REPORT ON GROUND INVESTIGATION AT CORBY OLD VILLAGE PRIMARY SCHOOL CORBY
REPORT STATUS SHEET

<table>
<thead>
<tr>
<th>Client:</th>
<th>Northamptonshire County Council</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report Title:</td>
<td>Report on Ground Investigation at Corby Old Village Primary School, Corby</td>
</tr>
<tr>
<td>Report Type:</td>
<td>Desk Study/Phase I Geoenvironmental Risk Assessment and Phase II Geotechnical/ Geoenvironmental Ground Investigation</td>
</tr>
<tr>
<td>Report Number:</td>
<td>AG2063-14-T65</td>
</tr>
<tr>
<td>Report Status:</td>
<td>Validated Issue 1</td>
</tr>
<tr>
<td>Date:</td>
<td>September 2014</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>One Copy Issued</th>
<th>Signed for and on behalf of Applied Geology Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report Author</td>
<td>T Collins BSc (Hons) MSc FGS Senior Geologist</td>
</tr>
<tr>
<td></td>
<td>22/09/2014</td>
</tr>
<tr>
<td>Checked</td>
<td>G P Wiggin BSc (Hons) MSc Principal Engineer</td>
</tr>
<tr>
<td></td>
<td>22/09/2014</td>
</tr>
<tr>
<td>Authorised</td>
<td>S Day BSc (Hons) MSc CGeol FGS SiLC Director</td>
</tr>
<tr>
<td></td>
<td>22/09/2014</td>
</tr>
</tbody>
</table>
# CONTENTS

1.0 INTRODUCTION ................................................................................................................................. 1

2.0 SITE LOCATION AND DESCRIPTION .................................................................................................. 2

2.1 General .................................................................................................................................................. 2
2.2 Walkover Survey .................................................................................................................................. 2
2.3 Proposed Development ....................................................................................................................... 4

3.0 DESK STUDY INFORMATION .................................................................................................................. 4

3.1 Site History ........................................................................................................................................... 4
3.2 Anticipated Geology ........................................................................................................................... 5
3.3 Mining History/Geological Cavities ..................................................................................................... 6
3.4 Radon ................................................................................................................................................... 7
3.5 Background Chemistry ....................................................................................................................... 7
3.6 Hydrology ............................................................................................................................................ 8
3.7 Hydrogeology ..................................................................................................................................... 8
3.8 Ecology ............................................................................................................................................... 9
3.9 Environmental Searches ..................................................................................................................... 9
3.10 Contemporary Trade Directories ....................................................................................................... 10

4.0 CONCEPTUAL MODEL .......................................................................................................................... 10

4.1 Summary of Site History ..................................................................................................................... 10
4.2 Summary of Anticipated Geology ....................................................................................................... 11
4.3 Potential Source - Pathway – Receptor Pollutant Linkages .................................................................. 11

5.0 SITE WORK ......................................................................................................................................... 13

5.1 General ................................................................................................................................................ 13
5.2 Driven Continuous Sampling Boreholes ............................................................................................. 14
5.3 Foundation Inspection Pits .................................................................................................................. 14

6.0 LABORATORY TESTING ......................................................................................................................... 15

6.1 Geotechnical Testing .......................................................................................................................... 15
6.2 Chemical Testing .................................................................................................................................. 15

7.0 GROUND CONDITIONS .......................................................................................................................... 16

7.1 General ................................................................................................................................................ 16
7.2 Hardstanding and Made Ground .......................................................................................................... 16
7.3 Relict Topsoil ...................................................................................................................................... 16
7.4 Northampton Sand Ironstone .............................................................................................................. 16
7.5 Groundwater ...................................................................................................................................... 17
7.6 Contamination ..................................................................................................................................... 17

8.0 RESULTS & SIGNIFICANCE OF LABORATORY TESTING FOR POTENTIAL CONTAMINANTS ................................................................................................................................. 17

8.1 Assessment of Soil Results .................................................................................................................. 17
8.2 Controlled Waters Risk Assessment ................................................................................................... 19

9.0 ASSESSMENT ....................................................................................................................................... 20

9.1 General ................................................................................................................................................ 20
9.2 Foundation Design ............................................................................................................................... 20
9.3 Floor Slab .......................................................................................................................................... 21
9.4 Excavations ....................................................................................................................................... 21
9.5 Buried Concrete .................................................................................................................................. 21
9.6 Contamination Aspects ....................................................................................................................... 22
9.7 Buried Services ................................................................................................................................... 23

10.0 HEALTH & SAFETY .............................................................................................................................. 24

11.0 LIMITATIONS AND EXCEPTIONS OF ASSESSMENT ........................................................................ 25

GENERAL NOTES

LIST OF REFERENCES
APPENDICES

APPENDIX A  DRAWINGS & FIGURES
APPENDIX B  DESK STUDY DATA
APPENDIX C  EXPLORATORY HOLE LOGS
APPENDIX D  LABORATORY TEST RESULTS & DATA SHEETS
1.0 INTRODUCTION

An area of land at Old Corby Primary School, Corby, is being considered for redevelopment by Northamptonshire County Council, (the Client). The proposals for the site comprise the construction of three extensions to the existing school building, as shown on Drawings ‘Alterations and Extensions Corby Old Village Primary School, reference No(s) M5496/A/106.4 and M5496/A/111.1, dated February 2014, prepared by QMP Consultancy Services. This report presents the results of a desk study/Phase I Geoenvironmental Risk Assessment and combined Phase II Geotechnical & Geoenvironmental Ground Investigation, undertaken on behalf of the Client.

The desk study/Phase I assessment and Phase II ground investigation were undertaken to:

- Permit formulation of an opinion, as to the potential for hazardous substances or conditions to exist on, at or near the site at levels or in a situation likely to warrant mitigation or consideration appropriate to the intended end use proposed by the Client and as stated above.

- Establish geological conditions and geotechnical parameters to permit safe and economic development design.

The terms of reference/brief for the works were mutually developed between Lend Lease (Project Managers) and Applied Geology and are outlined in our proposal and estimate AG14-4394-01 of the 4th July 2014. Limitations and Exceptions of the report are presented in Section 11.

More specifically, the services provided are summarised below and detailed in the following Sections.

- A site inspection and walkover survey to identify indicators (as defined in later sections) of the existence of hazardous substances or conditions on and in the vicinity of the site.

- A review of the following sources to provide data on likely ground conditions, geohazards and features which may affect development and to obtain information about the potential for hazardous substances to exist at and in the vicinity of the site:
  - GroundSure – GeolInsight & EnvirolInsight environmental databases.
  - GroundSure – MapInsight historical maps.
  - British Geological Survey (BGS) - published information & on-line borehole database.
  - Multi-Agency Geographical Information for the Countryside (MAGIC) on-line database.
  - Environment Agency Web Site.

- Ground investigation together with sampling, monitoring and a programme of laboratory testing.
- Assessment and reporting of the results of the works.

Statutory Service Plans were part supplied by the Client with supplementary plans (Linesearch) obtained by Applied Geology in advance of the site work. A Utilities Survey Drawing prepared by Amethyst Surveys, ref 10100, dated the 14 and 15th November 2013 and a Topographic Survey Drawing prepared by Global Surveys, ref 13679-Topo-1 dated November 2013, were provided by the Client’s Engineer.

2.0 SITE LOCATION AND DESCRIPTION

2.1 General

The proposed extension are located on the eastern, northern and southern elevations of the existing school building, which is located at the centre of the Corby Old Village Primary School site. The Corby Old Village Primary School is located approximately 1km to the northeast of Corby town centre. The Ordnance Survey grid reference for the centre of the site is SP 897 889 as shown on the Site Location Plan presented in Appendix A.

2.2 Walkover Survey

The site was inspected on the 31st July 2014, concurrent with the ground investigation.

Eastern Extension At the time of the investigation the footprint of the eastern extension comprised an area of asphalt playground adjacent to an existing single storey classroom, which stood to the west. The playground extended to the east, south and north, with landscaping, including mature trees, lying at the edges of the playground.

Southern Extension At the time of the investigation the proposed southern extension area comprised a garden and playground area, incorporating a covered walkway with school buildings lying to the north, east and west. The southern edge of the proposed footprint lies within an area of asphalt playground with landscaping containing outdoor play equipment lying to the south adjacent to the school site boundary. A date stone on the school building indicates a construction date of 1913.
Western Extension At the time of the investigation the footprint of the western extension comprised an area of asphalt playground adjacent to an existing single storey classroom, which stood to the east. The playground extended to the west, south and north, with the walled school boundary lying at the northern and western edges of the playground.

No potentially contaminative sources or uses were identified on or within the immediate vicinity of the site other than an industrial unit which was noted immediately to the north of the site although the former access road and yard area was significantly overgrown with trees suggesting the site had been vacant for a significant period of time.
It should be noted that Applied Geology Limited does not provide arboricultural surveys or specialist surveys for the detection of invasive plant species (such as Japanese Knotweed) or protected species of wildlife. Whilst no Japanese Knotweed or other controlled or invasive species was noted it is recommended that if required, separate investigation by specialists be undertaken to confirm this.

2.3 Proposed Development

The proposals for the site comprise the redevelopment of three areas of existing playground with extensions to an existing Primary School, comprising a new Main Hall measuring 11m by 15m incorporating two toilet areas and an enclosed corridor, a class room extension on the eastern elevation comprising a 6m by 2.6m extension to the Willow Classroom and a new classroom of dimensions 6.5m by 8.6m extending from the northern elevation, as shown on Drawing No M5496/A/106.4 dated 23/01/14, prepared by QMP Consultancy Services. A copy of which is included in Appendix A.

