

Castledine Environmental

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Phase 1 Land Contamination Risk Assessment

for

Discharge of Planning Conditions on a Pre-Proposal Development

on the site of

Hollytree Farm, Main Street, Oxton, Nottingham NG25 0SQ

Date: June 2020

Status: Final Report

Reference: 1559D Hollytree - Oxton

Date: 13/06/2020

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EXECUTIVE SUMMARY

The site is currently occupied by a dwelling, parking area, bricked barns, a dilapidated timber barn and a lawned garden area.

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a LOW risk with respect to the proposed development.

It is not envisaged any further testing will be required.

It is recommended that remediation in-line with section 11.0 is undertaken

It is recommended that the asbestos roofed barn on site should be subject to an asbestos survey and then removal by appropriately qualified personal prior to any demolition or redevelopment occurring in order to ensure site works do not cause future contamination of the site.

It is not envisaged any further testing will be required.

A watching brief (as outlined in Appendix E) should be had during the course of demolition, site clearance and construction works for any obvious contamination (e.g. oil spillage in ground, buried waste, possible asbestos containing material) development should stop and Castledine Environmental should be contact to determine if further assessment or changes to the remediation scheme are required.

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1.0 QUALITY ASSURANCE

Castledine Environmental. confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental. would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine Environmental.

Kevin Castledine

(Proprietor)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental. assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine Environmental. have been appointed by Lynette Swinburn of Savills to undertake a Phase 1 Desk study on land at Hollytree Farm, Main Street, Oxtun, Nottingham, NG25 0SQ.

4.0 SCOPE

Castledine Environmental. have prepared this report for the sole use and reliance of Lynette Swinburn and her appointees for the purpose of ensuring compliance with:

- paragraph 170, 178, & 179 of the National Planning Policy Framework 2018,
- part C1 of the building regulations.

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine Environmental.

The report consists of a preliminary risk assessment in accordance with BS10175:2011+A2:2017 and CLR11 "Model Procedures for the Management of Land Contamination".

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment.
- To characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities.
- To assess historical and current surrounding land use in relation to known or potential off site contamination issues that may impact on the subject site and
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in the village of Oxton, Nottingham at National Grid Reference 462806,351036 and is approximately 0.14ha in area.

The site is rectangular in shape and orientated east to west. The site is directly bounded by Main Street to the west, field to the north and adjacent dwellings and gardens to east and south. The immediate surroundings are residential with the areas beyond this predominantly agricultural.

The site interior comprises a gravelled parking area, dwelling, bricked barn and bricked lean-to barns, a dilapidated timber barn and a lawned garden area.

The gravelled parking area is located in the western extent of site, directly off Main Street via a gate. A brick built, concrete floored and pottery roofed barn is located directly east from the car parking area with entry via large doubled doors. The dwelling on site is located directly south of the parking area. The dwelling was noted to be rendered brick with tiled roofing.

Access to the eastern extent of site is via a pathway located north of the brick barn. A second barn extends westwards from the brick-built barn with 4 No. stables and entries noted here. The base of these stables was seen to be loose soil and brick. At the far western extent of this building is a small lean-to barn which is orientated north to south and constructed of brick with potentially asbestos containing roofing materials.

To the south of these barns lies a third barn which was seen to be in a poor state of disrepair. This was seen to be constructed of cinder block, stone, concrete flooring with a timber structure and corrugated metal roofing.

The remainder of site is occupied by a well-maintained, healthy in appearance lawned garden area in the far western extent of site. Small concrete pads which formerly had pillars for a Dutch barn were noted in this area. A telegraph pole was noted in the far south eastern corner of site.

The potentially asbestos containing roofing materials on site are considered a potential contaminant source. Topographically the site is level.

Photos of the site are present in Appendix C

6.0 REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA

An environmental search listing historical and environmental factors likely to affect the property has been reviewed.

The most pertinent information is summarised in the following sections.

A copy is presented in Appendix A

Additional geological and hydrological data was obtained from the British Geological Survey.

6.1 HYDROLOGICAL

6.1.1 AQUIFER

6.1.1.1 SUPERFICIAL GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	75m	SE	Secondary (Undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	156	SE	Secondary B	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers

6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES

The Groundsure report records no groundwater, surface water or potable water abstraction licences held within 250m of site.

6.1.3 SOURCE PROTECTION ZONE

The Groundsure report records the site as being directly within a Type 3 Total Catchment with an additional Type 3 record located 183m north.

6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL

ū	location	Summary	Soil / Surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: <300mm/year	Vulnerability: High Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: High Aquifer type: Principal Flow mechanism: Well connected fractures
2	21m S	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: <300mm/year	Vulnerability: High Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: High	Vulnerability: High Aquifer type: Principal Flow mechanism: Well connected fractures
3	26m S	Summary Classification: Principal bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Intermediate Infiltration value: >70% Dilution value: <300mm/year	Vulnerability: High Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: High	Vulnerability: High Aquifer type: Principal Flow mechanism: Well connected fractures
4	44m NW	Summary Classification: Principal bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: <300mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: High Aquifer type: Principal Flow mechanism: Well connected fractures

6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records an unnamed, underground watercourse located 8m south of site. Further above ground records are located 37m, 170m, 194m (2 No. records) and 201m south west and 106m and 107m east of site.

