



**Castledine  
Environmental**

LAND CONTAMINATION SURVEYS

# **Phase 1 Land Contamination Risk Assessment**

for

## **Erection of 6 No. Dwellings Following Demolition of Existing Buildings**

on land to the north of

**White Hall Farm, Church Street,  
Kilham,  
East Riding of Yorkshire  
YO25 3RQ**

**Date: November 2021**

Status: Final Report

Reference: 3190D P1 Arundel - Kilham

Date: 17/11/2021

Tel: 01509 880399 Mob: 07779 305682 Email: [kevin@castledineenvironmental.co.uk](mailto:kevin@castledineenvironmental.co.uk)

4 Wymeswold Road, Hoton, Loughborough, Leicestershire, LE12 5SN

## EXECUTIVE SUMMARY

The site currently comprises a demolished barn, an intact barn and exterior areas comprising access routes, fielded areas and an area for materials storage. Historical agricultural practises (including a sheep-dip area) along with the development of the site and subsequent contemporary demolition works have the potential to have contaminated the site.

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

**It is recommended that further investigation inline with Section 11.0 be planned and carried out on site.**

**This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken.**

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 contacted 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

(Director)

## **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, geotechnical considerations 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 Mr. M. Arundel to undertake a Phase 1 Desk study on land to the north of White Hall Farm, Church Street, Kilham, East Riding of Yorkshire YO25 4RQ.

### 4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Mr. M. Arundel and his appointees for the purpose of ensuring compliance with:

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework 2021
- Part C1 of the building regulations
- Condition No.25 of the East Riding of Yorkshire Council planning approval reference DC/17/00898/OUT/EASTNN and 20/04117/REM

<https://newplanningaccess.eastriding.gov.uk/newplanningaccess/applicationDetails.do?activeTab=documents&keyVal=QL0PHSBJ0KG00>

*25. Development shall not begin until an investigation and risk assessment of land contamination has been completed by a competent persons and a report of the findings submitted to and approved in writing by the Local Planning Authority. This shall include an appropriate survey of the nature and extent of any contamination affecting the site, and an assessment of the potential risks to human health, controlled waters, property and ecological systems. Where unacceptable risks are identified, an appropriate scheme of remediation to make the site suitable for the intended use must also be submitted to and approved in writing by the local planning authority.*

*This condition is imposed to ensure that risks from land contamination to the futures users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other receptors.*

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, CLR11 “Model Procedures for the Management of Land Contamination” and LCRM “Land Contamination Risk Management”.

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 Kilham in the East Riding of Yorkshire at National Grid Reference: 506363,464505 and is approximately 0.51ha in area.

The site is irregular in shape and is orientated north to south. The site is located in a small village which is within a larger, predominantly agricultural area. The site is directly bounded by North Back Lane to the North, Church Street to the south and neighbouring dwellings and gardens to the south west and south east, with small paddocked or fielded areas located north west and north east.

The site interior comprises an access track, a demolished barn, an intact barn and exterior areas comprising hardstanding access routes and soft-



landscaping fielded areas. The site access track leads north off Church Street to the south and is tarmacked, before giving way to a gravelled access route which, when it reaches the main site area, is comprised of made ground rubbles and gravels. The site access track then crosses the central area of site and terminates at the northern boundary at North Back Lane. Adjacent and neighbouring dwellings are located to either side of the access track in the southern extent of site. In the main site area, north of the adjacent dwellings, an under-demolition timber framed barn was noted along the eastern boundary here. Evidence of former potentially asbestos containing roofing materials was noted scattered throughout this area along with refuse timbers. The flooring of this former barn was noted to be concrete. Materials storage was then noted in the south western corner of site and comprising brick pallets and timber. A second, intact barn was noted on the western boundary of site, with the interior noted to be concrete floored and the exterior corrugated material of PACM composition. The remainder of site is occupied by fielded areas which are located in the northern, north western, north eastern and eastern extents of site. Notable features here include a large spoil heap of scraped topsoil, which the client indicated was from the access-forming works. The heap was located in the south eastern corner of the main site area (see photo plan in appendices). Evidence of fires was noted adjacent to and just north of the spoil heap. A stack of potentially asbestos containing corrugated sheets was noted adjacent to the central area of the eastern boundary. The remaining features were 2 No. small pits excavated in the north eastern and north western corners of site. The pits showed topsoils atop residual bedrock gravels of chalk.

