to remain unchanged. The footpath crossing the southern portion of site is no longer marked, and the site no longer appears to be divided into two fields.</p> <p>Off-site: Extensive residential development has occurred in the surrounding area to the immediate west and southwest, with some development occurring to the south and 500m to the east. The garage c. 75m south of the site and Great Barton Voluntary controlled school also c. 75m south of the site have been constructed. The Smithy to the southwest is no longer present. The school to the immediate northwest is now marked as "corner cottage". A telephone exchange is present c. 130m northeast and an additional gravel pit is marked c. 150m east adjacent the existing gravel pits.</p>
1988, 1994 (1:10,000)	<p>On-site: The site appears to remain unchanged. A stand of trees is present at the location of the pond.</p>

Map Dates	Description
1985, 1994, 1993-1994, 1993-1995 (1:2,500) 1999 (Google Earth Imagery)	Off-site: The surrounding area remains relatively unchanged. Further residential development has occurred to the west and southwest, infilling areas of residual open land. A council yard is marked c. 300m north.
2001, (1:10,000) 2007, 2008 (Google Earth Imagery)	On-site: The site appears relatively unchanged. By 2007 the strip of woodland along the eastern boundary and northeast corner has been planted and is showing growth. Off-site: The surrounding area remains relatively unchanged. A residential building has been constructed immediately adjacent the southeast boundary behind the garage/petrol filling station. A small building and car parking area has been constructed immediately adjacent the southwest boundary, associated with the school to the south. The gravel pits to the east in the icehouse plantation are no longer marked.
2010, (1:10,000) 2016, 2018 (Google Earth Imagery)	On-site: The site appears to remain unchanged. Off-site: The surrounding area appears relatively unchanged.

3.2 Summary

In summary, the site has remained open agricultural land since 1883, with vegetation planted along the eastern boundary and northeast corner of the site between 2003 and 2007. A small pond has historically been present in the central southern portion of the site but appeared to have permanently dried up at the time of the site visit. Most of the surrounding area was historically agricultural and residential in land use, remaining generally agricultural to the north and east and generally residential to the west and south. Most surrounding residential development occurred in the 1970s and 1980s. A smithy was historically present c. 100m to the south until before 1971, and the garage/petrol filling station that remains present c.75m to the south was constructed by 1971. Gravel mining historically occurred approximately 100m to the east from 1883 with pits present on historical mapping until at least 2001 after which large scale (detailed) mapping was not available. Small scale mapping indicates that the area surrounding the pits has been covered with trees ever since. Given this history and the Google Earth images appearing to show depressions in the tree covered area it is considered unlikely that the pits have been significantly infilled. Although this cannot be fully discounted.

Potentially contaminative land uses within 150m of the Site comprise a garage/petrol filling station c.75m to the south, historical Smithy c. 130m to the south and potentially infilled pits c. 130m to the east.

4.0 Conceptual Site Model and Preliminary Qualitative Risk Assessment

4.1 Conceptual Site Model

This report section uses the information gathered in previous sections and aims to identify potential contaminant sources at the site and sensitive receptors which may be impacted by them. Consideration of viable pathways which may link a source and receptor can then enable an assessment of Potential Pollutant Linkages (PPLs).

When identifying the PPLs relevant to this site, SLR has considered the proposed redevelopment across the entire site for residential housing with private gardens, public open space and children's play area, expansion of the primary school and community facilities.

4.1.1 Sources

UK contaminated land statutory guidance², defines a Contaminant as:

"a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of Controlled Waters".

Given the history of the site as open farmland, there were no potential on-site sources of contamination identified.

Given the history of the surrounding area which includes a garage/petrol filling station, former smithy and former gravel quarrying areas, possible off site sources of potential contamination comprise residual soil contaminants from smithy activities, petroleum hydrocarbons from activities and long term storage at the garage/petrol filling station and infilling of former gravel pits.

Potential contaminant sources therefore include:

- S1 – Former and current off-site fuel storage including current USTs at the petrol filling station;
- S2 – Made Ground at the off-site former smithy; and
- S3 – Made Ground in off-site potentially infilled gravel pits

4.1.2 Pathways

UK contaminated land statutory guidance defines a Pathway as:

"a route by which a receptor is or might be affected by a contaminant".

Following an assessment of the environmental and geological setting of the site and considering the land use, it is considered that a number of potential pathways for contaminant impact could exist.

- P1 - Ingestion or inhalation of contaminated soil dust;
- P2 - Gas migration and accumulation of vapours from soil or groundwater;
- P3 – Vertical and lateral migration of contaminants in groundwater; and
- P4 – Ingestion of home-grown vegetables.