6.1.6 DISCHARGE CONSENTS

ID	Distance (m)	Direction	Address	Description
1	34	SW	Nottingham Road Pumping Station	Effluent Type: Sewage DISCHARGES – Sewer Storm OVERFLOW – Water Company Permit Number: T/64/09313/O Permit Version: 1 Receiving Water: Oxton Dumble Issue date: 14/08/1984 Effective Date: 14/08/1984

6.2 PERMITTED PROCESSES

None within 250m of site.

6.3 POLLUTION INCIDENTS

ID	Distance (m)	Direction	Details	Impact
3	286	W	Incident Date: 20/02/2004 Incident Identification: 218247 Pollutant: Inorganic Chemicals/Products Pollutant Description: Other Inorganic Chemical or Product	Water Impact: Category 2 (Significant) Land Impact: Category 2 (Significant) Air Impact: Category 3 (Minor)

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS

None within 250m of site.

6.5 WASTE

6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)

None within 250m of site.

6.5.2 LANDFILL SITES

None within 250m of site.

6.6 HAZARDOUS SUBSTANCES

None within 250m of site.

6.7 ECOLOGICAL RECEPTORS

The Groundsure report records the site as being directly within the Derby and Nottingham Greenbelt and the Dover Beck Catchment (tributary of the Trent) surface water Nitrate Vulnerable Zone (NVZ) and the Nottinghamshire groundwater NVZ.

6.8 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC 2020" obtained from <http://www.bgs.ac.uk/data/mapViewers/home.html> under the [Open Government Licence](#)

6.8.1 SUPERFICIAL DEPOSITS

The Groundsure report records no superficial deposits on or within 250m of site.

BGS geological mapping indicates superficial deposits of Alluvium located on site, comprising clays, silts and sands.

6.8.2 BEDROCK

The Groundsure report records bedrock geology of Triassic Rocks (Undifferentiated) underlying site, comprising interbedded sandstone and conglomerate.

BGS geological mapping indicates bedrock geology of the Chester Formation underlying site, comprising a gravelly, pebbly sandstone.

The BGS states that this formation shows a progressive change in lithology northwards from Devon as a coarse-grained, typically well-cemented proximal facies to a fin-grained, less well-cemented distal facies in Lancashire. In Nottinghamshire, the formation comprises pinkish red or buff-grey, medium- to coarse-grained, pebbly, cross-bedded, friable sandstone.

6.8.3 ARTIFICIAL GROUND

BGS geological mapping indicates no artificial deposits or made ground records mapped within 250m of site.

6.8.4 COAL MINING

The site is in a coal mining reporting area. National Coal Authority interactive mapping indicates the site is not within a development high risk area, area of known or probable shallow coal workings, area of past or current opencast/surface mining nor within proximity to any coal outcrops or mine entries.

6.8.5 RADON

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protective measures are necessary as described in publication BR211:2015 by the Building Research Establishment

6.9 AERIAL PHOTOGRAPHY

Aerial photography shows the following

6.9.1 BING

Site is shown as occupied by the dwelling, barns and garden as seen on the site walkover. A series of small pillars/posts/pads casting small shadows can be seen in a rectangular shape in the eastern garden area. The field to the north shows some vegetation die back and a line through the field, indicating a possible service ditch.

6.9.2 GOOGLE MAPS

Site is shown as occupied by the dwelling, barns and garden as seen on the site walkover. The pillars or posts in the eastern garden area are still visible are this time but appear to be small concrete pads with no shadows seen. The field to the north shows no vegetation die back with no potential service ditch seen.

6.9.3 GOOGLE EARTH

9 No. images are held in the historic imagery dataset, as follows:

Date	Description
31/12/1999	Site is shown as occupied by the dwelling, parking area, garden, bricked barns, and the southern timber barn at this time. A possible vehicle parked in this area. The garden area to the west shows no sign of the former barn supports.
31/12/2000	No discernible change on site.
07/09/2004	The vehicle parked to the rear (west) the buildings on site is no longer present.
19/04/2007	The eastern garden area now has the remnant barn supports seen in the far western extent.
31/12/2010	No discernible change on site.
26/05/2012	The circular features in the eastern garden area are no longer show, the concrete pads for the demolished remain.
10/03/2015	No discernible change on site.
18/07/2017	The parking area has been gravelled at this time.
29/03/2019	No discernible change on site.
21/09/2019	The dilapidated barn south of the bricked barns is clearly in a state of disrepair at this time, with the roof misaligned with its base. The

6.9.4 ENVIRONMENTAL SEARCH

Date	Description
18/06/1999	Site is shown as occupied by the dwelling, barns and garden as seen on the site walkover.
20/10/2010	A possible vehicle is parked to the east of the barns. The concrete pads/pillars or posts are now seen in the eastern garden area.
29/03/2012	No discernible change on site.
08/05/2016	No discernible change on site.
29/03/2019	No discernible change on site.

