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Phase I

Environmental Risk Assessment

Longcross Film Studios, Chobham Lane, Longcross, Chertsey, KT16 0EE

A REPORT PREPARED

FOR AND ON BEHALF OF

ARK DATA CENTRES LIMITED

C/O HURLEY PALMER FLATT

Issue Date:	13 August 2020
Revision NO:	
Revision Date:	

ISSUING OFFICE:	Paragon, The Harlequin Building, 65 Southwark Street, London, SE1 0HR Tel: 020 7125 0112
DATE:	13 August 2020
REFERENCE:	20.0576/CB/KJH
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SIGNATURE:	
	For and on behalf of Paragon Building Consultancy Limited

H *Critical or high risk issue for urgent management attention*

M H *Moderate to high risk issue considered as a significant management item*

M *Medium risk issue for ongoing management or action*

L M *Low to medium risk issue that may require management or action*

L *Low risk item or for information only*

DASHBOARD SUMMARY

KEY ISSUES

	The following issues represent the key matters for consideration as a result of our Phase 1 Environmental Audit with regards to ground conditions as part of the proposed development of a data centre.	
1.	The Phase 1 preliminary risk assessment has identified that the site has a medium risk, resulting from residual contamination from the historical uses of the site. There are also potential sources of contamination on site as a result of the site's current land use.	M
2.	A slope has been identified along the western part of the site. It is understood that a retaining wall is to be constructed in this area. As such, further investigation is required to provide information on the slope to advise on the retaining wall design.	M

ENVIRONMENTAL RISK RATING

Based on the findings of this report, there are likely to be viable pollutant linkages associated with the proposed development site that would be considered as posing significant harm to human health or Controlled Waters.

Therefore, the risk associated with the development is **medium** and requires further investigation for land contamination purposes.

RECOMMENDATIONS

An intrusive Phase 2 Investigation is recommended to determine the geotechnical and geoenvironmental risks associated with the site. It is recommended that this includes:

- Drilling by means of a sonic drilling rig to advance through the Bagshot Formation and provide high quality samples for geotechnical testing. Boreholes to have in-situ testing and some to be installed with groundwater/gas monitoring wells;
- Windowless Sampler Boreholes to increase the sampling coverage and allow sampling of shallow soils. Boreholes to include in-situ geotechnical testing and installation of groundwater/gas monitoring wells;
- In-situ CBR testing for road and pavement design;
- Trial pitting across the site to increase the sampling coverage;
- Foundation inspection pits to confirm the foundations of buildings on top of the slope;

- Soil sampling and laboratory testing including standard contaminant suites (asbestos screening, heavy metals, Total Petroleum Hydrocarbons (TPH), Polyaromatic Hydrocarbons (PAH), Total Organic Carbon (TOC), phenol and cyanide.
- Geotechnical laboratory testing to be based on geology, but assumed to include Atterberg testing on cohesive deposits, Particle Size Distribution on granular deposits, sulphate testing, and triaxial testing on U100 samples (if recovered);
- Gas and groundwater monitoring; and
- Groundwater testing (if encountered) for a standard contaminant suite, similar to that set out above for the soils.
- An ecology survey may be required prior to the commencement of development and specialise advice should be sought in this regard.