3.0 DESK STUDY INFORMATION

3.1 Site History

Historical maps were obtained in order to determine any significant past activity or land usage. Copies of these maps are presented in Appendix B of this report and are described below:

Table 1 – Site History Summary

<table>
<thead>
<tr>
<th>Map Date</th>
<th>On The Site</th>
<th>In The Vicinity Of The Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>1884 – 1888</td>
<td>The site is shown as a school, with buildings shown along the southern</td>
<td>The site is located on the eastern edge of the village of Corby, which is surrounded by</td>
</tr>
<tr>
<td></td>
<td>edge of the site.</td>
<td>agriculture. A railway is shown approximately 450m to the west. A unnamed stream is shown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>approximately 60m to the north, flowing from west to east. Pumps and wells are shown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>between 5m and 20m to the west, 20m to the north, 50m to the south, 70m to the southeast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and a spring is shown 100m to the northwest.</td>
</tr>
<tr>
<td>1899 - 1900</td>
<td>The site appears unchanged.</td>
<td>An Ironstone Quarry is shown approximately 100m to the east of the site, with further</td>
</tr>
<tr>
<td></td>
<td></td>
<td>quarries shown approximately 250m to the south, 250m to the northwest, 500m to the north</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and 500m to the east. The quarries are connected by a series of tramways which connect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with the main rail line.</td>
</tr>
<tr>
<td>1938</td>
<td>The former buildings are no longer shown and a new school building is</td>
<td>The Ironstone Quarry to the east is no longer shown and appears restored to fields. Circular</td>
</tr>
<tr>
<td></td>
<td>shown occupying the centre of the site with a second building shown along</td>
<td>structures are shown to the northeast between 180m and 240m, the structures are unlabelled.</td>
</tr>
<tr>
<td></td>
<td>the sites southern boundary and further buildings along the eastern</td>
<td>An extensive iron and steel works is shown approximately 200m to the northeast, including</td>
</tr>
<tr>
<td></td>
<td>edge of the site.</td>
<td>multiple sidings and associated structures.</td>
</tr>
<tr>
<td>1950 - 1957</td>
<td>The site appears unchanged.</td>
<td>The Iron and Steel Works to the northeast is shown to contain tube works and rolling mill.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A ironstone quarry is shown approximately 500m to the south and extends to the southeast.</td>
</tr>
</tbody>
</table>
### Table 1: Map Date and Site Details

<table>
<thead>
<tr>
<th>Map Date</th>
<th>On The Site</th>
<th>In The Vicinity Of The Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961–1963</td>
<td>The site appears unchanged and is referenced as ‘Rowlett County Primary School’.</td>
<td>A garage is shown approximately 45m to the west and a further garage is shown 250m to the south. The circular structures to the northeast are now labelled as ‘Works’.</td>
</tr>
<tr>
<td>1967–1970</td>
<td>The site appears unchanged.</td>
<td>Two rectangular tanks are shown on the adjacent property adjoining the sites northern boundary. The Steel Works to the northeast appears to have been extended, the iron stone quarry located 500m to the south has been restored and is marked as ‘Stanion Lane Plantation’. A new road is shown ‘Lloyds Road’ approximately 30m to the east of the school buildings.</td>
</tr>
<tr>
<td>1972–1986</td>
<td>The site appears unchanged.</td>
<td>No significant changes noted.</td>
</tr>
<tr>
<td>1987–1993</td>
<td>The building adjacent to the southern edge of the site appears to have been demolished.</td>
<td>The tanks adjacent to the northern boundary are no longer shown, the site to the north is marked as a garage. The tanks located to the northeast appear to have been removed, with the outline shown as a dotted line, the site is labelled as ‘Gas Distribution’.</td>
</tr>
<tr>
<td>2002</td>
<td>The site appears unchanged.</td>
<td>No significant changes noted.</td>
</tr>
<tr>
<td>2010</td>
<td>The site appears unchanged.</td>
<td>No significant changes noted.</td>
</tr>
<tr>
<td>2011–2014</td>
<td>The site appears unchanged.</td>
<td>The Garage to the west is no longer shown and the site has been redeveloped with housing.</td>
</tr>
<tr>
<td>Aerial Photograph</td>
<td>The site appears unchanged.</td>
<td>The surrounding area appears unchanged.</td>
</tr>
</tbody>
</table>

### 3.2 Anticipated Geology

Reference to the published 1:50,000 scale British Geological Survey (BGS) map, Sheet 171 solid and drift edition, indicates the site to lie close to the interface between the outcropping Northampton Sand Ironstone (Ooidal ironstone), shown to the east and the Grantham Formation (interbedded mudstones, siltstones and sandstones, shown below the site and extending to the west. The Grantham Formation conformably overlies the Northampton Sand Ironstone and lies at shallow dip angles. The digital mapping contained within the Groundsure Report indicates both outcropping Northampton Sand Ironstone and Grantham Formation below the site. Superficial deposits are shown on the 1:50,000 scale map to directly underlie the site and comprises Glacial Till of the Oadby Member, however, the more recent digital mapping contained within the Groundsure Report indicates the Till to be absent below the site, with the nearest outcrop lying approximately 60m to the south. The most recent data has been used as the basis for the diagrammatic conceptual model drawing included in Appendix A.

The 1:50,000 scale BGS map of the area indicates Made Ground (infilled ground) associated with opencast ironstone workings is present approximately 150m to the southeast and 400m to the north of the site, with further Made Ground associated with ironstone quarrying extending to the east. The BGS map associates the Made Ground with restored suspected ironstone quarry workings. The Groundsure Report contains details of infilled ground 33m to the north, 224m to the south and 397m to the west recorded as unspecified pits and unspecified old quarries.

A review of the BGS archive borehole database indicated three relevant records within 250m of the site, a summary is presented within Table 2 below:
Table 2 – Summary of Selected BGS Boreholes

<table>
<thead>
<tr>
<th>Borehole Ref</th>
<th>Location</th>
<th>Date Drilled</th>
<th>Strata Encountered</th>
</tr>
</thead>
</table>
| SP88NE968    | 96m - NE | 1978         | G.L to 0.50m. Sand and Gravel Fill.  
0.50 to 6.80m. Sandy clay with ironstone and flint nodules.  
Fill (restored ironstone quarry?)  
6.80 to 9.50m – Dark shaly Clay.  
Groundwater recorded at 4.60m bgl. |
| SP88NE969    | 109m - NE| 1978         | G.L to 0.75m. Slag and Clay Fill  
0.75 to 1.50m. Slag, clay and ironstone Fill  
1.50 to 6.50m. Sandy clay with ironstone and flint nodules.  
and boulders Fill (restored ironstone quarry?)  
6.50 to 9.50m – Dark shaly Clay.  
Groundwater recorded at 5.60m bgl. |
| SP88NE732    | 186m - NW| 1985         | G.L to 1.50m. Firm to stiff brown silty clay.  
1.50 to 2.70m. Light brown argillaceous LIMESTONE.  
2.70m to 8.40m. Light brown LIMESTONE.  
8.40m to 9.55m. Light brown SAND.  
9.55m to 10.00m. Light yellow brown SANDSTONE.  
10.00m to 15.00m. Light brown LIMESTONE.  
Groundwater recorded at 11.85m bgl. |

3.3 Mining History/Geological Cavities

Consultation of the Coal Authority's/Law Society’s Coal Mining Searches Directory indicates that the sites lies within an area for which a standard mining report is not required for new development.

The GroundSure GeoInsight Report indicates the site is not located in an area of recorded natural cavity formation, brine extraction, gypsum mining, tin mining or clay mining.

Details within the Groundsure Report derived from the Peter Brett Associates database of Non-Coal Mining Cavities indicates 'Barn Close Mine' located between 930m and 960m of the site associated with mining of magnetite, marcasite, siderite and ironstone. Further details contained within 'Ironstone Quarries of the Midlands – Corby Area' by Eric Tonks, indicates that the mine was operated as an extension of Old Barn Close Quarry to win ore from below a road, the mine was officially abandoned on 24th March 2014.

The Groundsure Report indicates five historic quarries and pits located within 250m of the site with the nearest located approximately 155m to the northwest associated with an unspecified pit. The report included details of nine historic ironstone quarries located between 150m and 975m of the site, one historic sandstone quarry is indicated 540m to the southwest and a clay and shale pit is located 560m to the south. One historic underground working is recorded located approximately 1km to the north, described as unspecified workings and dated to 1968 (possibly relating to Barn Close Mine).

Further details contained within ‘Ironstone Quarries of the Midlands – Corby Area’ by Eric Tonks indicates that the nearest workings to the site were some of the earliest quarry workings within the ore field, with the ironstone quarried and extracted for external sale via the railway network. The Quarry shown approximately 100m to the east of the site is referenced as ‘Rectory Farm’ Quarry.
and is shown as working between 1891 and 1899. ‘Lloyds Quarry’ is shown approximately 200m to the north of the site and is indicated to have been worked between 1879 and 1896. ‘West Glebe’ Quarry is shown approximately 400m to the west and is indicated to have been worked between 1899 and 1916.

The quarries were commonly worked as linear faces with the overburden stripped and placed within the worked out section of the quarry and the ore excavated and loaded directly into railway wagons. The early date of the workings suggests that the nearest quarries would have been worked in this way with restoration comprising ‘as dug’ natural soils. The BGS boreholes records include two records (SP88NE968 and SP88NE969) which appear to intercept a backfilled quarry with silty clay and nodules of ironstone encountered to depths of between 6.50m and 6.80m below ground level (bgl), confirming typically inert infill. Tonks indicates that Corby ironworks were constructed in 1910 with further development of the orefield undertaken to meet demand of the Ironworks as well as other established markets.

3.4 Radon

The site lies within an area currently defined in BR211:2007 (Radon: Guidance on Protective Measures for New Buildings) as requiring Full Radon Protection measures. The Groundsure Report indicates that the site is located within an area where 30% of the properties are above the Radon Action Level. The GroundSure report contains data from the BGS and Public Health England and indicates that full Radon Protective Measures, as detailed in BR211:2007, are required at this site. A copy of the GroundSure Report is presented in Appendix B.

3.5 Background Chemistry

Revised statutory guidance for Part 2A of the Environmental Protection Act was issued in April 2012. The revised guidance clarified that 'normal' background levels of contaminants in soils should not generally be considered cause to determine land as contaminated. The BGS was commissioned by DEFRA to produce guidance determining 'normal' background concentrations within England and Wales. The BGS assessed data for six metals, arsenic, cadmium, copper, mercury, lead and nickel and one organic compound, benzo(a)pyrene. The data was derived primarily from two studies ‘The Geochemical Baseline Survey of the Environment’ and the ‘English National Soil Inventory’.

