



Castledine Environmental

LAND CONTAMINATION SURVEYS

Phase 1 Land Contamination Risk Assessment

for

The Conversion of an Existing Agricultural Building into a Dwellinghouse

on the site of

**Ratcliffe House Farm,
Ratcliffe House Lane,
Ratcliffe, Culey, Atherstone,
Leicestershire**

Date: May 2024

Status:

Rev.A

Reference:

3730D P1 Garland - Atherstone

Date:

29/05/2024

Author:	Checked by:
David Wright (BSc, MA, FGS)	Andrew Lamont (BSc, FGS)

EXECUTIVE SUMMARY

The site is currently occupied by a Dutch-barn – in use for the storage of heavy farm machinery– and limited exterior areas comprising both concrete and a thin strip of soft-landscaping, which have been present on site since at least circa.2006.

The general, arable agricultural usage identified from at least circa.1885/86 until being developed with a farmyard and barn structures by circa.2006 are considered potential sources of contamination; however, arable soils were likely removed as part of the site development by this time, this and the relatively short length of time since development, coupled with the clean, well-maintained nature of the site act to somewhat reduce the risk. Specific potential sources of contamination include the development of the site for agricultural purposes, the potential for imported or produced made ground materials as part of the development, the usage of the site for storage of vehicles and machinery (and likely fuel, oil and/or lubricant storages – with noted, small-scale staining noted on the walkover) and the potential for asbestos presence atop the barn structure (whilst unlikely, due to being erected post asbestos regulations i.e. circa.2000, it is recommended that this is confirmed).

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

It is recommended that further, proportionate investigation inline with Section 16.0 is planned and carried out on site.

It is recommended that the structure on site be subject to an asbestos survey (and subsequent removal, if required) by appropriately qualified personnel. This should be carried out prior to any demolition or redevelopment occurring in order to ensure site works do not cause future contamination of the site.

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

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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.

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 AND SITE PROPOSALS

Castledine Environmental have been appointed by Ms. Garland to undertake a Phase 1 Desk study on a site at Ratcliffe House Farm, Ratcliffe House Lane, Ratcliffe, Culey, Atherstone, Leicestershire CV9 3LZ.

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Ms. Garland and associated appointees for the purpose of ensuring compliance with:

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework (NPPF) 2023.
- Part C1 of the building regulations.
- Support of Planning Application No. 23/01207/P3CQ.

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.

This report is to be regarded as a Preliminary Risk Assessment in accordance with the Environment Agency's Land Contamination Risk Management (LCRM – 2021), which replaces *CLR11 "Model Procedures for the Management of Land Contamination"*, carried out in accordance with BS 10175:2011+A2:2017, *"Investigation of Potentially Contaminated Land - Code of Practice"* and relevant sections of BS5930:2015+A1:2020, *"Code of Practice for Ground Investigations"*.

This report has been produced in order to discharge any relevant planning conditions outlined by the Local Authority and Environment Agency; however, further requirements may be imposed after the findings of this report that may need to be addressed at a later date.

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment;

- 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;
- Review of geological, hydrological and hydrological conditions at the site, pertaining to land contamination issues;
- 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; and
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in Atherstone, Leicestershire at National Grid Reference: 433677,298839 and is approximately 0.1ha in area.

The site is rectangular in shape and is orientated slightly north east to south west. The site is located within a wider, associated farmyard and is directly bounded by a wooded area to the north, a parking and turning area associated with the adjacent dwelling to the east, a concreted yard area directly south and west with 2 No. large barns located directly west and north west of site.

The site interior comprises a large, relatively modern and well-maintained Dutch-barn, with the southern face of the structure being open and very limited exterior areas. Access to site was provided via a private access route of approximately 0.37km length and leading southwards off Ratcliffe House Lane, to the north of site.

The barn was seen to be constructed of concrete flooring and walling, timber cladding and steel structuring with corrugated roofing materials (which post-date asbestos regulations). The southern half of the roofing was seen to be occupied by solar panelling. The interior of the structure was seen to be in use for the storage of various, large tractors and their associated trailers and agricultural attachments.

Some minor staining, including a small oil stain was noted atop the concrete within the barn, however, the concrete was seen to be intact and in a good condition.

The eastern face of the structure is then occupied by storage units, which are outside the site boundary, however are adjoined to the barn itself.

These units were seen to be constructed of brick with concrete flooring (again, noted to be in a good condition). The units were seen to contain a quad and chemical / pesticide tank and sprayer attachment and associated agricultural items.

The remaining areas on site then comprise a thin strip of soft-landscaping to the rear (north) of the barn, where some made ground gravels were noted underfoot, beneath the vegetation; and the concreted yard / vehicle movement area directly south of the barn. Just offsite and directly north west of site a propane tank was noted.