CONTENTS

PHASE 1 ENVIRONMENTAL AUDIT REPORT

CLIENT NAME: Ark Data Centres Limited C/O Hurley Palmer Flatt

PROPERTY ADDRESS: Longcross Film Studios
Chobham Lane, Longcross, Chertsey

INSPECTION DATE: 11 June 2020

1.0 KEY AUDIT FINDINGS

1.1	**Introduction**
1.1.1	This assessment has been carried out in general accordance with current UK best practice, requirements of the National Planning Policy Framework (NPPF) and guidance as given in the Contaminated Land Risk Management CLRM (CLR11 currently under revision), Contaminated Land Exposure Assessment (CLEA) framework, Part 2A of the Environmental Protection Act (EPA) 1990, DEFRA (2012) Part 2A Contaminated Land Statutory Guidance and CIRIA Contaminated Land Risk Assessment Guide to Good Practice C552 (2001).
1.2	**Development Proposals**
1.2.1	The Client intends to redevelop the site and construct a Data Centre with HV Energy Centre, generator and water tanks. At the time of writing no planning application has been made. However, proposed development plans are provided as Figure 2 in the Appendices. It is intended that this report be submitted in support of a planning application for this development.
1.3	**Environmental Site Assessment**
1.3.1	The site walkover identified that the site is part of the wider extents of the Longcross Film Studios. The site is situated in the south-western part of the studios and is formed of an area of car parking to the east of Durrant Road, a private road into the secure studios area. There are some areas (in the north of the demise) where Special FX works take place and so there are drums and Intermediate Bulk Containers (IBCs) of substances such as paints and varnishes near to warehouses, which are now vacant and await demolition.
1.3.2	There is a large slab area where former structures above have been demolished. Between this and the Special FX warehouse there are some slab areas where former buildings have been demolished (Buildings 60 and 61) with landscaping and trees in between.
1.3.3	In the south of the site area there was a studios canteen building (Building 100 and 101) which have since been demolished. There remains hard standing and soft landscaping with trees.

1.3.4	In the west of the demise there is a former office building (Building 114) which has since been subject to demolition. Along this flank is a slope which adjoins the main slab area.
1.3.5	Externally there are roadways and footpaths and areas of hard and soft landscaping. A steep slope is present in the western part of the site.
1.3.6	The property is immediately surrounded by other buildings associated with the film studio to the north. Infrastructure and the M3 is located to the south and east. The west of the site is flanked by an office (Building 124) and other studios land.
1.3.7	Some 235m west of the site there is an access road, Burma Road, where there are old signs indicating military use / MOD land. This road is now used as an access road for Crest Nicholson who are currently redeveloping wider parts of the studios. There are trees and wooded areas along Burma Road and nesting birds were observed. Chobham Common is also present to the west of Burma Road. Chobham Common is a biological Site of Special Scientific Interest, a Nature Conservation Review site, Grade I and a National Nature Reserve.
1.3.8	Further details on the site's description are provided in Appendix 2 together with a site layout plan (Figure 1).
1.4	**Historical Land Use**
1.4.1	Historical mapping indicated that the site was open, undeveloped woodland / scrubland for most of its history until structures were recorded on site on mapping editions from 2002 onwards. It is understood from anecdotal evidence that there was some informal landfilling on the wider film studios (off site). It is known from online research that the site was a military site long before this used for research and experiment relating to vehicles and tanks. Between 1941 and 2005 the site was used by various government military agencies until it became the Defence Evaluation & Research Agency site (DERA) and finally the Defence Logistics Organisation (DLO) Chertsey. The most recent use of the site was for the testing, evaluation and certification of the full range of British Army vehicles. It is understood that the site was later sold off and was then used by Longcross Film Studios. Historical map extracts are provided in Appendix 3.
1.4.2	The site was largely surrounded by undeveloped land / green belt and Chobham Common to the west. Longcross Station and railway were present beyond the studios to the north. The land to the east of the site were used for military use historically; there were also barracks buildings to the south.
1.5	**Potential Sources of Current and Historical Contamination**
1.5.1	Based on the current and historical land uses, it is likely that the following contaminants could be identified on site: • Total Petroleum Hydrocarbons; • Polycyclic Aromatic Hydrocarbons; • Heavy Metals; • Asbestos; and • Ground gas.

