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Proposed Residential Development at Land South of Bosworth Academy Desford Leicester



Phase I Desk Study Report

August 2025

Revision 00

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1.0 Executive Summary

- 1.1.1 The following is provided as an overview and should not be relied upon in isolation to the main report.

Summary overview

Existing site	The site is approximately 42ha in size and comprises an irregular shaped plot of land comprising multiple large fields currently used as arable farmland, situated to the southeast of Desford.
Proposals	It is proposed to develop the site with up to 500 residential properties with a two-form entry Primary School, community use buildings and associated links and infrastructure.
History	A review of the historical maps shows that the site has been undeveloped since the 1800's up to the present day, with the only significant changes being the infilling of two small ponds in the west, the installing of a 'drain' towards the east and occasional field boundary changes. The immediate surrounding area has primarily comprised rural/agricultural land since the earliest maps with residential development to the north, south east and immediate west. To the south west of the site RAF Desford was mapped until the late 1950's when it was redeveloped into a large industrial development associated with Caterpillar and has undergone further redevelopment over time.
Geology	BGS mapping records no superficial deposits in Area 1 except for a thin ribbon of alluvium in the north east associated with a watercourse and a small area to the south where the Oadby Member (Glacial Till) is mapped. In Area 2 there are no superficial deposits in the northern half, in the central and southern parts of Area 2 there are superficial deposits mapped as Glaciofluvial Deposits (Sand and Gravel), with the Oadby Member (Glacial Till) mapped directly off site to the south. In Area 3 there are no superficial deposits in the northern half, in the central and southern parts of Area 3 there are superficial deposits mapped as Glaciofluvial Deposits (Sand and Gravel). The bedrock geology across the majority of the site is mapped as the Edwalton Member (mudstone). In the northeast corner of the site in Area 1 a thin ribbon of the Cotgrave Sandstone Member (Sandstone) is mapped, beyond which is the Gunthorpe Member (mudstone).
Hydrology and hydrogeology	The Glaciofluvial Deposits and Alluvium deposits to the south west and north east are mapped as Secondary A Aquifers, and the Oadby Member to the south is mapped as a Secondary (undifferentiated) Aquifer. The underlying bedrock geologies of the Edwalton Member (mudstone) and Gunthorpe Member are mapped as Secondary B Aquifers, with the Edwalton Member (siltstone and dolomitic) and Cotgrave Sandstone Member mapped as Secondary A Aquifers. There are no groundwater Source Protection Zones within or in close proximity of the site.
Radon	The site is situated within a lower probability radon area (less than 1% of homes are estimated to be at or above the Action level). Therefore, no radon protective measures are necessary in the construction of new dwellings.
Mining and Natural Cavities	There are no man-made mining cavities or natural cavities recorded within 1.0km of the site.
Coal Authority	The site is not recorded within a coal mining area.
Contamination assessment	No significant potential sources of onsite contamination have been identified, due to the site being virtually unused since earliest mapping other than for continuous use as agricultural fields. There is a low risk of encountering areas of Made Ground around field entrances and where used to form a solid base for farm machinery to move, as well as where the two small ponds were infilled. The contaminants associated with the identified sources comprises pesticides/herbicides as well as metals, PAHs, asbestos and hydrocarbons. The risk of encountering contamination associated with the sources identified above is considered to be low.

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Summary overview

There are large areas of Made Ground to the immediate north and south west of the site associated with the construction of Bosworth Academy and the industrial estate respectively. It is believed that these soils relate to engineering redevelopment to assist in the development of the school to the north and the Caterpillar factory to the south west and these soils do not likely represent landfill type materials and are not considered to pose a significant risk to the site.

Off site to the south west, beyond Peckleton Lane is the grounds of the former RAF Desford which was later redeveloped into a manufacturing facility associated with Caterpillar. Such a large-scale site is likely to have potential sources of contamination associated with fuels/lubricants/solvents which could potentially migrate off site in the event of a spillage, through the potentially permeable Glaciofluvial Deposits.

Phase II Ground Investigation Recommendations

A Phase II Ground investigation covering the footprint of the site with laboratory testing is required to quantify these potential sources and risk, as well as to assess the potential infiltration of the underlying soils using machine excavated trial pits and BRE365 compliant soakage testing. The ground investigation will need to consider the human health risks associated with any proven-on site contamination for both a residential end use.

Table 1.1

2.0 Introduction

2.1 Client Instructions and Reliance

2.1.1 JPP Geotechnical & Environmental Ltd were appointed by Victoria Morrison of Claremont Planning Consultancy Ltd on behalf of Bellway Strategic Land, to carry out a Phase I Desk Study at a site known as the land south of Bosworth Academy, Desford.

2.1.2 This report has been produced for the benefit of Bellway Strategic Land and JPP Geotechnical & Environmental Ltd will not accept liability for the third-party use of the information herein without prior reliance agreed. This report is valid for 6 years from the date of issue however any significant changes to the proposals or followed legislation and guidance within this time could dictate a review of our findings and recommendations.

2.2 Site Proposals

2.2.1 We have been provided with a concept illustrative masterplan which shows the proposed extent of the development as a description of the development which at the time of writing comprised:

'Proposed development of up to 500 dwellings, two-form entry Primary School, community use building with potential for healthcare uses, link road between Leicester Lane and Peckleton Lane, public open space, Sustainable Drainage features, and associated works'

2.2.2 Associated drawings are attached in Appendix A, referenced 541-SK09 and 541-L01 respectively.

2.2.3 Based on the development proposals, the site, once developed, would be predominantly considered as residential land use, which for the purpose of a contamination risk assessment would be classified as Residential with plant uptake.