The storage and usage of heavy machinery, the minor staining noted beneath the machinery and the potentially asbestos containing, corrugated roofing materials are considered potential sources of contamination noted on the site walkover. Topographically, the site level.

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	39	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	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

None recorded within 1000m of site.

6.1.3 SOURCE PROTECTION ZONE

Site is not 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 bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Intermediate Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: High Aquifer type: Secondary Flow mechanism: Well connected fractures
2	39m SE	Summary Classification: Secondary bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Intermediate Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: High Aquifer type: Secondary Flow mechanism: Well connected fractures

6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records a large pond or small lake located approximately 75m south east of site with associated watercourses located 77m, 82m east, 107m, 115m south and 165m, 169m and 223m south west of site.

6.1.6 FLOOD RISK

According to both the Groundsure report and Environment Agency interactive online maps, the site is recorded to be at a low risk of flooding from the River and Seas (RoFRaS) and a negligible risk from surface water flooding on site.

This report does not replace a full hydrogeological survey and specialist studies may need to be undertaken to fully assess the risks posed from flooding.

6.1.7 DISCHARGE CONSENTS

None recorded within 500m of site.

6.2 PERMITTED PROCESSES

None recorded within 500m of site.

6.3 POLLUTION INCIDENTS

The Groundsure report records no pollution incidents located within 250m of site and no significant impact incidents located within 500m of site.

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS

None recorded within 500m of site.

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

None recorded within 500m of site.

6.5.2 LANDFILL SITES

None recorded within 500m of site.

6.6 HAZARDOUS SUBSTANCES

None recorded within 500m of site.

6.7 ECOLOGICAL RECEPTORS

The Groundsure report records the site as being located within the River Trent (from source to confluence with the Derwent) surface waters Nitrate Vulnerable Zone (NVZ) with an additional record of the NVZ being located 394m east of site.

No further sensitive land usages are recorded within 1000m of site.

6.8 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC 2024" 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 record no superficial geological deposits located on site with the nearest deposits being an area of Lacustrine Deposits, comprising clays, silts and sands laid down in a lake environment and located 39m south east of site.

6.8.2 SUPERFICIAL DEPOSITS PERMEABILITY

The Groundsure report records the Lacustrine Deposits 39m south east of the site to have a maximum estimated permeability recorded as 'moderate' and the minimum permeability as 'very low' and facilitated by intragranular flow mechanisms.

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 DEPOSITS

Both BGS geological mapping and the Groundsure report records bedrock geology of the Gunthorpe Member underlying site, comprising a red-brown mudstone with subordinate dolomitic sandstones and fine-grained sandstones with common gypsum veins and nodules.

6.8.4 BEDROCK PERMEABILITY

The Groundsure report records the site as being within an area where the maximum permeability of bedrock geology is recorded as 'low' and the minimum permeability as 'low' and facilitated by fracture flow mechanisms.

6.8.5 ARTIFICIAL GROUND

BGS geological mapping records no artificial deposits located on or within 250m of site.

6.8.6 COAL MINING

The site is not located in a coal mining reporting area and the local geology is not considered appropriate for such extraction. As such the risk from coal mining activities is considered to be low.

6.8.7 NON-COAL MINING

The Groundsure report records an area of bedded ore (manganese) extraction formerly located 470m south of site, with the Groundsure report stating:

“Underground mine workings are uncommon, although the geology is similar to that worked elsewhere. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.”

6.8.8 SURFACE WORKINGS

None recorded within 250m of site.

6.8.9 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 GOOGLE EARTH

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

Date	Description
December 1945	The site and surrounding areas are shown as large, open and unoccupied field.
December 1999	No discernible change on site nor to surrounding areas with both remaining as unoccupied, open field.
December 2000	No discernible change on site nor to surrounding areas with both remaining as unoccupied, open field.
July 2006	The site is now shown as occupied by the barn structure seen in the present-day, with concrete curtilage to the east, south and west of the barn, with both concrete and a thin strip of soft-landscaping to the north of the barn. The area directly west of site is now occupied by a second barn. A possible small home or static unit is located to the east of site.
December 2006	No major or discernible change on site. An area approx.27m SW of site has seen an extension of the concrete apron associated with both barns.
December 2010	No major or discernible change on site nor site relevant change to the surrounding areas.
September 2011	The adjoined units on the eastern face of the barn are now present. The concrete curtilage around both on site and adjacent barns has been extended and completed, bringing the site and surrounding areas inline with the present-day – this includes a new barn directly NW of site, the large-pond seen south of site and the associated dwelling east of site. The concrete apron approx.30m SW of site is shown as occupied by hay-bales and various, indiscernible storages.

