IAN FARMER ASSOCIATES

Geotechnical & Environmental Specialists

COAST 2 COAST DEVELOPMENTS LTD

POLVELLAN MANOR
LOOE PL13 2AH

PRELIMINARY INVESTIGATION REPORT

Contract: C61730

Date: SEPTEMBER 2018

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PRELIMINARY INVESTIGATION REPORT

carried out at

POLVELLAN MANOR

LOOE PL13 2AH

Prepared for

COAST 2 COAST DEVELOPMENTS LTD
c/o RLT Architects
The Old Stables
Chyandour Lane
Penzance
TR18 3LP

Contract: C61730

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EXECUTIVE SUMMARY

On the instructions of RLT Architects, on behalf of Coast2Coast Developments Ltd, a Preliminary Investigation in the form of a desk study and site reconnaissance has been carried out in order to assess the potential hazards on and adjacent to the site and prepare a risk assessment for further consideration.

It is understood that it is proposed to convert the existing property and the construction of additional apartments as a new residential development.

The site is situated at Looe, approximately 10.8 km to the south of the town centre of Liskeard and may be located by Grid Reference SX 25084 53722.

The geological map indicates the majority of the site to be underlain by the Upper Long Sands Sandstone Member. Described as sandstone, thin to thick beds, fine- to coarse-grained, fossiliferous with siltstone interbeds. The west of the site is indicated to be underlain by the Bovisand Formation, described as Slaty mudstone, medium to dark grey, with thin sandstone beds and sporadic thin limestone beds. Although not indicated as present on the site from the geological maps, there is the possibility that Made Ground may exist on the site due to the previous development on the site.

A review of the history of the site has been conducted based on readily available historical maps and walkover survey of the site was conducted on the 2nd of October 2018. At the time of the walkover survey, the site comprised a vacant property, Polvallen Manor and associated land. The site was irregular in shape and approximately 1.49Ha in size.

The vacant building was partially comprised of stone, masonry and brick construction, two storeys in height with pitched roof of slate construction. The hardstanding surrounding the building generally comprised tarmac or concrete at surface with localised areas of grass. The site area was gently sloping in a northerly direction, with a drop across the site of approximately 20m.

Much of the site was heavily overgrown with woodland and ruderal growth, making some areas of the site inaccessible. Several juvenile and mature trees were noted on the site, it was unclear at the time of the site walkover if any of these trees were subject to tree protection orders (TPO).

There was no significant visual or olfactory evidence of contamination, spills, bonfires or chemical storage on the site at the time of the site walkover. Sheets of asbestos bound cement roofing were observed in some areas of the site

The research has identified the following potential sources of contamination which may form part of a pollutant linkage:

- Contamination associated with former gas holding station located 40m east of the site.
- Contamination associated with Made Ground due to previous development on-site
- Potential gas associated with infilled land on site and historical landfill situated 216m west of the site
- Radon

This Preliminary Investigation Report has identified potential pollutant linkages on the site and as such, it is recommended that a ground investigation be undertaken to assess the actual nature, presence and extent of any contamination in the ground. A geotechnical assessment incorporating foundation solutions could also be undertaken at this time.

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- ENVIROCHECK REPORT
- Datasheet
- Historical Maps
- Site Sensitivity Maps (1:2 500 and 1:10 000)
- Soil Geochemistry Maps (1:10 000)
- Environmental Context Maps (1:25 000)
- Index Map

1.0 INTRODUCTION

1.1 General

1.1.1 On the instructions of RLT Architects, on behalf of Coast2Coast Developments Ltd, a Preliminary Investigation in the form of a desk study and site reconnaissance has been carried out in order to assess the potential hazards on and adjacent to the site and prepare a risk assessment for further consideration.

1.1.2 It is understood that it is proposed to convert the existing property and the construction of additional apartments as a new residential development.

1.1.3 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.1.4 It is recommended that a copy of this report be submitted to the relevant authorities to enable them to carry out their own site assessment and provide any comments.

1.1.5 The comments given in this report and the opinions expressed herein are based on the information obtained from the desk study and site reconnaissance. No intrusive investigation has been carried out to confirm the actual ground or environmental conditions.

1.1.6 Any risks identified in this report are perceived risks based on information reviewed. Actual risks can only be assessed following a physical investigation of the site.