2.3 Investigation Strategy and Objectives

2.3.1 The scope of works includes a Phase I Desk Study for the proposed development as detailed above. This includes a walkover survey of the site and review of an Envirocheck database report and historical mapping. This Phase I Desk Study Report considers the contamination and geotechnical risks to the proposed development and identified receptors including end users of the site.

3.0 Desk Study

3.1 Site Description

- 3.1.1 The site is located west of Leicester, just south east of Desford and borders onto Leicester Lane (B582) and Peckleton Lane and is situated to the west of the M1. The centre of the site is approximately located on a national grid reference of 448429, 302924.
- 3.1.2 The site is approximately 41.92ha in size and comprises an irregular shaped plot of land which comprises multiple large fields currently used as arable farmland. For the ease of reporting, the site has been split into three areas, Area 1 comprises the eastern half of the site to Leicester Lane, Area 2 comprises the central and southern areas of the site, and Area 3 comprises the western part of the site. These three areas cover the full application boundary outlined in the Location Plan drawing provided by the client (Ref: 541-L01).
- 3.1.3 The site is bounded by residential houses to the north west of the site with commercial and industrial properties to the south and south west. Bosworth Academy is situated immediately north of the site and there are several sports facilities to the south west and east, including Desford Model Flying Club which lists the address as the entrance to the site off Leicester Lane. OS maps show there to be a fall across the site from west to east, with a 100m AOD contour mapped within the east and a 125m AOD contour mapped within the west. A spot height taken from Peckleton Lane measures 129m AOD, suggesting a potential 25-30m change in elevation across the site.

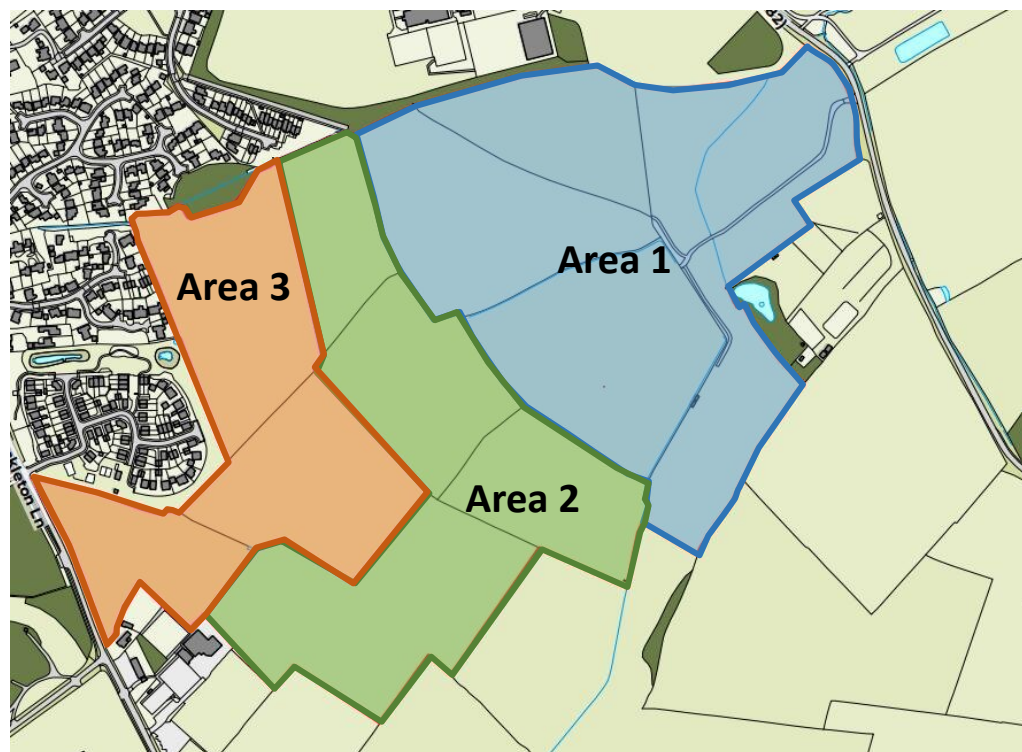


Figure 3.1: Ordnance Survey Mapping with named site areas for ease of review

3.2 Geology

- 3.2.1 According to the British Geological Survey (BGS) mapping, there is no artificial ground mapped on site. Artificial ground, classed as artificial deposit, was recorded immediately to the north of the site, associated with the grounds of Bosworth Academy. In addition, an area was also mapped to the south west, beyond Peckleton Lane, where a large industrial estate is situated, on the ground of the former RAF Desford.
- 3.2.2 The BGS records no landslides or faults mapped on site or within close proximity to the proposed site and no areas of mass movement are recorded.
- 3.2.3 BGS mapping records no superficial deposits in Area 1 except for a thin ribbon of alluvium in the north east associated with a watercourse and a small area to the south where the Oadby Member (Glacial Till) is mapped. In Area 2 there are no superficial deposits in the northern half, in the central and southern parts of Area 2 there are superficial deposits mapped as Glaciofluvial Deposits (Sand and Gravel), with the Oadby Member (Glacial Till) mapped directly south. In Area 3 there are no superficial deposits in the northern half, in the central and southern parts of Area 3 there are superficial deposits mapped as Glaciofluvial Deposits (Sand and Gravel).