Date	Description
April 2015	Solar-panelling has been installed on both the onsite and adjacent barns. Amount of storage in exterior areas SW of site has reduced. A vehicle or truck is parked on the apron to the south of the barn, with staining (likely water) running southwards.
April 2016	No major or discernible change on site; however, the vehicle which appeared to be leaking water in circa.2015 is now directly west of and offsite. An area approx.95m north and NW of site has now been developed with the solar farm seen in the present-day.
April 2018	No major or discernible change on site nor site relevant change to the surrounding areas
April 2020	No major or discernible change on site nor site relevant change to the surrounding areas
February 2021	No major or discernible change on site nor site relevant change to the surrounding areas
February 2021	No major or discernible change on site nor site relevant change to the surrounding areas
June 2021	No major or discernible change on site. The barn to the NW of site has been extended westwards and has doubled in size.
January 2022	No major or discernible change on site nor site relevant change to the surrounding areas
May 2023	No major or discernible change on site nor site relevant change to the surrounding areas

6.9.2 GOOGLE STREET VIEW

Google Street View imagery for the site is unavailable due to the site's location at the termination of a private access track.

6.10 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: 1885-1887, 1:10,560	The site is shown as unoccupied agricultural field.	The surrounding areas for approx.500m comprise open, unoccupied agricultural field. Notable features include 2 No. thin strips of pond located approx.240m north/NE, 2 No. smaller ponds approx.200m NE and a larger pond located approx.300m SE of site (which appear to remain persistent until the present-day).
OS County Series: 1886-1889, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1901, 1:10,560	No discernible change on site.	An unspecified pit is located approx.354m east of site.
OS County Series: 1903, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1924, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1925, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1938, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
Provisional: 1950, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1958, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
Provisional: 1965-1966, 1:10,560	No discernible change on site.	The unspecified pit to the east of site is no longer marked on mapping.
National Grid: 1974, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1991, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1994, 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	Site is now shown as occupied by the barn structure seen on the site walkover.	Barn seen directly west of site in present-day now shown on mapping.

Map	Onsite	Offsite
National Grid: 2024, 1:10,000	No discernible change on site.	The third barn seen directly NW of site in the present-day has now been erected, as has Ratcliffe House Farm dwelling to the east of site, alongside the large pond which has been excavated and is now present south of site.

6.11 CURRENT LAND USE DATA

The Groundsure report records an electricity substation located 149m west of site. No further current or recent industrial land usages are recorded within 250m of site.

6.12 PETROL AND FUEL SITES

None recorded within 500m of site.

6.13 HISTORICAL PETROL AND FUEL SITE DATABASE

None recorded within 500m of site.

6.14 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

The Groundsure report records an unspecified pit located 354m and 361m east of site and identified from historical mapping dated circa.1887 and 1901-1950. No further potentially contaminative usages are recorded within 500m of site.

6.15 HISTORICAL TANK DATABASE

None recorded within 500m of site.

6.16 HISTORICAL ENERGY FACILITIES

None recorded within 500m of site.

6.17 HISTORICAL GARAGE DATABASE

None recorded within 500m of site.

7.0 PRELIMINARY CONCEPTUAL SITE MODEL

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 in, on or under land (or within groundwaters) 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.

Source	A contaminant or pollutant that is in, on or under land that has the potential for cause harm or pollution to a receptor.
Pathway	The physical route by which a receptor is or could be affected by a contaminant or pollutant.
Receptor	Something or someone that could be adversely affected by a contaminant, i.e. people, controlled waters, ecological systems, buildings, crops, livestock.

By considering each of the three elements above, an assessment of actual and potential hazards to receptors can be carried out, taking into account the significance and degree of risk of each. The three elements above can exist separately; however, they only create a risk where they are linked together, thus creating a contaminant linkage. During the Preliminary Risk Assessment Stage, the linkages are referred to as 'Potential Contaminant Linkages', until they are confirmed via intrusive sampling, thus becoming 'Relevant Contaminant Linkages'.

A tabled, diagrammatic or matrix of pollutant linkages is considered to be a Conceptual Site Model (CSM), the source-pathway-receptor linkages are reviewed and displayed, apportioning a risk-rating and mitigation suggestion after each summary. 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 (at least circa.1885/87 to present-day)
- Noted storage of machinery and plant with small-scale spillage (noted on site walkover)
- Likely storage of fuels, chemicals / pesticides etc (some pesticide usage noted on site walkover)

Potential Sources and Associated Contaminants Identified	
Source	Potential Contaminants of Concern
• Agricultural use of the site (at least circa.1885/87 to present-day)	Made ground and potential for heavy metals, petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs) Asbestos – unlikely on building structure due to post-2000 development and erection
• Noted storage of machinery and plant with small-scale spillage (noted on site walkover)	Hydrocarbons TPH CWG, PAHs, heavy metals
• Likely storage of fuels, chemicals / pesticides etc (some pesticide usage noted on site walkover – quad)	Hydrocarbons TPH CWG, PAHs, volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs)