Topographically, the site access slopes upwards from the south to the north before levelling out at the main site area, which itself is level. Potential sources of contamination noted on the walkover include potentially asbestos containing materials noted on the barns, scattered over site and stacked along the eastern boundary; evidence of localised fires; made ground rubble access routes and the spoil heap arising from the access works. Photos of the site are present in Appendix D

## 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	0	On Site	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 nonaquifer in different locations due to the variable characteristics of the rock type
3	182	S	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 nonaquifer 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

**6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES**

None recorded within 250m of site.

**6.1.3 SOURCE PROTECTION ZONE**

The site is not located in a source protection zone (SPZ).

**6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL**

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one-kilometre square grid.

Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

ID	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: Intermediate Infiltration value: >70% Dilution value: <300mm/year	Vulnerability: High Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures
3	On site	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Intermediate Infiltration value: >70% Dilution value: <300mm/year	Vulnerability: High Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures

The Groundsure report also records the site as being within an area where significant soluble rocks are likely to be present, with the maximum percentage of grid square covered by maximum risk recorded as 69%. Problems are unlikely except with considerable surface or subsurface water flow. This data set identifies where solution features (i.e. within chalk or limestone) enable rapid movement of a pollutant may be present within a 1km grid square.

#### 6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records an unnamed, surface level watercourse located 3m south, 73m west and 132, 153m and 154m south east of site.

#### 6.1.6 DISCHARGE CONSENTS

None recorded within 250m of site.

**6.2 PERMITTED PROCESSES**

None recorded within 250m of site.

**6.3 POLLUTION INCIDENTS**

The Groundsure report records an incident located 117m east of site and dated 16/01/2003. The incident related to sewage materials with a Category 3 (minor) impact to air, land and water quality. No further pollution incidents are recorded within 250m of site.

**6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS**

None recorded within 250m of site.

**6.5 WASTE****6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)**

None recorded within 250m of site.

**6.5.2 LANDFILL SITES**

None recorded within 250m of site.

**6.6 HAZARDOUS SUBSTANCES**

None recorded within 250m of site.

**6.7 ECOLOGICAL RECEPTORS**

The Groundsure report records the site as being with the Yorkshire Chalk groundwaters nitrate vulnerable zone (NVZ) along with the River Hull from Arram Beck to Humber surface waters NVZ. The Groundsure report also records a Nitrate Sensitive Area located 47m north west of site and named Kilham.

**6.8 SOILS AND GEOLOGY**

"Contains British Geological Survey materials © NERC 2021" obtained from <http://www.bgs.ac.uk/data/mapViewers/home.html> under the [Open Government Licence](#)

**6.8.1 SUPERFICIAL DEPOSITS**

Both BGS geological mapping and the Groundsure report records superficial geological deposits of Glacial Sands and Gravels on site, comprising poorly sorted sandy, silty, sands, gravels and boulders.

**6.8.2 SUPERFICIAL DEPOSITS PERMEABILITY**

The Groundsure report records the site as within an area where the maximum permeability of superficial deposits is very high and the minimum permeability is high, facilitated by intergranular flow types.

This is a qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

**6.8.3 BEDROCK**

The Groundsure report records bedrock geology of the Flamborough Chalk Formation, comprising chalk. BGS geological mapping describes this formation as a white, well-bedded, flint-free chalk with common marl seams (typically about one per metre) with common stylolitic surfaces (serrated surfaces within a rock mass at which mineral material has been removed by pressure dissolution) and pyrite nodules.

**6.8.4 BEDROCK PERMEABILITY**

The Groundsure report records the site as being within an area where the maximum permeability of the bedrock is very high and the minimum is also very high, facilitated by fracture flow mechanisms.

This is a qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

**6.8.5 ARTIFICIAL GROUND**

Both BGS geological mapping and the Groundsure report record no artificial deposits located on or within 250m of site.