Figure 3.2a: Superficial Geology extract from Envirocheck Report

Key: Yellow = Alluvium, Pink = Glaciofluvial Deposits and Green = Oadby Member.

- 3.2.4 The bedrock geology across the majority of the site is mapped as the Edwalton Member (mudstone). In the northeast corner of the site in Area 1 a thin ribbon of the Cotgrave Sandstone Member (Sandstone) is mapped, beyond which is the Gunthorpe Member (mudstone).



Figure 3.2b: Bedrock Geology extract from Envirocheck Report

Key: Pale Brown = Edwalton Member, Brown = Cotgrave Sandstone Member and Orange = Gunthorpe Member

- 3.2.5 There are no BGS archive boreholes found within the confines of the site, the closest archive borehole situated north of the site along Station Road which recorded Glaciofluvial gravel deposits to 1.20m bgl, followed by eight layers of alternating red clay and hard 'skerry' layers to the base of the borehole of 16.00m bgl (Edwalton Member). Groundwater was encountered within the final layer with standing water levels recorded at 14.60m bgl upon completion.

3.3 Hydrology and Hydrogeology

- 3.3.1 The mapped Glaciofluvial Deposits and Alluvium deposits are mapped as Secondary A Aquifers whilst the Oadby Member to the south is mapped as a Secondary (undifferentiated) Aquifer. The underlying bedrock geologies of the Edwalton Member (mudstone) and Gunthorpe Member are mapped as Secondary B Aquifers, with the Edwalton Member (siltstone and dolomitic) and Cotgrave Sandstone Member mapped as Secondary A Aquifers.
- 3.3.2 The soils are mapped as having highly variable groundwater vulnerability with medium-high and high groundwater vulnerability along the north of the site, and low and medium groundwater vulnerability across the remainder of the site.
- 3.3.3 There are no groundwater Source Protection Zones (SPZ) within or in close proximity of the site.
- 3.3.4 There is an inland river within the eastern most field within Area 1 flowing southwards towards a pond situated immediately adjacent to the south east corner of the site. Additionally, there are presumed drainage ditches along the north, east and south boundaries of one of the fields within Area 1 which flows in a generally north east trajectory into site, as well as along the entire northern boundary of the site which flows to the east. A small pond is mapped within Area 3, along the east corner of the western most field by Peckleton Lane. In the wider area, watercourses appear to converge to the northeast of the site, where they then flow to the north to join into the Rothley Brook.
- 3.3.5 There is one water abstraction license issued within 500m, one within 1.0km of the site and four within 2.0km. The two closest licenses are associated with wells for Hills Barn Farm to the west and Stud Farm to the east.
- 3.3.6 There is one discharge consent listed on site, three within 250m and four within 1.0km. The closest four consents, including the consent listed on site along the north boundary of Area 2, are all operated by Severn Trent Water Limited, one of which was revoked in 2011, relating to either storm tanks or pumping stations discharging into a freshwater stream recorded as a tributary of the Rothley Brook. All remaining sites are related to sewage with only the south western being treated final effluent.
- 3.3.7 There are three pollution incidents listed within 250m of the site and one within 1.0km. The three closest incidents occurred along the northern western corner of Area 2 and Area 3 and were all recorded as a Category 3 – Minor Incidents, dated 1996 and 1998. The listed pollutants included a bright orange discolouration, 15 litres of petrol to drains and crude sewage associated with a blocked sewer.
- 3.3.8 The site is located within a nitrate vulnerable zone for surface water associated with the catchment of the River Soar.

3.4 Flooding Risk

- 3.4.1 The site is not located in an area at risk of flooding from rivers, seas or reservoirs. The closest area with a medium to extreme risk of flooding is situated approximately 0.75km to 1.0km north east of the site along the route of the Rothley Brook.

- 3.4.2 The site is not in or near to an area benefiting from flood defences.
- 3.4.3 The site has areas of low to high risk of surface water flooding along the routes of the mapped inland rivers, drainage ditches and ponds. These are situated along the northern boundary of the site, within the centre of the site and in the south eastern corner of Area 1.
- 3.4.4 Within Area 1 to the north east and east there are mapped areas of potential for groundwater flooding of the property below ground level and potential for groundwater flooding to occur at surface. In Area 3, there is the potential for groundwater flooding of the property below ground level and areas of limited potential for groundwater flooding to occur.

3.5 Site History

- 3.5.1 Historical maps have been assessed with the aim of identifying past land uses on and around the site. The historical maps obtained from Envirocheck are presented within Appendix B, due to the size of the site, the Envirocheck data and maps have been split into four sections (A, B, C and D), although pack A, appended, provides the best coverage of the site and has been predominantly utilized in our assessment.
- 3.5.2 A review of the historical maps is set out below in Table 3.5, which concentrates on the salient historical changes to site and surrounding area which could be considered to have potential to impact future development.