6.10 GOOGLE STREET VIEW

Imagery is dated May of 2016 with the site viewed from Main Street, facing east. The gravelled carparking area, dwelling and red bricked, western-most barn can be clearly seen.

6.11 HISTORIC MAPPING

The following historic maps have been reviewed as part of this assessment. Castledine Environmental do not hold a license for the reproduction and/or distribution of this data.

Map	Onsite	Offsite
OS County Series: Nottinghamshire, 1884-1885, 1:10,560	Site appears to be occupied by a building in the approximate area of the current day, western-most brick barn.	Surrounding areas predominantly agricultural. Dwellings are located directly south and west of site.
OS County Series: Nottinghamshire, 1885, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: Nottinghamshire, 1900-1901, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: Nottinghamshire, 1900, 1:2,500	An additional building has been built north of the initial building at this time.	Surrounding areas see little site relevant change.

Map	Onsite	Offsite
OS County Series: Nottinghamshire, 1915, 1:2,500	The site layout now matches that seen on the site walkover. With the dwelling, brick barns located on site. The timber barn is not present currently.	Surrounding areas see little site relevant change.
OS County Series: Nottinghamshire, 1920-1921, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS Plan, 1955, 1:10,560	No discernible change on site.	The village of Oxton to the north as seen some extension southwards, A building has been erected directly west of site in the area of the current day pub.
OS Plan, 1959-1964, 1:2,500	No discernible change on site.	A glasshouse is now located approx. 50m north east of site. Further housing development to the north and north east of site.
OS Plan, 1967, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS Plan, 1980-1987, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.

6.12 CURRENT LAND USE DATA

ID	Distance [m]	Direction	Company	Activity	Category
2	186	W	L R Servicing	Vehicle repair, servicing and testing	Repair and servicing

6.13 PETROL AND FUEL SITES

None within 250m of site.

6.14 HISTORICAL PETROL AND FUEL SITE DATABASE

None within 250m of site.

6.15 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

None within 250m of site.

6.16 HISTORICAL TANK DATABASE

None within 250m

6.17 HISTORICAL ENERGY FACILITIES

None within 250m of site.

7.0 POLLUTANT LINKAGE ASSESSMENT

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

The following sections discuss all the identified potential on and off site sources, pathways and receptors in the context of the proposed development and plausible pollutant linkages which may represent a risk to identified receptors from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

7.1 SOURCES

The following potential sources of contamination have been identified.

7.1.1 ONSITE

- Unknown use/storage in the buildings
- Unknown agricultural practises e.g. barns
- Potentially asbestos containing roofing materials on lean-to barn

7.1.2 OFFSITE

- Vehicle garage 186m west

7.2 PATHWAYS

A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development are identified as follows:

- Ingestion;
- Skin contact;
- Inhalation;
- Plant uptake,
- Direct contact by buried structures;
- Leaching of soluble contamination into groundwater

7.3 RECEPTORS

Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminant(s).

- Human Health
 - Current users of the site;
 - Future users of the site;
 - Users of neighbouring sites;
 - Construction workers; and
 - Services personnel working in trenches.
- Construction Materials

- Buried concrete, which may be affected by high concentrations of sulphate and/or low pH, in the soils and groundwater underlying the site; and
- Buried water pipes.
- Controlled Waters
- Ecological Receptors
- Flora and fauna using the proposed development

8.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) is a hypothesis of the nature and sources of contamination, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist. It creates a plausible source-pathway-receptor pollutant linkage (hazard), set within the context of the ground and proposed end use of the site.

8.1 PRELIMINARY CONCEPTUAL SITE MODEL

8.1.1 SOIL CONTAMINATION

Site is currently occupied by a dwelling, parking area, bricked barns, a dilapidated timber barn and a lawned garden area.

Although unlikely, historic agricultural practices have the potential to have contaminated the site with various substances including

- Metals and metalloids
- Asbestos
- pesticides

8.1.2 HAZARDOUS GROUND GAS AND VAPOURS

Geological mapping indicates records of Alluvium on and nearby site, the deposits often have an organic component and can produce hazardous ground gasses.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils	Direct Ingestion & Direct Contact	Site Workers	Li	Md	M	Site workers to wear appropriate PPE for health and safety reasons
Contaminated Soils	Inhalation of Dust	Site Workers	Li	Md	M	
Contaminated Soils	Direct Ingestion & Direct Contact	End Users	UI	Md	L	No off-site potential sources of contamination have been identified. Soil bases noted within the stables are considered potentially contaminated, these areas should be excavated to 600mm and replaced with 600mm of clean material or encapsulated beneath hardstanding or the proposed building footprint.
Contaminated Soils	Inhalation of Dust	End Users	UI	Md	L	
Contaminated Soils	Direct Ingestion	Flora and Fauna	UI	Md	L	
Contaminated Soils	Vertical and lateral migration	Controlled Waters	UI	Md	L	
Contaminated Soils	Direct contact	Services	UI	Md	L	
Ground Gases (Methane and CO ₂)	Vertical and lateral migration	End Users & Building Envelope	Li	Md	M	Records of alluvium are present both on and nearby site, therefore installation of ground gas protection measures inline with BS8485:2015+A1-2019 to CS2 is recommended.
Volatile and Semi-volatile Organic Compounds	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	No potential sources of ground vapour generation have been identified.
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	Site is not in a Radon Affected Area.

