

HERTS & ESSEX SITE INVESTIGATIONS

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GEOTECHNICAL ASSESSMENTS - ENVIRONMENTAL ASSESSMENT - DESKTOP STUDY - CONTAMINATED LAND

Report For :

LW Developments Ltd

Phase I DESK TOP STUDY REPORT

Site location :

**Northaw House,
Cuffley
Potters Bar
EN6 4PS**

**May 2018
Report No. 14736**

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LIST OF ABBREVIATIONS

BGS	British Geological Society
CIRIA	Construction Industry Research and Information Association
EA	Environment Agency
EFDC	Epping Forest District Council
GL	Ground Level
GW	Groundwater
HESI	Herts & Essex Site Investigations
LAPPC	Local Authority Pollution Prevention and Control
NOS	Not Otherwise Specified (waste material)
NHBC	National House-Building Council
OS	Ordnance Survey
PAH	Poly Aromatic Hydrocarbons
SPZ	Source Protection Zone
TPH	Total Petroleum Hydrocarbons
UFST	Underground Fuel Storage Tanks

DESK STUDY GENERAL NOTES

This report has been prepared based on the findings of investigations into the site conditions using current available data which has been recovered from Envirocheck to provide environmental data in relation to the site and surrounding area. Where possible, local sources have been researched to gain a better understanding of the site conditions. As part of this review, research has been undertaken with the Local Authority and the Environment Agency as to the site condition.

We can confirm that this report has been prepared based on the information gained and that this information is not exhaustive and that subsequent research may reveal additional facts that may influence the reporting. Where possible, this information has been researched.

All geological information has been researched using the British Geological Society website, (the geology viewer). The disclaimer associated with this portal confirms 'The British Geological Society accept no responsibility for omissions or misinterpretations of the data from their Data Bank as this may be old or obtained from Non-BGS sources and may not represent current interpretation.

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The accuracy of map extracts cannot be guaranteed and it should be recognized that different conditions on site may have existed between subsequent to the various map surveys.

We can confirm that within the assessment of the site, various websites have been visited and as such, we cannot confirm the validity of these sites and as such, this information is accepted de facto and without prejudice. Anyone relying on these sources does so at their own risk, however, Herts & Essex Site Investigations does undertake all reasonable care to ensure this data is relevant and correct.

It should be confirmed that the extent of review of this report has undertaken a broad review of on site features which would promote a contamination ground risk, however, this does not include ecological features and in particular Japanese Knotweed which should be reviewed under separate cover.

A review of the site will be made to confirm the extent of obvious Asbestos product or sheet materials either on the surface of the site soils or evident above ground, however, does not constitute a full Asbestos Survey by any means. This should be sought under separate cover.

DOCUMENT INFORMATION AND CONTROL SHEET

Client

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Qualifications

C.S.Gray

- ONC, HNC, P.G.Cert, P.G.Dip, M.Sc, (Geotechnical Engineering)
- SNIFFER modelling course
- CONSIM Groundwater Assessment Course.
- (28 Years in Geotechnical and Environmental Engineering)
- Asbestos Awareness Course;
- Non-Licensed Work with Asbestos Including>NNLW.
- Site Supervisors Safety Training Scheme, (SSSTS).

Document Status and Approval Schedule

Issue No	Status	Date	Prepared by : Rebecca Chamberlain Signature / Date	Technical review by : Chris Gray Martyn Smith Signature / Date	Checked By : Chris Gray Martyn Smith Signature / Date
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1 Final

REPORT ISSUE RECORD

As part of Herts & Essex Site Investigations approved Quality Management System, the company is required to document the issue of all reports to provide the client with a traceable control mechanism to prevent the issue of unauthorised copies.

All final copy reports are issued to the client on paper headed with Herts & Essex Site Investigations to assist in the identification of copied reports. Additionally, final copies are printed 'Velum' coloured paper for easy identification of final copy reports.

Notwithstanding the above, clients are at liberty to make copies of full or parts of these reports as they see fit, should they wish to do so. Additional controlled copies of documents may be supplied upon request, although, may be charged for, dependent upon the number of copies.

Please note, this reports has not been sent to the Local Authority, NHBC or Environment Agency with only the below issues made. Should copies be required for sending the relevant authorities, this can be undertaken upon request.

Controlled copies of this report have been issued according to the following schedule :-

Issue No	Recipient	Type	No. of copies	Date
1	HESI, (File Copy)	Paper	1	May 2018
2	LW Developments Ltd	Paper	1	May 2018
3	LW Developments Ltd	PDF	1	May 2018
4				
5				
6				
7				
8				

EXECUTIVE SUMMARY

PHASE 1 DESK TOP STUDY REPORT

Client	LW Developments Ltd												
Site Location	Northaw House, Cuffley Potters Bar EN6 4PS												
Existing Development	Vacant Offices (formally a manor house), with derelict outbuildings and grass paddocks.												
Proposed Development	Conversion of the offices (Manor House) and outbuildings to form residential land.												
Site Settings and Previous Uses	<p>The site area is recorded as a manor house and grounds since the earliest map reference. From Historic England the building was noted in place from 1698 and remains in place to date to the centre of the site area. Outbuildings and stables are in place to the east and west of the main building. These remain in place to date, although have recently been in use as offices and the out buildings and animal pens have become run down. The area within the north and south of the site form grass land from the earliest map and remain the same to date. Within the west of the site area there was a lodge house in place from 1896 to 1996.</p> <p>Surrounding the site area limited changes are recorded, to the north and south of the site area open land present, to the east and west of the site residential dwellings are in place. To the west of the site area an Electric Sub Station is in place from 1992. +Further from the site, 50m, to the south west within the open land there was a pond in place until 1970 when this feature may have been infilled.</p>												
Nearest Surface Water Feature	The nearest surface water feature is recorded as 15 meters to the northwest of the site, which looks to form ditches in place within the open land, also to the north east of the site about 15m a pond is recorded in place.												
Geological and Hydrological Profile	<table border="1"> <thead> <tr> <th>Geology</th> <th colspan="2">Aquifer Classification</th> </tr> </thead> <tbody> <tr> <td>Made Ground</td> <td>Shallow Made Ground Anticipated</td> <td>Not Classified</td> </tr> <tr> <td>Sand And Gravel</td> <td>Sands and gravels</td> <td>Secondary Aquifer</td> </tr> <tr> <td>London Clay</td> <td>Clay</td> <td>Unproductive Stratum</td> </tr> </tbody> </table>	Geology	Aquifer Classification		Made Ground	Shallow Made Ground Anticipated	Not Classified	Sand And Gravel	Sands and gravels	Secondary Aquifer	London Clay	Clay	Unproductive Stratum
	Geology	Aquifer Classification											
	Made Ground	Shallow Made Ground Anticipated	Not Classified										
	Sand And Gravel	Sands and gravels	Secondary Aquifer										
London Clay	Clay	Unproductive Stratum											
Groundwater Abstractions	No abstraction wells are recorded within 1.5 km of the site area.												
Source Protection Zone	The site does not lie within a Source Protection Zone.												
Potential Sources of Contamination	<p>Features On Site</p> <ul style="list-style-type: none"> - Offices - Manor House - Former Children's Hospital - Former stables and barns and outbuildings - Animal Pens - Inc Asbestos roof - Possible Asbestos fiber board - Former Lodge House 												
	<p>Features Off Site</p> <ul style="list-style-type: none"> - Pond-INFILLED - Potentially Infilled Land - Electric Sub Station 												
Previous Investigations	No reports relating to contaminated land are known to us at the time of writing this report relating to the site.												