Site History		
Map series	On site	Off site
1885-1886 (1:2500 & 1:10,560)	The site comprises numerous agricultural fields with trees mapped along some of the field boundaries and three separate footpaths running north to south. Three small ponds are mapped in the west of the site and a small sheepfold is mapped roughly centrally within the site. A small wooded area is mapped in the north west corner of the site.	The general surrounding area comprises multiple farms, hall and lodges with Desford mapped to the north and a windmill to the west. Leicester Road and Peckleton Lane are already mapped to the east and west respectively. An orchard is mapped to the north of the site. Railway tracks associated with Midlands Railway are mapped approximately 1.0km north east of the site.
1903-1904 (1:2500 & 1:10,560)	No significant changes to the site.	No significant changes to the surrounding area.
1915-1919 (1:2500 & 1:10,560)	A small sheepfold is mapped roughly centrally within the site. A watercourse is shown in the eastern part of the site, flowing to the north.	There is some residential development to the west of the site along Peckleton Lane. A spring is mapped approximately 0.75km north east of the site.
1930-1931	No significant changes to the site.	There is further residential development to the north east and Desford Pumping Station is now

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Site History		
Map series	On site	Off site
(1:2500 & 1:10,560)		mapped immediately south of the Midland Railway tracks to the north. There are also some tanks located in a small isolated pocket about 0.5km north east of the site.
1955 (1:10,000)	No significant changes to the site.	Further residential development of Desford to the north. The fields to the south west of the site are labelled as an "Airfield" which is believed to be RAF Desford.
1957-1963 (1:2500)	Limited field boundary changes within the south of the site.	The Airfield is no longer mapped and there is residential and industrial development to the south west and south east of the site. Further residential development of Desford to the north.
1964-1968 (1:10,000)	No significant changes to the site.	A sports field is mapped approximately 500m west of the site, just north of a disused rifle range. To the south east there is a stud farm, poultry houses and nursery between 0.75km and 1.00km. The Desford Pumping Station to the north is also not mapped and there has been some property development along Station Road.
1978-1984 (1:2500)	Only the northern footpath remains mapped within the site. Further field boundary changes within the south of the site and one of the ponds is no longer mapped.	Further development along Peckleton Lane including a warehouse to the south and a large works development, along with residential development between the site and works. To the north there is further residential development and the addition of a college with tennis courts to the north within 0.20km. Next to the stud farm to the south east a pumping station is mapped. To the north a sewage works can be seen mapped approximately 1.0km from the proposed site and a pumping station is also mapped on the northern side of the train tracks. To the south of the site there is also a works with tanks located between 0.50km and 1.00km away from the site.
1980-1985 (1:10,000)	Wooded area in the north west of the site is no longer mapped.	The school to the north is now shown. The land to the south west at the location of the former RAF Desford is under development, with large scale warehouses/industrial units under construction.
1994 (1:2500)	No significant changes to the site.	No significant changes to the surrounding area.

Site History

Map series	On site	Off site
2000 (1:10,000)	No footpaths are mapped within the site boundary. One of the ponds mapped within the west of the site is no longer mapped, leaving only one pond left within the west of the site.	The Bosworth College is now labelled and there has been continued expansion of the works to the southwest within the footprint of the former RAF Desford base. A pond is mapped on the site boundary to the south east.
2006 (1:10,000)	No significant changes to the site.	The works has continued to develop to the south west.
2013 (1:10,000)	No significant changes to the site.	Building immediately south of the site is now mapped as a sports centre.
2016 (1:10,000)	No significant changes to the site.	No significant changes to the surrounding area.
2025 (1:10,000)	There is a track mapped coming in from Leicester Lane towards a footbridge and a path in the eastern side of the site in Area 1. A drain is mapped within the centre of the site in Area 2, which links to the watercourse shown on the earlier mapping. A watercourse/drains is also recorded along the northern boundary of the site.	There are now two depots mapped to the west of the site and the industrial estate to the south west has continued to develop. Residential development is present immediately west of the site, bordering Area 3. A balancing pond is mapped approximately 0.45km north of the site.

Table 3.5

3.6 Historical Review

- 3.6.1 RAF Desford was situated immediately southwest of the site and was operational between the early 1900's upto the late 1950's when it was acquired by Caterpillar and was transformed into a manufacturing facility.
- 3.6.2 The site was operational during World War I as an emergency landing ground known as RFC Peckleton and was later returned to agricultural use. The site was later developed into a flying school in 1935 by aviation instrumentation company Reid and Sigrist, with a view of assisting in the expansion of the RAF. The site became part of the RAF Volunteer reserve in 1937, undergoing significant development and expansion.
- 3.6.3 During World War II the site was not operational as a bomber or fighter base and served as a training school and emergency landing airfield.

3.7 Aerial Photographs

- 3.7.1 Earliest available aerial imagery dated 1999 shows the site and surrounding area largely as seen in 1994 historical maps, with the addition of construction of residential properties observed immediately west of the site, which is completed by 2006 imagery. There is no significant change up until 2021 aerial imagery which shows further residential development immediately west of the site and south of the previously developed field, which is completed by 2023 imagery.
- 3.7.2 2022 imagery shows Bosworth Academy obtained a 3G AGP located within the east playing field, with 2023 imagery showing further industrial development to the west of the site. There is no significant change to the site itself up to 2025 aerial imagery.