7.1.2 OFFSITE

- Surrounding and associated farmyard (circa.2006 onwards)
- Infilled, unspecified pit (approx.354m east, circa.1901-1965/66)

Potential Sources and Associated Contaminants Identified	
Source	Potential Contaminants of Concern
Surrounding and associated farmyard (circa.2006 onwards)	Made ground and potential for heavy metals, petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs) Asbestos – unlikely on building structure due to post-2000 development and erection
Infilled, unspecified pit (approx.354m east, circa.1901-1965/66)	Ground gases (CO₂, CH₄, CO) – discounted due to the distance to feature (approx.354m east), small size of feature, time since infill (approx.58 years) and lack of credible pathways to site (flat topography, Gunthorpe Member – very low in permeability)

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 (direct and indirect via crop uptake);
- Dermal contact;
- Inhalation;
- Plant uptake;
- Direct contact by buried structures (i.e. pipe degradation and leaching, pH & Sulphate attack on concrete); and
- 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;
 - 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;
- Buried water pipes;
- Controlled Waters;
- Ecological Receptors; and
- Flora and fauna using the proposed development.

The site proposals are understood to be residential, as such the likely receptors are site workers during site development, end-users of the site following redevelopment (i.e. residents / tenants, children, visitors, service personnel), controlled waters (i.e. aquifers, watercourses), adjacent receptors (neighbours, flora and fauna, ecological receptors) and building fabric and buried utilities.

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 is currently occupied by a Dutch-barn – in use for the storage of heavy farm machinery and adjoined storage units – and limited exterior areas comprising both concrete and a thin strip of soft-landscaping, which have been present on site since at least circa.2006.

The general, arable agricultural usage of the site from at least circa.1885/86 to being developed with a farmyard and barn structures by circa.2006 are considered potential sources of contamination; however, prior arable soils were likely removed as part of the site development by circa.2006, and the relatively short length of time since development, coupled with the clean, well-maintained nature of the site act to somewhat reduce the risk. Specific potential sources of contamination include the development of the site for agricultural purposes, the potential for imported or produced made ground materials as part of the development, the usage of the site for storage of vehicles and machinery (and likely fuel, oil and/or lubricant storages – with noted, small-scale staining noted on the walkover) and the potential for asbestos presence atop the barn structure (whilst unlikely, due to being erected post asbestos regulations i.e. circa.2000, it is recommended that this is confirmed).

8.1.2 GROUND GAS AND HAZARDOUS VAPOURS

No significant potential sources of ground gas generation have been identified, with ponds in the local area remaining persistent until the present-day (allowing for vertical release of any ground gases) and an unspecified pit, being infilled by circa.1965/66 and located approximately 354m east of site being discounted as a potential hazard as no credible pathways are present (no superficial geological deposits and bedrock geology – Gunthorpe Member - is predominantly low in permeability) nor has any clear pressure gradient been identified nor topographical difference noted.