1.1.7 This report has been based, in part, on information supplied by others. The report has been prepared on the basis of that information being accurate.

1.1.8 The conclusions presented in this report are based on the guidance available at the time of preparation of the report. No liability can be accepted for the retrospective effects of any changes or amendments to legislation or guidance.

1.1.9 This Preliminary Investigation has been conducted in general accordance with CLR 3, ref. 8.0, CLR 11, ref 8.2, BS 10175, ref 8.3, and GPLC 1, ref 8.4.

2.0 SITE

2.1 Site Location

2.1.1 The site is situated at Looe, approximately 10.8 km to the south of the town centre of Liskeard and may be located by Grid Reference SX 25084 53722. A site location plan and aerial photograph are included in Appendix 1, Figures A1.1 and A1.2.

2.2 Site Walkover and Description

2.2.1 A walkover survey of the site was conducted on the 2nd of October 2018. The walkover was carried out in general accordance with CLR 2, ref. 8.5.

2.2.2 At the time of the walkover survey, the site comprised a vacant property, Polvallen Manor and associated land. The site was irregular in shape and approximately 1.49Ha in size.

2.2.3 Access was not made to the inside of the buildings for health and safety reasons, as they were in various states of repair, with some areas being derelict and potentially unsafe.

2.2.4 Access to the site was via a lane from Polean Lane on the sites southwestern boundary. The site was bounded to the south, east and west by residential properties. A car park lay to the north of the site.

2.2.5 The vacant building was partially comprised of stone, masonry and brick construction, two storeys in height with pitched roof of slate construction. The hardstanding surrounding the building generally comprised tarmac or concrete at surface with localised areas of grass.

2.2.6 The site area was gently sloping in a northerly direction, with a drop across the site of approximately 20m.

2.2.7 Much of the site was heavily overgrown with woodland and ruderal growth, making some areas of the site inaccessible. Several juvenile and mature trees were noted on the site, it was unclear at the time of the site walkover if any of these trees were subject to tree protection orders (TPO).

2.2.8 There was no significant visual or olfactory evidence of contamination, spills, bonfires or chemical storage on the site at the time of the site walkover. Sheets of asbestos bound cement roofing were observed in some areas of the site

2.2.9 Photographs from the walkover survey are included within Appendix 2, Figures A2.1 to A2.10.

2.3 Historical Maps

2.3.1 A review of the history of the site has been conducted based on readily available historical maps. Details of the findings are provided in the table below. All maps are provided in Appendix 4.

Map, Date and Scale	Site Description	Regional Setting
Cornwall & Isles of Scilly 1882 1:2500	The site is first shown to comprise an area of woodland. A building called Polvellan is located in the centre of the site.	A tidal mill pool is located immediately north of the site with a dam 40m northwest of the site. A railway is located 270m northeast of the site. A bone mill is located 110m east of the site. A Sunday school and school are located 20m and 100m south of the site. The site of a chapel and a congregation chapel are located 220m and 320m southeast of the site.
Cornwall & Isles of Scilly 1888-1989 1:10560	No significant observable changes to the site since the previously published map.	The site is located on the Looe estuary, with the village of Looe to the southeast. The surrounding area is comprised of woodland, agricultural fields and estuarine mud flats. A gas works, and quarry are located 670m and 790m north of the site. Three quarries, a smithy, a reservoir and a public house are located 320m to 520m northeast of the site. A quarry and a burial ground are located 380m and 540m east of the site. A chapel, two churches, a school, a smithy, a post office, a coastguard station and a lifeboat station are located 350m to 670m southeast of the site in the village of Looe. Two quarries and a reservoir are located 600m to 750m southwest. A quarry and old limekilns are located 550m to 630m northwest of the site.
Cornwall & Isles of Scilly 1907 1:2500	No significant observable changes to the site since the previously published map.	A cemetery is located 120m south of the site. A coastguard station is located 270m southeast of the site. Residential development has taken place to the south of the site.
Cornwall & Isles of Scilly 1908 1:10560	No significant observable changes to the site since the previously published map.	A quarry is located 950m north of the site. A Sunday school is located 560m south of the site. Sporadic residential development has taken place in the surrounding area.
Cornwall & Isles of Scilly 1938 1:10560	No significant observable changes to the site since the previously published map.	The previously mentioned gas works located 670m north of the site is no longer shown. Significant residential development has taken place in the surrounding area.
Ordnance Survey Plan 1962-1963 1:10000	No significant observable changes to the site since the previously published map.	A building is located 130m west of the site on the estuarine mud flats. Significant residential development continues in the surrounding area.
Ordnance Survey Plan 1969-1970 1:2500	The previously mentioned Polvellan House has expanded in size.	Part of the previously mentioned mill pond is now shown as a car park located immediately north of the site. A public convenience, hall, and obstacle golf course are located 25m, 40m, and 95m northeast of the site. An ambulance station, gas holder and hall is located 50m to 70m east of the site. A hall, electrical sub-station, and hotel are located 20m, 80m, and 250m southeast. Allotment gardens are located 150m south. A welding works and building material depot are located 80m and 130m west of the site. Sporadic residential development continues in the surrounding area.

