Castledine Environmental

LAND CONTAMINATION SURVEYS

Phase 1 Land Contamination Risk Assessment with Exploratory Investigation

for

The Conversion of Barn into 4 No. Small Dwellinghouses (Use Class C3)

on the site of

White Towers, Wood End, Bluntisham, Huntingdon PE28 3LE

Date: November 2024

Status:	Final Report
Reference:	3836D P1 Redwood - Bluntisham
Date:	18/11/2024

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EXECUTIVE SUMMARY

The site is currently occupied by a former agricultural barn and limited exterior areas comprising concrete hardstanding and grassed areas. Historically, the site remained part of a wider orchard usage from at least circa.1887 through until around circa.1973/76, when the present-day structure was erected. Following this, the site has been in use for storage purposes. Whilst on site, Castledine Environmental progressed a total of 2 No. hand-excavated inspection pits, allowing an assessment of the present ground conditions to be carried out, in light of the sites historical legacy and proposed residential usage. Made ground atop clayey deposits were encountered and, whilst no elevated contamination was identified (no exceedances of metals, metalloids, PAH, TPH CWG nor SVOC or asbestos presence identified), the ground conditions were poor with notable anthropogenic inclusions such as glass shards noted in made ground deposits.

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** to **MODERATE** level risk with respect to the proposed development, which can be *mitigated by provision of a Phase 3 Remediation Strategy and Verification Plan*.

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 3 Remediation Strategy and Verification Plan to be written.

A watching brief (as outlined in Appendix E) should be carried out by the site supervisor 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). Should previously unreported or undiscovered contamination be identified, then 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.

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 Mr. D. Bridgens to undertake a Phase 1 Desk study on a site at White Towers, Wood End, Bluntisham, Huntingdon PE28 3LE.

4.0 SCOPE

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

- National Planning Policy Framework (NPPF) December 2023.
- Part C1 of the building regulations.
- Condition No.3 of the Huntingdonshire District Council planning approval reference 24/00535/PMBPA.

3. Condition.

A. No development (except demolition of above ground structures) shall take place until an assessment of the nature and extent of contamination has been submitted to and approved in writing by the local planning authority. This assessment must be undertaken by a competent person and shall assess any contamination on the site, whether or not it originates from the site. Moreover, it must include;

(i) details of previous land uses;

(ii) a site investigation survey of the extent, scale and nature of contamination;

(iii) an assessment of the potential risks to;

a. human health,

b. property,*

c. adjoining land,

d. groundwaters and surface waters,

e. ecological systems and

f. archaeological sites and ancient monuments.

** Property (existing or proposed) includes buildings, crops, livestock, pets, woodland and service lines and pipes*

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".*

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).

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.

5.0 SITE DESCRIPTION

The site is located in Bluntisham, Huntingdon at National Grid Reference: 536224,275090 and is approximately 0.05ha in area.

The site is rectangular in shape and is orientated north to south. The site is located in predominantly rural area, being located outside the north western extent of the village of Bluntisham. The site is then directly bounded by field / orchard to the north, north west and west, an associated dwelling with Wood End (roadside) beyond to the south and residential areas / the village of Bluntisham to the south east and east of site.

The site interior comprises a former agricultural barn and limited exterior areas. Access to site was provided via a concreted driveway leading via the western face of an associated, offsite dwelling (located directly south of site), which then terminates to the front (south) of the onsite barn, at a concreted forecourt area. The building itself was seen to be constructed of brick with concrete structuring, concrete flooring (seen to be clean, intact and well-maintained with no significant evidence of hydrocarbon presence or release – visually or olfactorily) and PACM cladding and roofing. The interior of the barn was seen to be largely empty of storage, beyond contemporary storage for the ongoing redevelopment of the adjacent structure (i.e. piping, tools, materials, window frames, timbers, concrete bags and other, miscellaneous construction materials). The areas around the structure, comprising the exterior areas on site, then comprise the concreted forecourt to the south and grassed areas to the east, north and west of the structure. An offsite, yet formerly associated workshop building was noted directly west of site, within which similar construction materials storage was noted, similar to that within the onsite barn.

Additionally, whilst on site, a total of 2 No. hand-excavated inspection pits were formed in the grassed area between the offsite workshop to the west and the onsite barn. The ground conditions largely comprised made ground with fragments of brick, concrete and glass atop a sandy Clay. As

this is the most likely area of exposed ground which may remain on site (following redevelopment) and, coupled with the area's location between former workshop and onsite structure, two shallow environmental samples were taken from the area. Photographs of the area can be found as Photo Nos.12, 113 & 14 in Appendix D with a summary of the ground conditions and environmental sampling found as Section 7.3 in this report.

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 (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

ID	Distance (m)	Direction	Designation	Description
3	127	S	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
4	208	N	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

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

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 superficial aquifer - High Vulnerability Combined classification: Unproductive 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: High	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Well connected fractures

6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records no hydrological features located within 250m 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), a 1 in 30-year (0.30-1.00m) risk from surface water flooding on site and a low risk from groundwater flooding.

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 Great Ouse surface waters Nitrate Vulnerable Zone (NVZ) and the Huntingdon River Gravels groundwaters NVZ; records of the Counter Drain and 100 ft. drain NVZ (surface waters) are then located 22m and 875m north 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 superficial geological deposits of the Oadby Member on site, comprising a grey, weathering to brown silty clay with subordinate lenses of sand and gravels characterised by its chalk and flint gravel content.

6.8.2 SUPERFICIAL DEPOSITS PERMEABILTY

The Groundsure report records the site as being within an area where the maximum permeability of superficial deposits is recorded as ‘moderate’ and the minimum permeability as ‘low’ and facilitated by mixed flow mechanisms.