Human Health Risk	<p>We would suggest that there are potential sources of contamination relating to the historical land use within the centre of the site, that may be in place within the upper subsoil which will require assessment.</p> <p>Potential pathways in place within the site area recorded as :-</p> <ul style="list-style-type: none"> • Dermal Contact; • Inhalation of dust and fibres; • Ingestion of home grown produce; • Ingestion of dust and fibres • Ingestion of contaminated water through water main pipework; • Inhalation of vapours from soils; • Inhalation Asbestos dust and fibres (from Asbestos within the building); • Inhalation Asbestos dust and fibres (from asbestos within the soil). • Inhalation of vapours from Groundwater.
Ground Water Risk	<p>In light of the Secondary Aquifer within the site area there is a potential for groundwater to be in place and to be impacted on by the site area, although risks of contamination within the site area recorded as low, the follow pathways may be in place: -</p> <ul style="list-style-type: none"> • Leaching, lateral migration of shallow groundwater system underlying the site and subsequent abstraction well; • Leaching, lateral migration of shallow surface water system adjacent to the site.
Surface water Risk	<p>In light of the ditches and pond located to the north of the site, direct links between the site conditions and the stream may be in place and as such, the follow pathways may be in place: -</p> <ul style="list-style-type: none"> • Leaching, lateral migration of shallow surface water system adjacent to the site
Vapour Risk	<p>Sources of contamination that may promote a vapour risk are recorded in place as such risk maybe in place.</p> <p>Potential pathways in place within the site area recorded as: -</p> <ul style="list-style-type: none"> • Inhalation of vapours from soils - Visual and chemical tests to be completed initially;
Land Gas Risk	<p>Infilled land is recorded in place in the form of a historic pond located off site to the south west. As such, this will have been infilled with potentially waste product and degradable materials and as such, the potential for land gas risk is in place.</p> <p>The geology within the site area should be assessed and based on this, we would suggest that a land gas assessment may be required with a minimum of six monitoring rounds completed over falling or low atmospheric pressures or frozen ground conditions.</p>
Recommend ations	<p>Next Steps</p> <ul style="list-style-type: none"> • Intrusive shallow based excavation using window sampler to assess the geological conditions and recover samples; • Initially assess soils for presence / absence of fuels and if encountered :- <ul style="list-style-type: none"> ○ Install standpipe for the monitoring of both groundwater and land gas / vapour risks; • Targeted sampling to assess on site source risk; • Spatial sampling for use in statistical analysis; • Consideration through the site assessment as to the presence of Asbestos product within the site and subsoil within the site; • Assess the risk to and from the groundwater - Leachate testing and groundwater sampling if required; • Visual observations of the subsoil encountered to make initial assessment of the potential risk from contamination. • Watching brief to record assess and report on unexpected contamination. <p>Based on the above, a risk assessment should be completed when the findings of the investigation have been completed. This will result in a revised conceptual model based on actual site conditions and confirm the risks in place.</p>

PRELIMINARY RISK ASSESSMENT – DESK TOP STUDY - PHASE 1 REPORT

1 Context and Objectives of this report

1.1 Introduction

We have been asked by LW Developments Ltd to undertake an investigation of the above site in order to assess the potential environmental impact of the existing and historical use of the site on the proposed development sufficient to document the level of risk and impact on future users and the environment.

At this stage, we have been asked to carry out this report without further environmental works proposed, on completion of this report. We would suggest that the protocols for the investigation of the site should form this desk top study, an intrusive investigation and environmental report, a remediation strategy report and a final validation report, where required. This is the basis on which this report has been prepared and as such, these protocols are expected to follow this report.

1.2 Reference to the Current Planning Application Details

There is no current planning application for the site area with Welwyn Hatfield Borough Council.

1.3 Decision Notice Relating to Contaminated Land

In light of no current application in place there are no conditions in place

1.4 Report Objectives

The objectives of the project were as follows:

- To anticipate regulatory action;
- To assess the site for Part IIA;
- To ensure development is 'suitable for use' status;
- To assess the site in other regulatory contexts;
- To inform acquisition, transfer or sale plans;
- To support funding decisions;
- For valuation purposes;
- For insurance purposes

1.5 Timescales of the Assessment

The timescales for the site investigation process are based on immediate site investigation data and the assessment of the site conditions based on this report at present. The scope of this report which define the following :-

- Any immediate risks identified within the site that may promote a high risk to the immediate site conditions;
- Any current site use features that would promote a risk that required 'quick' action;
- Any construction or medium term risks within the site which may be present during the construction process within the site;
- Any long term risks within the site that may require long term assessments or interim monitoring;
- Any risks within the site that may change upon the change in use of the site to form the proposed development.

1.6 Level of Technical Confidence Expected

The scope of this report has been prepared in order to assess the historical impact of the site and any previous site uses on the existing and proposed development scheme. The level of risk will be prepared and assessed based on historical mapping and environmental information which has been gained to support the development of this report.

Whilst this is the case, gaps in map records and information will be in place that would reduce the readers confidence of the information sought. As such, this report has been prepared as a preliminary or Indicative Report with a Medium Confidence Level.

1.7 Management Constraints

The site investigation has been prepared based on a budget and time scales which has been agreed with the client. The desk top study fees have been agreed at this time which will dictate a way forward.

2 Broad Characteristics of the site

2.1 The Site

The site is located within a rural area, to the north east of Potters Bar in Hertfordshire the details of which are summarised in Table 1 with the location plan of the site shown in Appendix 2, Sheet 1.

Table 1 Site Detail

Site Address :	Northaw House, Cuffley Potters Bar EN6 4PS
Site assessed under	Site Owners Request - Aid as part of future planning applications
Current use of land :	Vacant offices and out buildings. Paddocks surrounding the building
Previous use of site, (if known)	Manor House and small holding
Grid Reference	NGR 527450, 202420
Site Area	9.91 Hectares
Local Authority	Welwyn Hatfield Borough Council
Gradient of the site	The site area generally slopes down to the North. Within the north of the site area there is a steeper gradient to the north within the paddock.
Proximity of Controlled Waters, (if known)	The nearest surface water feature is recorded as 15 meters to the northwest of the site, which looks to form ditches in place within the open land, also to the north east of the site about 15m a pond is recorded in place.

2.2 Existing Site Use

The site area is currently vacant office building (within the former manor House) as well within the out buildings. Some of these have become slightly dilapidated. Surrounding the building grass paddocks are in place, some of which were in use at the time of the walk over for sheep grazing.

2.3 Surrounding Land Uses

The surrounding land uses are detailed below :-

- To the North of the site, Judge's Hill is in place with open land beyond;
- To the East of the site, residential dwellings area in place;
- To the South of the site, open agricultural land is in place;
- To the West of the site, a residential dwelling is in place (The White House) with Coopers Lane. Beyond the road an Electric Sub Station is in place and residential land in place beyond.

2.4 Site Reconnaissance

The site walk over visit was undertaken in May 2018 on which the weather conditions were recorded warm although slightly overcast.

Access

Access into the site area is recorded as off Coopers Lane, to the west of the site area, where the road meets Well Road. A driveway leads from the entrance to the east through the center of the site area up to the complex of buildings; the driveway then becomes a dirt track as it leads through the paddocks, no vehicle access on to the site is available from the east of the site area.

Driveways and yard areas are in place around the buildings, free pedestrian access is in place across the site area. At the time of the walk over limited access to within the buildings was possible.

Site Area

The site area forms a large building to the center of the site area, with out-buildings in place to the east and west of the building. Surrounding the complex of buildings grass land and wood land is in place.

The main building forms a large three story building, with a basement area. At the time of the walk over the building was surrounded by scaffold which extends over the roof of the building, with metal sheeting protecting the building. No access to within the building was possible at the time of the walk over. The western section of the building forms one and two stories with slate roof, these are in place with small concreted yard areas. His building was formally use as offices, with storage of paperwork seem in place.

To the east of the main building, former brick stables area in place. His forms a double height area through the center, with an open fronted section to the west, (both have tiled roofs) and some very dilapidated brick former animal pens to the east. The roofs of this section had fallen into the building and had become over grown with weeds and brambles. This block was formally animal stables, although at the time of the walk over no access to within the building was possible. Within the open fronted section there was a concrete floor in place with storage of straw and hay. To the south of the building there are yards areas in place which have become over grown with grasses, weeds and nettles. To the north east there is a smaller brick and tiled roof building in place, again no access was possible. To the south of this building there is a brick plinth in place which may be location of a former tank.

To the west of the main building, a number of single story buildings are in place, forming vacant barns, animal pen and a vacant dwelling. Towards the east of the area two barns are in place, one was in use as an office for an architect, the other formed a storage building with limited access at the time of the walk over. A tarmac driveway leads from the main driveway to the west of these buildings, on the opposite side of the driveway two additional barns and a dilapidated animal yard and pens are in place. The two barns form wood clad buildings with tile roofs and had inert building materials within them. The animal/pig pens between the two barns were brick built with asbestos sheeting roofs. The corrugated sheeting was broken in places and had fallen to the floor surrounding the building, although did not look to extend a significant distance from the building. The yard area is laid to road stone and dirt. To the west of this yard area there is a two storey residential dwelling with a single storey extension to the north. At the time of the walk over the building was vacant.

Within the west of the site area, on either side of the access driveway there is a wooded area in place, and to the south west there is a wall garden in place, parts of the wall have become slightly ruined, and the area was unkempt with low level grasses and weeds.

Across the south of the site area a large grass field is in place with a section of woodland to the west. At the time of the walk over the grass was over grown, and the surface undulated due to fallen branched and animal activity.