Map, Date and Scale	Site Description	Regional Setting
Supply of Unpublished Information 1975 1:2500	The map is largely incomplete and has therefore been removed from further consideration.	The map is largely incomplete and has therefore been removed from further consideration.
Ordnance Survey Plan 1976-1978 1:10000	No significant observable changes to the site since the previously published map.	A sewage works is located 590m west. A boat building yard is located 540m northwest. A telephone exchange and swimming pool are located 410m and 970m northeast. A reservoir is located 950m south of the site. Significant residential development has taken place to the east of the site.
Additional SIMs 1978-1992 1:2500	No significant observable changes to the site since the previously published map.	The previously mentioned mill pool has reduced in size, the land is now shown as car parking. Residential development continues to the south of the site.
Ordnance Survey Plan 1980 1:10000	The map is largely incomplete and has therefore been removed from further consideration.	The map is largely incomplete and has therefore been removed from further consideration.
Additional SIMs 1983-1988 1:2500	No significant observable changes to the site since the previously published map.	The previously mentioned mill pool has reduced in size, the land is now shown as car parking. Residential development continues to the south of the site. A police station is located 270m northeast of the site.
Additional SIMs 1988-1989 1:2500	The map is largely incomplete and has therefore been removed from further consideration.	The map is largely incomplete and has therefore been removed from further consideration.
Additional SIMs 1992 1:2500	The map is largely incomplete and has therefore been removed from further consideration.	The map is largely incomplete and has therefore been removed from further consideration.
Large Scale National Grid Data 1995 1:2500	No significant observable changes to the site since the previously published map.	The mill pool has reduced in size. A play area and boat yard are located 110m and 80m east of the site. An electrical sub-station and bakery are located 100m and 170m west of the site.
Large Scale National Grid Data 1995 1:2500	No significant observable changes to the site since the previously published map.	The previously mention gas holder station is no longer shown on the map.
Large Scale National Grid Data 1995 1:2500	The map is largely incomplete and has therefore been removed from further consideration.	The map is largely incomplete and has therefore been removed from further consideration.
10k Raster mapping 2000 1:10000	No significant observable changes to the site since the previously published map.	A school is located 750m east of the site. A mast is located 290m south of the site. A council depot is located 620m west of the site. Residential development continues.

Map, Date and Scale	Site Description	Regional Setting
10k Raster mapping 2006 1:10000	No significant observable changes to the site since the previously published map.	No significant observable changes in the surrounding area since the previously published map.
Historical Aerial Photography 2013	The site is covered in woodland with a large building in the western central part of the site.	A car park and the estuary can be seen to the north of the site, and residential properties to the south of the site.
Vector Map Local 2018 1:10000	The historical map appears to be substantially accurate in comparison to the current setting.	The historical map appears to be substantially accurate in comparison to the current setting

2.4 Summary

2.4.1 The site is first shown to comprise an area of woodland. A building called Polvellan is located in the centre of the site.

2.4.2 The 1969 to 1970 map shows the previously mentioned Polvellan House has expanded in size. No further changes have been observed on the site until the most recently published map dated 2018.

3.0 SITE SETTING

3.1 Geological Setting

3.1.1 Details of the geology underlying the site have been obtained from the relevant geological map of the area, ref. 8.6.