6.8.3 BEDROCK DEPOSITS

Both BGS geological mapping and the Groundsure report records bedrock geology of the West Walton Formation and Ampthill Clay Formation (undifferentiated) underlying site, comprising predominantly grey, marine mudstones and silty mudstones with beds of argillaceous limestone nodules (or more or less persistent beds) at some levels; units of siltstone and sandstone at some levels, alongside shelly marl, limestone and sandy limestone developed locally (notably in the West Walton Formation).

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 ‘very 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 negligible.

6.8.7 NON-COAL MINING

The Groundsure report records no non-coal mining operations located within 500m of site.

6.8.8 SURFACE WORKINGS

ID	Distance (m)	Direction	Land Usage	Year of Mapping
A	31	E	Ponds	1959
A	32	E	Ponds	1902
A	32	E	Ponds	1887
A	32	E	Ponds	1925
A	32	E	Ponds	1924
A	41	E	Ponds	1902
1	136	NW	Covered reservoir	1992
2	214	W	Ponds	1977

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

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

Date	Description
December 1945	Imagery is indistinct; however, the site appears to remain unoccupied and within the SE corner of a larger field / orchard plot (of which the boundary remains the same as the present-day).
December 1999	The site is now shown as occupied by the barn structure and small forecourt area, as seen in the present-day on the site walkover. Areas directly north, NW and west remain occupied by orchard and the present-day, associated dwelling is located directly south and the adjacent shed directly west. A water tower and covered reservoir are now located approx.135m NW of site with a second, smaller water tower located approx.223m west of site.
October 2003	No discernible or major change on site nor site relevant change to the surrounding areas.
December 2003	No discernible or major change on site nor site relevant change to the surrounding areas.
December 2006	No discernible or major change on site nor site relevant change to the surrounding areas.
September 2008	No discernible or major change on site nor site relevant change to the surrounding areas.
October 2008	No discernible or major change on site nor site relevant change to the surrounding areas.
September 2012	No discernible or major change on site nor site relevant change to the surrounding areas.
April 2015	No discernible or major change on site nor site relevant change to the surrounding areas.
October 2018	No discernible or major change on site nor site relevant change to the surrounding areas.
May 2020	An area approx.30m south of site, beyond Wood End (roadside) is now shown as under residential development.

6.9.2 GOOGLE STREET VIEW

Google Street View imagery is dated circa.2008, 2011, 2021 and 2023 with the site viewed from Wood End roadside and facing north / north east. Imagery dated circa.2008 shows the site as remaining occupied by the barn-structure (still with PACM roofing and cladding), around which two agricultural tractors and a series of pallets can be seen. Imagery then dated circa.2011 shows the barn as closed, as does imagery dated circa.2021 and 2023 with no major change on site noted from the roadside.

6.10 HISTORIC MAPPING

The following historic maps have been reviewed as part of this assessment:

Map	Onsite	Offsite
OS County Series: 1887, 1:10,560	The site is shown as located in the SE extent of a wider orchard.	Areas directly north, NW, west and SW of site are marked as occupied by orchard features. Notable features beyond this include a relatively large pond approx.41m east (remains persistent until the present-day), with further ponds located approx.80-100m, 140m, 200m (remains persistent until the present-day) and 230m east of site and 50m NE with an area of marshland approx.240m NW of site (remains persistent until the present-day).
OS County Series: 1888, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1900-1902, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1901-1902, 1:2,500	No discernible change on site.	Orchard directly NW, west of site now enlarged, second orchard now approx.30m south of site.

Map	Onsite	Offsite
OS County Series: 1902, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1924, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1925-1927, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1926-1927, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1927, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1950, 1:10,560	Mapping on site and to the north, south and east is truncated and missing.	Mapping on site and to the north, south and east is truncated and missing; however, there appears no site relevant change to areas to the NW, west and SW of site.
Provisional: 1950, 1:10,560	Mapping on site and to the north, NW and NE is truncated and missing.	Mapping on site and to the north, NW and NE is truncated and missing; however, there appears no site relevant change to areas to the SW, south and SE of site.
Provisional: 1959, 1:10,560	No discernible change on site.	Mapping to the south, SE and SW is truncated and missing; however, there appears no site relevant change to areas to the NW, north and NE of site.
National Grid: 1970, 1:10,560	No discernible change on site.	Mapping to the south, SE and SW is truncated and missing; however, there appears no site relevant change to areas to the NW, north and NE of site.

Map	Onsite	Offsite
National Grid: 1972-1973, 1:2,500	No discernible change on site.	Three ponds formerly located approx.80m, 100m and 120m east of site have now been replaced with a large barn (Tower Farm), as had the pond approx.230m east (area now occupied by a new vehicle repair garage). The water tower seen approx.223m west in the present-day has now been erected.
National Grid: 1973-1976, 1:2,500	Mapping is offset and in error (being offset to the left); however, the site is now occupied by the barn structure seen in the present-day.	Mapping is offset and in error (being offset to the left); however, the associated dwelling now located directly south of site, as is the water tower north of site.
National Grid: 1977, 1:2,500	Site now confirmed as occupied present-day barn structure.	Mapping in surrounding areas is unclear, however there have been extensions to the surrounding orchard usages.
National Grid: 1976-1978, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1990, 1:2,500	No discernible change on site.	The shed seen directly west of the onsite structure in the present-day has now been erected, as has the covered reservoir NW of site.
National Grid: 1990-1991, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1991-1992, 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: 1990-1994, 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	No discernible change on site.	Surrounding areas see little site relevant change.

Map	Onsite	Offsite
National Grid: 2024, 1:10,000	No discernible change on site.	An area approx.30m southwards of site has now been developed into a small residential estate.