**6.8.6 NATURAL HAZARDS**

The Groundsure report records a very low risk from shrink-swell clays, running sands, collapsible deposits, landslide and ground dissolution of soluble rocks; and a negligible risk from compressible deposits.

**6.8.7 BGS ESTIMATED BACKGROUND SOIL CHEMISTRY**

The Groundsure report records BGS background soil chemistry for the site. This is the estimated values providing the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km<sup>2</sup>. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km<sup>2</sup>; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

The Groundsure report records arsenic, lead/bioaccessible lead, cadmium, chromium and nickel at background concentrations of 15mg/kg, 100mg/kg/60mg/kg, 1.8mg/kg, 60-90mg/kg and 15-30mg/kg, respectively.

Assuming a worst case GAC (generic acceptance threshold) of 1% SOM (soil organic matter), none of the recordings are above the generic acceptance thresholds of 37mg/kg, 200mg/kg (both lead and bioaccessible lead), 11mg/kg, 910mg/kg and 180mg/kg, respectively

**6.8.8 COAL MINING**

The site is not located in a coal mining reporting area.

**6.8.9 RADON**

The property is not located 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**

The site is shown as occupied by the access track leading north off Church Street before terminating at the main site area in the north. Evidence of a track can be seen extending from the termination of the access track through the fielded area to the secondary access on North Back Lane. An area of concrete or bare earth can be seen in the western / south west of the main site area of site, in the present-day area of materials storage. A patch of browned grass can be seen in the north eastern corner of site. The barn noted to be under demolition on the day of the walkover on the eastern boundary of site remains along with the barn located on the western boundary in the main site area.

**6.9.2 GOOGLE MAPS**

The site is shown as occupied by the access track leading north off Church Street before terminating at the main site area in the north. The main site area at this time is entirely occupied by vegetated and fielded areas. The barn noted to be under demolition on the day of the walkover on the eastern boundary of site remains along with the barn located on the western boundary in the main site area.

**6.9.3 GOOGLE EARTH**

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

Date	Description
December 2002	The site is shown as occupied by the access track leading north off Church Street before terminating at the main site area in the north. Evidence of the track continuing to the northern boundary can be seen leading through the fielded area in the north of site. The north to south orientated barn on the eastern boundary (seen to be under demolition on the day of the walkover) appears to be larger at this time, extending slightly westwards than that seen on the walkover.



Date	Description
December 2005	The linear barn along the eastern boundary has now been halved in size, with the western extent of the roofing appearing to have been removed.
May 2007	No major change on site.
April 2011	No major change on site.
July 2018	No major change on site.
August 2019	No major change on site.
September 2019	No major change on site.
March 2021	No major change on site.

#### 6.9.4 ENVIRONMENTAL SEARCH

Date	Description
03/07/1999	The site is shown as occupied by the access track leading north off Church Street before terminating at the main site area in the north. Evidence of the track continuing to the northern boundary can be seen leading through the fielded area in the north of site. The north to south orientated barn on the eastern boundary (seen to be under demolition on the day of the walkover) appears to be larger at this time, extending slightly westwards than that seen on the walkover.
23/09/2015	The linear barn along the eastern boundary has now been halved in size, with the western extent of the roofing appearing to have been removed.
10/10/2018	No major change on site.

#### 6.10 GOOGLE STREET VIEW

Google Street View imagery is dated September of 2011 with the site viewed off North Back Lane and facing south. The northern main site area including the fielded area can be made out along with the barn located on the western boundary. The remainder of site (the southern extent) cannot be viewed due to the sloping topography there, nor can the southern extent of site be viewed from the south due to its location at the end of a private access track.

**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 these maps.

<b>Map</b>	<b>Onsite</b>	<b>Offsite</b>
OS County Series: 1850, 1:10,560	The northern extent of site is unoccupied field with the southern extent occupied by an access track (as seen today) running between the structures of Whitehall Farm.	The immediate surroundings in the south are the dwellings and structures of Kilham to the east and west to the north, the surroundings are predominantly field.
OS County Series: 1890, 1:2,500	No discernible change on site.	Higher resolution mapping now shows All Saints Church and graveyard located approx.10m south east of site. The southern extent of site is surrounding by structures of Whitehall Farm. A smithy and saw pit are located approx.255m south west of site.
OS County Series: 1892, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1910, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1911, 1:10,560	No discernible change on site.	A smithy is now located approx.20m south of site.
OS County Series, 1946-1950, 1:10,560	No discernible change on site.	A sand pit located approx.500m east of site is now marked as 'old sand pit'.
Provisional, 1950- 1952, 1:10,560	A structure is now located in the central area of site and orientated east to west, likely a barn structure.	Surrounding areas see little site relevant change.