Within the south east and north of the site area, grassed paddocks are in place, section into three fields, at the time of the walk over these were in use for grazing of sheep. Within the fields clusters of mature trees are in place.

Vegetation

Across the site area, grasses, shrubs and trees are in place. Within the yard area surrounding the buildings this formed low level hardy weeds and plant growth was not so prevalent. Across the rest of the site area plant growth was good.

Above or below ground fuel or oil storage tanks

By examination of the site, no obvious above or underground fuel tanks are in place within the site.

Asbestos Containing Materials

Asbestos containing materials were reviewed on site from our walk over inspection. These were recorded within the complex of buildings and from our visual observations at the time of the walk over formed corrugated sheeting on the animal pens to the west, which has broken in place and fragments were seen in place on the surface around these buildings; also within the area of the dilapidated stables to the east, building debris is in place, with potential asbestos containing fiber board present. We recommend that an asbestos survey of the buildings be carried out, if not done so already, prior to any demolished or works on site; A full Asbestos survey will be required in order to fully consider Asbestos within the developed area of the site, and along any driveways.

Surrounding Area

To the north and south of the site area open land, forming pastures an agricultural land is in place.

To the east and west of the site area there are some detached dwellings in place with large gardens in place.

No significant features that would promote contamination risk within the site area are recorded in place.

Site Levels and Ground Cover

The site area generally slopes down to the North.

Within the north of the site area there is a steeper gradient to the north within the paddock. The southern section of the site and the area of the buildings form a more level area.

The majority of the site is laid to grass. Within the main complex of buildings some small areas of concrete, as well as road stone are in place within the yard areas. The driveways are laid to tarmac.







Current site activities







The site area is currently vacant, with only the paddocks within the north used for the grazing of sheep.


Effluent, Site Drainage and Services

Within the site area some manholes were in place mainly to the front of the main building. Services are in place within the site associated with the main building as well as some of the out buildings, although their location, condition or type are known.

2.5 Site Reconnaissance – Photos

Print 1	View of the front of the main building looking to the south	Print 2	View of the west wing to the main building looking to the south west
			
Print 3	View of the former stables to the east of the main building	Print 4	View of the former stables to the east of the main building
			
Print 5	View of the former stables to the east of the main building	Print 6	View of the former stables to the east of the main building
			

Print 7	View of the former stables to the east of the main building	Print 8	Potential Asbestos fibreboard to the south of the out building within the north east of the developed complex
			
Print 9	View of the former stables to the east of the main building	Print 10	View of the rear of the main dwelling looking to the north
			
Print 11	View of the rear of the main dwelling looking to the northeast	Print 12	View across the area of grass land within the south of the site area looking to the south
			

<p>Print 13</p>	<p>View across the area of grass land within the south of the site area looking to the west</p>	<p>Print 14</p>	<p>View within the west of the site area animal paddocks</p>
			
<p>Print 15</p>	<p>View across the area of grass land within the south of the site area looking to the south</p>	<p>Print 16</p>	<p>View across the site area looking to the north west</p>
			
<p>Print 17</p>	<p>Open Space area to the rear of the site</p>	<p>Print 18</p>	<p>Looking back at the main house and small outbuilding</p>
			







Print 19	View of walled garden	Print 20	View of walled garden
			
Print 21	View of small house towards main road	Print 22	View of external Animal Pens
			
Print 23	Asbestos roof on Animal Pens	Print 24	View of outbuilding
			

Table 2 Walk Over Inspection Risk

Feature	Location	Elevation	Is Risk Present?	Location To Target
Offices (former Manor House)	Centre	At GL.	✓	Within and around these features
Former stables and barns and outbuildings	Centre	At GL.	✓	Within and around these features
Animal Pens Inc Asbestos roof	Centre	At GL.	✓	Within and around these features
Driveways & Yards	Centre	At GL.	✓	Within and around these features
Possible Asbestos fibre board	Centre	At GL.	✓	Within and around these features
Paddocks	North and south of the site area		X	
Residential dwelling	Centre	At GL.	X	

3 Details of Searches Undertaken

Within this report, various searches have been undertaken in order to assess the risk associated with the development of the site from the historical and current use of the site and surrounding area. These include :-

- Environmental Data Search 1 : 10,000;
- Environmental Data Search 1 : 2,500;
- Site Sensitivity Maps and Data Sheets;
- Historical Maps;
- Internet Search;
- Local Authority Search – Planning Files;
- Consultation with Site Owner / Architect.

4 Information on Historical and Current Activities on the Site and Surrounding Area

The history of the site's land-use and development from Victorian times onwards has been researched from Ordnance Survey, (O.S.) maps. Extracts of the O.S. Maps and plans are presented in Appendix 4. Reference to historical maps provides invaluable information regarding the land use/history of the site, but historical evidence may be incomplete for the period pre-dating the first edition and between successive map references.

4.1 Discussion of the Development History

A summary of the historical development of the site and surrounding area, based on the information obtained from the above sources is provided in Table 3. It should be noted that these maps are only a small section of time and represent the timescales given in each of the map records. It is highly possible that development or features may have been developed within or surrounding the site which may influence the site and this should be borne in mind when assessing the history of the site.

Table 3 **Historic Maps Assessment**

Date	On Site Feature	On Site Mitigation (considering all possible pathways)	Off Site Feature	Off Site Mitigation (considering all possible pathways)
1882 Source Map Scale 1:10 560	Manor House (Nyn Lodge) – centre	Possible Soil Risk Possible Vapour Risk Possible GW Risk	Residential Land E & W	Limited Sources
	Open Land – N, E, S	No Sources	Open Land – N & S	No Sources
1873 Source Map Scale 1:2 500			Pond – E & SW	Receptors
1896 Source Map Scale 1:2 500	Re-named - Northaw House	Limited Sources		
	Outbuildings - W	Possible Soil Risk Possible Vapour Risk Possible GW Risk		
	Lodge House – W	Limited Sources		
1889 Source Map Scale 1:10 560				
1913 Source Map Scale 1:2 500				
1916 Source Map Scale 1:10 560				
1919 Source Map Scale 1:10 560				
1935 Source Map Scale 1:2 500				
1935 Source Map Scale 1:10 560				
1938 Source Map Scale 1:10 560				

Table 3a Historic Map Assessment - Continued.....

Date	On Site Feature	On Site Mitigation (considering all possible pathways)	Off Site Feature	Off Site Mitigation (considering all possible pathways)
1960 Source Map Scale 1:10 000				
1970 Source Map Scale 1:2 500			Pond SW - REMOVED	Possible Vapour Risk Possible GW Risk
1970 Source Map Scale 1:10 000				
1973 Source Map Scale 1:10 000				
1989 Source Map Scale 1:10 000				
1992 Source Map Scale 1:2 500			Electric Sub Station – W 50m	Possible Vapour Risk Possible GW Risk
1996 Source Map Scale 1:2 500	Lodge House – W - REMOVED	Limited Sources		
1999 Source Map Scale 1:10 00				
2006 Source Map Scale 1:10 000				
2018 Source Map Scale 1:10 000				

Table 4 Overview of Historic Map Assessment Risk

Identified Risk	Distance & Direction	Year	Is risk in place?	Considering All Pathways	
				Assessment Required.	Method of Assessment
Manor House (Nyn Lodge / Northaw House)	On Site – centre	1698* to Present	✓	Possible Soil, Risk Possible GW Risk Possible Vapour Risk	Recover Soil Samples Install Standpipes GW & Vapour Assessments
Open Land	On Site – N, E, S	Pre 1882 to Present	X	No Risks	
Outbuildings	On Site - W	1896 to Present	✓	Possible Soil, Risk Possible GW Risk Possible Vapour Risk	Recover Soil Samples Install Standpipes GW & Vapour Assessments
Lodge House	On Site – W	1896 to 1996	✓	Possible Soil, Risk Possible GW Risk Possible Vapour Risk	Recover Soil Samples Install Standpipes GW & Vapour Assessments
Residential Land	Off Site E & W	Pre 1882 to Present	X	Limited Risks	
Open Land	Off Site– N & S	Pre 1882 to Present	X	No Risks	
Pond INFILLED	Off Site – E - SW	Pre 1882 –Present Pre 1882 - 1970	✓	Possible GW Risk Possible Vapour Risk	Install Standpipes GW & Vapour Assessments
Electric Sub Station	Off Site – W 50m	1992 – Present	✓	Possible GW Risk Possible Vapour Risk	Install Standpipes GW & Vapour Assessments

* Historic England (<https://historicengland.org.uk/listing/the-list/list-entry/1100970>)

5 Details of the Intended Future Use of the Site

It is proposed to convert the main House, as well as the wing to the west and the stable block to the east of the site to form residential dwellings.