6.11 CURRENT LAND USE DATA

ID	Distance (m)	Direction	Company	Activity	Category
1	135	NW	Water tower	Water pumping stations	Industrial features
2	223	E	Electricity substation	Electrical features	Infrastructure and facilities
3	223	W	Water tower	Water pumping stations	Industrial features

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

ID	Distance (m)	Direction	Use	Date
B	314	W	Windmill	1900
B	320	W	Unspecified tank	1900
B	320	W	Disused windmill	1924
1	396	W	Corn windmill	1887

6.15 HISTORICAL TANK DATABASE

None recorded within 500m of site.

6.16 HISTORICAL ENERGY FACILITIES

ID	Distance (m)	Direction	Use	Date
A	220	E	Electricity substation	1990
A	220	E	Electricity substation	1973

6.17 HISTORICAL GARAGE DATABASE

The Groundsure report records a historical garage formerly located 212m east and identified from historical mapping dated circa.1973.

7.0 EXPLORATORY INVESTIGATION

7.1 CHEMICAL ASSESSMENT CRITERIA

On establishing the presence of pollutant linkages, it is then necessary to assess whether or not any of the linkages are significant, whereby significant harm is being caused or there is significant possibility of significant harm being caused to human health or the environment. In the absence of any evidence of ‘significant harm’, the risks will be assessed on the basis of a ‘significant possibility of significant harm’ being caused. In order to initially assess the risks, appropriate Tier 1 assessment criteria are derived which represent benchmark contamination concentrations with respect to relevant receptors. Concentrations recorded in excess of these levels **may** represent a significant risk to a specific receptor when considered as part of a pollutant linkage.

7.2 HUMAN HEALTH

The Environment Agency, through its Contaminated Land Exposure Assessment (CLEA) framework, published toxicological reports (TOX) and soil guideline values (SGVs).

SGVs are science-based generic assessment criteria that indicate human health risks from long-term exposure to soil contaminants. They are set at levels where there are ‘no appreciable’ or ‘minimal’ risks to human health. For each substance, different SGVs are applicable according to land use, for example, whether residential, allotment or commercial. They have been widely seen as over precautionary and offering councils a very weak indication of whether sites represent a "significant possibility of significant harm" (SPOSH) requiring determination under the contaminated land regime.

Following publication of the revised Part IIa Statutory Guidance DEFRA has commissioned the creation of Category 4 Screening levels (C4SL's) They are set at levels where there is a "Low" risk to Human Health (i.e. higher than that of SGV's but still sufficiently low to defiantly not be "Contaminated Land" as defined by section 78A of the Environmental Protection Act 1990 as amended). The C4SL's are calculated using the CLEA model using less conservative exposure and toxicological assumptions than the SGV's. C4SL's have also been calculated for Open Space land use. Atkins Ltd has derived ATRISKsoil Soil Screening Values SSVs using the 2009 guidance (SC050021/SR3 (the CLEA Report) and SC050021/SR2 (the TOX report)) for commercial/industrial, residential without home grown produce, residential with home grown produce and allotment land uses. These are based these on the default assumptions provided in the CLEA framework. Atkins SSVs for 6% soil organic matter (SOM) have been derived in line with the new guidance using the CLEA model.

LAQM in association with the CIEH have produced S4UL's are reproduced with permission; Publication Number S4UL3693

The pathways considered for the standard land uses include:

- Ingestion of soils;
- Ingestion of household dust;
- Ingestion of contaminated vegetables (residential with plant uptake only);
- Ingestion of soil attached to vegetables (residential with plant uptake only);
- Dermal contact with soils;
- Dermal contact with household dust;
- Inhalation of fugitive dusts from soils;
- Inhalation of fugitive household dust;
- Inhalation of vapours in outdoor air; and
- Inhalation of vapours in buildings.

These exposure routes have been evaluated independently of one another to identify the most sensitive exposure route. The SSV adopted for a given land use scenario is the most stringent screening value of all those relevant to the site.

The current proposals are to redevelop the site for a residential use with gardens. It is considered appropriate to compare the chemical testing results to those SGVs/SSVs with the appropriate 'residential with plant uptake' settings.

7.3 EXPLORATORY WORKS AND FINDINGS

7.4 FIELDWORK 06/11/24

Castledine Environmental attended site on the 6th of November 2024 the intention of carrying out a site walkover and limited, exploratory investigation. Accordingly, two hand-excavated locations (designated HP01 and HP02) were progressed to a maximum depth of 0.40m, and targeted areas of existing and proposed soft-landscaping. The purpose of the hand-excavated pits was to facilitate the assessment of ground conditions on site (i.e. made ground, natural or reworked natural deposits, their nature, extent and depth), alongside the taking of environmental samples for laboratory analysis.

The locations of all exploratory holes formed during the investigation were laid out by Castledine Environmental and a location plan of the exploratory hole locations can be found as Appendix C.

7.5 GROUND CONDITIONS ENCOUNTERED

The ground conditions on site can be broadly summarised as made ground overlying natural deposits.

All soil descriptions, logging and sampling were carried out in accordance with BS:5930:2015+A1:2020.

7.5.1 MADE GROUND

Made ground was encountered at both locations and extended from surface level to depths of 0.20m at both locations. The made ground consisted of a dark brown, gravelly, sandy Clay at HP01 with inclusions of pea gravels, concrete and brick fragments alongside rare plastic, glass and rootlets. At HP02, the stratum was seen to be a gravelly, clayey Sand within which inclusions of sandstone, brick, concrete and rare glass were noted.

7.5.2 NATURAL DEPOSITS

At both locations to final depths of 0.40m a brown, slightly gravely, sandy Clay was encountered (being exposed by both the formation of the hand-excavated pits and the prior foundation inspection pit), with gravels of quartzite and sandstone noted.

7.5.3 CORRELATION WITH BGS MAPPING

The natural deposits encountered at depth on site may potentially represent the Oadby Member, comprising a grey, weathering to brown silty clay with subordinate lenses of sand and gravels characterised by its chalk and flint gravel content. However, it must be noted that the hand-pits were of limited scope and depth and as such, this is not confirmed.