KEY: Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, UI = Unlikely
 Consequence Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor,
 Overall Risk VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision making. It should be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in Table 2, can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

TABLE 2. RISK CLASSIFICATION MATRIX

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High risk	Moderate Risk	Moderate/ Low Risk
	Likely (Li)	High risk	Moderate Risk	Moderate/Lo w Risk	Low Risk
	Low Likelihood (Lw)	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
	Unlikely (UI)	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the last three columns of Table 1.

TABLE 3. CLASSIFICATION OF RISK

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

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

9.0 ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** level of risk with respect to the proposed development.

It is recommended that remediation in-line with section 11.00 undertaken

It is recommended that the asbestos roofed barn on site should be subject to an asbestos survey and then removal by appropriately qualified personal prior to any demolition or redevelopment occurring in order to ensure site works do not cause future contamination of the site.

10.0 SUMMARY OF RISKS

10.1.1 SOIL CONTAMINATION

No off-site sources of potential contamination have been identified. While the majority of site is considered to be of low risk in relation to contamination. However, areas of soil bases noted within the bricked barns are potentially hazardous.

10.1.2 GROUND GASSES AND VAPOURS

Records of alluvium are present both on and nearby site, alluvium often has an organic or peaty component, and this can produce hazard ground gasses. RB17 'A Pragmatic Approach To Ground Gas Assessment' states:

'Sites on Alluvial soils do not generate sufficient hazardous gas flows to exceed Characteristic Situation 2 as defined in BS 8485: 2007 (this has been demonstrated by monitoring under floor venting systems - Wilson and Card, 1999). Therefore, if gas monitoring is not undertaken it is acceptable to simply install Characteristic Situation 2 protection on sites where Alluvial soils are present.'

As such, the alluvium deposits located on and nearby site are considered a potential hazard.

Installation of ground gas protection measures to Characteristic Situation 2, inline with BS8485:2015+A1-2019 is recommended in any proposed development.

11.0 RECOMMENDATIONS

As a precaution, should the soil bases located within the stables be situated within proposed soft landscaping, these areas should be excavated to at least 600mm and replaced with a minimum of 600mm of certified, clean materials; or these areas should be encapsulated below the proposed building footprint or under hardstanding.

Potential sources of hazardous ground gasses have been identified, as such installation of ground gas protection measures to Characteristic

Situation 2, inline with BS BS8485:2015+A1-2019 is recommended in any proposed development.

A watching brief (as outlined in Appendix E) should be had during the course of demolition, site clearance and construction works for any obvious contamination (e.g. oil spillage in ground, buried waste, possible asbestos containing material) development should stop and Castledine Environmental should be contact to determine if further assessment or changes to the remediation scheme are required.

It is recommended that the asbestos roofed barn on site should be subject to an asbestos survey and then removal by appropriately qualified personal prior to any demolition or redevelopment occurring in order to ensure site works do not cause future contamination of the site.

The findings of this report should be discussed with the Local Planning Authority / Local Council Contaminated Land Officer prior to submission inline with section 5.2.4 of BS10175 so that a Phase 3 remediation scheme and verification plan can be drafted.

12.0 FURTHER ENVIRONMENTAL INVESTIGATION

It is not envisaged that further testing or work will be required.

13.0 REFERENCES

13.1 LEGISLATION AND REGULATIONS

13.1.1 ACTS

- [1] Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

13.1.2 PLANNING REGULATIONS

- [2] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293
- [3] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

13.1.3 CONTAMINATED LAND REGULATIONS

- [4] The Contaminated Land (England) Regulations 2000. SI2000/No.227
- [5] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663
- [6] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

13.2 STATUTORY GUIDANCE

- [7] Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. Department of Environment, Food and Rural Affairs
- [8] Communities and local Government, 2018: National Planning Policy Framework.

13.3 BRITISH STANDARDS

- [9] BS 5930:2015 Code of practice for site investigations
- [10] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice
- [11] BS 8485:2015+A1:2019 BS 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- [12] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

13.4 NON STATUTORY TECHNICAL GUIDANCE

13.4.1 ENVIRONMENT AGENCY

- [13] Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

13.4.2 CIRIA PUBLICATIONS

- [14] Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association
- [15] Mallett, H., Cox, L., Wilson, S. and ,Corban M... 2014, *C 735 Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* London: Construction Industry Research and Information Association

13.4.3 CL:AIRE

- [16] Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17.* CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

14.0 APPENDICES


APPENDIX A

ENVIRONMENTAL SEARCH

APPENDIX B

CURRENT SITE PLANS



Rev	Date	Scale	Size				
Project	Holly Tree Farm, Oxton	JAN 19	1:200	A3			
Drawing Title	Existing Site Plan	Project No.	1813 (1)	Draw No.	003	Rev.	-
© Alex McIntyre Architects, The Studio, 1 Clarendon Terrace, Derby Road, Notts, NG2 1LY, www.oxonarch.co.uk, T:0115 959977							

APPENDIX C

SITE PHOTOS AND LOCATIONS

Castledine Environmental
Land Contamination Survey Specialists

Site Walkover Photos

Address: Hollytree Farm, Main Street, Oxton
Client: Lynette Swinburn

Photo No.3: Concrete flooring noted within green doored barn.