² DEFRA; 2012; EPA 1990: Part2A, Contaminated Land Statutory Guidance, PB13735; April 2012

4.1.3 Receptors

UK contaminated land statutory guidance defines a Receptor as:

“something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or Controlled Waters.” Under the proposed residential with private garden and open space end use the following potentially sensitive receptors have been identified:

- R1 - Human Health (future site users);
- R2 – Site Buildings;

Controlled Water (groundwater within the Principal and Secondary A aquifers) is not considered as a receptor to site derived contamination given there are no on-site sources. The relatively short-term risk to construction workers involved in redevelopment of the site is best addressed via contractor Health and Safety Plans and Risk Assessments and is not discussed further here.

4.2 Qualitative Risk Assessment

UK contaminated land statutory guidance and associated supporting guidance documents including LCRM³ and R&D66⁴ recommend that a qualitative assessment of risk should be provided for each identified PPL in order to determine any risk management actions. Qualitative assessment has been completed according to the methodology set out in Appendix 4.

Risk is based on a consideration of both:

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

In order to then determine the risk to the identified receptor, both the likelihood and severity of the potential hazard is considered in line with the matrix in Annex 4 of R&D66. Table 4-1: Conceptual Site Model and Qualitative Risk AssessmentTable 4-1 provides a qualitative risk assessment.

³ Land Contamination Risk Management (LCRM), EA 2020.

⁴ Guidance for the Safe Development of Housing, R&D66, DEFRA, EA, CIEH 2008

Table 4-1: Conceptual Site Model and Qualitative Risk Assessment

Source	Pathway to Hazard	Receptor	Consequence	Likelihood	Risk
S1 – Former and current fuel storage including USTs at off-site garage/petrol filling station	P2 - Gas migration and accumulation of vapours from soil or groundwater P3 – Vertical and lateral migration of contaminants in groundwater P4 – Ingestion of home grown vegetables	R1 - Human Health (future site users);	Health Impact - Medium	Unlikely	<p>Low Risk</p> <p>No recorded leakages or spills at the petrol filling station. The petrol filling station is c. 75m from the southern site boundary. Vapours are unlikely to migrate the distance to site and are likely to disperse and dilute to low concentrations prior to reaching the site boundary. Groundwater is likely to be approximately 30m below ground level so any impact from off-site sources is unlikely to impact site users.</p> <p>Home grown vegetables do not uptake petroleum hydrocarbon contaminants. Groundwater is likely to be approximately 30m below ground level at the site and well beyond the rooting zone of home grown produce.</p>
S2 – Made Ground beneath former off-site smithy	P1 - Ingestion or inhalation of contaminated soil dust; P2 – Ingestion of home grown vegetables	R1 - Human Health (future site users);	Health Impact - Medium	Unlikely	<p>Low Risk</p> <p>Intrusive investigation of surface soils at the nearby smithy determined no significant contamination deeming the site suitable for a residential use with private garden land use scenario. Significant wind-drive deposition of soil dust is unlikely given the cohesive nature of the surface soils, relatively low volume of source material and dilution effect of deposition.</p>
S3 – Made Ground in off-site potentially infilled areas to the east	P2 – Gas migration and accumulation of vapours from soil	R1 – Human Health R2 – Site Buildings	Health Impact – Medium (Asphyxiation) Building Impact – Medium (Explosion)	Unlikely	<p>Low Risk</p> <p>Former pits located c.130m east and topographically downgradient of the site. Unlikely to be significantly infilled (no records of landfilling, still present up to 2001 and surrounding area covered by trees ever since). Ground gases are unlikely to migrate upgradient the distance to site.</p>

5.0 Conclusions and Recommendations

5.1 Conclusions

The site is an approximately triangular shaped piece of agricultural land which remains undeveloped, with some planted woodland along the eastern boundary and northeast corner and a dry pond in the southern portion of the site. The surrounding area to the north and east is largely open agricultural land and the area to the south and west is largely residential.

A petrol filling station is located c. 75m to the south having been present since before 1971. A smithy was historically present c. 130m to the south at the property now known as "The Forge". Gravel mining occurred in areas c. 130m to the east of the site with pits that were still marked as present in 1994 until OS mapping no longer recorded the presence of those features.

Groundwater sensitivity is considered to be high given the underlying Principal aquifer and source protection zone. Surface water sensitivity is low given there are no significant surface water features on-site or within 100m and there are no surface water abstractions within 1km.

There were no potential on-site sources of contamination identified. Off-site sources of contamination that were identified included the historical and current storage of fuels at the petrol filling station to the south, made ground at the former smithy, and potentially infilled land at the gravel pits to the east. Qualitative risk assessment indicates that the site represents a low risk of contamination impacts to human health and structures associated with the proposed redevelopment for residential use with private gardens.

5.2 Recommendations

No further investigation or remediation is considered necessary for the proposed redevelopment.