The dwelling to the west of the complex of buildings is also proposed to be redeveloped.

To the western boundary (in the location of the historical Lodge House), a new dwelling and garden is proposed.

In place of the out buildings within the site area, additional dwellings with driveways and private gardens are proposed.

Within the area of the wall garden within the southwest of the site three new dwellings are proposed.

The areas of open within the north and south of the site will remain open land.

6 References of Planning Applications

No current planning application is in place for the site area. From a review of the Welwyn Hatfield Borough Council web site no current application is in place.

Historical applications are recorded for the site area, these relate to the conversion of the site area to offices with a lodging area for the caretaker

7 Discussion with Local Authority

No discussion with the Local Authority has been completed.

8 Consultation with Environment Agency

Consultation has not been made with the Environment Agency at this time. The information gained from Envirocheck and the EA web site has provided sufficient information at this stage. The assessment of the site should take into account the groundwater regime within the site area and the possible risk from both on site and off site contamination.

Should heavy or persistent contamination be identified within any Phase 2 or intrusive investigation, consultation will be required and will be undertaken.

9 Consultation with Appropriate Bodies/Local Sources

Historic England (<https://historicengland.org.uk/listing/the-list/list-entry/1100970>)

This building is listed under the Planning (Listed Buildings and Conservation Areas) Act 1990 as amended for its special architectural or historic interest.

House, built in 1698, now office. Painted plaster on red brick. Slate mansard roof. 2 storeys and attics over sunken basement. 7-window elevation stepping forward in 3 shallow projections, the centre 2 projections and the angles with chamfered quoins. Continuous moulded eaves cornice with square modillions. 1st floor band. Pedimented to 3-window centre with bullseye window. C1800 semi circular porch with 2 Doric columns and pilaster responds fluted at the necks. Flush panel door in moulded frame. 6 stone steps and plain iron railings, similar railings fronting ditch. Recessed 1st floor sash windows. Ground floor French windows. Box dormers. Flanking quadrant red brick walls. Stone flag entrance hall with groin vaulting and reeded door surrounds each side. C19 replica staircase. Original service staircase with barley twist balusters on right centre.

Plainer 2-3 storey service blocks on W join with late C18/early C19 former stable block in painted brick, the slate roof with central ventilator. 1:4:1 windows, the outer bays recessed and with 2-storey relieving arches. (Pevsner (1977)).

Northaw House Hospital for Children

Coopers Lane, Northaw, Potters Bar, Herts EN6 4PS

Medical dates: 1950 - 1970

Medical character: Convalescent

In 1950 Northaw House Hospital for Children opened as a preconvalescent unit for children from the Royal Northern Hospital. It had 36 beds and was administered by the Northern Group Hospital Management Committee, part of the North East Metropolitan Regional Hospital Board.

By 1954, when the Hospital had 40 beds, its running costs were £14,331 a year. By 1958 these had risen to £16,829.

In 1963, as a consequence of the fusion of the Archway and Northern Groups (which became the North London Group), control of the Hospital was transferred to the Barnet Group Hospital Management Committee.

In 1963 a 'Mother and Child Unit' was established to provide support for inexperienced young mothers and their babies. Improvements were made to all the wards and, from 1964, the Hospital began to accept patients from a large area - from central London to Watford.

From June 1965 a ward with 6 cots was adapted for small mentally handicapped children.

The Hospital closed in 1970 with 36 beds.

Present status (June 2009)

The Grade II listed building now houses the offices of the Architects Co-Partnership.



The entrance to the driveway off Coopers Lane.



Northaw House, as seen from Judge's Hill on the north (above and below). It was built in 1698, with extensions added throughout the 18th century.



References

(Author unstated) 1962 The 'disappearing hospitals'. *British Medical Journal* 1 (5274), 323-331.

<https://ezitis.myzen.co.uk/northaw.html>

10 Previous Reporting

No previous reports are known to us at the time of writing this report.

11 Environmental Settings

11.1 Superficial Deposits and Solid Geology

The ground conditions based on geological maps and BGS information shows the site to be located within an area of Sand and Gravel. This is seen to overlie London Clay which will be in place to depth. Surrounding the site to the north east no superficial deposit is recorded in place.

11.2 BGS Boreholes

No BGS Boreholes are reported surrounding the site.

Table 5 Geological Information

Geological Unit	Brief Description	Anticipated thickness, (m)	Aquifer Type
Superficial Deposits/Drift			
<u>On Site</u>			
Filled/Re-worked ground	Made Ground, (Potentially Contaminated Stratum).	0.5-1.00 meters+	Not Classified
Sand And Gravel	Sand & Gravel Deposits	4-6 meters	Secondary A Aquifer
Solid Geology Deposits			
London Clay	Clay	15m +	Unproductive Stratum

11.2 Hydrology

The nearest surface water feature is recorded as 15 meters to the northwest of the site, which looks to form ditches in place within the open land, also to the north east of the site about 15m a pond is recorded in place.

The nearest discharge consent is recorded 19 meters to the north east of the site, for Sewage Discharges - Final/Treated Effluent - Not Water Company

The nearest pollution incident to controlled waters is recorded 233 meters to the west of the site which are recorded as Minor Incidents from Unknown Sewage in 1994.

11.3 Hydrogeology

The published Environment Agency Groundwater Vulnerability Map of the area, (Sheet 39 West London), indicates the site to be located within an area classified as a Secondary A Aquifer. The underlying geology is recorded as an Unproductive Stratum which is formed by London Clay.

No abstraction wells are recorded within 1.5 km of the site area.

The site does not lie within a Source Protection Zone.

11.4 Implication of groundwater

In light of the underlying Secondary A Aquifer, groundwater links are possible and therefore some degree of assessment will be required to classify the extent of risk to a groundwater system, as well as abstraction wells, surface water features and source protections zones surrounding the site area.

In accordance with Environment Agency guidance document: -

- Groundwater Protection: Principles and Practice (GP3) Part 5 – Remedial Targets Methodology,

The document confirms :-

- “Selecting compliance points for use in land contamination risk assessments the distance to a set compliance point should not exceed 50 metres for hazardous substances or a maximum of 250 metres for non-hazardous pollutants unless there are specific physical constraints on the ability to use the groundwater resource. Any increases above these specified distances may be justified but must be supported by a sustainability assessment that takes into account environmental, social and economic factors.”

Considering the above, groundwater risk may be in place if significant contamination or a persistent source of contamination are encountered or recorded within the site area, within the information to date risk is considered possible.

11.5 Flooding

The site does not lie within an area which is susceptible to flooding.

11.6 Landfill Sites

No landfill sites are recorded are recorded in place.

Infilled land has been identified as in place some 43 meters to the southwest of the site which was Unknown Filled Ground in 1877, which forms an infilled pond.

Table 6 Sensitivity of Environmental Receptors in the Vicinity of the Site

Receptor Type	Receptor(s)	Sensitivity	Comments
Groundwater	Secondary A Aquifer	Moderate	Possible risk to underlying Gravel Deposits
	Unproductive Stratum	Low	Limited risk of migration to a lower groundwater system
Water Abstraction	NONE		
Source Protection Zone	NONE		
Surface Water	Pond	Medium	The nearest surface water feature is recorded as 15 meters to the northwest of the site, which looks to form ditches in place within the open land, also to the north east of the site about 15m a pond is recorded in place.
Flooding	NONE		
Ecological	NONE		

12 Site Drainage and Other Potential Man Made Pathways

Drainage is recorded in place, although, the site has not been reviewed for drainage routes. A full drainage assessment may aid in the assessment of the site in relation to pathway creation for pollution to migrate.

13 Regulatory Data

Information relating to the potential hazards associated with environmental regulatory controls are summarised in Table 7 and 8. This information is recorded in full within the Envirocheck data provided within Appendix 5. The salient points recorded within this data are re-created below.

Table 7 Summary of Regulatory Data - Sources

Data	On Site	Off Site	Distance from site.	Is potential risk in place?
Sources				
Discharge Consents	None	Sewage Discharges - Final/Treated Effluent - Not Water Company	NE, 19m	X
Pollution Incident to Controlled Waters	None	Minor Incident - Unknown Sewage in 1994	W 223m	X
Potentially Infilled Land	None	Unknown Filled Ground (Pond, marsh, river, stream, dock etc)	SW 43m	✓
Radon Potential - Radon Protection Measures	No radon protective measures are necessary in the construction of new dwellings or extensions			X

Table 8 Summary of Regulatory Data - Receptors

Data	On Site	Off Site	Distance from site.	Is potential risk in place?
Receptors				
Nearest Surface Water Feature	None	Ditch & Pond	NW & NE, 15m	✓
Water Abstractions	None	None		X
Detailed River Network Lines	None	Inland river	NW 15m	✓
		Inland river	NE 15m	✓
Source Protection Zone	None			X

Table 9 BGS Estimated Chemistry Data

BGS Estimated Soil Chemistry Pollutant	BGS Estimated Soil Chemistry
Arsenic	<15
Cadmium	<1.8
Chromium	60-90
Lead	<100
Nickel	15-30

Considering the background concentrations present, Potential for human health risk is not anticipated within this area.