Specific to this site the BGS database references concentrations of arsenic to be generally elevated within areas of outcropping ironstone compared with the general national upper confidence limit of the 95th percentile (UCL95).

The national UCL95 for arsenic is listed as 32 mg/kg based on a national dataset of 41,509 rural origin samples with a specific ironstone dataset of 437 samples giving a UCL95 of 220mg/kg, indicating a marked increase of naturally occurring background arsenic within areas of outcropping ironstone.

The Groundsure report includes details of the estimated background soil chemistry for five metals (arsenic, cadmium, chromium, nickel and lead) at the site and in the immediate vicinity to the site. A summary of the estimated concentrations is presented in Table 3, below.
Table 3 – Summary of Estimated Background Chemistry

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Estimated Range (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>35 - 60</td>
</tr>
<tr>
<td>Cadmium</td>
<td>&lt;1.8</td>
</tr>
<tr>
<td>Chromium</td>
<td>90 - 180</td>
</tr>
<tr>
<td>Nickel</td>
<td>15 – 60</td>
</tr>
<tr>
<td>Lead</td>
<td>&lt;150</td>
</tr>
</tbody>
</table>

3.6 Hydrology

The Corby Old Village Primary School is close to the summit of a low hill with ground levels falling towards the north, east and south. The mapping of the area, walkover survey and Groundsure report indicate the nearest surface watercourse as an unnamed stream located approximately 60m to the north of the site. There are no surface water abstraction licenses indicated within the Groundsure Report to lie within 500m of the site, with two abstractions indicated within 1000m at distances of 504m and 618m to the south both associated with abstraction for process water. There are four active discharge licenses within 500m of the site associated with two miscellaneous discharges at 155m and 471m and two sewage discharges at 478m all associated with the Willow Brook or a tributary of the Willow Brook.

The Environment Agency Web site indicates that the site lies outside of any flood plain, although a Zone 2 (1 in 1000 to 1 in 100 Risk) Flood area is shown 9 m to the north, with a Zone 3 (1 in 100 or greater Risk) Flood area shown 19m to the north. This report is however not intended to be a full hydrological study and if a flood risk assessment is needed, additional analysis by others is recommended to confirm this aspect of the development.

3.7 Hydrogeology

According to the GroundSure report the Northampton Sand Ironstone is classified as a classified as a Secondary (A) Aquifer and the Grantham Formations classified as a Secondary (undifferentiated) Aquifer. Secondary (A) Aquifers are defined as 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. Undifferentiated secondary aquifers are defined as aquifers of unknown properties. The underlying Whitby Mudstone is indicated as unproductive strata. The superficial Oadby Till deposits indicated approximately 60m to the south are also indicated as unproductive strata. There are no groundwater abstraction licences within 2000m of the site and the site is not located within a groundwater source protection zone.

The British Geological Survey indicates the site lies within an area where there is potential for sub-surface groundwater flooding. This rating is associated with risk to basements and other below ground structures. This data has a ‘High’ confidence rating.
3.8 Ecology

Information from environmental and ecological datasets were obtained from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website undertaken 28th July 2014 and the Groundsure Report.

There are no SSSI (Site of Special Scientific Interest), Local or National Nature Reserves, Special Areas of Conservation or Special Protection Areas within 2000m of the site. An Ancient Woodlands entry is recorded 1100m to the south of the site. Details are provided in the Groundsure Report with map extracts from the MAGIC search presented in Appendix B.

If a full assessment of Environmental or Ecological aspects is required, it is recommended that other specialists are consulted.

3.9 Environmental Searches

Information pertaining to environmental issues was obtained from a GroundSure report, commissioned by Applied Geology Limited, dated 22nd August 2014. This database contains sets of data corresponding to the databases held by a number of sources including: the Environment Agency (EA), British Geological Survey (BGS), Health Protection Agency (HPA), Coal Authority (CA), Department for the Environment, Farming and Rural Affairs (DEFRA) and Local Authorities (LAs). A copy of the report is included in Appendix B.

Table 4 – Summary of Environmental Database Searches. Features within 250m

<table>
<thead>
<tr>
<th>Feature</th>
<th>Groundsure</th>
<th>Environment Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfills</td>
<td>No (Infilled ground indicated)</td>
<td>No</td>
</tr>
<tr>
<td>Contamination Issues</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pollution Incidents</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

There has been seven recorded pollution incidents within 500m of the site. The incidents occurred at distances of between 364m and 495m and occurred between 2001 and 2003. Four instances relate to oil and fuel spills described as of no impact or of minor impact, two instances of contaminated water from firefighting described as minor at a distance of 440m from the site and as significant to water at a distance of 495m from the site and one incident relating to food and drink described as of no or minor impact. These are considered unlikely to have directly impacted upon the site.

Landfills have not been identified within 250m of the site with the nearest recorded landfill located approximately 435m from the site boundary and associated with accepting inert waste.

A single waste treatment facility is indicated within 250m of the site boundary, and is shown 228m to the north, associated with physio-chemical treatment of waste. The licence is held by Alpha Tankers Limited.
### 3.10 Contemporary Trade Directories

There are twenty currently active industrial activities indicated within 250m of the site of which two potentially contaminative activities have been identified to occur at a number of different sites. The following table summarises the contemporary Trade Directory (of currently operating businesses) entries within 250m of the site.

#### Table 5 – Summary of Contemporary Trade Directories

<table>
<thead>
<tr>
<th>Company</th>
<th>Trade</th>
<th>Distance from site (m)</th>
<th>Principal Potential contaminants</th>
</tr>
</thead>
</table>
| Electricity Sub Station(s) | Electrical Features | 98m – SE  
156m – N  
221m – SW  
234m – SW  
243m – N | PCBs  
(depending on construction date) |
| Various | Vehicle Sales, maintenance, storage or repairs | 136m – NW  
187m – W  
200m – NW  
204m – NW  
208m – NW  
217m – NW  
232m – S | Hydrocarbons |

Owing to the sites location close to the top of a hill and hence the down gradient location of each of the substations and vehicle sales, maintenance and repair facilities relative to the site and the relative distances between these sources and the site, which are generally in excess of 100m. The risk of PCB or hydrocarbon contamination occurring at the site from these off site sources is considered negligible.

### 4.0 CONCEPTUAL MODEL

In developing a Conceptual Model for the site, pollutant linkages are determined by identifying likely sources of contamination from previous and current site uses, possible targets such as site users, neighbouring site users and Controlled Waters and linkages between them. These are discussed below together with a diagrammatic representation, included in Appendix A, of the potential pollutant linkages for this site.

#### 4.1 Summary of Site History

The site is shown as a school from the earliest available map, with the current school building understood to have been built in 1913 and remaining largely unchanged to the present. The surrounding area was initially shown as predominantly residential with agriculture surrounding the village, ironstone quarrying occurs locally from circa 1890 with the growth of quarrying and construction of an ironworks to the northwest in 1910 gradually resulting in an increase of the size of Corby.
4.2 **Summary of Anticipated Geology**

The site is anticipated to be directly underlain by natural soils comprising weathered ‘rock’ associated with the Northampton Sand Ironstone (sand) and Grantham Formation (sand and clay). Possible disturbed or reworked soils (Made Ground) may also be present associated with the original development of the school, but are considered unlikely to be present in any significant thickness.

4.3 **Potential Source - Pathway – Receptor Pollutant Linkages**

4.3.1 **Sources**

**On-site**

The site history indicates limited potential for potential contamination beyond the possibility of disturbed soils associated with the initial development of the site.

The Northampton Sand Ironstone Formation can contain naturally occurring elevated concentrations of arsenic, chromium and nickel, when compared to other areas of the UK.

The Northampton Sand Ironstone is also a known source of Radon Gas.

Potentially sulphate bearing soil may be present below the site associated with the weathered regolith of the Northampton Sand Ironstone and Grantham Formations or from direct contact with the rock.

**Off-site**

Within the vicinity of the site a potential off site source of soil gas has been identified associated with infilling of former ironstone quarrying located approximately 100m to the east of the site. The age of the quarrying and records from the BGS indicates the quarry to have been infilled with as dug overburden with the associated risk of soil gas generation considered to be low.

The off-site current electricity substations and vehicle servicing/maintenance/ servicing facilities, former offsite garage and historical gas works identified are not considered to be potential sources of contamination at the site due to the distance between these off site sources and the site and the location of these off site sources down gradient of the site. With particular reference to the sub-station sites PCBs are also not very mobile within soil and typically do not migrate far from the source of any original leak.

4.3.2 **Pathways**

The proposals for the site comprise the redevelopment of three existing areas of asphalt playground with a new main hall, a new classroom and a classroom extension. The proposed redevelopment footprints comprise entirely of hardstanding. The risk to proposed end users via ingestion, dermal contact and inhalation pathways is therefore considered negligible.

Groundworkers may come into contact with possible contaminants associated with any Made Ground or natural soils via ingestion, dermal contact and inhalation.
pathways, although provision of adequate welfare facilities and by following good practice these potential pathways are considered diminished.

The Northampton Sand Ironstone Formation is described as a Secondary (A) Aquifer comprising typically of permeable layers capable of supporting water supplies, locally these permeable layers may offer preferential pathways for potential contaminants. The Grantham Formation is described as an undifferentiated Secondary Aquifer with undetermined permeability properties.

The existing site layout comprises areas of asphalt playground with the proposed end use comprising a main hall and classrooms, with limited/negligible surface infiltration such that leachates are unlikely to be created from contact with surface water and any underlying potentially contaminated soils.

Viable pathways for migration of contaminants associated with offsite contemporary trade activities are not considered to be present.

4.3.3 Receptors

End Users

End users are considered unlikely to encounter contamination associated with the near surface soils.

End users may be exposed to harmful concentrations of naturally occurring Radon from the underlying bedrock.

Controlled Waters

The Northampton Sand Ironstone and Grantham Formation are Secondary Aquifers and hence are potential sensitive receptors.

Buildings

Aqueous solutions of sulphate can attack hardened concrete. The attack causes expansive chemical reactions, which result in a reduction in strength and durability of the concrete.

Construction Workers

Groundworkers are considered sensitive receptors, who could require protection if significant contamination was present, although generally short exposure durations, adoption of good hygiene practice and the use of PPE are likely to limit any risk.