7.5.4 GROUNDWATER

Groundwater was not encountered during the site investigation.

7.5.5 CONTAMINATION

Potential evidence of contamination was encountered in the form of anthropogenic inclusions within the made ground assessed on site, i.e. including brick and concrete fragments; however, no direct evidence of contamination (i.e. road planings, ash etc) were noted, beyond the presence of sharps (i.e. glass), which is classed as a physical contaminant.

7.6 QUANTITIVE RISK ASSESSMENT

Sample results have been compared directly against a generic screening criterion (GAC) for a residential with plant uptake usage. In order to adopt a conservative approach, a Soil Organic Matter (SOM) of 1% has been used in the below assessment.

7.6.1 METALS AND SEMI METALS - RESIDENTIAL WITH PLANT UPTAKE (1% SOM):

Determinant	Units	Accreditation	S4UL (mg/kg)	Highest Value(s) (mg/kg)	Location of Highest value	Exceedance? Y/N
Arsenic	(mg/kg)	MCERTS	37	20.3	HP02 0.10m	N
Cadmium	(mg/kg)	MCERTS	11	1.7	HP02 0.10m	N
Chromium (total)	(mg/kg)	UKAS	910	44.1	HP02 0.10m	N
Chromium (VI)	(mg/kg)	U	6	<0.040	All	N
Copper	(mg/kg)	MCERTS	2400	34.5	HP02 0.10m	N
Lead	(mg/kg)	MCERTS	200	98.3	HP02 0.10m	N
Mercury	(mg/kg)	UKAS	1.2	<0.7	All	N
Nickel	(mg/kg)	MCERTS	180	31.9	HP02 0.10m	N
Zinc	(mg/kg)	MCERTS	3700	667	HP02 0.10m	N
Selenium	(mg/kg)	MCERTS	250	<3.0	All	N
Total Phenols	(mg/kg)	MCERTS	280	<0.50	All	N
pH	pH units	MCERTS	-	8.5-7.9	HP01 – HP02	-
Asbestos	-	-	-	NAD	All tested	N

7.6.2 NON-METALS - RESIDENTIAL WITH PLANT UPTAKE (1% SOM):

Determinant	Units	Accreditation	S4UL (mg/kg)	Highest Value(s) (mg/kg)	Location of Highest value	Exceedance? Y/N
Naphthalene	(mg/kg)	MCERTS	2.3	<0.016	All	N
Acenaphthylene	(mg/kg)	UKAS	170	<0.015	All	N
Acenaphthene	(mg/kg)	UKAS	210	<0.013	All	N
Fluorene	(mg/kg)	MCERTS	170	<0.013	All	N
Phenanthrene	(mg/kg)	MCERTS	95	0.046	HP02 0.10m	N
Anthracene	(mg/kg)	MCERTS	2400	0.021	HP02 0.10m	N
Fluoranthene	(mg/kg)	MCERTS	280	0.153	HP02 0.10m	N

Pyrene	(mg/kg)	MCERTS	620	0.137	HP02 0.10m	N
Benzo(a)anthracene	(mg/kg)	MCERTS	7.2	0.096	HP02 0.10m	N
Chrysene	(mg/kg)	MCERTS	15	0.108	HP02 0.10m	N
Benzo(b)fluoranthene	(mg/kg)	MCERTS	2.6	0.124	HP02 0.10m	N
Benzo(k)fluoranthene	(mg/kg)	MCERTS	77	0.052	HP02 0.10m	N
Benzo(a)pyrene	(mg/kg)	MCERTS	2.2	0.093	HP02 0.10m	N
Indeno(1, 2, 3,-cd)pyrene	(mg/kg)	MCERTS	27	0.090	HP02 0.10m	N
Dibenzo(a,h)anthracene	(mg/kg)	MCERTS	0.24	0.021	HP02 0.10m	N
Benzo(g, h, i)perylene	(mg/kg)	MCERTS	320	0.111	HP02 0.10m	N
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	NC	1.05	HP02 0.10m	-

7.6.3 NON-METALS - RESIDENTIAL WITH PLANT UPTAKE (1% SOM):

Determinant	S4UL (mg/kg)	Highest Value (mg/kg)	Location of Highest value	Exceedance? Y/N
Aliphatic				
EC 5-6	42	<0.10	All	N
EC >6-8	100	<0.10	All	N
EC >8-10	27	<0.10	All	N
EC >10-12	130	<1.0	All	N
EC >12-16	1100	0.5	HP02 0.10m	N
EC >16-35	65000	9.6	HP02 0.10m	N
EC >35-44	65000	0.7	HP02 0.10m	N
Aromatic				
EC 5-7 (Benzene)	70	<0.010	All	N
EC >7-8 (Toluene)	130	<0.010	All	N
EC >8-10	34	<0.010	All	N
EC >10-12	74	1.4	HP02 0.10m	N
EC >12-16	140	4.2	HP02 0.10m	N
EC >16-21	260	4.1	HP02 0.10m	N
EC >21-35	1100	28.3	HP02 0.10m	N
EC >35-44	1100	5.7	HP02 0.10m	N

7.7 ANALYSIS OF RESULTS

Laboratory analysis has identified no exceedances of metals, metalloids, PAHs nor TPH CWG nor has elevated phenol or the presence of asbestos been detected and all SVOC testing is below laboratory detection limits.

8.0 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.