Table 10 Geological Hazards

Geological Hazard	Distance & Direction	Feature	Risk Assessment Required
Non Coal Mining Areas of Great Britain	On Site		No Hazard
Collapsible Ground	On Site		Very Low
Compressible Ground	On Site		No Hazard
Ground Dissolution Features	On Site		No Hazard
Landslide	On Site		Low
Running Sand	On Site		Very Low
Shrinking or Swelling Clay	On Site		Moderate

Table 11 Summary of Contemporary Trade Entries

Trade Name	Trade Use	Distance & Direction from Site	Is potential risk in place?	Comment
No trades are recorded within 300 meters of the site area, (See Envirocheck Data)				

*NB The above information is taken from the Envirocheck trade directories

14 Identification of Potential Contaminants of Concern and Source Areas

Potential sources of contamination are brought forward for further risk assessment which are detailed in Table 12 :-

Table 12 Table of Source Risk

Source Risk	Additional Features	Source of Information	Location	Date	Considering Site Specific Pathways	
					Assessment Required.	Method of Assessment
Features On Site						
Offices (former Manor House)		Walk Over	Centre	1698* to Present		
Manor House (Nyn Lodge / Northaw House)		Historical Maps	Centre	1698* to Present		
Children's Hospital		Historic England	Centre	1950 - 1970	Possible Soil, Risk	Recover Soil Samples
Former stables and barns and outbuildings		Walk Over Historical Maps	Centre	1974-Present	Possible GW Risk Possible Vapour Risk	Install Standpipes GW & Vapour Assessments
Animal Pens Inc Asbestos roof		Walk Over	Centre			
Possible Asbestos fibre board		Walk Over	Centre			
Lodge House		Historical Maps	On Site – W	1896 to 1996		
Features Off Site						
Pond			Off Site – E 15m	Pre 1882 –Present		
INFILLED			- SW 50m	Pre 1882 - 1970	Possible GW Risk Possible Vapour Risk	Install Standpipes GW & Vapour Assessments
Potentially Infilled Land			Off Site – SW 43m			
Electric Sub Station			Off Site – W 50m	1992 – Present		

15 Outline Conceptual Model

What must now be considered is what contamination should be identified as a potential hazard as a result of the use of the site specific areas. In order to undertake this task, the **Contaminated Land Reports, (CLR10)**, has been used which details some trades and potential sources of contamination. In addition to this, the Department of Environment Industry Profiles have been incorporated which detail trade, and also, specific site usage of the trade and contaminant sources.

The information below incorporates a hazard assessment of the features surrounding the site that could potentially impact on the proposed development. This is based on the information below :-

Table 13 CIRIA Contaminated Land Risk Assessment Table

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Extracted from CIRIA Publication C552 Contaminated Land Risk Assessment

Table 14 Risk Assessment A

Source (Potential Contaminating Use)	Potential Contaminants	Receptors	Pathways	Associated Hazard, [Severity]	Proposed Site Use Risk Assessment		
					Likelihood of occurrence	Potential Risk	Notes
<ul style="list-style-type: none"> - Offices - Manor House - Former Children's Hospital - Former stables and barns and outbuildings - Animal Pens - Inc Asbestos roof - Possible Asbestos fiber board - Former Lodge House 	TPH's Naphthalene,	Site Users Construction Workers.	Direct contact; Inhalation dust and fibers. Dermal contact	Medium	Likely	Moderate	Possible risk in place
			Ingestion of home grown produce	Medium	Likely	Moderate	Possible risk in place
			Ingestion of contaminated water through water main pipework	Medium	Likely	Moderate	Possible risk in place
			Inhalation of vapours	Medium	Likely	Moderate	Possible risk in place
			Inhalation of vapours through contaminated ground waters	Medium	Likely	Moderate	Possible risk in place
		Adjoining Land Owners	Direct contact; Inhalation dust and fibers. Dermal contact	Medium	Low Likelihood	Moderate / Low	Distance reduces risk
			Ingestion of home grown produce	Medium	Low Likelihood	Moderate / Low	Distance reduces risk
			Ingestion of contaminated water through water main pipework	Medium	Low Likelihood	Moderate / Low	Distance reduces risk
			Inhalation of vapours	Medium	Low Likelihood	Moderate / Low	Distance reduces risk
			Inhalation of vapours through contaminated ground waters	Medium	Low Likelihood	Moderate / Low	Distance reduces risk
		Controlled Surface Water;	Leaching, lateral migration of shallow groundwater to a target receptor.	Medium	Low Likelihood	Moderate / Low	Distance reduces risk
		Ground Water; Abstraction Well.	Leaching, migration through fissures / cracks which may migrate to a groundwater receptor.	Medium	Likely	Moderate	Possible risk in place
		Flora	Plant Uptake Direct Contact	Medium	Likely	Moderate	Possible risk in place
		Asbestos	Site Users Construction Workers.	Inhalation dust and fibers (from Asbestos within the building)	Severe	Likely	High
Inhalation dust and fibers (from asbestos within the soil)	Severe			Likely	High	Possible risk in place	
Metals Metalloids PAH's	Site Users Construction Workers.	Direct contact; Inhalation dust and fibers; Dermal contact;	Medium	Likely	Moderate	Possible risk in place	
		Ingestion of home grown produce	Medium	Likely	Moderate	Possible risk in place	
	Controlled Surface Water;	Leaching, lateral migration of shallow groundwater to a target receptor.	Medium	Likely	Moderate	Possible risk in place	
	Ground Water; Abstraction Well.	Leaching, migration through fissures / cracks which may migrate to a groundwater receptor.	Medium	Likely	Moderate	Possible risk in place	
TPH's Naphthalene,	Buildings; Construction Materials. Services	Direct contact with contaminated soils;	Medium	Likely	Moderate	Possible risk in place	
		Direct contact with contaminated groundwater	Medium	Likely	Moderate	Possible risk in place	

Table 15 Risk Assessment B

Source (Potential Contaminating Use)	Potential Contaminants	Receptors	Pathways	Associated Hazard, [Severity]	Proposed Site Use Risk Assessment				
					Likelihood of occurrence	Potential Risk	Notes		
Features Off Site – Pond- INFILLED – Potentially Infilled Land – Electric Sub Station	TPH's Naphthalene. CO ₂ , CH ₄ . PCB's	Site Users Construction Workers.	Direct contact; Inhalation dust and fibers. Dermal contact	Medium	Unlikely	Low	No Action		
			Ingestion of home grown produce	Medium	Unlikely	Low	No Action		
			Ingestion of contaminated water through water main pipework	Medium	Unlikely	Low	No Action		
			Inhalation of vapours	Medium	Low Likelihood	Moderate / Low	Distance from the site and the London Clay within and surrounding the site reduces risk		
			Inhalation of land Gases	Medium	Low Likelihood	Moderate / Low	Distance from the site and the London Clay within and surrounding the site reduces risk		
			Inhalation of vapours through contaminated ground waters	Medium	Low Likelihood	Moderate / Low	Distance from the site and the London Clay within and surrounding the site reduces risk		
	Adjoining Land Owners			Direct contact; Inhalation dust and fibers. Dermal contact					
				Ingestion of home grown produce					
				Ingestion of contaminated water through water main pipework					
				Inhalation of vapours					
				Inhalation of vapours through contaminated ground waters					
	Controlled Surface Water;			Leaching, lateral migration of shallow groundwater to a target receptor.					
	Ground Water; Abstraction Well.			Leaching, migration through fissures / cracks which may migrate to a groundwater receptor.					
	Flora			Plant Uptake Direct Contact	Medium	Unlikely	Low	No Action	
	Asbestos	Site Users Construction Workers.		Inhalation dust and fibers (from Asbestos within the building)	Severe	Unlikely	Moderate / Low	No Action - Distance removes risk	
Inhalation dust and fibers (from asbestos within the soil)				Severe	Unlikely	Moderate / Low	No Action - Distance removes risk		
Metals Metalloids PAH's	Site Users Construction Workers.		Direct contact; Inhalation dust and fibers; Dermal contact;	Medium	Unlikely	Low	No Action		
			Ingestion of home grown produce	Medium	Unlikely	Low	No Action		
			Controlled Surface Water;			Leaching, lateral migration of shallow groundwater to a target receptor.			
			Ground Water; Abstraction Well.			Leaching, migration through fissures / cracks which may migrate to a groundwater receptor.			No liability from third parties
TPH's		Buildings; Construction	Direct contact with contaminated soils;	Medium	Unlikely	Low	No Action		