3.8 Environmental Database Review

- 3.8.1 An Envirocheck Report has been obtained and is included within Appendix B. The key points noted within the report are discussed within the following sections of this report.
- 3.8.2 There are no contaminated land register entries within 1.0km of the site.
- 3.8.3 There are two Local Authority pollution prevention and controls listed within 500m of the site and one within 1.0km, all of which are listed under Caterpillar Inc. Only the furthest listed entry is active, since 2008, for coating of metal and plastic, the closer two entries were either revoked or transferred.
- 3.8.4 There are no fuel station entries listed within 1.0km of the site.
- 3.8.5 There are two contemporary trade directories listed within 250m of the site, seven within 500m and a further nine within 1.0km of the site. The closest contemporary trade directories are 116m northwest and 127m northwest of the site linked to a garage service which is now inactive and a bath resurfacing company which is currently active. There are three other active entries relating to Machinery – Industrial and Commercial, Fireplaces and Mantelpieces, and mobile diagnostics garage. The rest of the entries are inactive.
- 3.8.6 There are fifteen points of interest for manufacturing and production within 500m of the site and a further eighteen entries within 1.0km. These points of interest are primarily situated to the southwest and three locations in the northwest. All locations are either classed as Tanks (Generic), Unspecified Works or Factories, arable or livestock farming.
- 3.8.7 There are two points of interest for public infrastructure within 500m and one within 1.0km. The closest locations are 343m and 361m relating to a graveyard and sewage pumping station respectively. The third entry is 950m relating to a sewage works.
- 3.8.8 There is one point of interest for recreational and environmental areas within 250m of the site and five within 1.0km, all of which are listed as either play areas or playgrounds.

3.9 Landfill Sites and Infilled Ground

- 3.9.1 There is one historical landfill site recorded within 250m, one within 500m, and one within 1.0km of the site. The closest is located 128m north east of the site along Leicester Lane, No. 2, which received Commercial and Household Waste between 1963-1965. The second historical landfill site is located 265m north east of the site at Leicester Lane and received unknown Material across an unspecified date range.
- 3.9.2 There are two records of Local Authority landfill coverage on site listed under Hinckley and Bosworth Borough Council and Leicestershire County Council.
- 3.9.3 There is one entry of Local Authority recorded landfill sites within 250m, one within 500m and one within 1.0km, all of which are listed under Leicestershire County Council and hold no information.
- 3.9.4 BGS geology maps of the area records Made Ground lining the northern boundary, with a larger Made Ground deposit and smaller Worked Ground deposits to the south west underlying the nearby industrial estate. It is believed that these soils relate to engineering redevelopment to assist in the development of the school to the north and the Caterpillar factory to the south west and these soils do not likely represent landfill type materials.
- 3.9.5 There are no BGS recorded landfill sites recorded within 1.0km of the site.
- 3.9.6 There are no registered landfill sites recorded within 1.0km of the site.
- 3.9.7 There are no records of potentially infilled land (non-water) within 1.00km of the site.
- 3.9.8 There are two records of potentially infilled land (water) within 250m of the site, five within 500m, and six within 1.0km of the site. Twelve of thirteen locations are dated from 1955 and are unknown filled ground, one is dated 1903 and is also an unknown filled ground. A review of historical maps show three small ponds mapped within Area 3 of the site, one of which was mapped adjacent to an existing pond that can be seen on modern day mapping and is presumed to have been backfilled between 1962-1963 and 1981-1984 mapping.
- 3.9.9 There are no registered waste transfer sites recorded within 1.0km of the site.
- 3.9.10 There are no registered waste treatment or disposal sites within 1.0km of the site.

3.10 Geological Hazards

- 3.10.1 The following table (overleaf) summarises the associated geological hazard risks on the subject site and in close proximity to the site, which have been taken from the Envirocheck Report.
- 3.10.2 The range in the recorded hazards is considered to be associated with the changes in mapped superficial geologies across the site and the underlying bedrock.

Geological Hazard (Ground Stability)	No Hazard	Very Low	Low	Medium	High
Collapsible	✓	✓			
Compressible	✓	✓		✓ (on-site)	
Ground Dissolution	✓				
Landslide		✓	✓		
Running Sand	✓	✓	✓		
Shrinking or Swelling Clay	✓	✓	✓		
Table 3.10					

3.11 Radon Risk

- 3.11.1 The site is in a lower probability radon area (less than of 1% homes are estimated to be at or above the Action Level). However, the report states that no radon protective measures are necessary in the construction of new dwellings or extensions.

3.12 UXO Risk

- 3.12.1 Based on the freely available online data, hazard risk mapping records indicates that the site and surrounding area are classified as at a low risk from Unexploded Ordnance (UXO), therefore no further action is required.
- 3.12.2 RAF Desford to the southwest was historically not an active airfield during either WWI or WWII based on our review of the available online information/records.

3.13 Mining and Mineral Sites

- 3.13.1 There are no man-made mining cavities or natural cavities recorded within 1.0km of the site.
- 3.13.2 There are no BGS mineral sites within 1.0km of the site.

4.0 Walkover Survey

4.1 General Description and Boundaries

- 4.1.1 The site is approximately 42ha in size and comprises numerous active agricultural fields. Four fields were noted to have mature crops growing which impacted the overall extent of the walkover survey; the remaining fields were either harvested or had been recently ploughed. All fields were observed to be lined with hedgerows, brambles and/or semi-mature to mature deciduous and coniferous trees. Multiple ditches were observed throughout the site, primarily throughout Area 1 and the eastern boundary of the site. A small pond is mapped immediately east of the site. Overhead electricity cables with pylons were observed in the east of the site within Area 1 and Area 2, running in a general north east-south west orientation.
- 4.1.2 Access to the site was via Leicester Lane (B582) to the east, this access road leads to the centre of Area 1, additionally, another access point was observed off Peckleton Lane to the west. There are three public footpaths mapped centrally within Area 1 and Area 3 and along the field boundaries between Area 2 and Area 3 which are also shown on the Constraints Plan provided by Edge Urban Design (Ref: 785-SK01). Made Ground with anthropogenic material, such as bricks and concrete, were observed throughout the site especially within Area 1. Additionally, a large manure pile was observed in the centre of Area 1 and several containers, with one marked as a toilet, were observed in the south east.
- 4.1.3 The immediate surrounding area primarily comprises agricultural land use to the east and south, residential land use to the north and north west and mixed residential and industrial land use to the west and south west. Bosworth Academy and associated playing fields are located immediately north of the site beyond a watercourse and occupies approximately half of the northern site boundary. There are multiple sports facilities and one residential property located adjacent to the south west of the site, lining the south west boundary of Area 3.