4.3.4 Diagrammatic Representation:

A diagrammatic representation of the Conceptual Model described above is presented in Appendix A and summarised in Table 6 below.
Table 6 - Initial Conceptual Site Model

<table>
<thead>
<tr>
<th>Source</th>
<th>Pathway</th>
<th>Receptor</th>
<th>Risk*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential contaminants within Made or Disturbed Ground</td>
<td>Inhalation, ingestion, dermal and direct contact.</td>
<td>End Users</td>
<td>Negligible</td>
</tr>
<tr>
<td>and or elevated naturally occurring concentrations of metals.</td>
<td></td>
<td>Groundworkers</td>
<td>Low**</td>
</tr>
<tr>
<td></td>
<td>Leaching of contaminants from Made Ground into permeable lenses.</td>
<td>Grantham Formation/Northampton Sand Ironstone</td>
<td>Low</td>
</tr>
<tr>
<td>Soil gas from Made Ground /disturbed ground on site and off site infilled Ironstone quarries (methane and carbon dioxide)</td>
<td>Migration into buildings and any excavations during construction</td>
<td>End users</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groundworkers</td>
<td>Negligible**</td>
</tr>
<tr>
<td>Radon</td>
<td>Migration into buildings</td>
<td>End users</td>
<td>High</td>
</tr>
<tr>
<td>Potential soluble sulphates within Made Ground/natural soils</td>
<td>Direct Contact with buried concrete.</td>
<td>Building foundations</td>
<td>Medium</td>
</tr>
</tbody>
</table>

* Definition of Risk Categories

** Assumes appropriate PPE and welfare provision on site

Negligible - Contaminants that might have unacceptable impact on key receptors, are unlikely to be present, or, no pathway is envisaged.

Low Risk: Contaminants may be present but are unlikely to be at levels to have unacceptable impact on key receptors, or pathways are likely to be minimal.

Medium Risk: Contaminants are probably present and might have an unacceptable impact on key receptors. Pathways may also be present therefore remedial measures may be necessary to reduce the risks.

High Risk: Contaminants probably or certainly present and pathways are probably also present. Therefore contaminants are likely to have an unacceptable impact on key receptors and therefore remedial measures are likely to be necessary to reduce risks to acceptable levels.

5.0 SITE WORK

5.1 General

Fieldwork was generally carried out, where relevant, in accordance with BS5930 :1999 “Code of Practice for Site Investigations”, BS10175:2011 “Investigation of Potentially Contaminated Sites - Code of Practice”, the Association of Geotechnical and Geoenvironmental Specialist Guidelines for Good Practice in Site Investigations (August 1998) and supervised by an experienced Engineering Geologist.

The locations of the exploratory holes were selected by Lend Lease (the Client’s Engineer) and set out on site by Applied Geology Limited, with adjustments in accordance with utility locations. A plan showing the proposed locations is included within Appendix A. The sampling strategy for the exploratory hole locations was to best investigate the ground and contamination conditions across the site given available access and based on the desk study. The borehole locations were located in order to target the three proposed extension footprints.

Prior to commencement on site, statutory services plans were either provided by the client or obtained by Applied Geology. The exploratory holes were set out to
avoid the locations of known services. Prior to drilling, the proposed locations were scanned with a cable avoidance tool (CAT) and service pits excavated by hand to a depth of 1.2m below ground level (bgl).

The positions of the exploratory holes were defined by measuring relative to site features, with reference co-ordinates obtained using a GPS (+/- 5m accuracy), levels were extrapolated from the topographic surveys prepared by Global Surveys. The locations are presented on Drawing No AG2063-14-02 included in Appendix A.

Descriptions and depths of the various strata recovered are presented on the exploratory hole records, reproduced in Appendix C together with sample depths, the results of in-situ testing, comments on groundwater inflows and any other pertinent information. The strata descriptions are in accordance with BS5930:1999 incorporating Amendment No 2 (2010). Disturbed plastic pot and glass amber jar samples were recovered from the various strata and stored and transported in cool boxes, where relevant, for possible future chemical laboratory testing.

5.2 Driven Continuous Sampling Boreholes

Three Driven Continuous Sampling (DCS) boreholes (DCS1 – DCS3) were drilled at the site on the 31st July 2014 to depths of between 1.65m and 3.25m bgl using a track mounted Archway Competitor sampling rig.

Samples of the deposits encountered were recovered in 1.00m long clear plastic liners, which were logged and sub-sampled on site by an Engineering Geologist.

The undrained shear strength of cohesive materials was determined where practical at selected intervals using a hand held penetrometer or hand shear vane.

During the drilling process, in-situ Standard Penetration Tests (SPTs) were undertaken at selected depths to determine the relative density of coarse grained deposits encountered or the in-situ strength of fine grained deposits by comparing the SPT "N" value results with published empirical data. Groundwater seepages were noted during drilling if encountered.

Details of the strata encountered, groundwater strikes, hand penetrometer/hand vane tests, samples taken and the SPT "N" values, (uncorrected for overburden pressure), are presented on the individual exploratory hole records presented in Appendix C of this report.

5.3 Foundation Inspection Pits

Three hand excavated foundation inspection pits (HDTP1 – HDTP3) were excavated at the site on the 31st July 2014 to expose the existing building foundations. The pits were excavated to depths of between 1.40m and 1.44m bgl using hand tools and were subsequently logged and photographed by an Engineering Geologist. The pits were backfilled with compacted arisings and the ground surface reinstated with cold lay asphalt.

Details of the strata encountered, photographs and foundation details are presented on the individual exploratory hole records presented in Appendix C of this report.
6.0 LABORATORY TESTING

6.1 Geotechnical Testing

A programme of geotechnical laboratory testing was undertaken on samples of the natural strata from both sites.

The geotechnical testing was carried out in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes and was undertaken by specialist laboratory (Terra Tek, UKAS Lab No 0126) and comprised three Atterberg limit and moisture content test undertaken upon samples from the Northampton Sand Ironstone Formation.

Additional analysis was carried out in accordance with BRE “Special Report 1 Concrete in Aggressive Ground - 2005” for a brownfield site and was undertaken by specialist laboratory (Chemtest, UKAS Lab No 2183) and comprised three samples of the Northampton Sand Ironstone Formation, which were tested for soluble sulphate and pH, with chloride, nitrate and magnesium being scheduled as dependant options in order to classify the standard of buried concrete for the site.

The results of the geotechnical testing are presented in Appendix D.

6.2 Chemical Testing

The chemical testing undertaken was selected based upon the desk study and walkover. The purpose of the testing was to determine the contamination potential of the soils encountered on site.

One samples of the near surface Made Ground/Subbase, one sample of the relict topsoil and one sample of the shallow weathered Northampton Sand Ironstone were analysed for the following suite of contaminants:

- Selected metals suite [arsenic, cadmium, chromium (total), copper, mercury, nickel, lead, selenium, vanadium, zinc];
- Speciated (to US 16) Polycyclic Aromatic Hydrocarbons (PAH);
- Soil organic Matter (SOM);
- pH.

No evidence of any on site fuel storage was noted during the walkover or from a review of the desk study data, with no evidence of hydrocarbons observed during the ground investigation, therefore petroleum hydrocarbon testing was not undertaken.

Similarly significant Made Ground was not encountered and therefore laboratory asbestos analysis was not undertaken.

The number of samples tested was designed to be sufficient to form an initial assessment of the contamination potential of the site, taking into account its known history and the materials encountered in the investigation.

Hence, it falls in line with the general requirements of BS10175 'Investigation of Potentially Contaminated Sites'.
MCERTS accredited methods, in accordance with Environment Agency recommendations, were specified where available.

Inert WAC analysis has been undertaken upon a selected sample of the weathered Northampton Sand Ironstone.

The results of the chemical testing are presented in Appendix D.

7.0 GROUND CONDITIONS

7.1 General

The ground investigation has identified Made Ground comprising imported subbase material below the asphalt playground. Relict topsoil was encountered within one location. The Northampton Sand Ironstone Formation was encountered across the site.

The ground conditions encountered are described in the following sections.

7.2 Hardstanding and Made Ground

Hardstanding and Made Ground was encountered within each of the boreholes and hand dug trial pits from ground level to depths of between 0.27m and 0.53m bgl.

An initial layer of asphalt was encountered within each borehole and or trial pit either from ground level or from below an initial layer of paving slabs (encountered within DCS2). The asphalt was encountered to depths of between 0.07m and 0.25m overlying subbase to depths of between 0.27m and 0.53m bgl. The subbase comprised variable material including recycled asphalt scalpings, sandy basalt gravel and sandy limestone gravel and cobbles, with rare fragments of brick.

7.3 Relict Topsoil

Topsoil was encountered within DCS2 from depths of between 0.38m and 0.86m bgl. The topsoil was described as firm grey brown organic slightly sandy slightly gravelly clay.

7.4 Northampton Sand Ironstone

Northampton Sand Ironstone was encountered in each of the three boreholes (DCS1 to DCS3) and within the three hand dug foundation inspection pits (HDTP1 to HDTP3), from depths of between 0.27m and 0.86m extending to the base of the exploratory holes at depths of between 1.40m and 3.25m bgl. The stratum initially comprised interbedded firm to stiff orange brown and dark brown slightly sandy to sandy slightly gravelly clay with gravel of angular sandstone and medium dense to dense yellow brown and orange brown silty sand becoming weak orange thinly bedded ironstone from depths of between 1.45m and 2.40m bgl.

The existing school foundations were identified at depths of between 1.32m and 1.40m bgl founded within the weathered Northampton Sand Formation.
Within the initial cohesive soils hand shear vane tests returned results of between 50kN/m² and 65kN/m² (medium strength), with Standard Penetration Tests ranging between N=19 and N=44. Within the granular weathered ‘rock’ SPT results ranged between N=30 and a refusal of 50 blows for 75mm, giving an extrapolated N value of 200 with the results generally increasing with depth. An SPT ‘N’ value versus depth plot is included within Appendix A.