Naphthalene, VOC's, PCB's	Materials. Services	Direct contact with contaminated groundwater	Medium	Low Likelihood	Moderate / Low	Distance from the site and the London Clay within and surrounding the site reduces risk
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Table 16 Overview of Risk Assessments - Proposed Site Use

		A	B	
Receptors	Pathways	<ul style="list-style-type: none"> - Offices - Manor House - Former Children's Hospital - Former stables and barns and outbuildings - Animal Pens - Inc Asbestos roof - Possible Asbestos fiber board - Former Lodge House 	Features Off Site	
			<ul style="list-style-type: none"> - Pond-INFILLED - Potentially Infilled Land - Electric Sub Station 	
Site Users	Direct Contact, Inhalation of Dust and Fibres, Dermal Contact	✓	X	
	Ingestion of home grown vegetation	✓	X	
	Ingestion of contaminated water through water main pipework	✓	X	
	Inhalation of vapours from soils	✓	X	
	Construction Workers	Inhalation of vapour from contaminated ground waters	✓	✓
		Inhalation of land gas vapours	X	✓
		Inhalation Asbestos dust and fibers (from Asbestos within the building)	✓	X
	Inhalation Asbestos dust and fibers (from asbestos within the soil)	✓	X	
Adjoining Land Owners	Direct Contact, Inhalation of Dust and Fibres, Dermal Contact	X	No Liability from third parties	
	Ingestion of home grown vegetation	X		
	Ingestion of contaminated water through water main pipework	X		
	Inhalation of vapours from soils	X		
	Inhalation of vapours from contaminated ground waters	X		
Flora	Plant Uptake / Direct Contact	✓	X	
Groundwater; Abstraction Well & Surface Water	Leaching, lateral migration of shallow groundwater to a River or surface water receptor.	✓	No Liability from third parties	
	Leaching, lateral migration of shallow groundwater system underlying the site and subsequent abstraction well or SPZ	✓		
Buildings	Direct contact with contaminated soils.	✓	X	
	Direct contact with contaminated groundwater	✓	✓	

*NB : Due to Severe Consequence from Asbestos and Explosive Gases, some risk is assessed and potentially in place and therefore highlighted above.

GW Only: Some risks have been assessed as a direct result of potential mobilisation of groundwater contamination that may influence the site. A pictorial conceptual model has been reproduced within this report to confirm the above findings

16 Discussion on Sources of Contamination

The assessments of the site have drawn conclusions of historical and ongoing land uses which may impact on the proposed development which will be further considered through location, (either on or off site) and nature of risk. These are discussed below:-

Table 17 Pollutant Risk

Risk Assessment	Land Use	Pollutant
Risk Assessment A	Features On Site	Soil, Groundwater & Vapour Risk
	<ul style="list-style-type: none"> - Offices - Manor House - Former Children's Hospital - Former stables and barns and outbuildings - Animal Pens - Inc Asbestos roof - Possible Asbestos fiber board - Former Lodge House 	Moisture Content, pH, Electrical Conductivity, Cyanide, (Free), Cyanide, (Total), Organic Matter, Boron, Sulfate, (2:1 water soluble), Chromium, (Hexavalent), Sulfate, (Total), Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Zinc, Speciated PAH's, (EPA Priority 16), Phenols, Asbestos, Total Petroleum Hydrocarbons (aliphatic/ aromatic 8-Band), Naphthalene VOC's Soil Sampling Groundwater & Vapour Assessment
Risk Assessment B	Features Off Site	Groundwater & Vapour Risk
	<ul style="list-style-type: none"> - Pond-INFILLED - Potentially Infilled Land Electric Sub Station 	Total Petroleum Hydrocarbons (aliphatic/ aromatic 8-Band), Naphthalene, CO ₂ , CH ₄ . PCB's. Groundwater & Vapour Assessment
Spatial Sampling, (General Assessment)		Moisture Content, pH, Electrical Conductivity, Cyanide, (Free), Cyanide, (Total), Organic Matter, Boron, Sulfate, (2:1 water soluble), Chromium, (Hexavalent), Sulfate, (Total), Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Zinc, Speciated PAH's, (EPA Priority 16), Phenols, Asbestos.

17 Next Steps

Considering the information gathered to date, we would suggest that an appropriate way forward would be to assess the condition of the subsoil within the site resulting from the historical and former uses of the site as detailed within previous sections of this report.

Within the site area and over its history there have been areas of the site surrounding the main complex of buildings where open land is in place, which has remained unchanged. These areas across the north and south of the site area are unlikely to contain significant contamination with no sources recorded in place. Therefore the further works proposed should be targeted around the complex of buildings in place towards the centre of the site.

We would suggest that the most viable way of assessing risk will be to consider the following assessment techniques.

17.1 Soil Assessment

Considering the site area, we would suggest that the most appropriate way forward would be to undertake a series of window sampler boreholes across the site to provide targeted sampling and additionally, general and spatial sampling of the subsoil to provide the necessary coverage of the site conditions.

Soil sampling will be completed recovering samples in appropriate containers for analysis by the analytical chemist. All sampling will be sent directly to the chemist in cool boxes to retain the integrity of the soil sample. Appropriate GQRA or DQRA assessments will be completed and reported in an Environmental Report as and when this is available and where appropriate.

Table 18 Soils Assessment - Targeted Sampling

<u>Feature</u>	<u>Method Of Investigation</u>
Offices	
Manor House (Former Children's Hospital)	Window Sampler Boreholes
Lodge House	Hand Auger Boreholes
Former stables and barns and outbuildings	
Animal Pens	

Table 19 Soils Assessment – Spatial Sampling

<u>Feature</u>	<u>Method Of Investigation</u>
Asbestos	Window Sampler Boreholes
Possible Asbestos fibreboard	Hand Auger Boreholes

17.2 Groundwater Assessment

As part of the justification for groundwater risk assessments or limitations of any groundwater assessments required, the following should be considered:-

- Soil contamination has a potential to be in place and as such, risk to groundwater is possible;
- BGS Records show the underlying geology as Sand & Gravel which is a Secondary Aquifer, where ground water may be in place, below this London Clay is recorded in place which forms an Unproductive Strata and will therefore not contain groundwater and will also reduce any migration potential.
- No abstraction wells are recorded within 1.5 km of the site area.
- The site does not lie within a Source Protection Zone.

Human Health Risk

- There is a potential for the former uses within and surrounding the site to have impacted on the groundwater, although the groundwater within the site is likely to be localised and the London Clay if in place within the site area will reduce the migration potential, therefore risk of contamination groundwater impacting on human health through vapours or through drinking water purposes is low.

Method of Groundwater Assessment

In order to gain an understanding of the groundwater system and the level of risk in place, we can confirm that the following works should be completed:-

- The Geology within the site should be confirmed;
- The depth of the Geology within the site should be assessed and if ground water is encountered some assessment of the risk to ground should be carried out;
 - Considering the size and nature of the site, the groundwater elevation may be perched at locations and as such, strikes may be local to lenses or pockets of more permeable ground in order to provide surface water run off.
 - Standpipes should be installed across the site, in order to orientate the groundwater table to identify groundwater flow direction. Three to four standpipes should be installed for groundwater assessment such that orientation of the groundwater table can be undertaken;
 - We would recommend that the installation of the boreholes at the site should be completed in order determine the groundwater elevation. The groundwater / standpipes should then be left in order to allow groundwater to reach equilibrium concentration which represents the groundwater condition at the site. The boreholes should be left for a minimum period of one week in order to allow the groundwater to reach equilibrium at which time, sampling of the groundwater can be completed and retained in appropriate containers. The sample should then be sent to the analytical chemist for assessment in appropriate transport conditions;
 - It is possible that groundwater assessments may require extending the standpipes into any superficial deposits suggested by the Envirocheck report;
 - In light of the size and nature of the site should ground water risk be recorded within the site area each borehole should be sampled and tested for the range of pollutants as identified within this report. The potential risks should be initially assessed against the UK Drinking Water standard as a Tier 1 assessment Criteria with possible further assessments required where heavy contamination or risk deemed in place;
 - The assessment of groundwater will also be used to consider the risks to surface water features and whether the site may impact on surface water features which are recorded to the northeast and northwest of the site;
 - Risk assessment A & B, to classify the extent of pollutants to be identified within the groundwater sample.