3.1.2 The geological map indicates the majority of the site to be underlain by the Upper Long Sands Sandstone Member. Described as sandstone of variable type, thin to thick beds, fine- to coarse-grained, fossiliferous with siltstone interbeds. Limestone beds up to 0.5m are present through the upper part of the member. Sedimentary bedrock formed between 410.8 and 393.3 million years ago during the Devonian period.

3.1.3 The west of the site is indicated to be underlain by the Bovisand Formation, described as Slaty mudstone, medium to dark grey, with thin sandstone beds and sporadic thin limestone beds. Packets of quartzitic sandstone beds are present in the form of the Upper and Lower Longsands Sandstone members. Formed between 410.8 and 393.3 million years ago during the Devonian period.

3.1.4 Although not indicated as present on the site from the geological maps, there is the possibility that Made Ground may exist on the site due to the previous development.

3.2 Hydrogeological Setting

3.2.1 The hydrogeological records, provided by the Environment Agency, indicate that the site is situated on a Secondary A Aquifer, relating to the variably permeable Upper Long Sands Sandstone Member and the Bovisand Formation.

3.2.2 The Environment Agency defines Secondary A aquifers 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'.

3.2.3 The Envirocheck vulnerability map indicates the soil to be of high leaching potential.

3.2.4 Soils of high leaching potential are soils that readily transmit liquid discharges because they are either shallow or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.

3.2.5 The site is not located within a groundwater source protection zone.

3.2.6 There are no groundwater abstraction wells within 500m of the site.

3.3 Hydrological Setting

3.3.1 The nearest surface watercourse is the West Looe River, located approximately 86m to the north of the site at its closest point.

3.3.2 There is a pond / lake located 50m to the north of the site.

3.3.3 The surface water is at approximately 5-10m below the level of the site.

3.3.4 The site is situated within an area defined by the Environment Agency as being at risk of flooding from rivers or the sea at the extent of extreme flood. The risk to the site is considered by the Environment Agency to be low.

3.3.5 There is no available river quality classification data for the nearest watercourse.

3.3.6 There are no surface water abstractions within 500m of the site.

3.4 Radon

3.4.1 The British Geological Survey, in conjunction with the Radiation Protection Division of the Health Protection Agency, ref. 8.7, indicates the site to lie within an area where there is a probability of 10% to 30% of present or future homes being above the action level of 200Bq/m^3. As such, the site is classified as a Radon Affected Area.

3.4.2 Therefore, the guidance recommends that full radon protective measures should be installed in the proposed development in line with the Building Research Establishment, Report BR211, ref 8.8.

3.5 Soil Geochemistry

3.5.1 The British Geological Survey data indicates the following concentrations of naturally occurring metals to be representative of background levels in natural soil underlying the site. The levels are based on those present in rural soils and are not necessarily representative of levels within Made Ground which may be encountered on site:

Element	Concentration (mg/kg)
Arsenic	15-25
Cadmium	<1.8
Chromium	60-90
Lead	<100
Nickel	15-30

4.0 ASSESSMENT OF GEOTECHNICAL RISK

4.1 Geological Constraints

4.1.1 The following are brief findings relating to factors identified during the research from the Envirocheck data site that may have a potential impact upon the engineering of the proposed development.

Potential Hazard	Assessed Risk	Comment
BGS Recorded Mineral Sites	Low	Closest at 381m east, relates to a ceased opencast in producing sandstone.
Man-Made or Natural Cavities	None	
Collapsible Ground	Very low	The underlying geology may be collapsible when saturated with water.
Compressible Ground	Very low	The underlying geology may be compressible
Ground Dissolution	None	
Landslide	Very low	The site slopes to the north
Running Sand	Very low	Likelihood will relate to grading of sand strata below the water table.
Shrinking or Swelling Clay	None	
Unconsolidated Made Ground	Moderate to high	There is evidence of previous development on the site.
Bearing Pressure	Low	The underlying geology, as interpreted from the relevant geological map, should have an acceptable bearing capacity.
Aggressive conditions for construction materials	Moderate to high	The underlying geology, as interpreted from the relevant geological map, do not typically contain high concentrations of sulphates or sulphides.
Shallow or high groundwater table	Low to moderate	Site is within an area where deep and/or shallow structures are at potential risk from high / rising groundwater

4.2 Geotechnical Risk Assessment

4.2.1 An assessment of the main hazards associated with the site is detailed below. Unless stated otherwise, the presence of such hazards are based on information from the research or reconnaissance and have not been confirmed by an intrusive investigation.