The results of Atterberg limit tests carried out on three samples of the weathered Northampton Sand Ironstone have indicated one of the samples to be non-plastic and have given uncorrected plasticity index values of 10% and 17% for the two further samples. The corrected plasticity index values are 9% and 12%, with corresponding corrected plastic limits of 11% and 12% and corrected liquid limits of 28% and 31%. Moisture contents were between 18% and 21%. These results indicate the clays to be of low plasticity (to non-plastic) and low shrinkage potential. The results give a consistency index of 0.76 and 1.00 (stiff) which broadly accords with the field descriptions.

7.5 Groundwater

Groundwater was not encountered during the drilling of the boreholes.

7.6 Contamination

No visual or olfactory evidence of any gross contamination was encountered within the soils recovered from the boreholes.

8.0 RESULTS & SIGNIFICANCE OF LABORATORY TESTING FOR POTENTIAL CONTAMINANTS

8.1 Assessment of Soil Results

Suites of contamination testing on soil samples were carried out as described in Section 6.2. The results of this testing are presented in Appendix D of this report.

Based on the conceptual model and proposed redevelopment layout, pathways between proposed end users and contaminants within the soils have not been identified. The laboratory results have nonetheless been assessed to relevant human health screening values should the proposed scheme change.

Applied Geology Limited has followed the guidance given in the CLR 11 publication and other available guidance to assess the contaminant concentrations. Details of the methodology followed are briefly outlined below.

The available chemical data is sorted into appropriate datasets depending on sampling regime and ground conditions. An initial generic quantitative risk assessment is undertaken on this data using statistical tests, where appropriate, and appropriate screening values.

Risk to human health has been initially assessed by comparing soil results against various published statutory and non-statutory screening criteria. These have been sourced from the following, in order of preference:
The latest guidance from the HPA advises that for the assessment of speciated Polyaromatic Hydrocarbons (PAH) contamination benzo(a)pyrene (b(a)p) can be used as a surrogate marker for ‘genotoxic’ (gene damaging) PAHs.

The surrogate marker approach estimates the toxicity of a mixture of PAHs in an environmental matrix by using data from toxicity studies in which a PAH mixture of known composition was tested. Exposure to the surrogate marker (b(a)p) for C4SL is assumed to represent exposure to all the PAHs in the environmental matrix. Thus, the level of toxicity ascribed to the surrogate represents the toxicity of the PAH mixture. This allows an assessment of the combined carcinogenic risk associated with genotoxic PAHs using only b(a)p. Genotoxic PAH carcinogens have been marked with an asterix (*) on the summary Table in Appendix E.
In addition, where available the concentrations detected have been compared with the recorded naturally occurring background concentrations provided within the Groundsure Report, based on BGS data.

One sample of the relict topsoil, one sample of the Made Ground and one sample of the weathered Northampton Sand Ironstone were analysed and the results of this analysis have been initially assessed by direct comparison to the selected screening values.

The results including a summary table are presented in Appendix D and are discussed below.

**Topsoil**

The soil test results obtained from analysis undertaken on one sample of the relict Topsoil have been directly compared to and found not to exceed the residential public open space or residential without plant uptake screening values (2.5% soil organic matter).

**Made Ground**

The results from analysis undertaken on one sample of the Made Ground/subbase have been directly compared to and found generally not to exceed the residential public open space or residential without plant uptake screening values with the exception of a benzo(a)pyrene concentration of 22mg/kg which exceeds the C4SL of 10mg/kg.

Some asphalt fragments may have become intermixed with the subbase material, which is considered the probable cause of the elevated PAH concentrations.

**Weathered Northampton Sand Ironstone**

The soil test results obtained from analysis undertaken on one sample of the weathered Northampton Sand Ironstone have been directly compared to and found not to exceed the residential public open space or residential without plant uptake screening values (2.5% soil organic matter). The arsenic result of 56mg/kg falls below the residential public open space C4SL screening value of 79mg/kg and lies within the anticipated 'natural background' concentrations for the area, which are indicated to range between 35 and 60mg/kg.

### 8.2 Controlled Waters Risk Assessment

The desk study searches, walkover survey and findings from the ground investigation have not identified potential significant sources of contamination at the site itself. The ground investigation has confirmed the site to be partly underlain by cohesive layers within the Northampton Sand Ironstone. Groundwater was absent at shallow depth. The proposed development layout indicates each extension to comprise hardstanding. The chemical testing of soil samples has not found any onerous or potentially mobile contaminants. Based on these factors the potential for groundwater contamination to occur at the site or to impact upon distant surface water abstraction receptors is considered to be negligible.
9.0 **ASSESSMENT**

9.1 **General**

**Site Proposals**

The proposals for the site comprise the redevelopment of areas of existing playground with a new main hall, new changing room and classroom extension, as shown on Drawing No M5496/A/106.4 dated 23/01/14, prepared by QMP Consultancy Services.

**Summary of Ground Conditions**

The investigation has proven shallow Made Ground associated with subbase to pavement areas overlying Northampton Sand Ironstone. Groundwater was not encountered.

9.2 **Foundation Design**

It is recommended that as part of the site clearance, all existing services are removed from the proposed building footprints and that any subsequent voids are infilled with a suitable clean fill material.

It is envisaged that footings will be placed through the Made Ground, relict topsoil and initially firm weathered Northampton Sand Ironstone into the stiff clay or dense silty sand of the weathered Northampton Sand Ironstone to a depth of approximately 1.4m (to correspond with the existing foundations) or in accordance with the NHBC 4.2 guidance (if deeper).

Based upon traditional calculations and engineering judgement of appropriate parameters based upon the insitu and laboratory results, a net allowable bearing pressure of 150kN/m$^2$ is considered appropriate for conventional strip foundations of typical standard dimensions (up to 1.0m wide). This net bearing pressure should provide a minimum factor of safety of 3 against shear failure and maintain total settlements at less than 25mm. It is recommended that foundations be nominally reinforced to help mitigate the effects of differential movement of foundations spanning both the cohesive and granular horizons.

Trees were observed within the landscaping close to the eastern elevation and adjacent to the site boundary at the western elevation. Within the zones of influence of these trees minimum foundations depths should initially be based on the depths given within publications, such as the NHBC standards and the relative levels between the site and the proposed foundation level.

The ‘rock’ strength deposits can be considered non shrinkable and foundations would not be required to be deepened below ‘rock head’. If foundations were placed upon the ‘rock’ a net allowable bearing pressure of 300kN/m$^2$ is considered appropriate for conventional strip or pad foundations of typical standard dimensions (up to 1.0m wide for strips and 2.0m x 2.0m for pads). This net bearing pressure should provide a minimum factor of safety of 3 against shear failure and maintain total settlements at less than 25mm.
It should be recognised that in some cases, particularly where groups of trees exist, the potential zone of desiccation may be greater than that indicated by the NHBC Standards. Therefore all foundations should be inspected by a suitably qualified engineer to ensure footings are placed beneath any obvious evidence of desiccation or presence of tree roots and thereby place foundations within moisture stable conditions. Anti-heave precautions may be required where foundations are deepened due to the presence of trees and are in excess of 1.5m deep.

9.3 **Floor Slab**

Based upon the presence of Made Ground, relict topsoil and shrinkable strata with trees fringing the boundaries of the site (particularly the proposed eastern extension), a suspended slab is recommended.

9.4 **Excavations**

It should be possible to achieve the required depth for foundation excavations using traditional hydraulic plant. Deep excavations are not anticipated with excavations to between 1.50m and 2.40m bgl (if required) expected to be in interbedded sandy clay and silty sand soils associated with the weathered Northampton Sand Ironstone which are expected to remain stable for short periods. Vertically sided excavations in clays are liable to sudden collapse particularly where fissuring is present. Trench support or the angle of batter should be designed by an appropriately qualified engineer or competent person to suit the required depth and the ground and groundwater conditions.

Excavations in fissured clays and jointed rock should take into account the presence and alignment of such discontinuities.

Care should be taken when digging excavations to prevent undermining or causing loss of support to the foundations of the nearby structures. Surcharging such as from spoil or vehicle movements close to excavation sides should be avoided.

Practical guidance on trench excavation is given in CIRIA Report 97 Trenching Practice. Guidance on groundwater control is given in CIRIA Report 113 Control of groundwater for temporary works. Temporary works should be designed by a suitably qualified engineer or a competent person particularly where personnel access is necessary, in accordance with the requirements of the Construction (Design and Management) (CDM) Regulations.

9.5 **Buried Concrete**

The results of the sulphate tests carried out on three samples of the Northampton Sand Ironstone as part of the geotechnical testing have identified a characteristic water soluble sulphate 0.66g/l and pH of 6.9.

From these results the Design Sulphate Class has been calculated to be DS-1 and the Aggressive Chemical Environment for Concrete (ACEC) determined as AC-1s for the site as defined by the BRE Special Digest 1, Concrete Aggressive Ground, 2005, assuming static groundwater. Further reference should be made to BRE Special Digest 1 for requirements in respect of types of cement and aggregate to be used and variations in type of concrete construction.
9.6 Contamination Aspects

9.6.1 Soil

The soil test results have indicated the concentrations of contaminants to be generally below the Human Health screening values for a conservative residential without plant or residential public open space end use, with the exception of one elevated benzo(a)pyrene result associated with the subbase (probably from asphalt fragments). With respect to the end users of the site incorporating staff and pupils of the school the conceptual model indicates the proposed redevelopment footprint to fully comprise hardstanding with an associated negligible risk to proposed end users from the underlying soils. On this basis remedial measures are not considered to be necessary.

Any soil required to be imported to site must be certified as being "clean and inert" either by testing at source or by certificates provided by the supplier.

It is noted that if any excavated material is to be reused on site, a Waste Management Plan (WMP) and / or a Materials Management Plan (MMP) will be required. Any such materials must be suitable for re-use without further treatment, and only the quantity necessary for the specified works should be used. Any materials not within these definitions may need to be considered as waste whereby a Waste Management Licence Exemption will may also be required. In order to obtain an Exemption, one of the Exemption Criteria must be met and the Relative Objectives satisfied.

9.6.2 Updated Conceptual Model

The ground investigation and conceptual model has indicated that for the proposed layout the soils on site present a negligible risk to end users and controlled water. Elevated concentrations of sulphates were not encountered. Significant Made Ground or sources of potential soil gas have not been identified. Radon is known to occur naturally within the area and full radon protection measures are required. The Conceptual Site Model has therefore been updated accordingly.