Map	Onsite	Offsite
National Grid, 1976, 1:2,500	The site has now been developed with an additional barn structure located in the area of the westernmost barn in the present-day. A sheep dip area is located in the south east of the main site area in the northern extent of site.	A sheep dipping area is located approx.100m west of site. The smithy to the south is now named a blacksmiths and either remains or has been converted in a residential dwelling. A coal yard is marked approx.250m east of site. Large poultry houses have been erected in the adjacent field/farm to the east of site.
National Grid, 1982, 1:10,000	No discernible change on site.	Surrounding areas have seen further residential development of the village of Kilham. A covered reservoir and water works is now located approx.500m north west of site.
National Grid, 1984, 1:2,500	No discernible change on site.	The large poultry units to the east of site in the adjacent field have been removed.
National Grid, 1990, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid, 2001, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
LandLine, 2003, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid, 2010, 1:10,000	No discernible change on site.	The north to south orientated linear barn along the eastern boundary of site has now been erected on site.
National Grid, 2021, 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
A	121	E	Pump	Water pumping stations	Industrial features
1	187	E	Pump house	Water pumping stations	Industrial features

ID	Distance [m]	Direction	Company	Activity	Category
2	239	SE	Robert D Webster Ltd	Agricultural machinery and goods	Industrial products

### 6.13 PETROL AND FUEL SITES

None recorded within 250m of site.

### 6.14 HISTORICAL PETROL AND FUEL SITE DATABASE

None recorded within 250m of site.

### 6.15 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

ID	Distance [m]	Direction	Use	Date
1	18	S	Smithy	1911
A	22	S	Smithy	1946
A	71	S	Smithy	1952
B	188	W	Saw pit	1952
2	193	E	Pumping station	1982
B	196	W	Saw pit	1946
B	233	W	Saw pit	1911

### 6.16 HISTORICAL TANK DATABASE

None recorded within 250m of site.

### 6.17 HISTORICAL ENERGY FACILITIES

None recorded 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**

- Agricultural use of the site (sheep-dipping area)
- PACM's noted on site including scattered debris
- Made ground deposits noted on site
- Heap noted on site from access-works
- Burnt areas adjacent to heap and in fielded area

### **7.1.2 OFFSITE**

No significant sources of offsite contamination have been identified.

## **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**

The site currently comprises a demolished barn, an intact barn and exterior areas comprising access routes, fielded areas and an area for materials storage. Historical agricultural practises (including a sheep-dip area) along with the development of the site and subsequent demolition

works have the potential to have contaminated the site with various substances including:

- Metals and metalloids;
- Polycyclic aromatic hydrocarbons (PAH's);
- Asbestos
- Sheep-dip chemicals (arsenic, organophosphorus or synthetic pyrethroids)

#### **8.1.2 HAZARDOUS GROUND GAS AND VAPOURS**

No significant sources of ground gas or vapour generation identified.

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	Li	Md	M	Potential sources of contamination noted on site. Recommend a Phase 2 Intrusive Site Investigation be carried out with targeted sampling in areas of proposed soft-landscaping, noted asbestos debris and the sheep-dip area.
Contaminated Soils	Inhalation of Dust	End Users	Li	Md	M	
Contaminated Soils	Direct Ingestion	Flora and Fauna	Li	Md	M	
Contaminated Soils	Vertical and lateral migration	Controlled Waters	Li	Md	M	
Contaminated Soils	Direct contact	Services	Li	Md	M	
Ground Gases (Methane and CO <sub>2</sub> )	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	
Volatile and Semi-volatile Organic Compounds	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	
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/Low 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

<b>Very high risk (Vh)</b>	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.
<b>High risk (Hi)</b>	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.
<b>Moderate risk (Md)</b>	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.
<b>Low risk (Lw)</b>	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.
<b>Very low risk (VI)</b>	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 **MODERATE** level of risk with respect to the proposed development.