8.1 SOURCES

The following potential sources of contamination have been identified:

8.1.1 ONSITE

- Site's location within a wider orchard (circa.1887-1973/76)
- Present-day usage of site (circa.1973/76 until present-day)
- Potentially asbestos roofing atop barn (noted on walkover)
- Made ground (noted on walkover, sampled – not contaminative from what was sampled, however glass shards noted)

Potential Sources and Associated Contaminants Identified	
Source	**Potential Contaminants of Concern**
Site's location within a wider orchard (circa.1887-1973/76)	Heavy metals, PAHs, SVOC
Present-day usage of site (circa.1973/76 until present-day)	Hydrocarbons TPH CWG, PAH's, heavy metals, SVOC's, asbestos – area between workshop and onsite structure tested, no elevated contaminants beyond the presence of glass
Potentially asbestos roofing atop barn (noted on walkover)	Asbestos
Made ground (noted on walkover, sampled – not contaminative from what was sampled, however glass shards noted)	Hydrocarbons TPH CWG, PAH's, heavy metals, SVOC's, asbestos – area between workshop and onsite structure tested, no elevated contaminants beyond the presence of glass

8.1.2 OFFSITE

- Adjacent orchard usage (circa.1887 to present-day)

- Adjacent workshop / storage shed (noted on walkover, present from at least circa.1990)
- Infilled ponds:
  - approx.41m east (remains persistent until the present-day)
  - approx.80-100m NE
  - approx.40m NE
  - approx. 200m NE (remains persistent until the present-day)
  - 230m east of site

Potential Sources and Associated Contaminants Identified	
Source	**Potential Contaminants of Concern**
Adjacent orchard usage (circa.1887 to present-day)	Heavy metals, PAHs, SVOC
Adjacent workshop / storage shed (noted on walkover, present from at least circa.1990)	Hydrocarbons TPH CWG, PAH's, heavy metals, SVOC's, asbestos – area between workshop and onsite structure tested, no elevated contaminants beyond the presence of glass
Infilled ponds: - approx.41m east (remains persistent until the present-day) - approx.80-100m NE - approx.40m NE - approx. 200m NE (remains persistent until the present-day) - 230m east of site	Ground gases (CO2, CH4, CO) Discounted due to remaining persistent until the present-day, being redeveloped with structures (unlikely to be deleterious and of geotechnical suitability) and/or distance and lack of superficial geology and predominantly low to very low bedrock geology in the local area.

8.2 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.

8.3 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.

9.0 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.

9.1 PRELIMINARY CONCEPTUAL SITE MODEL

9.1.1 SOIL CONTAMINATION

The site is currently occupied by a former agricultural barn and limited exterior areas comprising concrete hardstanding and grassed areas. Historically, the site remained part of a wider orchard usage from at least circa.1887 through until around circa.1973/76, when the present-day structure was erected. Following this, the site has been in use for storage purposes (including various machineries, agricultural usages and materials). Whilst on site, a total of 2 No. hand-excavated inspection pits were formed, allowing an assessment of the present ground conditions to be carried out, in light of the sites historical legacy and proposed residential usage. Made ground atop clayey deposits was encountered and, whilst no elevated contamination was identified (no exceedances of metals, metalloids, PAH, TPH CWG nor SVOC or asbestos presence identified), the ground conditions were poor (anthropogenic inclusions) and glass shards were also noted within the deposits.

9.1.2 GROUND GAS AND HAZARDOUS VAPOURS

No significant potential sources of hazardous ground gas generation have been identified (historical infilled ponds in the surrounding area either remain persistent until the present-day, or have been redeveloped with structures atop – indicating a lack of deleterious content and likely infill was geotechnically stable and suitable, thus reducing the risk) and the site is located in an area where both superficial (Oadby Member) and bedrock geologies (West Walton Formation and Ampthill Clay Formation – undifferentiated) are predominantly low to very low in permeability, this acting to reduce impact from offsite sources. The site's historical agricultural usage (i.e. barn and storage) is considered a limited source of hydrocarbon presence; however, no significant evidence of hydrocarbon presence or storage has been identified on site, nor has hydrocarbon impacted subbases or concrete flooring been identified. Furthermore, environmental sampling carried out on site (between the most likely source of hydrocarbons – offsite workshop) has shown no elevated hydrocarbon presence.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Conseq.	Risk	Possible Mitigation
Contaminated Soils *(agricultural usage – environmental sampling identified no exceedances of contaminants; however, glass is present)*	Direct Ingestion & Direct Contact	Site Workers *(during site works, excavations, eating and drinking)*	Lw	Md	M/L	Site workers to wear appropriate PPE for health and safety reasons, suitable usage and adherence to relevant HSE guidance considered sufficient to mitigate hazards to LOW.
Contaminated Soils *(agricultural usage – environmental sampling identified no exceedances of contaminants; however, glass is present)*	Inhalation of Dust, Dry Arisings	Site Workers *(during site works, excavations, eating and drinking)*	Lw	Md	M/L	
Contaminated Soils *(agricultural usage – environmental sampling identified no exceedances of contaminants; however, glass is present)*	Crop Uptake & Direct Ingestion, Direct Contact	End Users *(residents / tenants, children, visitors, service personnel)*	Lw	Md	M/L	Whilst limited potential sources of soil contamination have been identified on and adjacent to site, site proposals include very limited exterior areas, with hardstanding and building footprint occupying the majority of site. As such, the majority of relevant pollutant linkages will be severed, following site redevelopment – as a matter of produce, environmental sampling was carried out in the west of site (between site and adjacent workshop) to provide an indicative of ground conditions and potential contaminants. Environmental sampling identified no exceedances of contaminants; however, glass shards were noted – as such, it is considered prudent to remediate this (and any other proposed exterior soft-landscaped areas) by way of excavation and replacement with certified clean materials (or encapsulation by hardstanding).
Contaminated Soils *(agricultural usage – environmental sampling identified no exceedances of contaminants; however, glass is present)*	Inhalation of Dust, Dry Arisings	End Users *(residents / tenants, children, visitors, service personnel)*	Lw	Md	M/L	
Contaminated Soils *(agricultural usage – environmental sampling identified no exceedances of contaminants; however, glass is present)*	Crop Uptake & Direct Ingestion, Direct Contact	Flora and Fauna *(on and offsite)*	Ul	Md	L	
Contaminated Soils *(agricultural usage – environmental sampling identified no exceedances of contaminants; however, glass is present)*	Vertical and lateral migration *(both superficial and bedrock geologies predominantly low to very low in permeability)*	Controlled Waters *(Secondary Undifferentiated and Unproductive Aquifers)*	Ul	Md	L	
Contaminated Soils *(agricultural usage – environmental sampling identified no exceedances of contaminants; however, glass is present)*	Direct contact *(pipe degradation and leaching)*	Services *(impacted new potable supply piping)*	Lw	Md	M/L	
Ground Gases (Methane and CO_2) *(no significant potential sources identified)*	Vertical and lateral migration *(both superficial and bedrock geologies predominantly low to very low in permeability)*	Site Workers & Excavations, End Users & Building Envelope *(ingress and build-up)*	Ul	Md	L	No significant potential sources of hazardous ground gas generation identified – see Section 9.1.2.
Volatile and Semi-volatile Organic Compounds *(no significant potential sources identified and environmental sampling showed no significant hydrocarbon presence)*	Vertical and lateral migration *(both superficial and bedrock geologies predominantly low to very low in permeability)*	Site Workers & Excavations, End Users & Building Envelope *(ingress and build-up)*	Ul	Md	L	No significant hydrocarbon storage, presence or usage has been identified on site and environmental sampling has identified no significant of exceeding presence of hydrocarbons. As such, the risks from hazardous vapours are considered to be low – recommend a Watching Brief (inline with Appendix E) be applied during site works.
Radon	Vertical and lateral migration	End Users & Building Envelope	Ul	Md	L	Site is not located in a Radon Affected Area.