Table 7 – Updated Conceptual Site Model

<table>
<thead>
<tr>
<th>Source</th>
<th>Pathway</th>
<th>Receptor</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential contaminants within Made or Disturbed Ground and or elevated naturally occurring concentrations of metals – None encountered</td>
<td>Inhalation, ingestion, dermal and direct contact.</td>
<td>End Users</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Leaching of contaminants from Made Ground into permeable lenses.</td>
<td>Northampton Sand Ironstone</td>
<td>None **</td>
</tr>
<tr>
<td>Radon</td>
<td>Migration into buildings</td>
<td>End users</td>
<td>Full Radon Protection Measures</td>
</tr>
<tr>
<td>Potential soluble sulphates within Made Ground/natural soils</td>
<td>Direct Contact with buried concrete.</td>
<td>Building foundations</td>
<td>DS1-AC-1s no special precautions **</td>
</tr>
</tbody>
</table>

** Assumes appropriate PPE and welfare provision on site
Within a previously used site it is important to accept that "hot spots" of contamination may exist and care and close vigilance should be part of any site work. Experienced environmental personnel should be available to visit the site and action any unusual material encountered. The information available on this site suggests the risk of any significantly impacted material requiring extensive remediation being found is considered "low".

9.6.3 Disposal of Soil Arisings off-Site

Any excavated soil material and excess spoil disposed of off-site should be treated as Waste and classified as Inert, Non-hazardous or Hazardous for off-site disposal prior to removal from site as required by the “Duty of Care” (Environmental Protection Act, 1990) legislation together with Annex II of Directive 1999/31/EC (“Landfill Directive”).

All waste soils should be sorted to prevent mixtures of waste types. Where possible, any waste soil should be recycled and the volume of soil to be disposed of should be minimised. Initially, Basic Characterisation of the waste is required whereby the material should be described and its source of origin recorded (a site plan, exploratory hole records and the certificates of chemical analysis in this report should be included).

This should also include data on its composition and leaching behaviour, its European Waste Catalogue (EWC) code, and where relevant any hazardous properties according to Annex III of Directive 91/689/EEC. This information should be provided to the licensed waste contractor.

The relict organic topsoil horizon would not be suitable for landfilling due to its organic content. It is expected that the existing subbase material would fall within the non-hazardous category and natural soil arisings at the site would fall within the Inert category. The soils excavated on the site would fall under the EWC description “Soil and Stones”, EWC code 17 05 04 with restrictions excluding topsoil and peat. Waste Acceptance Criteria (WAC) testing is required for all other Inert wastes and Hazardous Waste where relevant.

Inert WAC analysis has been undertaken upon a selected sample of the weathered Northampton Sand Ironstone. The results fall below the respective Inert criteria limits.

Any asbestos must be disposed of by suitably licensed contractors to a suitably licensed facility.

9.7 Buried Services

Water supply pipework can be affected by contaminants or aggressive materials within the ground, hence the results of the contamination testing in relation to the possible effects on any supply pipes should be considered. To fully assess the possible effects on these items consultation should be undertaken with the local Water Authority and reference made to the following document:

This site investigation report is not intended to be used as a Site Assessment Report (SAR) as required by the above referenced document. However, the results of the desk study and chemical testing may provide useful information.

The results of the desk study and visual observations on site suggests that hydrocarbons have not been used or stored on or in the close vicinity of the proposed extension footprints, the visual inspection of the soils gave no evidence of hydrocarbons.

In respect of other buried services, the following documents may be of use:

- Department of the Environment (DoE) Report 2982(P), Effects of Organic Chemicals in Contaminated Land on Buried Services (DWQ 9025), July 1992


As well as assessing the possible aggressive affects of these contaminants on the various cables the possible ignition of combustible soils due to temperature rises in the cables and indeed the possible ageing affects of high temperatures within the soils should also be considered. In addition as many of these cables are laid directly in the ground care should be taken that no large, sharp or heavy objects are left in the soil or within the soils used to backfill these trenches.

10.0 HEALTH & SAFETY

As outlined within the HSE publication ‘Successful Health and Safety Management - HSG65’ this report should inform your development of safe systems of work and information as an input into the safety management system. The presence of asbestos within the soils encountered in DCS1 should be noted.

When developing risk control systems we suggest making reference to the CIRIA report 132 "A guide for safe working on contaminated sites" and the HSE document "Protection of workers and the general public during the development of contaminated land – HSG66". All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999.

The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations 2007.
11.0 LIMITATIONS AND EXCEPTIONS OF ASSESSMENT

Northamptonshire County Council (the Client) has requested that a Phase I Geoenvironmental Risk Assessment and Phase II ground investigation be performed in order to assess the potential geoenvironmental and geotechnical implications associated with future redevelopment of the sites. The report is not a comprehensive site characterisation and should not be construed as such.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Northamptonshire County Council. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Applied Geology Limited. If any unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The findings and opinions conveyed via this report are based on information obtained from a variety of sources as detailed within this report, and which Applied Geology Limited believes are reliable. Nevertheless, Applied Geology Limited cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The report represents the findings and opinions of experienced geoenvironmental consultants. Applied Geology Limited does not provide legal advice and the advice of lawyers may also be required.

The opinions presented in this report are based on findings derived from a site inspection and walkover and offsite surveys, a review of records and historical sources, and comments made by interviewees. Applied Geology Limited has not found indicators that suggest that hazardous substances exist at the site at levels likely to warrant mitigation or consideration appropriate to the end use stated by Northamptonshire County Council, although full Radon protection measures will be required. Not finding such indicators does not mean that hazardous substances do not exist at the site.

The most recent site inspection/walkover survey was performed on 31st July 2014. Northamptonshire County Council is advised that the conditions observed by Applied Geology Limited are subject to change. Certain indicators of the presence of hazardous substances may have been latent at the time of the most recent site reconnaissance and may subsequently have become observable.

It is possible that Applied Geology Limited’s researches, while fully appropriate for a Phase I Geoenvironmental Risk Assessment, failed to indicate the existence of important information sources. Assuming such sources actually exist, their information could not have been considered in the formulation of Applied Geology Limited’s findings and opinions.

Similarly, the work carried out for the Phase II investigation carried out between July and September 2014 can only investigate and monitor a small part of the subsurface conditions. Certain indicators or evidence of hazardous substances may have been, outside the very limited portion of the subsurface investigated or monitored, latent at the time of this work or only partially intercepted by the works and thus their full significance could not have been appreciated.
Groundwater levels are particularly susceptible to variation. Accordingly, it is possible that Applied Geology Limited’s work whilst fully appropriate for a Phase II investigation failed to indicate the presence or significance of hazardous substances. Assuming such materials present a hazard, their presence could not have been considered in the formulation of Applied Geology Limited’s findings and opinions. The subsurface geological profiles and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

Applied Geology Limited believes that providing information about limitations is essential to help Northamptonshire County Council identify and thereby manage its risks. These risks can be mitigated - but they cannot be eliminated, through additional research. Applied Geology Limited will on request advise Northamptonshire County Council of the additional research opportunities available, their impact on risk, and their cost.
GENERAL NOTES

A) The assessment made in this report is based on the site terrain and ground conditions revealed by the various field investigations undertaken and also any other relevant data for the site including previous site investigation reports (if available) and desk study data. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available. It must be recognised that many of the Environmental Searches obtained during the course of the desk study are often lengthy. Applied Geology have, where appropriate and in the interests of simplicity, only reproduced the summary of the searches within the report. A full copy of all the search data is held at the Applied Geology office and is available for inspection if required.

B) Where any data supplied by the Client or other external source, including that from previous site investigations, has been used it has been assumed that the information is correct. No responsibility can be accepted by Applied Geology for inaccuracies within this data.

C) Whilst the report may express an opinion on possible configurations of strata between or beyond the exploratory locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy.

D) Comments on groundwater (and landfill gas) conditions are based on observations made during the course of the present and past investigations or with reference to published data unless otherwise stated. It should be noted, however, that groundwater (and landfill gas) levels vary due to seasonal (or atmospheric conditions) or other effects.

E) The copyright of this report and other plans and documents prepared by Applied Geology is owned by Applied Geology and no such report, plan or document may be reproduced, published or adapted without the written consent of Applied Geology. Complete copies of the report may, however, be made and distributed by the Client as an expedient in dealing with matters related to its submission.

F) This report is prepared and written in the context of the proposals stated in the introduction to the report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Applied Geology for re-assessment and if necessary, re-appraisal.

G) The survey was conducted and this report was prepared for the sole internal use and reliance of the Client. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Applied Geology. If an unauthorised third party comes into possession of this report they rely on it at their peril and Applied Geology owes them no duty of care and skill.

H) Ground conditions should be monitored during the construction of the works and the recommendations of the report re-evaluated in the light of this data by the supervising geotechnical or geo-environmental engineers.

I) Unless specifically stated, the investigation has not taken into account the possible effects of mineral extraction.

J) The economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, depends on very many factors in addition to geotechnical considerations and hence its evaluation is outside the scope of this report.