4.2 Topography and Drainage

- 4.2.1 The overall topography of the site is relatively uneven, but the site generally slopes down from west to east. Spot heights from available mapping on Peckleton Lane to the west and Leicester Lane to the east recorded levels of 129m AOD and 96m AOD respectively, indicating an overall 33m change in elevation across the site. A steep incline towards the south was observed along the north west boundary of the site, immediately east of the residential properties.
- 4.2.2 Multiple drainage ditches were noted throughout the site, some of which with standing water and some were observed to be empty. A stream with water flowing was observed within the southern part of Area 1, flowing to the northeast and a stream was also observed along the northern site boundary.
- 4.2.3 No clear evidence of field drainage was observed during our walkover survey, however this does not preclude the presence of such features.

4.3 Buildings and land use onsite and within the immediate vicinity

- 4.3.1 There were two containers and a metal outbuilding labelled as a 'toilet' in the southern field of Area 1. Internet research reveals that the site is also home to the Desford Model Flying Club and the features identified are believed to be associated with the club. No further features of note were identified across the site.
- 4.3.2 In the surrounding area there are residential properties to the north, north west and west of the site, with Bosworth Academy to the north and industrial properties to the west and south west. To the east of the site is Leicester Lane (B582). Peckleton Lane bounds the site to the west with "Sport in Desford" south west of the site.

4.4 Vegetation

- 4.4.1 There are numerous mixed hedgerows along the site and field boundaries with sporadic semi-mature to mature trees noted. A detailed arboriculture report should be commissioned to determine the species of the trees encountered for future foundation design.
- 4.4.2 There were numerous fields with maize present restricting access to some areas of the site during our walkover survey.

5.0 Site Photographs



Photograph 5.1 View of the eastern gate entrance off Leicester Lane looking west into the field (Area 1).



Photograph 5.2 View off the access road within Area 1, looking west, with crops either side and pylons with overhead cabling in fields beyond.



Photograph 5.3 View of temporary buildings including a building labelled 'toilet' in the south east field of Area 1.



Photograph 5.4 View centrally within Area 1, looking north east, showing overhead cabling with pylons and manure pile.



Photograph 5.5 View of the north east corner of the Area 2, looking east.



Photograph 5.6 View of water flowing within a stream along the southern boundary of Area 1.

6.0 Contamination Assessment

6.1 Legislation and framework

- 6.1.1 Statutory legislative Part 2A of the Environmental Protection Act 1990 establishes the legal framework for dealing with Contaminated Land in England. Contaminated land is defined by the legislation as, 'Any land that appears to the local authority by reasons of substances in, on or under the land that significant harm is being caused if there is a significant possibility of such harm being caused or Pollution of controlled waters is being or is likely to be caused'.
- 6.1.2 An analytical framework has been adopted which is based on a risk assessment methodology using the identification and analysis of the pollutant linkages between source-pathway-receptor. Definition of risk as outlined by the model procedure in CLR 11 is 'a combination of probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence'. The pollutant linkage comprises the following elements. Each can exist independently but they create a risk only where they are linked together. Identifying whether a pollutant linkage exists allows regulators to determine whether there is a possibility of significant harm.
- **A contaminant (source):** a substance that is in, or under the land and has the potential to cause harm or to cause pollution to controlled waters
 - **A pathway:** a route or means by which a receptor can be exposed to, or affected by, a contaminant
 - **A receptor:** in general terms, something that could be adversely affected by a contaminant such as people, an ecological system, property, or a water body.
- 6.1.3 Our approach considers the above in terms of a Conceptual Model. This is a diagrammatic or written representation of the characteristics of a site showing possible relationships between contaminants, pathways, and receptors. Risks from landfill type gases are considered using the same analytical methodology and following BS8485: 2015, CIRIA C665 and NHBC. If there is no pollutant linkage in the Conceptual Model, there is not a risk. If the Conceptual Model determines there to be a pollutant linkage, it still needs to be determined whether remediation is necessary.
- 6.1.4 The proceeding assessment firstly considers a qualitative approach, taking into account all of the aspects of the desk study and site walkover to derive a Preliminary Conceptual Model. This is then supplemented by a quantitative risk assessment utilising quantitative data (laboratory testing or gas measurements where appropriate) to support the assessment and derive conclusions.
- 6.1.5 It is important to consider the uncertainties in these assessments such as limitations or restrictions in the investigations and justify how conclusions have been derived.

7.0 Preliminary Conceptual Model

7.1 Introduction

- 7.1.1 This preliminary conceptual model summarises the identified pollutant linkages for this site following on from our desk-based assessment. The preliminary conceptual model summarises the identified sources of contamination both onsite and offsite, potential pathways for contaminant migration and the existing and future receptors based on the proposed development plans.