Risk to the Ground Water

- Pathway to the ground water and receptors are potential in place within the site area due to the Sand & Gravel, if in place.

17.3 Land Gas Assessment

Limited sources of land gases are in place for the site area formed by an infilled pond within the open land to the south west of the site area, should significant made ground or organic matter be encountered within the site area reassessment may be required, although for the information collect to date the risk of this is low.

Considering the potential for Land Gas risks the geology within the site area should be considered. If significant granular soils are in place, the migration risk to the site area may be in place and therefore the following assessment may be required.

Land gas monitoring should be specifically targeting the following land uses.

Table 20 Land Gas Assessment - Response Zone

Feature	Targeted Response Zone	Location to Target	Vapour or Gas risk
Made ground and Infilled ground	Made Ground	Site Wide	Land Gases - CO ₂ , CH ₄ .
Pond-INFILLED/ Potentially Infilled Land	Sand and Gravel	Migration onto the south of the site	Land Gases - CO ₂ , CH ₄ .

Considering the above, we would suggest that soil testing is undertaken to assess the infilled ground its depth and type, and a standpipe should be installed within the site with response zones placed within the upper made ground solely, and the following assessments completed as follows :-

- Install standpipes to allow vapour and Land Gas risk to be considered from the upper made ground, and any superficial deposits;
- Assess vapour risk over a minimum of six monitoring rounds to comply with CIRIA C665 to consider risks to buildings, CLR 11 and R & D Publication 66;
- Monitoring should be completed over falling or low atmospheric pressures or in periods where ground conditions are frozen to provide the worst case scenario for the site, although, the site is laid to hard cover which will restrict natural ventilation of any gases.
- Reporting of land gas and vapour risk/ can be completed assessing soils in situ using a Photo Ionisation Detector for Volatile Organic Compounds, (which include BTEX). Flow rates should also be noted for reporting purposes.

17.4 Vapour Risk Assessment

Considering the potential for vapour risk to be in place from various source as noted below, the following risk are in place.

Table 21 Vapour Risk Assessment - Response Zone

Feature	Targeted Response Zone	Location to Target	Vapour or Gas risk
Electric Sub Station	Sand and Gravel	Migration onto the west of the site area	TPH's, Naphthalene, PCB's
Former Children's Hospital		Centre of the site	
Former stables and barns and outbuildings	Made Ground	Centre of the site	TPH's, Naphthalene. VOCs
Former Lodge House		West of the site area	

Considering the above, we would suggest that soil testing is undertaken to assess whether contamination that may promote a vapour risk is in place within the site area and the groundwater.

17.5 Working Brief

It should be noted that this investigation is undertaken in order to identify the extent of contamination as a result of historic and ongoing use. Should any areas of the site be encountered within the development that appear potentially contaminated through visual or olfactory assessment outside that discussed within this report, consultation with ourselves should be undertaken in order to identify the risk associated with the material.

Table 22 Overview of Works

Receptor	Scope of Investigation Works Required			Proposed Method of Assessment	Proposed Site Works to Complete
	Soils	Assessment of : Vapour and Gas	Ground and Surface Water		
Human Health	✓	✓	✓*	Window Sampling - Soil sampling - Install standpipe - Groundwater sampling*	Recover samples of the made ground; Assessment of the underlying natural soils to consider contamination; Leachate testing on elevated samples; Vapour Risk Assessment; Analysis of soil samples for GQRA Assessment; Reporting
Surface Water	✓	X	✓*	Window Sampling - Soil sampling - Install standpipe - Groundwater sampling*	Recover samples of the made ground; Assessment of the underlying natural soils to consider contamination; Leachate testing on elevated samples.
Ground Water	✓	X	✓*	Window Sampling - Soil sampling - Install standpipe - Groundwater sampling*	Recover samples of the made ground; Assessment of the underlying natural soils to consider contamination; Leachate testing on elevated samples; Vapour Risk Assessment; Analysis of soil samples for GQRA Assessment; Reporting
Services & Building	✓	✓	X	Window Sampling - Soil sampling	Recover samples of the made ground; Vapour Risk Assessment; Groundwater Assessment; Analysis of soil samples for GQRA Assessment. Reporting
Geotechnical Assessment	✓	N/A	X	Window Sampling	Recover samples of the natural soils for laboratory testing; Assessment of shallow soils for conventional foundation; Consider deeper or piled foundations; Reporting.

NB * Initial assessments of the site should be undertaken using Leachate Testing and water sampling if required.

- # Complete soils testing to assess if vaporous contamination is in place within the site area.

APPENDIX ONE

CONCEPTUAL MODEL

Northaw House, Cuffley Potters Bar EN6 4PS

Site Specific Source-Pathway-Receptor - Proposed Site Use

Key
 Purple = Possible pathways
 Green = Possible receptors
 Red = Possible sources

Potential Pathways

Human Health

- ① Direct contact with contaminants in soil/dust or water
- ② Inhalation of contaminants through soil/dust/particles
- ③ Dermal Contact
- ④ Ingestion of home grown produce
- ⑤ Ingestion of contaminated water through water main pipework
- ⑥ Inhalation of Land Gas and Vapours
- ⑦ Inhalation of Vapours from Groundwater
- ⑧ Migration to off site Adjoining Land Owners

Flora

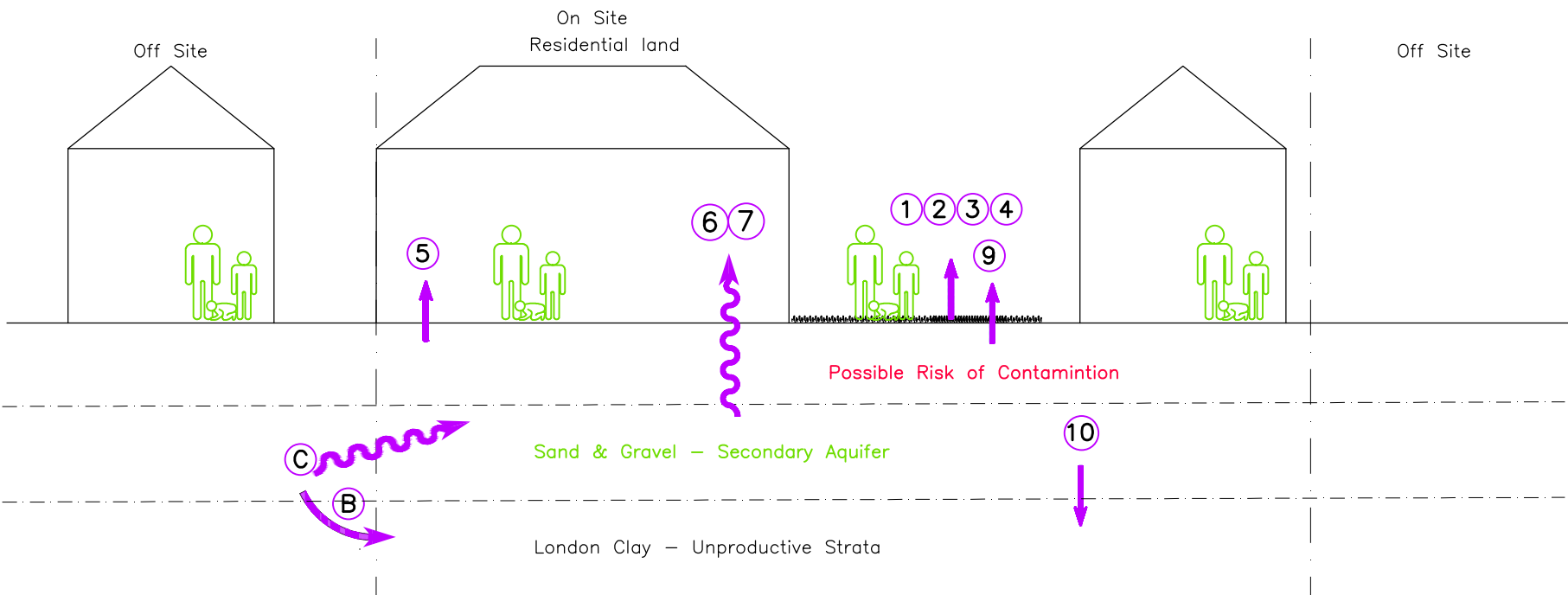
- ⑨ Plant Uptake & Direct Contact with soil