KEY: Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, Ul = 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 (Ul)	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 (Vl)	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

10.0 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 risk with respect to the proposed development, which can be *mitigated by provision of a Phase 3 Remediation Strategy and Verification Plan*.

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 3 Remediation Strategy and Verification Plan to be written.

11.0 SUMMARY OF RISKS

12.0 HUMAN HEALTH

12.1.1 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's historical legacy, the site development proposals themselves and the lack of elevated contamination identified within the present soft-landscaping area. The site is proposed to be almost entirely encapsulated beneath building footprint and hardstanding, which will act to sever relevant pollutant linkages associated with soil contamination; however, whilst limited exterior areas are proposed and environmental sampling has shown no contaminant exceedances, the soils have been noted to be poor and unlikely to be suitable as a growing medium or for use in any proposed soft-landscaping (i.e. anthropogenic inclusions such as brick, concrete and more pertinently, glass shards and fragments). As such, it is recommended that any proposed soft-landscaping in the final site design by remediated by way of excavation and replacement with a *minimum* of 600mm of pre-certified, clean materials as a matter of prudence.

12.1.2 SITE WORKERS

The risks to site workers during site works are considered to be low to moderate, due to the potential for asbestos presence within roofing and cladding on the present site structure and the presence of sharps / poor quality soils in exterior areas on site. The potential for the inhalation of asbestos fibres and/or direct contact with glass shards within made ground are considered risks to site workers. The provision for considered usage of PPE, adherence to relevant HSE guidance during site works and provision of an asbestos survey (And removal, if required) on the existing site structure would be sufficient to mitigate the risks to low.

- 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.

13.0 CONTROLLED WATERS

The risks to controlled waters are considered to be low, due to the largely impermeable superficial and bedrock geologies in the local area inhibiting significant offsite migration, the lack of significant or mobile contamination identified or expected on site and the predominantly unproductive nature of the underlying aquifers.

14.0 STRUCTURES

14.1.1 GROUND GASES

No significant potential sources of hazardous ground gas generation have been identified (historical infilled ponds in the surrounding area either remain persistent until the present-day, or have been redeveloped with structures atop – indicating a lack of deleterious content and likely infill was geotechnically stable and suitable, thus reducing the risk) and the site is located in an area where both superficial (Oadby Member) and bedrock geologies (West Walton Formation and Ampthill Clay Formation – undifferentiated) are predominantly low to very low in permeability, this acting to reduce impact from offsite sources.

14.1.2 HAZARDOUS VAPOURS

The site's historical agricultural usage (i.e. barn and storage) is considered a limited source of hydrocarbon presence; however, no significant evidence of hydrocarbon presence or storage has been identified on site, nor has hydrocarbon impacted subbases or concrete flooring been identified. Furthermore, environmental sampling carried out on site (between the most likely source of hydrocarbons – offsite workshop) has shown no elevated hydrocarbon presence.

14.1.3 POTABLE WATER SUPPLY PIPING

Whilst no elevated TPH CWG presence has been identified from the soils sampled, the soils were seen to be of poor-quality with anthropogenic inclusions – as such, it is recommended that as a matter of prudence, any new potable piping is laid in a clean, fresh excavation and is suspended in an inert pea-gravel matrix, to prevent contact with residual site soils

(however, made ground deposits seen to be largely thin in depth on site, likely to be removed as part of site development). It is also recommended that the local water supply company are contacted in regards to their piping specification.

15.0 RECOMMENDATIONS

At this stage, based on the desk study information collected, it is considered that allowance be made for the following:

- A certified clean soil capping system in all private gardens and areas of soft landscaping.
- Water supply pipes being laid in fresh, clean excavations and being suspended in an inert pea-gravel matrix.

It is also recommended that a Watching Brief (as outlined in Appendix E) should be carried out by the site supervisor 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). Should previously unreported or undiscovered contamination be identified, then development should stop and Castledine Environmental should be contacted to determine if further assessment or changes to the remediation scheme are required.