7.2 Overview of Sources of Contamination

- 7.2.1 The site has been open undeveloped agricultural land from the earliest map up to the present day, with occasional field boundary changes, infilling of small ponds in the west and the addition of a drain being the only signs of any development, with no significant land use or development observed.
- 7.2.2 The immediate surrounding area has primarily comprised rural/agricultural land since earliest mapping with residential development of Desford to the north along with the construction of Bosworth Academy College. The former RAF Desford site to the south west was developed into a large-scale industrial manufacturing site by Caterpillar and has since developed further with new commercial units and logistics sites.

7.3 Potential sources of On-site contamination

- 7.3.1 Our review of the historical maps has indicated that the site has been undeveloped since the earliest mapping, with the only notable changes being changes to the field boundaries, infilling small ponds within Area 3 of the site and the addition of a drain within Area 1.
- 7.3.2 Throughout the site, the most likely source of contamination would be considered to be long-term use of pesticides/herbicides, which may have led to residual degraded compounds in the Topsoil. In addition, there is also a risk of isolated pockets of Made Ground of unknown composition and compaction could be encountered around field entrances and where it was used to form a solid base for machinery to move between fields and where footpaths/tracks are present.
- 7.3.3 The areas where the ponds were infilled, although small, may present isolated pockets of Made Ground and potential ground gas production risk depending on the composition of the infill material.
- 7.3.4 As such, the potential contaminants associated within the site are likely to include metals, metalloids, PAHs, pesticides and hydrocarbons (associated with farm machinery).

7.4 Potential sources of Off-site contamination.

- 7.4.1 No significant sources of off-site contamination arising from the historical or current land uses have been identified in the immediate land surrounding the site to the north, east, west or south of the site.
- 7.4.2 Further off site to the south west, beyond Peckleton Lane is the grounds of the former RAF Desford which was later redeveloped into a manufacturing facility associated with Caterpillar. Such a large-scale site is likely to have potential sources of contamination associated with fuels/lubricants/solvents which could potentially migrate off site in the event of a spillage, through the potentially permeable Glaciofluvial Deposits and associated water table.
- 7.4.3 BGS mapping has identified large deposits of Made Ground lining the northern boundary of the site underlying Bosworth Academy, as well as to the south west underlying the industrial estate which, first shown in 1957-1963 mapping. It is believed that these soils relate to engineering redevelopment to assist in the development of the school to the north and the Caterpillar factory to the south west and these soils do not likely represent landfill type materials and are not considered to pose a significant risk to the site.
- 7.4.4 The construction of residential properties and sports facilities immediately west of the site may have led to the formation of limited extents of Made Ground along the north west and south west boundaries. There is a low risk of potential contaminants along these boundaries which could include metals, metalloids, PAHs and asbestos.
- 7.4.5 The small ponds which have been infilled in the surrounding area are not considered to pose a significant risk of ground gas generation given the age of infill and small-scale nature.
- 7.4.6 Off site to the north east small limited extents of landfill was mapped and recorded in the 1960's receiving mixed waste. Given the age of infill and small-scale nature these are not considered to pose a significant risk of ground gas generation. In addition, the impermeable nature of the bedrock geology would significantly reduce the mobility of any gases generated.

7.5 Pathways

- 7.5.1 The future development comprises residential land use with associated areas of soft and hard landscaping for the installation of a new roads for access to the site once developed. Therefore, all pathways associated with consumption, inhalation and absorption are considered viable at this stage. In areas where hard surfacing is proposed, such as car parks and access road, pathways associated with consumption, ingestion and absorption are considered to be broken, and as such the only remaining pathway in such areas would be inhalation.

- 7.5.2 There is a potential pathway for ground gas ingress into proposed buildings through the underlying soils where the Glaciofluvial Deposits are encountered, which would also potentially allow for migration of off-site sources of contamination onto the subject site. Where the bedrock soils are encountered the risks associated are considered to be negligible due to the impermeable nature of the bedrock geology. Therefore, a potential risk to end users within confined spaces remains at this stage, albeit it low given the absence of identified sources of gas generation.
- 7.5.3 During construction works, construction workers are likely to come into contact with soils during the development of the site, which would form short term consumption, ingestion, inhalation and absorption pathways.
- 7.5.4 The underlying shallow soil, where the Glaciofluvial Deposits are encountered, may potentially represent pathways for the migration of off-site contamination onto the subject site due to their potential permeability.
- 7.5.5 There is a stream and multiple drainage ditches mapped within Area 1 and along the northern boundary of the site flowing in a general north easterly trajectory. Additionally, there is a small pond situated on a field boundary in Area 3 and just off the south east corner of the site, with low to high risk of surface flooding mapped along these features. Therefore, there is the potential for contaminants to be mobilised via the identified surface water features.

7.6 Receptors

- 7.6.1 Identified human receptors include future site residents and construction workers. Plants and trees are considered potential receptors as well as building materials and infrastructure.
- 7.6.2 The stream, drainage ditches and ponds are considered as potential surface water receptors.
- 7.6.3 Based on the published geological mapping and associated aquifer designation the underlying soils across the majority of the site are not expected to contain a mobile groundwater table which would be considered at risk from sources of onsite contamination. Within the south west of the site there is the potential to encounter sands and gravels associated with the mapped Glaciofluvial Deposits, which may potentially support a mobile water table in continuity with the nearby pond within Area 3.
- 7.6.4 Plants and trees are considered to be potential receptors as the site includes soft landscaping areas and trees.

7.7 Pollutant Linkages and Model Summary

7.7.1 The following table provides a written representation of the Conceptual Model for the site considering the preceding discussion of Source, Pathways and Receptors and the derived risk.