Controlled Surface Water, Ground Water & Abstraction Well

- ⑩ Leaching, lateral migration of shallow groundwater to a target receptor

Off Site Sources

- Ⓐ Migration of contamination to the site area
- Ⓑ Migration of land gases/ Vapours to the site area
- Ⓒ Migration of contaminated groundwater to the site area



APPENDIX TWO

SITE PLANS

HERTS & ESSEX SITE INVESTIGATIONS

THE OLD POST OFFICE, WELLPOND GREEN,
STANDON, WARE, HERTS, SG11 1NJ

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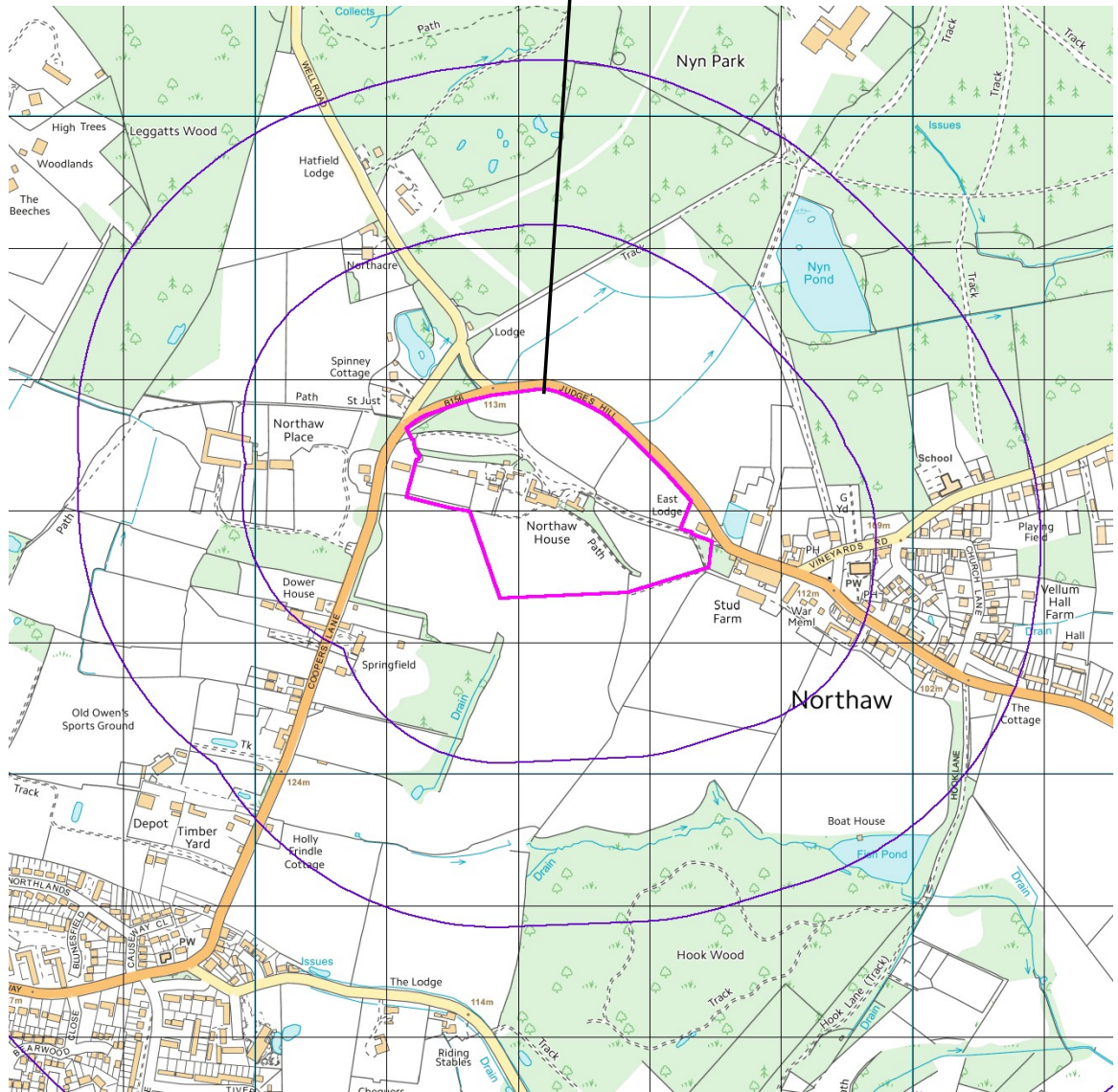
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Northaw House, Cuffley Potters Bar EN6 4PS

Location Plan



The Site



Not To Scale
Sketch No: DTS/14736/02/01

HERTS & ESSEX SITE INVESTIGATIONS

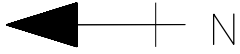
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Existing Site Plan



Not To Scale
Sketch No: DTS/14736/02/02

HERTS & ESSEX SITE INVESTIGATIONS

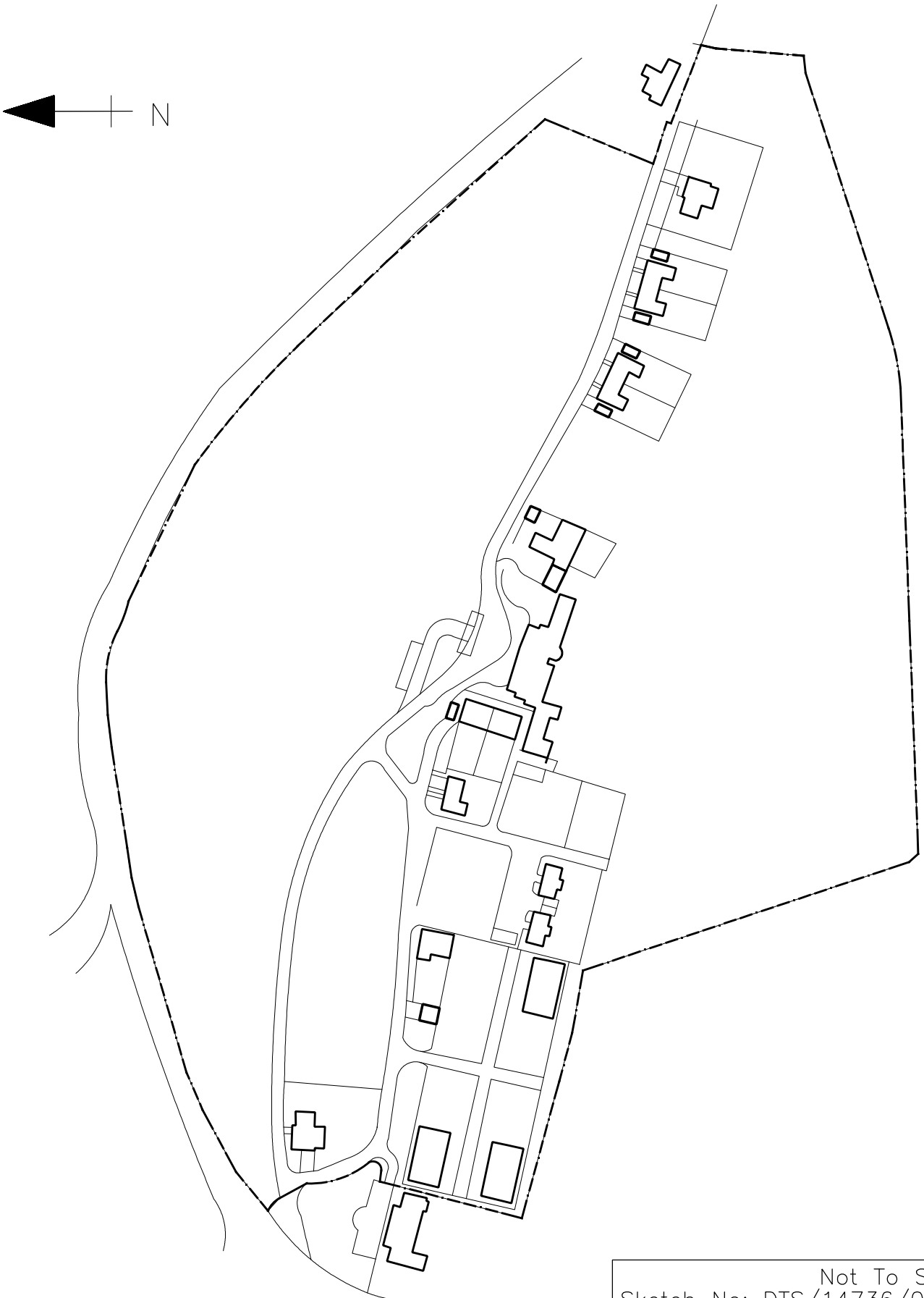
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Proposed Site Plan



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