The storage of plant / farm machinery on site along with noted, very small-scale staining of hydrocarbons atop the concrete within the barn and the general agricultural usage of the site are considered limited potential sources of hazardous vapours, which should be investigated further.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Conseq.	Risk	Possible Mitigation
Contaminated Soils (<i>historied arable agricultural usage, subsequent farmyard development and usage, storage and usage of heavy farm / plant machinery</i>)	Direct Ingestion & Direct Contact	Site Workers (<i>during site works, excavations, eating and drinking</i>)	Lw	Md	M/L	Site workers to wear appropriate PPE for health and safety reasons, suitable usage and adherence to relevant HSE guidance during site works (and provision of an asbestos survey, if required) considered sufficient to mitigate hazards to LOW – following confirmation via small-scale intrusive sampling.
Contaminated Soils (<i>historied arable agricultural usage, subsequent farmyard development and usage, storage and usage of heavy farm / plant machinery</i>)	Inhalation of Dust, Dry Arisings	Site Workers (<i>during site works, excavations, eating and drinking</i>)	Lw	Md	M/L	
Contaminated Soils (<i>historied arable agricultural usage, subsequent farmyard development and usage, storage and usage of heavy farm / plant machinery</i>)	Crop Uptake & Direct Ingestion, Direct Contact	End Users (<i>residents / tenants, children, visitors, service personnel</i>)	Lw	Md	M/L	Limited potential sources of soil contamination have been identified which, should they exist and remain on site, may impact end-users of site. Potential sources include likely made ground associated with the site's development (and noted on site walkover), the general former arable agricultural usage of the site and the more contemporary farmyard usage (i.e. storage and usage of heavy machinery) and the – limited – potential for asbestos presence (both within made ground and atop the structure – although this was erected following asbestos regulation). As such, it is recommended that the small-scale spillage and subbase to the concrete of the barn is investigated for hydrocarbon presence, and environmental sampling should be carried out in areas of proposed soft-landscaping as part of a limited, proportionate Phase II SI.
Contaminated Soils (<i>historied arable agricultural usage, subsequent farmyard development and usage, storage and usage of heavy farm / plant machinery</i>)	Inhalation of Dust, Dry Arisings	End Users (<i>residents / tenants, children, visitors, service personnel</i>)	Lw	Md	M/L	
Contaminated Soils (<i>historied arable agricultural usage, subsequent farmyard development and usage, storage and usage of heavy farm / plant machinery</i>)	Crop Uptake & Direct Ingestion, Direct Contact	Flora and Fauna (<i>on and offsite</i>)	UI	Md	L	
Contaminated Soils (<i>historied arable agricultural usage, subsequent farmyard development and usage, storage and usage of heavy farm / plant machinery</i>)	Vertical and lateral migration (<i>no superficial, bedrock geology predominantly low in permeability</i>)	Controlled Waters (<i>Secondary Undifferentiated and B Aquifers, watercourse 75m SE</i>)	UI	Md	L	
Contaminated Soils (<i>historied arable agricultural usage, subsequent farmyard development and usage, storage and usage of heavy farm / plant machinery</i>)	Direct contact (<i>pipe degradation and leaching</i>)	Services (<i>impacted new potable supply piping</i>)	Lw	Md	M/L	
Ground Gases (Methane and CO ₂) (<i>infilled ponds remain persistent and unspecified pit discounted as potential source</i>)	Vertical and lateral migration (<i>no superficial, bedrock geology predominantly low in permeability</i>)	Site Workers & Excavations, End Users & Building Envelope (<i>ingress and build-up</i>)	UI	Md	L	Limited, potential sources of hazardous ground gas generation discounted as significant hazards – see Section 8.1.2.
Volatile and Semi-volatile Organic Compounds (<i>storage and usage of heavy farm / plant machinery on site, small-scale spillage noted</i>)	Vertical and lateral migration (<i>no superficial, bedrock geology predominantly low in permeability</i>)	Site Workers & Excavations, End Users & Building Envelope (<i>ingress and build-up</i>)	Lw	Md	M/L	The storage of heavy machinery and likely associated fuels, oils and lubricants coupled with the agricultural usage of the site and small-scale spillages noted on the site walkover are considered limited, potential sources of hazardous vapour generation – TPH CWG sampling should be carried out on the concrete subbase to discount this potential.
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	Site is not located 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

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 to MODERATE** level of risk with respect to the proposed development.

It is recommended that further investigation inline with Section 16.0 is planned and carried out on site.

It is recommended that the structure on site be subject to an asbestos survey (and subsequent removal, if required) by appropriately qualified personnel. This should be carried out prior to any demolition or redevelopment occurring in order to ensure site works do not cause future contamination of the 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**11.0 HUMAN HEALTH**

Agriculture is a potentially contaminative land usage and as such, agricultural sites and land may have been used for a wide range of potentially contaminative activities. Such activities include fuel, oil and lubricants storage (bunded and non-bunded, associated with agricultural machinery), the repair and maintenance of machinery and vehicles on site, the storage of silage and other feeds, animal wastes and excrement's, agricultural chemicals and the likely presence of asbestos (prevalent on older farmyards). This is likely the reason why a contamination condition was placed on your application.

11.1.1 RESIDENTS / END-USERS

The risks to end-users of the site are considered to be low to moderate when assessed against the sensitive, residential end-usage of the site. The site is proposed to be almost entirely encapsulated beneath building footprint and hardstanding; however, areas of soft-landscaping are proposed. Whilst the hazards from soil contamination to end-users in the main site area are considered to be low, should onsite soils be used to form said soft-landscaping, there exists credible pathways for contamination to impact end-users (inhalation of dusts, direct contact, direct and indirect ingestion, surface water run-off). Furthermore, limited vapour hazards to end-users via the building envelope are considered potentially present, due to the noted staining and agricultural usage of the site. Additionally, the potential for hydrocarbon impact from made ground deposits to new potable water supply piping is considered a hazard to end-users of the site via impacted potable supplies.

11.1.2 SITE WORKERS

The risks to site workers during site works are considered to be low to moderate, due to the limited potential for asbestos contamination along with a likely extent of made ground. The provision for considered usage of PPE and adherence to relevant HSE guidance would be sufficient to mitigate the risks to low, following confirmation of both soil and vapour hazards on site via a small-scale intrusive Phase II Site Investigation.

- Site workers are to maintain good hygiene standards during site works.
- If access to deep excavations is required, pre-monitoring should be carried out.
- In accordance with Control of Asbestos Regulation (CAR) 2012, a provision for RPE/PPE and suitable working protocol should be provided during any works with asbestos containing materials.