16.0 REMEDIATION STRATEGY AND VERIFICATION PLAN

When this report has been agreed with your Local Planning Authority, a Phase 3 Remediation Strategy and Verification Plan would need to be produced regarding the remediation of proposed soft-landscaping on site.

17.0 REFERENCES

17.1 LEGISLATION AND REGULATIONS

17.1.1 ACTS

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

17.1.2 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

[4] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2017 SI2017/No.571

17.1.3 CONTAMINATED LAND REGULATIONS

[5] The Contaminated Land (England) Regulations 2000. SI2000/No.227

[6] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663

[7] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

17.2 STATUTORY GUIDANCE

[8] 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

[9] Communities and local Government, 2023: National Planning Policy Framework.

17.3 BRITISH STANDARDS

[10] BS 5930:2015+A1:2020 Code of practice for site investigations

[11] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice

[12] BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

[13] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

[14] Bs 10176:2020 Taking Soil Sample for Determination of Volatile Organic Compounds (VOCs)

17.4 NON-STATUTORY TECHNICAL GUIDANCE

17.4.1 ENVIRONMENT AGENCY

[15] Land Contamination Risk Management (LCRM) 2020, updated 2023

17.4.2 CIRIA PUBLICATIONS

[16] 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

[17] 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

17.4.3 CL:AIRE

[18] 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)

18.0 APPENDICES

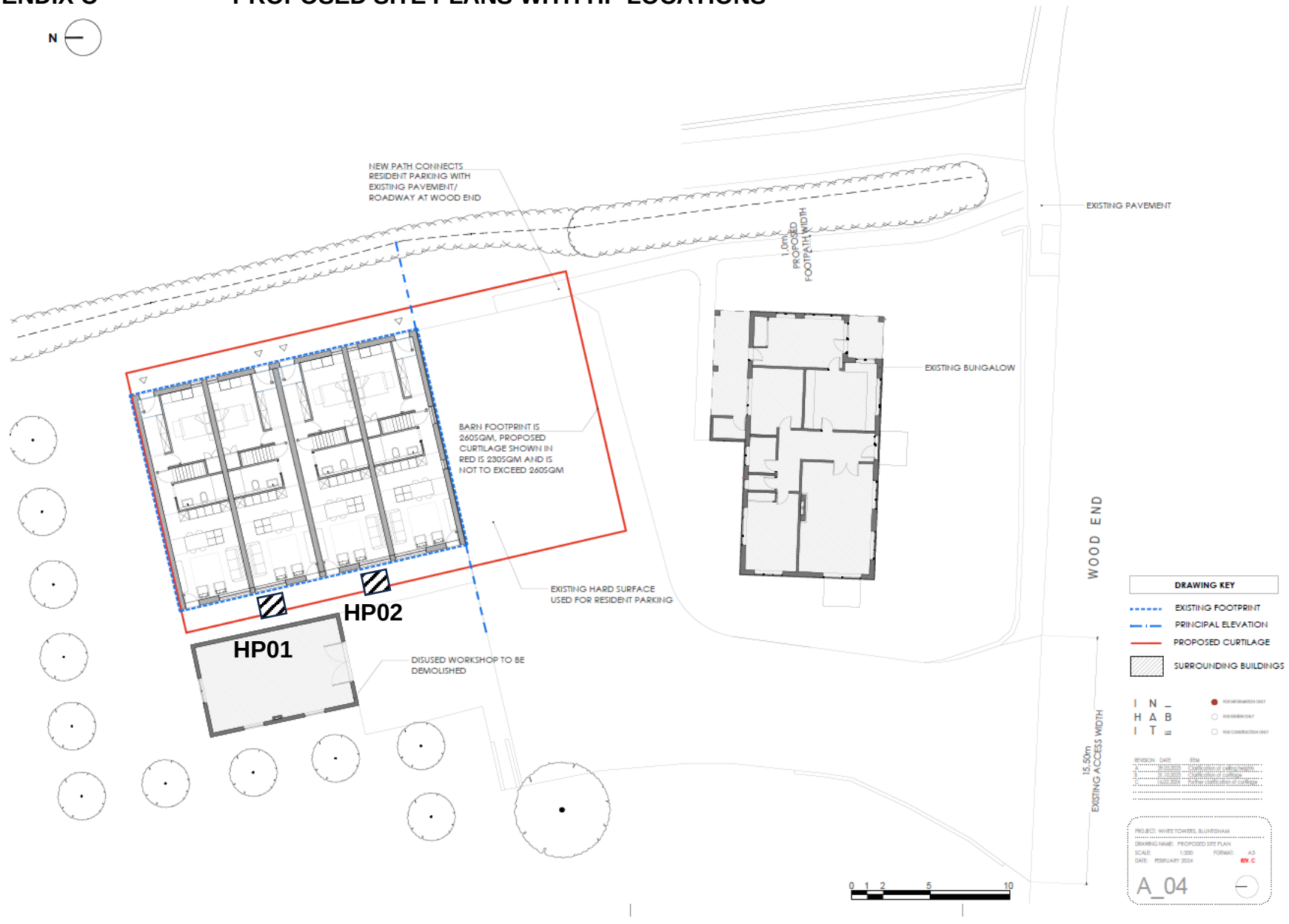
APPENDIX A **ENVIRONMENTAL SEARCH**

Separate Groundsure Report

APPENDIX B **HISTORICAL MAPPING**

Separate Map Packs (2 No. files)

APPENDIX C PROPOSED SITE PLANS WITH HP LOCATIONS



APPENDIX D SITE PHOTOS AND LOCATIONS

Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: White Towers, Wood End, Bluntisham
Client: Mr. D. Bridgens

Photo No.1: Facing NE outside the SW corner of the barn to be converted showing the front (southern) face of the barn