K) Applied Geology operates as a Consultancy and does not operate its own laboratory for soil testing, this work being sub contracted to known and respected, generally UKAS accredited, laboratories. Applied Geology can therefore not be held responsible for the testing carried out.
# LIST OF REFERENCES COMMONLY USED BY APPLIED GEOLOGY IN REPORTS

<table>
<thead>
<tr>
<th>SECTION/TITLE</th>
<th>AUTHOR/PUBLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LABORATORY TESTING</strong></td>
<td></td>
</tr>
<tr>
<td>BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes</td>
<td>BSI</td>
</tr>
<tr>
<td><strong>SITE WORK</strong></td>
<td></td>
</tr>
<tr>
<td>BS 10175:2011 Code of Practice for the Investigation of Potentially Contaminated Sites</td>
<td>BSI</td>
</tr>
<tr>
<td><strong>FOUNDATION DESIGN</strong></td>
<td></td>
</tr>
<tr>
<td>BRE Special Digest 1. 2005 Third Edition. Concrete in Aggressive Ground</td>
<td>BRE</td>
</tr>
<tr>
<td>NHBC Standards, Chapter 4.2. Building Near Trees. 2011</td>
<td>National House Building Council</td>
</tr>
<tr>
<td>Engineering in Chalk (C574). 2002</td>
<td>CIRIA</td>
</tr>
<tr>
<td>Engineering in Mercia Mudstone (C570). 2001</td>
<td>CIRIA</td>
</tr>
<tr>
<td><strong>SOIL GAS</strong></td>
<td></td>
</tr>
<tr>
<td>Indicative Atlas of Radon in Scotland (HPA – CRCE-023), 2011</td>
<td>HPA</td>
</tr>
<tr>
<td>Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments. BS8485:2007</td>
<td>BSI</td>
</tr>
<tr>
<td>Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present (C665). 4th Ed, 2007</td>
<td>NHBC &amp; RSK Group</td>
</tr>
<tr>
<td><strong>GROUNDWATER</strong></td>
<td></td>
</tr>
<tr>
<td>BRE Digest 365: Soakaway Design. 2003</td>
<td>BRE</td>
</tr>
<tr>
<td><strong>CONTAMINATION ASPECTS (Soil &amp; Groundwater)</strong></td>
<td></td>
</tr>
<tr>
<td>Cover Systems for Land Regeneration. Thickness of Cover Systems for Contaminated Land. 2004, BR465</td>
<td>AGS/BRE</td>
</tr>
<tr>
<td>Planning Policy Statement 23: Planning and Pollution Control. 2004.</td>
<td>HMSO</td>
</tr>
<tr>
<td>NHBC Standards, Chapter 4.1: Land Quality – Managing Ground Conditions. 2011</td>
<td>National House Building Council</td>
</tr>
<tr>
<td>ATRISK* Sp Soil Screening Values</td>
<td>Atkins</td>
</tr>
<tr>
<td>CLEA Software (Version 1.08)</td>
<td>Environment Agency</td>
</tr>
<tr>
<td>The Water Supply (Water Quality) Regulations. 2011</td>
<td>DWI</td>
</tr>
<tr>
<td>Prioritisation &amp; Categorisation Procedure For Sites Which May Be Contaminated (CLR Report No6)</td>
<td>Department of the Environment, Contaminated Land Research Report</td>
</tr>
<tr>
<td>Code of Practice for the Investigation &amp; Mitigation of Possible Petroleum-Based Land Contamination. 1993</td>
<td>The Institute of Petroleum</td>
</tr>
<tr>
<td>DISPOSAL OF SOIL</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BURIED SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites. (10/WM/03/21). 2010</td>
</tr>
<tr>
<td>Effects of Organic Chemicals in Contaminated Land on Buried Services (DWQ 9025, Report 2982(P)). 1992</td>
</tr>
<tr>
<td>The Impact of Contaminated Land on Buried Electrical Cables (CONTAM-2.5AM). 1998</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PAVEMENT DESIGN</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>HEALTH &amp; SAFETY ASPECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Guide for Safe Working on Contaminated Sites (Report 132)</td>
</tr>
<tr>
<td>Protection of Workers and the General Public During the Development of Contaminated Land (HSG66)</td>
</tr>
<tr>
<td>Construction (Design &amp; Management) Regulations 2006 (CDM)</td>
</tr>
<tr>
<td>Control of Substances Hazardous to Health Regulations 2002</td>
</tr>
<tr>
<td>Workplace Exposure Limits. EH40/2006</td>
</tr>
<tr>
<td>Trenching Practice. Guidance on Groundwater Control (Report 97)</td>
</tr>
<tr>
<td>Control of Groundwater for Temporary Works (Report 113)</td>
</tr>
</tbody>
</table>

20/02/12
APPENDIX A
Corby Old Village Ground Investigation

Scope

• Desk Study
• 3 Nr Boreholes
• 3 Nr Trial Pits
• WAC test
• Contamination testing suite & environmental risk assessment based on CLEA procedures
APPENDIX B
Historical Map Pack

Legend

County Series 1:10,560 scale
National Grid 1:10,000 scale

If you have a query regarding any of the maps provided please contact GroundSure’s technical helpline. We will endeavour to answer any queries you may have.

Technical Helpline
Tel: 01273 819 700
maps&data@groundsure.com
www.groundsure.com

Information present on these legends is sourced from the same Ordnance Survey mapping as the maps used in this product.
Historical Map Pack

Legend

If you have a query regarding any of the maps provided within this map pack, please contact GroundSure’s technical helpline. We will endeavour to answer any queries you may have.

Technical Helpline:
Tel:01273 819 700
maps&data@groundsure.com
www.groundsure.com
Site Details:

Client Ref: EMS_260887_352332
Report Ref: EMS_260887_352332
Grid Ref: 489722, 288987

Map Name: National Grid
Map date: 1964
Scale: 1:2,500
Printed at: 1:2,500

To view map legend click here

Legend
Dear Sir/ Madam,

Thank you for placing your order with GroundSure. Please find enclosed the GroundSure GeoInsight as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
GroundSure GeoInsight
Overview of Findings

The GroundSure GeoInsight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and GroundSure’s unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Geology

1.1 Artificial Ground

1.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site? Yes

1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary? Yes

1.2 Superficial Geology and Landslips

1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site? No

1.2.2 Are there any records relating to permeability of superficial geology within the study site boundary? No

1.2.3 Are there any records of landslip within 500m of the study site boundary? No

1.2.4 Are there any records relating to permeability of landslips within the study site boundary? No

1.3 Bedrock, Solid Geology & Faults

1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section. Yes

1.3.2 Are there any records relating to permeability of bedrock within the study site boundary? Yes

1.3.3 Are there any records of faults within 500m of the study site boundary? No

1.4 Radon data

1.4.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is in a Radon Affected Area, as greater than 30% of properties are above the Action Level

1.4.2 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? Full radon protective measures are necessary

Section 2: Ground Workings

<table>
<thead>
<tr>
<th>Section 2: Ground Workings</th>
<th>On-site</th>
<th>0-50m</th>
<th>51-250</th>
<th>251-500</th>
<th>501-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Historical Surface Ground Working Features from Small Scale Mapping</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>Not Searched</td>
<td>Not Searched</td>
</tr>
<tr>
<td>2.2 Historical Underground Workings from Small Scale Mapping</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2.3 Current Ground Workings</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

Section 3: Mining, Extraction & Natural Cavities

<table>
<thead>
<tr>
<th>Section 3: Mining, Extraction &amp; Natural Cavities</th>
<th>On-site</th>
<th>0-50m</th>
<th>51-250</th>
<th>251-500</th>
<th>501-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Historical Mining</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>
### Section 3: Mining, Extraction & Natural Cavities

<table>
<thead>
<tr>
<th></th>
<th>On-site</th>
<th>0-50m</th>
<th>51-250</th>
<th>251-500</th>
<th>501-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2 Coal Mining</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.3 Johnson Poole and Bloomer Mining Area</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>3.4 Non-Coal Mining</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.5 Non-Coal Mining Cavities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.6 Natural Cavities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.7 Brine Extraction</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.8 Gypsum Extraction</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.9 Tin Mining</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.10 Clay Mining</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Section 4: Natural Ground Subsidence

<table>
<thead>
<tr>
<th></th>
<th>On-site</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Shrink Swell Clay</td>
<td>Negligible</td>
</tr>
<tr>
<td>4.2 Landslides</td>
<td>Very Low</td>
</tr>
<tr>
<td>4.3 Ground Dissolution of Soluble Rocks</td>
<td>Null</td>
</tr>
<tr>
<td>4.4 Compressible Deposits</td>
<td>Moderate</td>
</tr>
<tr>
<td>4.5 Collapsible Deposits</td>
<td>Very Low</td>
</tr>
<tr>
<td>4.6 Running Sand</td>
<td>Very Low</td>
</tr>
</tbody>
</table>

### Section 5: Borehole Records

<table>
<thead>
<tr>
<th></th>
<th>On-site</th>
<th>0-50m</th>
<th>51-250</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 BGS Recorded Boreholes</td>
<td>0</td>
<td>1</td>
<td>24</td>
</tr>
</tbody>
</table>

### Section 6: Estimated Background Soil Chemistry

<table>
<thead>
<tr>
<th></th>
<th>On-site</th>
<th>0-50m</th>
<th>51-250</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Records of Background Soil Chemistry</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

### Section 7: Railways and Tunnels

<table>
<thead>
<tr>
<th></th>
<th>On-site</th>
<th>0-50m</th>
<th>51-250</th>
<th>251-500</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Tunnels</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Not Searched</td>
</tr>
<tr>
<td>7.2 Historical Railway and Tunnel Features</td>
<td>0</td>
<td>1</td>
<td>11</td>
<td>Not Searched</td>
</tr>
<tr>
<td>7.3 Historical Railways</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Not Searched</td>
</tr>
<tr>
<td>7.4 Active Railways</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Not Searched</td>
</tr>
</tbody>
</table>

Report Reference: EMS-260887_352333
Client Reference: EMS_260887_352333
<table>
<thead>
<tr>
<th></th>
<th>On-site</th>
<th>0-50m</th>
<th>51-250</th>
<th>251-500</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5 Railway Projects</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
1 Geology
1.1 Artificial Ground Map

Artificial Ground Legend

Site Outline

500

Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

1 Geology

1.1 Artificial Ground

1.1.1 Artificial/Made Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:171

Are there any records of Artificial/Made Ground within 500m of the study site boundary? Yes

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>LEX Code</th>
<th>Description</th>
<th>Rock Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33.0</td>
<td>N</td>
<td>WMGR-MGRD</td>
<td>INFILLED GROUND</td>
<td>ARTIFICIAL DEPOSIT</td>
</tr>
<tr>
<td>2</td>
<td>224.0</td>
<td>S</td>
<td>WMGR-MGRD</td>
<td>INFILLED GROUND</td>
<td>ARTIFICIAL DEPOSIT</td>
</tr>
<tr>
<td>3</td>
<td>397.0</td>
<td>W</td>
<td>WMGR-MGRD</td>
<td>INFILLED GROUND</td>
<td>ARTIFICIAL DEPOSIT</td>
</tr>
<tr>
<td>4</td>
<td>441.0</td>
<td>S</td>
<td>WGR-OPEN</td>
<td>WORKED GROUND (UNDIVIDED)</td>
<td>VOID</td>
</tr>
<tr>
<td>5</td>
<td>479.0</td>
<td>S</td>
<td>WGR-OPEN</td>
<td>WORKED GROUND (UNDIVIDED)</td>
<td>VOID</td>
</tr>
</tbody>
</table>

1.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? Yes

<table>
<thead>
<tr>
<th>Distance (m)</th>
<th>Direction</th>
<th>Flow Type</th>
<th>Maximum Permeability</th>
<th>Minimum Permeability</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.0</td>
<td>N</td>
<td>Intergranular</td>
<td>Very High</td>
<td>Very Low</td>
</tr>
</tbody>
</table>
1.2 Superficial Deposits and Landslips

Map

Legend


Site Outline

500 Search Buffers (m)

1000

Report Reference: EMS-260887_352333
Client Reference: EMS_260887_352333
1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/Drift Geology

Are there any records of Superficial Deposits/Drift Geology within 500m of the study site boundary? Yes

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>LEX Code</th>
<th>Description</th>
<th>Rock Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>59.0</td>
<td>S</td>
<td>TILMP-DMTN</td>
<td>TILL, MID PLEISTOCENE</td>
<td>DIAMICTON</td>
</tr>
</tbody>
</table>

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? No

Database searched and no data found.