12.0 CONTROLLED WATERS

The risks to controlled waters are considered to be low, due to the lack of superficial geological deposits in the local area, the largely impermeable bedrock geology in the area inhibiting significant offsite and vertical migration, the lack of productive aquifer beneath site, the lack of abstraction sites within 1000m of site and likely lack of significant contamination on site capable of impacting controlled waters.

13.0 STRUCTURES

13.1.1 GROUND GASES

No significant potential sources of ground gas generation have been identified, with ponds in the local area remaining persistent until the present-day (allowing for vertical release of any ground gases) and an unspecified pit, being infilled by circa.1965/66 and located approximately 354m east of site being discounted as a potential hazard as no credible pathways are present (no superficial geological deposits and bedrock geology – Gunthorpe Member - is predominantly low in permeability) nor has any clear pressure gradient been identified nor topographical difference noted.

13.1.2 HAZARDOUS VAPOURS

The storage of plant / farm machinery on site along with noted, very small-scale staining of hydrocarbons atop the concrete within the barn and the general agricultural usage of the site are considered limited potential sources of hazardous vapours, which should be investigated further.

13.1.3 POTABLE WATER SUPPLY PIPING

Due to the potential for both PAH contamination (likely made ground deposits and subbases on site – PAH prevalent within such deposits) and the potential for hydrocarbon contamination (agricultural development and usage, storage and usage of heavy machinery and noted, small-scale staining) on site, there exists the potential for new potable water piping to be impacted by residual site soils. PAH and hydrocarbon degradation and leaching can impact potable supply piping and thus impact potable supplies themselves, offering a potential risk to end-users via impacted water supplies.

14.0 RECOMMENDATIONS

Due to the sensitive, residential end-usage of the site, the former agricultural usages of the site (both arable and subsequently with heavy machinery etc), the likely presence of made ground on site and proposed soft-landscaping within site boundaries, it is recommended that a limited, proportionate Phase II Site Investigation is planned and carried out on site.

The formation of trial pits in external areas of site and areas of proposed soft-landscaping will allow for an assessment of the ground conditions on site (i.e. made ground, natural or reworked natural deposits, their nature, extent and depth) alongside the taking of environmental samples (including heavy metals, metalloids, PAHs, phenol, SOM) for laboratory analysis.

Further TPH CWG sampling should be carried out beneath the subbase of the barn (likely following the breaking or drilling out of a small aperture), to ascertain the potential for hazardous vapour generation here (and to confirm or negate if a VOC resistant membrane will be required in the development); and – should the asbestos survey indicate the presence of such – asbestos testing should also be carried out.

The combination of the above works will allow iterative updates to the Conceptual Site Model (CSM), indicating if further remediation works are required or that the site is considered fit for its intended usage.

15.0 REFERENCES**15.1 LEGISLATION AND REGULATIONS****15.1.1 ACTS**

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

15.1.2 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

15.1.3 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

15.2 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.

15.3 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)

15.4 NON-STATUTORY TECHNICAL GUIDANCE**15.4.1 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

15.4.2 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

15.4.3 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)

16.0 APPENDICES

APPENDIX A ENVIRONMENTAL SEARCH

Separate Groundsure Report

APPENDIX B HISTORICAL MAPPING

Separate Map Packs (2 No. files)