Photo No.4: Facing south west showing eastern face of barns.



Castledine Environmental
Land Contamination Survey Specialists

Site Walkover Photos

Address: Hollytree Farm, Main Street, Oxton
Client: Lynette Swinburn

Photo No.5: Soiled base in northern extent of brick barns.

Photo No.6: Soiled base in northern extent of brick barns.



Castledine Environmental
Land Contamination Survey Specialists

Site Walkover Photos

Address: Hollytree Farm, Main Street, Oxton
Client: Lynette Swinburn

Photo No.7: Soiled base in northern extent of brick barns.

Photo No.8: Soiled base in northern extent of brick barns.



Castledine Environmental
Land Contamination Survey Specialists

Site Walkover Photos

Address: Hollytree Farm, Main Street, Oxton
Client: Lynette Swinburn

Photo No.9: Facing north west toward dilapidated southern timber barn.

Photo No.10: Concrete flooring noted within dilapidated timber barn.



Castledine Environmental
Land Contamination Survey Specialists

Site Walkover Photos

Address: Hollytree Farm, Main Street, Oxton

Client: Lynette Swinburn

Photo No.11: Facing east showing south eastern corner of site.

Photo No.12: Facing NW from SE corner of site showing garden area.



APPENDIX D SOIL SCREENING CRITERIA

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Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
Default Suite																			
Arsenic	C4SL			40			37			49			640			79			170
Beryllium	S4UL			1.7			1.7			35			12			2.2			63
Boron	S4UL			290			11000			45			240000			21000			46000
Cadmium	C4SL			22			150			3.9			410			220			880
Chromium (III)	S4UL			910			910			18000			8600			1500			33000
Chromium (VI)	C4SL			21			21			170			49			21			250
Copper	S4UL			2400			7100			520			68000			12000			44000
Lead	C4SL			310			200			80			2330			630			1300
Mercury Elemental	S4UL			1.2			1.2			21			58 ^{VAP} (25.8)			16			30 ^{VAP} (25.8)
Mercury inorganic	S4UL			40			56			19			1100			120			240
Mercury methyl	S4UL			11			19			6			320			40			68
Nickel	S4UL			180			180			230			980			230			3400
Selenium	S4UL			250			430			88			12000			1100			1800
Vanadium	S4UL			410			1200			91			9000			2000			5000
Zinc	S4UL			3700			40000			620			730000			81000			170000
Phenol	S4UL	280	550	1100	750	1300	2300	66	140	280	760 ^{DIR} (31000)	1500 ^{DIR} (35000)	3200 ^{DIR} (37000)	760 ^{DIR} (11000)	1500 ^{DIR} (11000)	3200 ^{DIR} (11000)	760 ^{DIR} (8600)	1500 ^{DIR} (9700)	3200 ^{DIR} (11000)
Acenaphthene	S4UL	3000 ^{SOL} (57)	4700 ^{SOL} (141)	6000 ^{SOL} (336)	210	510	1100	34	85	200	84000 ^{SOL} (57.0)	97000 ^{SOL} (141)	100000	15000	15000	15000	29000	30000	30000
Acenaphthylene	S4UL	2900 ^{SOL} (86.1)	4600 ^{SOL} (212)	6000 ^{SOL} (506)	170	420	920	28	69	160	83000 ^{SOL} (86.1)	97000 ^{SOL} (212)	100000	15000	15000	15000	29000	30000	30000