Photo No.2: Facing north from outside the southern face of the barn showing concrete curtilage to the south of barn



Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: White Towers, Wood End, Bluntisham
Client: Mr. D. Bridgens

Photo No.3: Facing slightly NW outside the eastern face of the barn showing PACM cladding and roofing on barn



Photo No.4: Facing south from outside the rear (northern) face of the barn from the adjacent field



Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: White Towers, Wood End, Bluntisham
Client: Mr. D. Bridgens

Photo No.5: Facing slightly SE outside the NW corner of site



Photo No.6: Facing north showing the interior of the barn with miscellaneous construction materials storage within



Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: White Towers, Wood End, Bluntisham
Client: Mr. D. Bridgens

Photo No.7: Example shot of the intact, agricultural grade concrete flooring within the barn (no staining noted)



Photo No.8: Showing the interior of the SW extent of the barn



Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: White Towers, Wood End, Bluntisham
Client: Mr. D. Bridgens

Photo No.9: Showing further intact, well-maintained concrete with no staining or evidence of such noted (inside eastern extent)



Photo No.10: Showing further intact, well-maintained concrete with no staining or evidence of such noted (inside western extent)



Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: White Towers, Wood End, Bluntisham
Client: Mr. D. Bridgens

Photo No.11: Facing south from inside the barn showing the barn extent and concrete structuring with further storage



Photo No.12: Former foundation inspection pit showing relatively fresh, gravelly Clay arisings (rear NE corner)



Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: White Towers, Wood End, Bluntisham
Client: Mr. D. Bridgens

Photo No.13: HP01 formed adjacent to the foundation of the barn (adj. to the SW corner of the barn)



Photo No.14: HP02 formed directly west of the barn (adj. to the NW corner of the barn – proposed soft-landscaping)



APPENDIX E WATCHING BRIEF

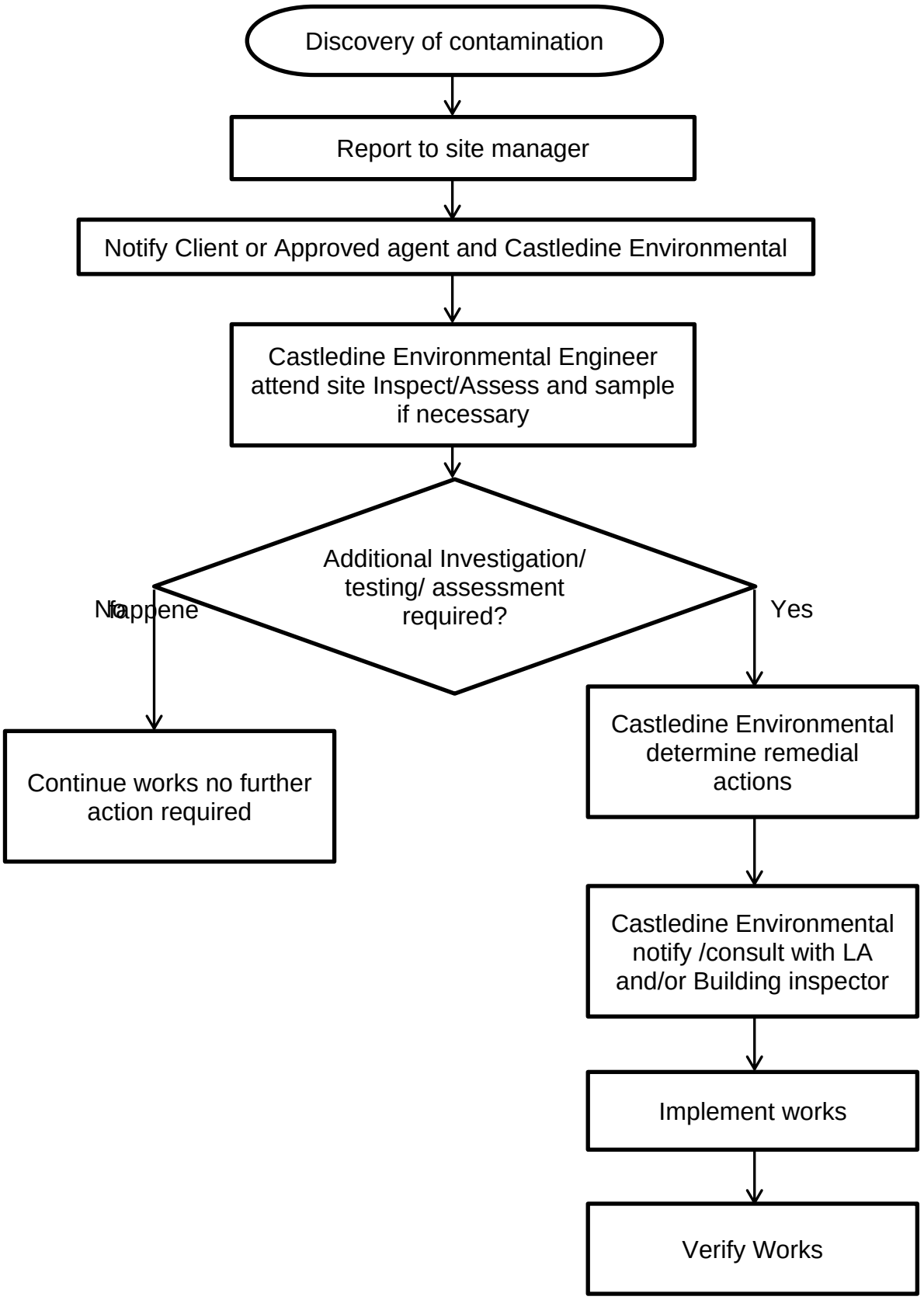
It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ashy materials, soils exhibiting strong odours, brightly coloured materials, and former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



APPENDIX G LABORATORY ANALYSIS

- Found as separate PDF(s)