**It is recommended that further investigation inline with Section 11.0 be planned and carried out on site.**

**This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken.**

## **10.0 SUMMARY OF RISKS**

### **10.1.1 SOIL CONTAMINATION**

Historically, the site access and field layout (in the north of site) has remained relatively static over time since circa.1850. A barn structure (not seen on the site walkover) was erected in the central area of site by circa.1950 with the structures seen today (i.e. the intact barn on the western boundary and the under-demolition, linear barn along the eastern) erected by circa.1976 and circa.2001, respectively. A sheep-dipping area has also been noted in the south eastern extent of the main site area in the north, with this feature present on mapping from circa.1976 through to circa.2003-2010. Furthermore, 2 No. areas of burnt ground were noted on the site walkover with the first located in an area of proposed soft-landscaping in the presently-fielded area in the north east of site; and the second adjacent to and partially within a heap noted in the south eastern extent of site, adjacent to the sheep-dip area. The heap was noted to be largely comprised of soils and gravels, with client information indicating this heap originated from the access-forming works on site. Furthermore, the intact barn noted on the western boundary was noted to be constructed of potentially asbestos containing materials, with evidence of a similar material being removed from the under-demolition barn in the eastern extent of site. The PACM cladding was noted stored in a pile adjacent to the eastern boundary in the north east of site, with further scatted debris of similar composition noted in the central area of site. As such, considering the historical agricultural usage of the site, the noted debris, burnt ground, sheep-dip and PACMs noted on site, there is a potential for shallow site soils to be contaminated.

### **10.1.2 GROUND GASSES AND VAPOURS**

No significant sources of ground gas or vapour generation have been identified. The graveyard to the south east of site is not considered a potential risk as any gas generated is likely to migrate vertically from the grave as opposed to laterally and to site.

**11.0 FURTHER ENVIRONMENTAL INVESTIGATION**

It is recommended that a Phase 2 Intrusive Site Investigation is planned and carried out on site. This should involve the formation of trial pits targeted at areas noted to be potentially contaminated. This includes areas of soft-landscaping (in particular the northern extent of site), the area of historical sheep-dipping, the spoil heap and adjacent burnt patches of ground and areas where scattered PACM debris has been noted.