Sources of Contamination	Receptors	Exposure Pathways		Risk	
		Identified		Present	
On Site: Historic and current agricultural activities and Made Ground associated with access tracks – Metals, inorganics, polycyclic aromatic hydrocarbons, pesticides, herbicides, asbestos. Potential ground gas production with infilled ponds in Area 3. Off Site: Nearby industrial estate which could contain Heavy Metals, PAH’s, Hydrocarbons, solvents and Asbestos. Adjacent agricultural fields - Metals, pesticides and herbicides	Human Health				
	<i>Future site users</i>	Yes	<i>Ingestion</i>	Yes	Low
			<i>Inhalation</i>	Yes	
			<i>Absorption</i>	Yes	
			<i>Consumption</i>	Yes	
	<i>Construction operatives</i>	Yes	<i>Ingestion</i>	Yes	Low
			<i>Inhalation</i>	Yes	
			<i>Absorption</i>	Yes	
	Controlled Waters				
	<i>Groundwater</i>	Yes	<i>Leaching</i>	Yes	Low
			<i>Run-off</i>	Yes	
			<i>Saturation</i>	No	
<i>Surface Water</i>	Yes	<i>Leaching</i>	Yes	Low	
		<i>Run-off</i>	Yes		
		<i>Saturation</i>	Yes		
<i>Drinking Water</i>	No	<i>Leaching</i>	No	n/a	
		<i>Run-off</i>	No		
		<i>Saturation</i>	No		
Building Materials and Infrastructure	Yes	<i>Chemical attack</i>	Yes	Low	
Plants	Yes	<i>Phytotoxicity</i>	Yes	Low	

Table 7.7

Table 7.7

8.0 Summary and Recommendations.

- 8.1.1 The site comprises numerous active agricultural fields and is located immediately south east of Desford, Leicester. There are multiple drains and a stream mapped within Area 1 to the east and along the northern boundary of the site, as well as a small pond situated along a field boundary in Area 3 to the west and a slightly larger pond immediately off the south east corner of the site.
- 8.1.2 Two small ponds within Area 3 have been infilled between 1960s and 1980s historical mapping, leading to risk of potential Made Ground and ground gas production. There is also the potential for isolated areas of Made Ground along field boundaries throughout the site to provide a solid base for farming equipment to manoeuvre on. The long term historical and current agricultural use throughout the site may have led to elevated concentrations of pesticides and herbicides.
- 8.1.3 The large-scale industrial manufacturing facilities to the south west of the site could potentially pose a risk to the site through the migration of contaminants through the underlying permeable Glaciofluvial Deposits which could therefore migrate onto the subject site.
- 8.1.4 A Phase II Ground Investigation covering the footprint of the site with laboratory testing is required to quantify these potential sources and risk. The ground investigation will need to consider the human health risks associated with any proven-on site contamination for both a residential end use. In addition to human health risks the site is considered to potentially pose a risk to controlled waters (surface water).
- 8.1.5 It is considered that traditional shallow foundations may be suitable for the site assuming there is no deep made ground present or soft/loose deposits at shallow depths. Foundation deepening will be required in close proximity to trees/hedgerows which are to be maintained/removed due to potential effects of desiccation and seasonal swelling and shrinkage. Piled foundations may be required if foundation depths exceed 2.5m bgl.
- 8.1.6 Soakaways are unlikely to be viable due to the anticipated cohesive deposits near the surface and an alternative surface water drainage strategy, such as detention basins linking to identified surface water features is recommended. Where Glaciofluvial Deposits are encountered in the west of the site it is likely that these may be water bearing. Where these soils transition out onto the underlying impermeable mudstone bedrock, a spring line may form, which may be the origin of the water flow noted in the ditches across the site. As such discharge of surface water into the Glaciofluvial Deposits would likely result in an increased flow rate appearing downslope at the transition point. BRE365 soakage testing with machine excavated trial pitting will be required to assess the infiltration potential of the underlying soils.

- 8.1.7 A Phase II Ground Investigation is recommended to assess ground conditions on site, inform foundation design. As predominantly cohesive deposits are anticipated from near surface, a suitable grid of trial pitting to provide a good lateral and vertical coverage of the site is recommended. Windowless sampler boreholes are also recommended in order to install groundwater monitoring wells. This would also allow further infiltration testing to assess the infiltration potential of the soils for a longer period of time and to identify the local water table.
- 8.1.8 CBR values should be confirmed through in situ testing.
- 8.1.9 A detailed topographical and buried services survey will be necessary together with enquiries with other buried services prior to any intrusive investigations. The service operators may request confirmation of the positions by excavations.

9.0 References

- 9.1 BS 10175:2011+A2:2017 Investigation of potentially contaminated sites – Code of Practice
- 9.2 BS 5930:2015+A1:2020 Code of Practice for ground investigations
- 9.3 The LQM/CIEH S4ULs for Human Health Risk Assessment
- 9.4 Land Contamination Risk Management – replacement for Contaminated Land Report 11 Model Procedures for the Management of Land Contamination
- 9.5 Guidelines for Environmental Risk Assessment and Management (Green Leaves III) DEFRA
- 9.6 CIRIA C552 Contaminated Land Risk Assessment – A Guide to Good Practice
- 9.7 CIRIA C665 Assessing Risks Posed by Hazardous Gases to Buildings
- 9.8 BS 8485:2015 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- 9.9 BS3882:2015 Specification for Topsoil
- 9.10 BRE Special Digest 1 ‘Concrete in Aggressive Ground’



Appendix A
Drawings and Walkover Images