APPENDIX C PROPOSED AND CURRENT SITE PLANS

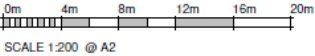


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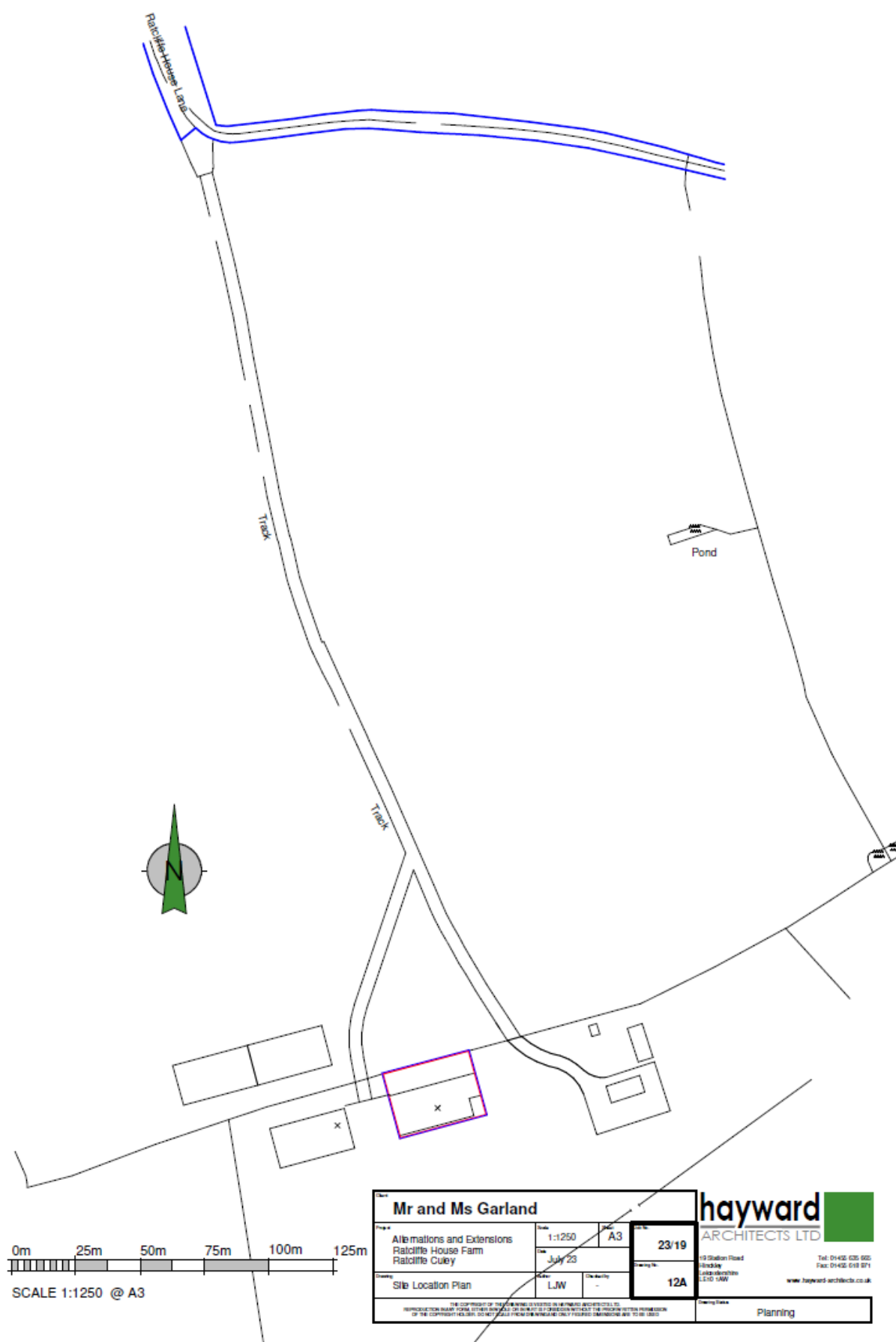
19 Station Road
Hinckley
Leicestershire
LE10 1AW

Tel: 01455 635 625
Fax: 01455 618 971
www.haywardarchitects.co.uk

Client Garland		
Project Title Barn Conversion Ratcliffe House Farm Ratcliffe Culey		
Drawing Title Site Plan		
Scale 1:200	Date OCT 23	Sheet A2
Author LW	Checked by	
Job No. 23/19	Drawing No. 15B	
Status Planning		



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APPENDIX D

SITE PHOTOS AND LOCATIONS



Site Walkover Photos

Photo No.1: Facing slightly NW outside the SE corner of site showing the front (southern) face of the Dutch-barn



Address: Ratcliffe House Farm, Culey
Client: Ms. V. Garland

Photo No.2: Facing NW outside the eastern boundary of site showing adjoined units on the eastern face of barn





Site Walkover Photos

Photo No.3: Facing west showing the interior of the first unit on the eastern face of the barn



Address: Ratcliffe House Farm, Culey
Client: Ms. V. Garland

Photo No.4: Interior of the first unit showing concrete flooring, general storages alongside quad & pesticide tank, lawn mower





Site Walkover Photos

Photo No.5: Facing west along the rear (northern) face of the barn and adj. dog kennel



Address: Ratcliffe House Farm, Culey
Client: Ms. V. Garland

Photo No.6: Facing east in the rear area of site back towards the location of Photograph No.9





Site Walkover Photos

Photo No.7: Facing west along the rear face of the barn showing grassed area here and propane tank to rear of barn



Address: Ratcliffe House Farm, Culey
Client: Ms. V. Garland

Photo No.8: Facing east outside the western boundary of site showing the western face of barn and adj. topsoil heap