1.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site* boundary? No

Database searched and no data found.

* This includes an automatically generated 50m buffer zone around the site
1.3 Bedrock and Faults Map

Bedrock and Faults Legend

Site Outline

Search Buffers (m)

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:171

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/ Solid Geology within 500m of the study site boundary:

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>LEX Code</th>
<th>Description</th>
<th>Rock Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0</td>
<td>On Site</td>
<td>GRF-SDSM</td>
<td>Grantham Formation - Sandstone, Siltstone And Mudstone</td>
<td>Aalenian</td>
</tr>
<tr>
<td>2</td>
<td>0.0</td>
<td>On Site</td>
<td>NS-OOLF</td>
<td>Northampton Sand Formation - Ooidal Ironstone</td>
<td>Aalenian</td>
</tr>
<tr>
<td>3</td>
<td>417.0</td>
<td>SE</td>
<td>WHM-MDST</td>
<td>Whitby Mudstone Formation - Mudstone</td>
<td>Toarcian</td>
</tr>
<tr>
<td>4</td>
<td>479.0</td>
<td>S</td>
<td>WHM-MDST</td>
<td>Whitby Mudstone Formation - Mudstone</td>
<td>Toarcian</td>
</tr>
</tbody>
</table>

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

<table>
<thead>
<tr>
<th>Distance (m)</th>
<th>Direction</th>
<th>Flow Type</th>
<th>Maximum Permeability</th>
<th>Minimum Permeability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>On Site</td>
<td>Mixed</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>0.0</td>
<td>On Site</td>
<td>Mixed</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

* This includes an automatically generated 50m buffer zone around the site

Report Reference: EMS-260887_352333
Client Reference: EMS_260887_352333
1.4 Radon Data

1.4.1 Radon Affected Areas
Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is in a Radon Affected Area, as greater than 30% of properties are above the Action Level.

1.4.2 Radon Protection
Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? Full radon protective measures are necessary.
2 Ground Workings

2.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on GroundSure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

The following Historical Surface Ground Working Features are provided by GroundSure:

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>NGR</th>
<th>Use</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>155.0</td>
<td>NW</td>
<td>489751289221</td>
<td>Unspecified Pit</td>
<td>1884</td>
</tr>
<tr>
<td>2A</td>
<td>161.0</td>
<td>NE</td>
<td>489891289163</td>
<td>Pond</td>
<td>1950</td>
</tr>
<tr>
<td>3A</td>
<td>163.0</td>
<td>NE</td>
<td>489895289161</td>
<td>Pond</td>
<td>1950</td>
</tr>
<tr>
<td>4</td>
<td>171.0</td>
<td>NE</td>
<td>489891289175</td>
<td>Pond</td>
<td>1992</td>
</tr>
<tr>
<td>5B</td>
<td>235.0</td>
<td>NW</td>
<td>489477289175</td>
<td>Unspecified Quarry</td>
<td>1950</td>
</tr>
<tr>
<td>6B</td>
<td>239.0</td>
<td>NW</td>
<td>489474289178</td>
<td>Cuttings</td>
<td>1950</td>
</tr>
<tr>
<td>7B</td>
<td>239.0</td>
<td>NW</td>
<td>489474289178</td>
<td>Cuttings</td>
<td>1899</td>
</tr>
<tr>
<td>8C</td>
<td>239.0</td>
<td>S</td>
<td>489546288547</td>
<td>Unspecified Old Quarry</td>
<td>1950</td>
</tr>
<tr>
<td>9C</td>
<td>241.0</td>
<td>S</td>
<td>489544288545</td>
<td>Unspecified Old Quarry</td>
<td>1950</td>
</tr>
<tr>
<td>10B</td>
<td>243.0</td>
<td>NW</td>
<td>489491289185</td>
<td>Pond</td>
<td>1950</td>
</tr>
<tr>
<td>11</td>
<td>246.0</td>
<td>SW</td>
<td>489454288841</td>
<td>Unspecified Pit</td>
<td>1968</td>
</tr>
</tbody>
</table>

2.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the GroundSure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? Yes

The following Historical Underground Working Features are provided by GroundSure:

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>NGR</th>
<th>Use</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>967.0</td>
<td>N</td>
<td>489534290695</td>
<td>Unspecified Workings</td>
<td>1968</td>
</tr>
</tbody>
</table>
2.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? Yes

The following Current Ground Workings information is provided by British Geological Survey:

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>NGR</th>
<th>Commodity Produced</th>
<th>Pit Name</th>
<th>Type of working</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>148.0</td>
<td>NE</td>
<td>489905</td>
<td>Ironstone</td>
<td>Corby</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>406.0</td>
<td>S</td>
<td>489557</td>
<td>Ironstone</td>
<td>Corby</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>507.0</td>
<td>NW</td>
<td>489550</td>
<td>Ironstone</td>
<td>Cardigan</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>520.0</td>
<td>W</td>
<td>489154</td>
<td>Ironstone</td>
<td>Corby</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>542.0</td>
<td>SW</td>
<td>489336</td>
<td>Sandstone</td>
<td>Corby</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>561.0</td>
<td>S</td>
<td>489670</td>
<td>Clay &amp; Shale Weldon &amp; Corby Brick Works</td>
<td></td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>577.0</td>
<td>SW</td>
<td>489475</td>
<td>Ironstone</td>
<td>Corby</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>682.0</td>
<td>W</td>
<td>489000</td>
<td>Ironstone</td>
<td>West Glebe</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>786.0</td>
<td>E</td>
<td>490545</td>
<td>Ironstone</td>
<td>Weldon</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>839.0</td>
<td>E</td>
<td>490550</td>
<td>Ironstone</td>
<td>Rectory Farm</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
<tr>
<td>Not shown</td>
<td>972.0</td>
<td>NE</td>
<td>490450</td>
<td>Ironstone</td>
<td>Old Glebe</td>
<td>A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site</td>
<td>Ceased</td>
</tr>
</tbody>
</table>
3 Mining, Extraction & Natural Cavities Map

Mining, Extraction and Natural Cavities Legend

Non-Coal Mining

- Highly likely
- Likely
- Unlikely
- Highly unlikely
- Rare


Report Reference: EMS-260887_352333
Client Reference: EMS_260887_352333
3 Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from GroundSure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? Yes

The following Historical Mining information is provided by GroundSure:

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>NGR</th>
<th>Details</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>651.0</td>
<td>SE</td>
<td>489892</td>
<td>Ironstone Quarry</td>
<td>1950</td>
</tr>
<tr>
<td>Not shown</td>
<td>967.0</td>
<td>N</td>
<td>489534</td>
<td>Unspecified Workings</td>
<td>1968</td>
</tr>
</tbody>
</table>

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? Yes

The following information provided by JPB is not represented on mapping: Whilst outside of an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property. Further details and a quote for services can be obtained by emailing this report to enquiries.gs@jpb.co.uk.
3.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? Yes

The following Non-Coal Mining Cavities information provided by Peter Brett Associates:

<table>
<thead>
<tr>
<th>ID</th>
<th>Distance (m)</th>
<th>Direction</th>
<th>NGR</th>
<th>Address</th>
<th>Superficial Deposits</th>
<th>Bedrock Deposits</th>
<th>Extracted Mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>934.0</td>
<td>SE</td>
<td>490500 288400</td>
<td>'Barn Close Mine' (1), Corby, Northamptonshire</td>
<td>Glacial Till</td>
<td>Lincolnshire Limestone, Northampton Sand Formation</td>
<td>Magnatite, Marcasite, Siderite, Ironstone</td>
</tr>
<tr>
<td>2</td>
<td>960.0</td>
<td>SE</td>
<td>490600 288500</td>
<td>'Barn Close Mine', Corby, Northamptonshire</td>
<td>-</td>
<td>Lincolnshire Limestone, Northampton Sand Formation</td>
<td>Magnatite, Marcasite, Siderite, Ironstone</td>
</tr>
</tbody>
</table>

3.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

3.7 Brine Extraction

This dataset provides information from the Brine Compensation Board which has been discontinued and is now covered by the Coal Authority.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.
3.8 Gypsum Extraction
This dataset provides information on Gypsum extraction from British Gypsum records.
Are there any Gypsum Extraction areas within 1000m of the study site boundary? No
Database searched and no data found.

3.9 Tin Mining
This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level.
Are there any Tin Mining areas within 1000m of the study site boundary? No
Database searched and no data found.

3.10 Clay Mining
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.
Are there any Clay Mining areas within 1000m of the study site boundary? No
Database searched and no data found.
4 Natural Ground Subsidence
4.1 Shrink-Swell Clay Map
4.3 Ground Dissolution Soluble Rocks Map
4.6 Running Sand Map

Running Sand Legend

- Site Outline
- Search Buffers (m)
- No Data / Null
- Negligible
- Very Low
- Low
- Moderate
- High