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
Anthracene	S4UL	31000 ^{VAP} (1.17)	35000	37000	2400	5400	11000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000
Benz(a)anthracene	S4UL	11	14	15	7.2	11	13	2.9	6.5	13	170	170	180	29	29	29	49	56	62
Benzo(a)pyrene	S4SL	3.2	3.2	3.2	2.2	2.7	3.0	0.97	2.0	3.5	35	35	36	5.7	5.7	5.7	11	12	13
Benzo(b)fluoranthene	S4UL	3.9	4.0	4.0	2.6	3.3	3.7	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16
Benzo(ghi)perylene	S4UL	360	360	360	320	340	350	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600
Benzo(k)fluoranthene	S4UL	110	110	110	77	93	100	37	75	130	1200	1200	1200	190	190	190	370	410	440
Chrysene	S4UL	30	31	32	15	22	27	4.1	9.4	19	350	350	350	57	57	57	93	110	120
Dibenz(ah)anthracene	S4UL	0.31	0.32	0.32	0.24	0.28	0.3	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4
Fluoranthene	S4UL	1500	1600	1600	280	560	890	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400
Fluorene	S4UL	2800 ^{SOL} (30.9)	3800 ^{SOL} (76.5)	4500 ^{SOL} (183)	170	400	860	27	67	160	63000 ^{SOL} (30.9)	68000	71000	9900	9900	9900	20000	20000	20000
Indeno(123cd)pyrene	S4UL	45	46	46	27	36	41	9.5	21	39	500	510	510	82	82	82	150	170	180
Naphthalene	S4UL	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 ^{SOL} (76.4)	460 ^{SOL} (183)	1100 ^{SOL} (432)	4900	4900	4900	1200 ^{SOL} (76.4)	1900 ^{SOL} (183)	3000
Phenanthrene	S4UL	1300 ^{SOL} (36)	1500	1500	95	220	440	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300
Pyrene	S4UL	3700	3800	3800	620	1200	2000	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000
TPH fractions																			
TPH ali EC05-EC06	S4UL	42	78	160	42	78	160	730	1700	3900	3200 ^{SOL} (304)	5900 ^{SOL} (558)	12000 ^{SOL} (1150)	570000 ^{SOL} (304)	590000	600000	95000 ^{SOL} (304)	130000 ^{SOL} (558)	180000 ^{SOL} (1150)
TPH ali >EC06-EC08	S4UL	100	230	530	100	230	530	2300	5600	13000	7800 ^{SOL} (144)	17000 ^{SOL} (322)	40000 ^{SOL} (736)	600000	610000	620000	150000 ^{SOL} (144)	220000 ^{SOL} (322)	320000 ^{SOL} (736)
TPH ali >EC08-EC10	S4UL	27	65	150	27	65	150	320	770	1700	2000 ^{SOL} (78)	4800 ^{VAP} (190)	11000 ^{VAP} (451)	13000	13000	13000	14000 ^{SOL} (78)	18000 ^{VAP} (190)	21000 ^{VAP} (451)

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
TPH ali >EC10-EC12	S4UL	130 ^{VAP} (48)	330 ^{VAP} (118)	770 ^{VAP} (283)	130 ^{VAP} (48)	330 ^{VAP} (118)	760 ^{VAP} (283)	2200	4400	7300	9700 ^{SOL} (48)	23000 ^{VAP} (118)	47000 ^{VAP} (283)	13000	13000	13000	21000 ^{SOL} (48)	23000 ^{VAP} (118)	24000 ^{VAP} (283)
TPH ali >EC12-EC16	S4UL	1100 ^{SOL} (24)	2400 ^{SOL} (59)	4400 ^{SOL} (142)	110 ^{SOL} (24)	2400 ^{SOL} (59)	4300 ^{SOL} (142)	11000	13000	13000	59000 ^{SOL} (24)	82000 ^{SOL} (59)	90000 ^{SOL} (142)	13000	13000	13000	25000 ^{SOL} (24)	25000 ^{SOL} (59)	26000 ^{SOL} (142)
TPH ali >EC16-EC35	S4UL	65000 ^{SOL} (8.48)	92000 ^{SOL} (21)	110000	65000 ^{SOL} (8.4)	92000 ^{SOL} (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
TPH ali >EC35-EC44	S4UL	65000 ^{SOL} (8.48)	92000 ^{SOL} (21)	110000	65000 ^{SOL} (8.48)	92000 ^{SOL} (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
TPH aro EC05-EC07	S4UL	370	690	1400	70	140	300	13	27	57	26000 ^{SOL} (1220)	46000 ^{SOL} (2260)	86000 ^{SOL} (4710)	56000	56000	56000	76000 ^{SOL} (1220)	84000 ^{SOL} (2260)	92000 ^{SOL} (4710)
TPH aro >EC07-EC08	S4UL	860	1800	3900	130	290	660	22	51	120	56000 ^{VAP} (869)	110000 ^{SOL} (1920)	180000 ^{VAP} (4360)	56000	56000	56000	87000 ^{VAP} (869)	95000 ^{SOL} (1920)	100000 ^{VAP} (4360)
TPH aro >EC08-EC10	S4UL	47	110	270	34	83	190	8.6	21	51	3500 ^{VAP} (613)	8100 ^{VAP} (1500)	17000 ^{VAP} (3580)	5000	5000	5000	7200 ^{VAP} (613)	8500 ^{VAP} (1500)	9300 ^{VAP} (3580)
TPH aro >EC10-EC12	S4UL	250	590	1200	74	180	380	13	31	74	16000 ^{SOL} (364)	28000 ^{SOL} (899)	34000 ^{SOL} (2150)	5000	5000	5000	9200 ^{SOL} (364)	9700 ^{SOL} (899)	10000
TPH aro >EC12-EC16	S4UL	1800	2300 ^{SOL} (419)	2500	140	330	660	23	57	130	36000 ^{SOL} (169)	37000	38000	5100	5100	5000	10000	10000	10000
TPH aro >EC16-EC21	S4UL	1900	1900	1900	260	540	930	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800
TPH aro >EC21-EC35	S4UL	1900	1900	1900	1100	1500	1700	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900
TPH aro >EC35-EC44	S4UL	1900	1900	1900	1100	1500	1700	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900
TPH >EC44-EC70	S4UL	1900	1900	1900	1600	1800	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900
VOCs - BTEX & MTBE																			
Benzene	C4SL			0.87			3.3			0.18			98			140			230