Site Walkover Photos

Photo No.9: Facing NE outside the SW corner of site



Address: Ratcliffe House Farm, Culey
Client: Ms. V. Garland

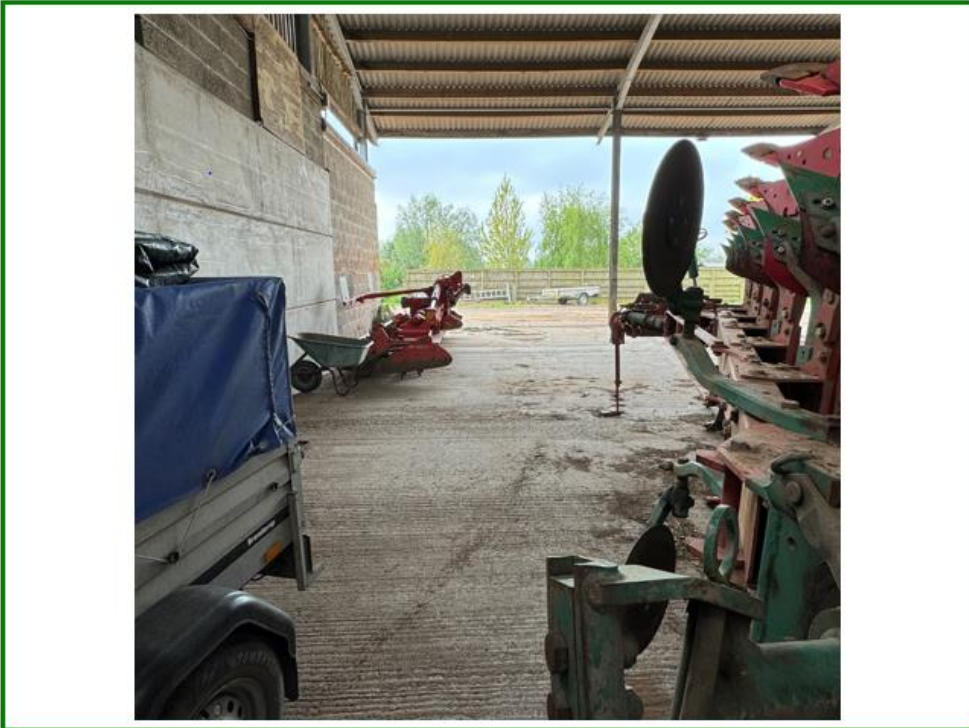
Photo No.10: Facing north showing storage of heavy plant / farm machinery including tractors within Dutch-barn





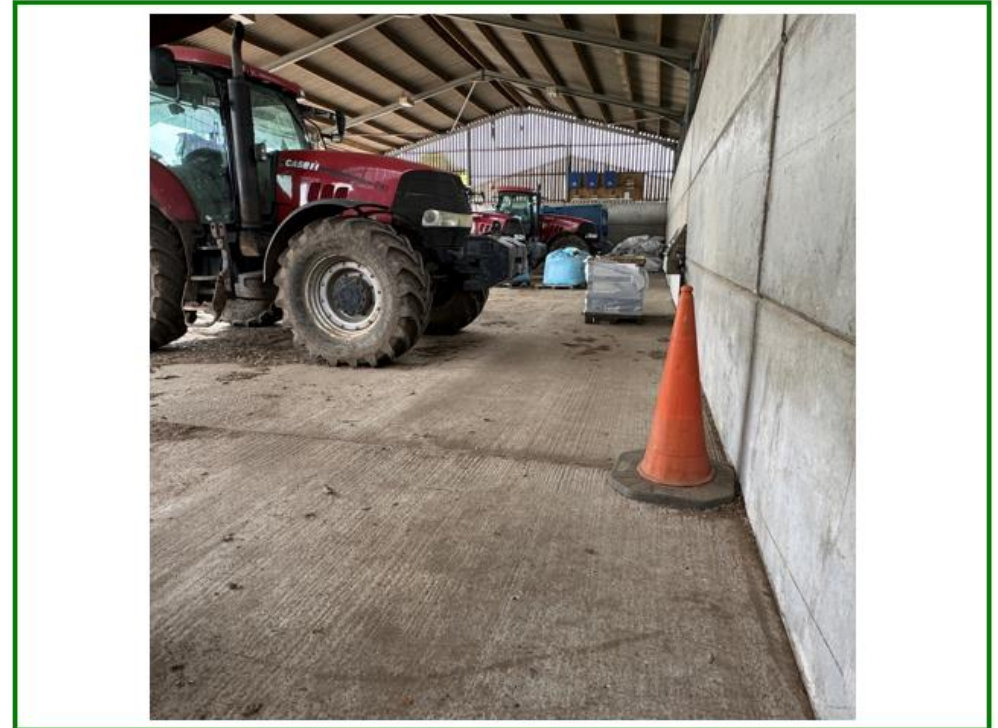
Site Walkover Photos

Photo No.11: Facing south inside the NE interior corner of the barn showing trailer machinery for adj. farm tractors



Address: Ratcliffe House Farm, Culey
Client: Ms. V. Garland

Photo No.12: Facing west from the same location as Photograph No.15 showing occupation of the Dutch-barn



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 ashy 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