**12.0 REFERENCES****12.1 LEGISLATION AND REGULATIONS****12.1.1 ACTS**

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

**12.1.2 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

**12.1.3 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

**12.2 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.

**12.3 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)

**12.4 NON STATUTORY TECHNICAL GUIDANCE****12.4.1 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.

**12.4.2 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

**12.4.3 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)

**13.0 APPENDICES**

**APPENDIX A**

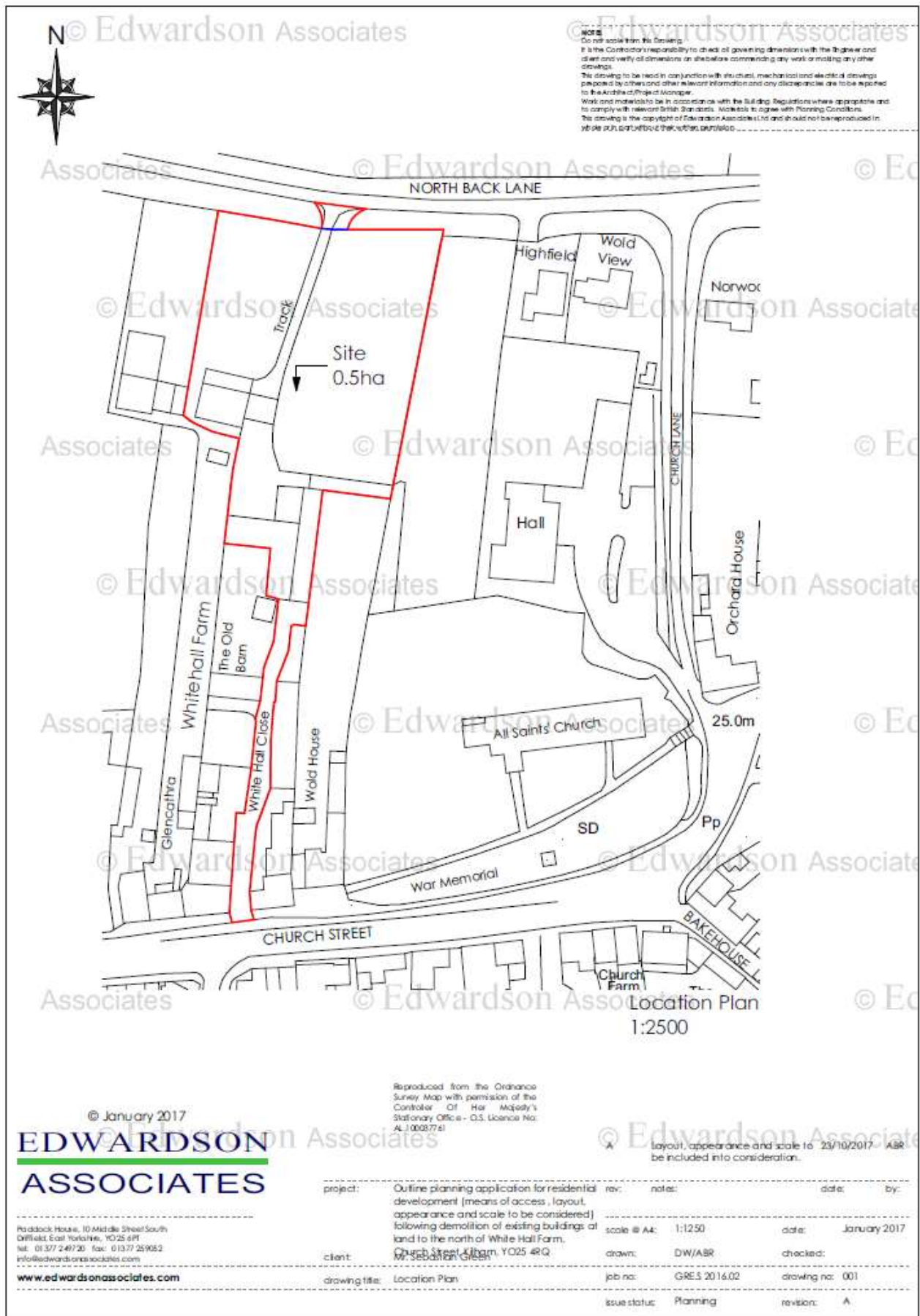
**ENVIRONMENTAL SEARCH**



**APPENDIX B**

**HISTORICAL MAPS**





APPENDIX D

SITE PHOTOS AND LOCATIONS



Site Walkover Photos

**Photo No.1: Facing north off Church Street towards the main site area showing site access track**



**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.2: Facing north off the access track towards the main site area via gravelled track**





Site Walkover Photos

**Photo No.3: Facing south from the main site area back towards Church Street and showing site access**



**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.4: Facing north showing demolished barn (right) and access to remainder of northern extent of site**





Site Walkover Photos

**Photo No.5: Facing north showing interior and concrete flooring of demolished barn**



**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.6: Facing west from access track adjacent to demolished barn showing materials storage in west of site**





Site Walkover Photos

**Photo No.7: Facing south west from central area of site showing area of materials storage along western boundary**



**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.8: Facing north from the central area of site towards secondary site access**





Site Walkover Photos

Photo No.9: Facing north west from central area of site showing barn and further materials (bricks) storage



Address: Land North of White Hall Farm, Kilham  
Client: Mr. M. Arundel

Photo No.10: Facing west showing interior of the barn and concrete flooring along with PACM composition of barn







Site Walkover Photos

**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.11: Facing SW from the NE corner of site showing main site area, small pit (foreground) and spoil heap (background)**

**Photo No.12: Facing slightly SW from the NE corner of site toward the western boundary and NW corner (right)**





Site Walkover Photos

**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.13: Facing south from offsite on North Back Lane showing secondary site access of this road**