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
Toluene	S4UL	880 ^{VAP} (869)	1900	3900	130	290	660	22	51	120	56000 ^{VAP} (869)	110000 ^{VAP} (1920)	180000 ^{VAP} (4360)	56000	56000	56000	100000 ^{VAP} (869)	100000 ^{VAP} (192)	100000 ^{VAP} (4360)
Ethylbenzene	S4UL	83	190	440	47	110	260	16	39	91	570 ^{VAP} (518)	13000 ^{VAP} (1220)	27000 ^{VAP} (2840)	24000	24000	25000	17000 ^{VAP} (518)	22000 ^{VAP} (1220)	27000 ^{VAP} (2840)
Xylene, o-	S4UL	88	210	480	60	140	330	28	67	160	6600 ^{VAP} (478)	15000 ^{SOL} (1120)	33000 ^{SOL} (2620)	41000	42000	43000	17000 ^{SOL} (478)	24000 ^{SOL} (1120)	33000 ^{SOL} (2620)
Xylene, m-	S4UL	82	190	450	59	140	320	31	74	170	6200 ^{VAP} (625)	14000 ^{VAP} (1470)	31000 ^{VAP} (3460)	41000	42000	43000	17000 ^{VAP} (625)	24000 ^{VAP} (1470)	32000 ^{VAP} (3460)
Xylene, p- (use this for combined m & p)	S4UL	79	180	430	59	130	310	29	69	160	5900 ^{SOL} (576)	14000 ^{SOL} (1350)	30000 ^{SOL} (3170)	41000	42000	43000	17000 ^{SOL} (576)	23000 ^{SOL} (2620)	31000 ^{SOL} (3170)
VOCs – chlorobenzenes																			
Chlorobenzene	S4UL	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 ^{SOL} (675)	2000 ^{SOL} (1520)	2900
1,2-Dichlorobenzene	S4UL	24	57	130	23	55	130	94	230	540	2000 ^{SOL} (571)	4800 ^{SOL} (1370)	11000 ^{SOL} (3240)	90000	95000	98000	24000 ^{SOL} (571)	36000 ^{SOL} (1370)	51000 ^{SOL} (3240)
1,3-Dichlorobenzene	S4UL	0.44	1.1	2.5	0.4	1	2.3	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470
1,4-Dichlorobenzene	S4UL	61	150	350	61	150	350	15	37	88	4400 ^{VAP} (224)	10000 ^{VAP} (540)	2500 ^{VAP} (1280)	17000	17000	17000	36000 ^{VAP} (224)	36000 ^{VAP} (540)	36000 ^{VAP} (1280)
Hexachlorobenzene	S4UL	4.1 ^{VAP} (0.2)	5.7 ^{VAP} (0.5)	6.7 ^{VAP} (1.2)	1.8 ^{VAP} (0.2)	3.3 ^{VAP} (0.5)	4.9	0.47	1.1	2.5	110 ^{VAP} (0.2)	120	120	16	16	16	30	30	30
Pentachlorobenzene	S4UL	19	30	38	5.8	12	22	1.2	3.1	7	640 ^{SOL} (43)	770 ^{SOL} (107)	830	100	100	100	190	190	190
1,2,3-trichlorobenzene	S4UL	1.5	3.7	8.8	1.5	3.6	8.6	4.7	12	28	102	250	590	1800	1800	1800	770 ^{VAP} (134)	1100 ^{VAP} (330)	1600 ^{VAP} (789)
1,2,4-trichlorobenzene	S4UL	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 ^{VAP} (318)	2600 ^{VAP} (786)	4000 ^{VAP} (1880)