1.5.2	It is possible that similar contaminants may arise from the wider extent of the MOD / film studio land that is present to the east of the site, although there is a significant change in site levels with the subject site being positioned at high elevation than the land to the east so the migration of contaminants from off-site sources may be restricted in the shallow subsurface.
1.6	**Environmental Setting**
1.6.1	Geological environmental and mapping data records summarised in Appendix 4 and Appendix 5 respectively indicate that the site is underlain by River Terrace Deposits (Sand and Gravel) in the western part of the site. This is classified as a Secondary (A) Aquifer of high permeability. The River Terrace Deposits are underlain by the Windlesham Formation (Sand, Silt and Clay) and Bagshot Formation (Sand) which are both classified as Secondary (A) Aquifers of high permeability. There are no groundwater abstractions within a 1km radius of the site, and the site is not located within a Source Protection Zone for groundwater. The nearest surface water feature is an unnamed inland river approximately 180m west of the site.
1.6.2	A number of borehole records have been obtained from BGS records that are situated within 50m of the site. The records indicate the ground conditions comprise Made Ground to 3m bgl over Sand, described as 'peaty, black with layers of brown/green silty sand and stones and roots', over the Bagshot Beds, described as 'orange-brown, grey-green silty and clayey with stones', to the base of the borehole at 15m. Groundwater was noted at 3m bgl.
1.7	**Flood Risk**
1.7.1	The Environment Agency website indicates that the flood risk at the site is less than 1 in 1,000 chance of flooding in any year. The site has marginal areas shown to be susceptible to surface water flooding, however this is limited to external areas. The site is shown to be susceptible to groundwater flooding, however the BGS confidence rating in the result is low.
1.8	**Waste**
1.8.1	A landfill has been identified 450m northwest of the site. The record indicates that the landfill received industrial, commercial and household waste between 1960 and 1978. The potential for ground gas to migrate onto site from the landfill is limited due to the distance, however ground gas monitoring was recommended to be completed as part of future investigations as a precautionary measure and due the likelihood of Made Ground being present.
1.9	**Environmental Databases & Previous Reports**
1.9.1	No significant issues of environmental concern have been identified from third party databases or information searches.
1.9.2	The site is not located in a radon affected area.
1.9.3	The site is not located in a coal affected area.

1.9.4	We have been provided with an earlier environmental report for review: Entec UK Limited (1999). DERA Chertsey Land Quality Assessment. Dated 4 October 1999. Although Paragon cannot be held responsible for the accuracy of the work of others, the following key points and extracts have been noted: • The report did not identify significant contamination in the development area. Within the wider film studios and Crest housing development area, concentrations of petroleum hydrocarbons, PCBs, and faecal coliforms were identified within the soil and cadmium and nickel within the groundwater. • Explosive residues were only identified near Building 120 which is situated off-site. • No recommendations were made within the development area. Recommendations were made for remediation within the wider film studios and Crest housing development area.
1.9.5	The following data is obtained from the Groundsure report, obtained to complete this risk assessment, which is based on natural subsidence information provided by the British Geological Survey. The maximum Shrink-Swell hazard rating identified on the study site – **Very Low** The maximum Landslide hazard rating identified on the study site - **Very Low** The maximum Soluble Rocks hazard rating identified on the study site - **Negligible** The maximum Compressible Ground hazard rating identified on the study site - **Negligible** The maximum Collapsible Rocks hazard rating identified on the study site - **Very Low** The maximum Running Sand hazard rating identified on the study site - **Low**
1.9.6	Based on the foregoing, geotechnical risk assessment and detailed investigations are required.
1.10	**Regulatory Consultation**
1.10.1	The Contaminated Land Officer (of Runnymede Borough Council) has not been contacted directly at this time. In addition, no formal planning application has been made. It is intended that this document will be submitted to Runnymede Borough Council as part of an application.
1.10.2	The Environment Agency has not been contacted at this stage.

2.0 ENVIRONMENTAL RISK ASSESMENT

2.1	**Qualitative Risk Assessment of Pollutant Linkages**
2.1.1	In order to assess the risks associated with the presence of ground contamination, the linkages between the sources and potential receptors need to be established and evaluated. This is in accordance with Part 2A of the Environmental Protection Act (EPA) 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that: • Significant harm is being caused or there is a significant possibility of such harm being caused; or • Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.