- Soil Conditions

  The risk of concrete attack for material emplaced within the Upper Long Sands Sandstone Member and Bovisand Formation is considered to be low.

  The underlying bedrock is anticipated to comprise typically weather bedrock, and as such should be suitable for development.

  Should any weathered bedrock be of a relatively fine nature (i.e. a sand), then a high groundwater table may cause subsidence due to running sand. It is considered the risk associated with this is low to moderate.

The location and anticipated geology of the site suggests there to be a low risk from high groundwater in the north of the site. Should this be the case, then pumping may be required from any excavations on site.

- Topography

  The Envirocheck data provided indicates only a very low risk of landslip subsidence.

- Previous Use

  Historical mapping indicates previous development on the site including structural and infrastructure changes. Therefore, the presence of buried structures such as services, basements and old foundations is a potential risk.

4.3 Conclusions of Geotechnical Risk Assessment

4.3.1 The research has identified evidence of potential hazards associated with underlying ground conditions, either natural or man-made, and therefore it is recommended that further work be carried out to confirm the presence, nature or extent of those hazards anticipated to impact on the site.

5.0 ENVIRONMENTAL SEARCHES

5.1 Potential Sources of Contamination

5.1.1 A search was made of records held by the various regulatory authorities and other statutory bodies to determine the presence or otherwise of past and current activities on or within 500m of the site which have the potential to give rise to the presence on site of contaminants. The findings are given in the table below:

Activity	On Site	Off Site (distance / direction)	Detail
Contaminated Land Register Entries	None	None within 500m	
Discharge Consents	None	Ten between 0-250m, ten between 251-500m	Closest at 107m west, relates to discharge of surface water into a freshwater river/stream.
Integrated and Local Authority Pollution Prevention and Controls	None	One between 0-250m	Closest at 229m east, relates to a petrol filling station.
Pollution Incidents to Controlled Waters	One	Eight between 0-250m, twelve between 251-500m	Closest located onsite, relates to the release of miscellaneous foam into tidal water due to natural causes. Listed as a Category 3 – Minor Incident.
Prosecutions Relating to Authorised Processes or Controlled Waters	None	None within 500m	
Registered Radioactive Substances	None	None within 500m	
Substantiated Pollution Incident Register	None	None within 500m	
Water Abstractions	None	None within 500m	
BGS Recorded Landfill Sites	None	None within 500m	
Historical Landfill Sites	None	One between 0-250m, one between 251-500m	Closest at 216m west, relates to a site taking commercial and household waste.
Licenced Waste Management Facilities	None	None within 500m	
Local Authority Recorded Landfill Sites	None	None within 500m	
Registered Landfill Sites	None	None within 500m	
Potentially Infilled Land	One	Three between 251-500m	Closest located onsite, relates to unknown potentially filled land (water).
Registered Waste Transfer, Treatment or Disposal Sites	None	None within 500m	
Hazardous Substances	None	None within 500m	
Explosive Sites	None	None within 500m	
Contemporary Trade Entries	None	Fourteen between 0-250m, twelve between 251-500m	Closest at 21m east, relates to a veterinary services business.
Fuel Station Entries	None	One between 0-250m	Located 234m east, relates to a BP petrol station.

5.2 Green Belt Areas

5.2.1 There are no designated areas or as yet un-adopted areas of Green Belt land within 1km of the site.

5.3 Designated Sites

5.3.1 A review of the MultiAgency Geographic Information for the Countryside website, ref 8.10, was undertaken to assess whether there were any Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) or Local Nature Reserves (LNR) which may be impacted by the development.

5.3.2 The enquiries indicated there are is one LNR and no SSSIs or NNRs within 1km of the site.

5.4 Nitrate Vulnerable Zone

5.4.1 The site is not located within an area designated as a nitrate vulnerable zone.

6.0 ASSESSMENT OF GEOENVIRONMENTAL RISK

6.1 General

6.1.1 The definition of 'contaminated land', along with the relevant details on legislation and guidance is set out in Appendix 3.

6.1.2 The assessment of potential risk has been based on the guidelines given in CIRIA report C552, ref 8.9. These guidelines are summarised in Appendix 3.