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
1,3,5-trichlorobenzene	S4UL	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 ^{VAP} (36.7)	580 ^{VAP} (90.8)	860 ^{VAP} (217)
1,2,3,4-tetrachlorobenzene	S4UL	24	56	120	15	36	78	4.4	11	26	1700 ^{VAP} (122)	3080 ^{VAP} (304)	4400 ^{VAP} (728)	830	830	830	1500 ^{VAP} (122)	1600	1600
1,2,3,5-tetrachlorobenzene	S4UL	0.75	1.9	4.3	0.66	1.6	3.7	0.38	0.90	2.2	49 ^{VAP} (39.4)	120 ^{VAP} (98.1)	240 ^{VAP} (235)	78	79	79	110 ^{VAP} (39)	120	130
1,2,4,5-tetrachlorobenzene	S4UL	0.73	1.7	3.5	0.33	0.77	1.6	0.06	0.16	0.37	42 ^{SOL} (19.7)	72 ^{SOL} (49.1)	96	13	13	13	25	26	26
VOCs - chloroalkanes & alkanes																			
Chloroethene (aka vinyl chloride)	S4UL	0.00077	0.0010	0.0015	0.00064	0.00087	0.0014	0.00055	0.0010	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4
1,2-Dichloroethane	S4UL	0.0092	0.013	0.023	0.0071	0.011	0.019	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28
Tetrachloroethene	S4UL	0.18	0.4	0.92	0.18	0.39	0.9	0.65	1.5	3.6	19	42	95	1400	1400	1400	810 ^{SOL} (424)	1100 ^{SOL} (951)	1500
1,1,1,2-Tetrachloroethane	S4UL	1.5	3.5	8.2	1.2	2.8	6.4	0.79	1.9	4.4	110	250	560	1400	1400	1400	1500	1800	2100
1,1,2,2-Tetrachloroethane	S4UL	3.9	8	17	1.6	3.4	7.5	0.41	0.89	2.0	270	550	1100	1400	1400	1400	1800	2100	2300
Tetrachloromethane	S4UL	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400
Trichloroethene	S4UL	0.017	0.036	0.080	0.016	0.034	0.075	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120
1,1,1-Trichloroethane	S4UL	9	18	40	8.8	18	39	48	110	240	660	1300	3000	140000	140000	140000	57000 ^{VAP} (1425)	76000 ^{VAP} (2915)	100000 ^{VAP} (6392)
Trichloromethane	S4UL	1.2	2.1	4.2	0.91	1.7	3.4	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100
Other phenols & chlorophenols																			
Chlorophenols	S4UL	0.87	2	4.5	94	150	210	0.13	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100
Pentachlorophenol	S4UL	27 ^{VAP} (16.4)	29	31	0.22	0.52	1.2	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120
Pesticides																			
Aldrin	S4UL	7.3	7.4	7.5	5.7	6.6	7.1	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
Atrazine	S4UL	610	620	620	3.3	7.6	17.4	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400
Dichlovos	S4UL	6.4	6.5	6.6	0.032	0.066	0.14	0.0049	0.010	0.022	140	140	140	16	16	16	26	26	27
Dieldrin	S4UL	7	7.3	7.4	0.97	2	3.5	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31
Endosulfan - alpha	S4UL	160 ^{VAP} (0.003)	280 ^{VAP} (0.007)	410 ^{VAP} (0.016)	7.4	18	41	1.2	2.9	6.8	5600 ^{VAP} (0.003)	7400 ^{VAP} (0.007)	8400 ^{VAP} (0.016)	1200	1200	1200	2400	2400	2500
Endosulfan - beta	S4UL	190 ^{VAP} (0.00007)	320 ^{VAP} (0.0002)	440 ^{VAP} (0.0004)	7	17	39	1.1	2.7	6.4	6300 ^{VAP} (0.00007)	7800 ^{VAP} (0.0002)	8700	1200	1200	1200	2400	2400	2500
Hexachlorocyclohexanes - alpha (inc. Lindane)	S4UL	6.9	9.2	11	0.23	0.55	1.2	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48
Hexachlorocyclohexanes - beta (inc. Lindane)	S4UL	3.7	3.8	3.8	0.085	0.2	0.46	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16
Hexachlorocyclohexanes - gamma (inc. Lindane)	S4UL	2.9	3.3	3.5	0.06	0.14	0.33	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15
Explosives																			
HMX	S4UL	6700	6700	6700	5.7	13	26	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 ^{VAP} (0.35)	23000 ^{VAP} (0.39)	24000 ^{VAP} (0.48)
RDX	S4UL	13000	13000	13000	120	250	540	17	38	85	210000	210000	210000	26000	26000	27000	49000 ^{SOL} (18.7)	51000	53000
2,4,6-Trinitrotoluene	S4UL	65	66	66	1.6	3.7	8.1	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270
Other organics																			
Carbon disulphide	S4UL	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700
Hexachloro-1,3-butadiene	S4UL	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51

VAP S4UL exceeds vapour saturation limit (presented in brackets)
 SOL S4UL exceeds solubility saturation limit (presented in brackets)
 DIR S4UL based on threshold protective of direct skin contact (value in brackets based on health effects of long term exposure)

APPENDIX E**WATCHING BRIEF**

It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ash materials, soils exhibiting strong odours, brightly coloured materials, and former demolition materials.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

1. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Client or their appointed agent who will in turn contact Castledine Environmental to request an engineer to visit the site to assess the extent of the 'contamination'.
2. Castledine Environmental shall make records of their inspection, and pass details of these to the Local Authority.
3. Where the conditions revealed differ from those previously anticipated, the Castledine Environmental shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
4. Depending on the results of the testing either:
 - a. no further work will be required;
 - b. a further detailed risk assessment will be required; and/or
 - c. Localised specific remedial measures will be necessary.
Appraisal criteria will vary depending on the nature of the assessment.
5. The results of any such testing will be sent to the Local Authority Pollution Control Section, Local Authority development control section, and the appointed building inspector. If remediation is required, the LA/Building inspector will be informed of the date and time of the proposed works.

6. Remediation will be undertaken in accordance with a method statement submitted for approval. The works shall be supervised where necessary by Castledine Environmental who shall provide a Verification Report for the Local Authorities.
7. A copy of the discovery strategy should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