2.1.2	Risk from contamination is assessed by consideration of possible linkages between contaminant sources and potential pathways between them. A contaminant linkage must exist in relation to particular land before the land can be considered potentially to be contaminated land under Part 2A, including evidence of the actual presence of contaminants.
2.1.3	This assessment is based on the potential current and historical sources identified, the site's environmental setting and the development proposals to evaluate the potential source-pathway-receptor linkages, which must exist to define a site as contaminated land. The risk assessment considers the site within an area context and assesses potential risks to identified receptors in relation to the existing site setting and the proposed development.
2.2	**Potential Contaminants of Concern**
2.2.1	Based on the above, the potential contaminants of concern that require further investigation are associated with Made Ground due to the historical uses of the site and changes in elevation. Contaminants of concern include: • Total Petroleum Hydrocarbons; • Polycyclic Aromatic Hydrocarbons; • Heavy Metals; • Asbestos; and • Ground gas.
2.2.2	Polychlorinated Biphenyls (PCBs), vapours, Volatile Organic Compounds (VOCs), and explosive residues have not been listed as a potential source as these were not identified within the development area in the previous investigation by Entec.
2.3	**Potential Active Pathways**
2.3.1	Inhalation / ingestion / dermal contact to future site users is likely to be minimal following completion of the development as extensive hardstanding will prevent site users coming into contact with residual underlying contaminants. As soft landscaped areas are proposed, confirmation that contamination is absent from such areas should be sought by means of investigation. If contamination is present, these areas should be capped with a clean cover system.
2.3.2	There is the potential for wider site users to be exposed to translocated particulates / fibres during the development, however, it is anticipated that with control measures in place the pathways can be broken.
2.3.3	Inhalation / ingestion / dermal contact to current site workers and construction workers may occur during construction. However, it is anticipated that with control measures in place the pathway can be broken.

2.3.4	The development may require piling and as such may inadvertently produce a preferential pathway for contaminants to migrate into the deeper geology, which are classified moderately sensitive aquifers – see below. It is not yet clear at what depth the groundwater table is at and whether there is an appreciable flow direction. As such, the potential for migration of dissolved phase contamination off the site in groundwater cannot be entirely discounted at this stage. The SSSI would be considered as up-gradient and therefore unlikely to be at risk of site derived contamination impacts (if any). However, there are new residential dwellings down-gradient of the development area which would need to be assessed, albeit the risk is probably minimal since the residential area is some 380m from the development site.
2.4	**Potential Receptors**
2.4.1	The key receptors that have been identified for this site are the construction workers and offsite workers during the redevelopment and future site users and landscape/maintenance workers once the development is complete.
2.4.2	Property including site structures and services and plants/landscaping are considered a receptor as they may be in contact with contaminated soils.
2.4.3	Whilst there are no groundwater abstractions within a 1km radius of the site, and the site is not located within a Source Protection Zone for groundwater, the geology underlying the site (River Terrace Deposits, Windlesham Formation and Bagshot Formation) are classified as a Secondary (A) Aquifer of high permeability.
2.4.4	The nearest surface water feature is an unnamed inland river approximately 180m west of the site.
2.4.5	There are also off-site residential properties, currently being constructed by Crest, which are situated some 380m from the site.
2.5	**Risk Evaluation**
2.5.1	CIRIA C552 (2001) has been used to define the risk rating presented in the Preliminary Qualitative Risk Assessment below in Table 1. The methodology and definition of risk associated with these linkages is set out in detail in Appendix 6. In summary, an evaluation of each viable pollutant linkage is made in relation to the 'probability of a risk being realised' (P) against the 'consequence of a risk being realised' (C) to establish a 'risk classification' (R). From this, the potential risk management requirements are established.
2.5.2	A simplified diagrammatic representation of the CSM is also provided in Appendix 6.