6.1.3 The assessment of environmental risk is aimed at identifying the possible risk, if any, arising from substances used or deposited on the site, or from any other sources of land contamination, based on the principles of the pollutant linkage.

6.1.4 The assessment is based on the proposed development end use, taking account of present and previous use. It is based only on a review of historical maps, desk based data and site reconnaissance; therefore it contains some elements of conjecture based on professional judgement. A comprehensive risk assessment can only be made following an intrusive investigation and testing regime.

6.1.5 The proposed development comprises a new residential development with gardens and associated infrastructure.

6.2 Potential Sources of Contamination Identified

6.2.1 The research has identified the following potential sources of contamination which may form part of a pollutant linkage:

- Contamination associated with former gas holding station located 40m east of the site.
- Contamination associated with Made Ground due to previous development on-site
- Potential gas associated with infilled land on site and historical landfill situated 216m west of the site
- Radon

6.3 Potential Pathways Identified

6.3.1 The research has identified a number of potential pathways which are relevant to the potential sources of contamination identified above and may form part of a pollutant linkage.

6.3.2 Those identified are detailed within the Conceptual Site Model, along with the receptors relevant to the development on a site specific basis.

6.4 Hazard Identification

6.4.1 The research has identified a number of potential sources and pathways which are considered 'likely' to be present which, taking into account the potential receptors identified, form potential pollutant linkages and have been used in the formulation of the Conceptual Site Model.

6.5 Hazard Assessment

6.5.1 An assessment of the main sources of contamination and the potential for unacceptable risk to receptors is detailed below. Unless stated otherwise, it is considered 'likely' that a potential source is present at this stage, in order to provide a preliminary estimation of the risk and therefore determine the need for further work.

- Human Health

  There is evidence for the potential for radon to be present at levels for which full protection measures have been recommended. The risk to end-users is considered to be high, however, with the correct implementation of full radon protection measures, this risk is considered to be negligible.

  There is the potential for the migration of explosive gases from the potentially infilled land onsite and the historic landfill located 216m west, the risk to end-users is considered to be is considered to be moderate.

  There is the potential for the migration onto site from contamination associated with the nearby gas holding station. The main receptor group is anticipated to be site end-users and the risk is considered to be moderate to high.

  There is likely to be contamination associated with Made Ground on the site due to previous development. The main receptor groups are anticipated to be site workers and site end-users, the risk is considered to be low to moderate.

- Construction Material

  There is considered to be a moderate to low risk due to chemical attack on construction materials emplaced within the Made Ground.

  If hydrocarbons are present in any form, there is likely to be a risk to water supply pipes.

- Controlled Waters

  The site is located on a Secondary A Aquifer relating to the variably permeable bedrock geology. The Envirocheck vulnerability data indicates the soil to be of high leaching potential.

  The site is no located within a groundwater source protection zone. There are no groundwater or surface water abstractions within 500m of the site. The nearest surface watercourse is the West Looe River located 86m to the north.

  Therefore, any consequence of contamination to the water environment is considered to be significant, and as such a moderate risk level has been assigned.

6.6 Conceptual Site Model

6.6.1 The research has therefore identified the following pollutant linkages that require further consideration and have been used to formulate the Conceptual Site Model.

Potential Contamination Sources	Potential Contaminants of Concern	Potential Pathways	Receptor Group
Possible contamination associated with gas holding station, potentially infilled land and historical landfill and Made Ground.	Inorganic Compounds • Metals • Cyanide Organic Compounds • TPH • PAH • BTEX • Phenols Others • pH • Organic Matter • Asbestos	• Soil ingestion • Vegetable uptake • Dermal contact • Inhalation of contaminated dust • Vapour inhalation	Human Health • Site occupants • Site users • Construction workers • Maintenance workers • Neighbouring site users/general public
		• Plant uptake and accumulation of contaminants	Ecology • Landscaped areas • Sensitive or protected habitats
		• Lateral migration • Surface run-off • Infiltration	Controlled Waters • Surface waters • Groundwater • Tidal waters
		• Direct contact of contaminants with building materials	Building Materials or Services • Concrete • Plastic pipes and services • Structural iron & steel work
Natural Geology / Made Ground / Nearby Landfill	• Radon • Carbon dioxide • Methane • Carbon monoxide • Hydrogen sulphide	• Inhalation • Explosion	• Human Health • Property

6.7 Conclusions of Geoenvironmental Risk Assessment

6.7.1 The research has identified evidence of potential sources of contamination on or which may impact on the site, with plausible pathways to the likely receptors, and therefore potential pollutant linkages have been suggested.