**Photo No.14: One of 2 No. small pits noted in the NE and NW corner of sites showing topsoil atop residual bedrock chalk**





Site Walkover Photos

**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.15: Spoil heap of topsoil noted in the SE corner of the main site area (northern extent of site)**

**Photo No.16: Evidence of localised fires noted adjacent to the spoil heap with melted plastics noted within**





Site Walkover Photos

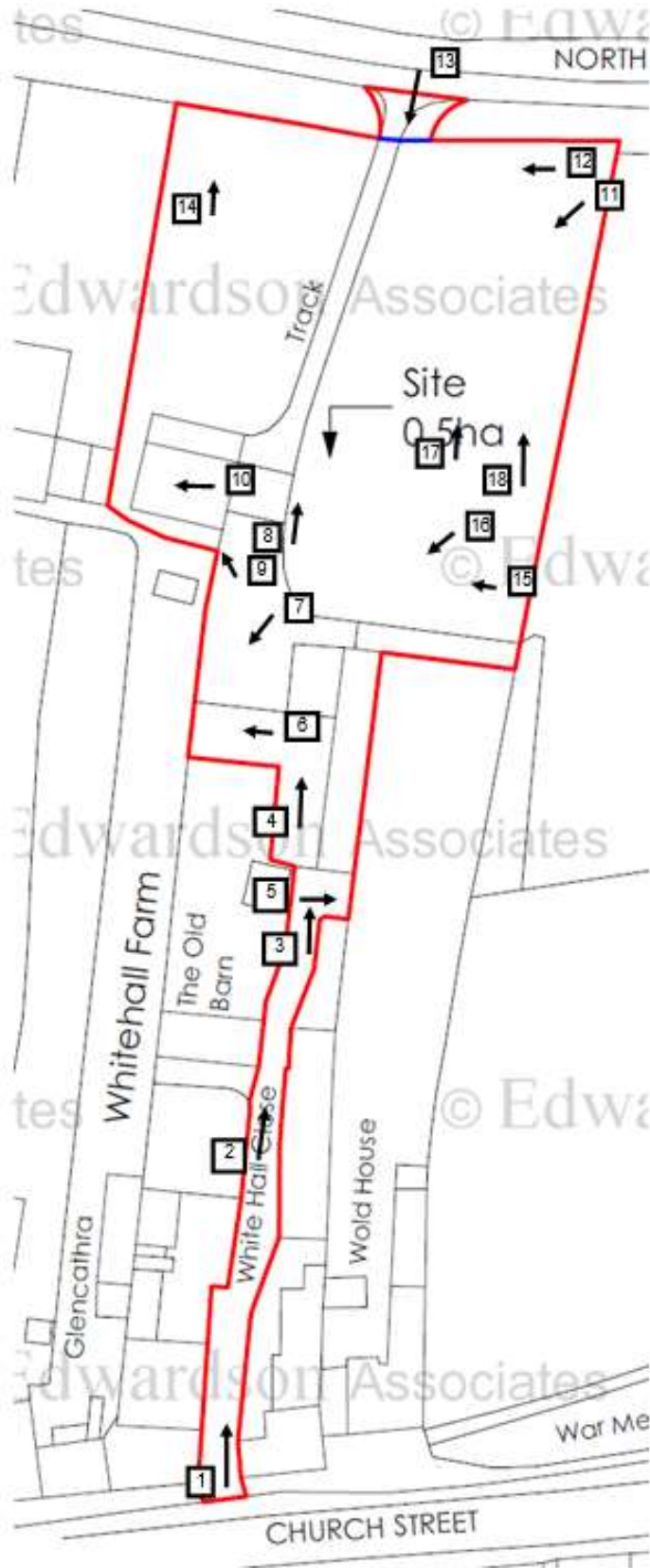
**Photo No.17: Facing north from the SE corner of the main site area showing spoil heap (left) and asbestos sheets (right)**



**Address: Land North of White Hall Farm, Kilham**  
**Client: Mr. M. Arundel**

**Photo No.18: Facing north from the northern side of the spoil heap showing a second area of localised burning**





**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.

APPENDIX F

DISCOVERY STRATEGY