6.7.2 It is recommended that further work be carried out to confirm the presence, nature or extent of any contamination which is anticipated to impact on the site.

6.8 Consultation

6.8.1 During development, consultation may be required for a number of reasons with a number of regulatory Authorities. The following provides an indication as to the most likely Authorities with which consultation may be required:

- **Local Authority.** There may be a planning condition regarding contamination and consultation will be required with a designated Contaminated Land Officer within the Environmental Health Department. The Local Authority is generally concerned with human health risks.

- **Environment Agency.** Where a site is within a groundwater protection zone or has been designated as a special site, the Environment Agency is likely to be involved to ensure that controlled waters are protected.

- **National House Building Council, NHBC.** Section 4.1 of the NHBC Standards, ref 8.10, requires land management to be addressed. For a new housing development to be approved by the NHBC, any contamination will require remediation accompanied by a validation report.

6.8.2 Based on the results of any consultation, there may be specific investigation and/or remediation requirements imposed by one or more of the Authorities.

7.0 RECOMMENDATIONS

7.1 Further Work

7.1.1 An intrusive investigation should be undertaken to address the issues raised in Chapter 4.0 and Chapter 6.0.

7.1.2 The following scope of works is suggested in order to collect the required data:

- The sinking of exploratory holes for the recovery of samples for geotechnical and chemical contamination analysis.

- The installation and monitoring of gas and groundwater monitoring standpipes.

7.2 Other Considerations

7.2.1 There are several other areas of research which are beyond the scope of this report. All or none of the following may be applicable to the site, either on the outcome of consultation with a regulatory body or as a result of the research for this Preliminary Investigation. They include:

- **Archaeology.** Should the site be situated on or within an area of archaeological sensitivity, the advisor to the relevant local authority should be consulted. The requirement for an archaeological report may be identified within a planning condition, if appropriate, for the site.

- **Ecology.** There may be a requirement for a detailed ecological report, dependant on the type or size of the development, or due to evidence identified during the site reconnaissance or desk study. This requirement may be identified within a planning condition, or recommended within Section 7.0.

8.0 REFERENCES

8.1 CLR 3, '*Documentary research on industrial sites*', Report by RPS Consultants Ltd, DoE, 1994

8.2 CLR 11, '*Model Procedures for the Management of Land Contamination*' Report by Defra and the Environment Agency, 2004

8.3 BS 10175: 2011 '*Investigation of potentially contaminated sites. Code of practice*', British Standards Institute, 2011

8.4 GPLC1, *'Guiding principles for land contamination'*, Environment Agency, 2010

8.5 CLR 2, '*Guidance on preliminary site inspection of contaminated land*', Report by Applied Environmental, DoE, 1994

8.6 British Geological Survey website, Geology of Britain Viewer, http://mapapps.bgs.ac.uk/geologyofbritain/home.html

8.7 HPA-RPD-033, '*Indicative Atlas of Radon in England and Wales*', Health Protection Agency, 2007

8.8 BR211, '*Radon: Protective measures for new dwellings*'. BRE, 2007

8.9 C552, '*Contaminated Land Risk Assessment, A Guide to Good Practice*', CIRIA, 2001

8.10 Multi-Agency Geographic Information for the Countryside website, http://www.magic.gov.uk

8.11 Standards, *'Land Quality – Managing Ground Conditions'*, Chapter 4, NHBC, 2010

8.12 The Environmental Protection Act, Part IIA, Section 78, 1990

8.13 Environment Act 1995, Section 57, DoE, 1995

8.14 Water Environment and Water Services (Scotland) Act, 2003

8.15 Planning Policy Statement 23: Planning and Pollution Control, ODPM, 2004

8.16 Science Report SC050021/SR2, '*Human health toxicological assessment of contaminants in soil*'. Environment Agency, 2009

8.17 Science Report SC050021/SR3, '*Updated technical background to the CLEA model*'. Environment Agency, 2009

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APPENDIX 1

DRAWINGS