2.5.3

Table 1 Preliminary Qualitative Risk Assessment

Receptor	Sources	Pathways	P	C	R	Justification
Human Heath						
Construction workers and off site workers	Organic and inorganic contamination from the historical development of the site as MOD land	Direct contact, ingestion, and inhalation via outdoor soils or translocated soil and dust indoors.	Likely	Medium	M	**Moderate risk:** Ingestion, inhalation and dermal contact with contaminated soils in excavations or stockpiles cannot be discounted. Asbestos fibres and residual contaminants may be present onsite. Personal Protective Equipment (PPE) and Risk Assessments and Method Statements are required during construction to mitigate risk. There is the potential for current wider users of the film studios to be exposed to translocated particulates / fibres during the development, however, it is anticipated that with control measures in place the pathway can be broken.
	Ground gas from Made Ground	Inhalation, migration through granular and fractured soils into confined spaces.	Likely	Medium	M	**Moderate risk:** There is potential for ground gas at the site due to historical site uses. Personal Protective Equipment (PPE) and Risk Assessments and Method Statements are required during construction to mitigate risk.
Future site users including maintenance / landscape workers	Organic and inorganic contamination in soils and groundwater from the historical development of the site as MOD land	Direct contact, ingestion, and inhalation of outdoor soils or translocated soil and dust indoors.	Likely	Medium	M	**Moderate risk:** With respect to the future development, areas of risk to future site users are likely to be restricted to areas of soft landscaping. To manage the risk, these areas would be subjected to chemical testing followed by installation of 'clean', imported capping topsoil. Contaminants within areas beneath the proposed buildings and roads are not considered to be accessible and therefore do not present a risk to future site users. If asbestos is located on site, the asbestos register will be updated. Future maintenance of the landscaped areas is to be managed by use of Personal Protective Equipment (PPE).
	Ground gas from Made Ground	Inhalation, migration through granular and fractured soils into confined spaces.	Likely	Medium	M	**Moderate risk:** There is potential for ground gas at the site due to the historical uses of the site. Gas monitoring has been recommended as part of an intrusive investigation at the site to determine a suitable management strategy.

2.5.4

Table 1 Preliminary Qualitative Risk Assessment cont'd

Receptor	Sources	Pathways	P	C	R	Justification
Property						
Site structures and services	TPH in site soils	Direct contact between soil and structures or services.	Low likelihood	Medium	L M	**Low to moderate risk:** Made Ground is likely to be present as a result of the historical uses of the site. As such, chemical analysis of the soils will be required to determine the requirements for buried concrete and whether barrier pipework is required for drinking water supply pipework. By ensuring that appropriate building materials are used as part of the new development, the risks can be managed.
	Ground gas	Migration through granular and fractured soils into confined spaces.	Likely	Medium	M	**Moderate risk:** There is potential for ground gas at the site due to the historical uses of the site.
Off-site residential properties (380m east)	Organic and inorganic contamination	Direct contact between soil and structures or services	Low	Medium	L M	**Low to moderate risk:** Made Ground is likely to be present as a result of the historical uses of the site. However, there is a low likelihood that off-site residential properties would be affected due to the distance from the site.
	Ground gas	Migration through granular and fractured soils into confined spaces	Low likelihood	Medium	L M	**Low to moderate risk:** There is potential for ground gas at the site due to the historical uses of the site. However, there is a low likelihood that off-site residential properties would be affected due to the distance from the site.
Plants /Landscaping	Organic and inorganic contamination in soils	Root contact and uptake	Low likelihood	Medium	L M	**Low to moderate risk:** There are currently some nominal areas of soft landscaping on site and areas of soft landscaping are proposed as part of the future development. Testing of the underlying soils will be required to check for the presence of contaminants and determine whether the soils are a suitable growth medium for planting. Significant issues are not anticipated, as the risks can be controlled straightforwardly during development by importing fresh topsoil as part of a capping layer.
Groundwater						
Secondary (A) Aquifer	Organic and inorganic contamination in soils	Soil leaching and migration of potential soil contamination .	Likely	Medium	M	**Moderate Risk:** Leaching of mobile contaminants through soil pore space to the shallow water table and deeper aquifer cannot be discounted. Furthermore, piling may be required onsite which may produce a preferential pathway for contaminants to migrate.
Surface Waters						
Unnamed Inland River (180m west)	Leachable metals and organic contamination	Soil leaching and migration into drains and sewers which discharge into the ditch.	Low likelihood	Medium	L M	**Low to moderate risk:** Direct discharge or surface run off of contaminants to surface water features is low to moderate due to the distance between the site and inland river. Furthermore, the potential for migration of dissolved phase contamination in groundwater cannot be discounted at this stage.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

3.1.1 Based on the findings of this report, there are likely to be viable pollutant linkages associated with the proposed development site that would be considered as posing significant harm to human health or Controlled Waters. As such, the risk associated with the development is **medium** and requires further investigation for land contamination purposes.

3.1.2 A slope has been identified along the western part of the site. It is understood that a retaining wall is to be constructed in this area. As such, further investigation is required to provide information on the slope to advise on the retaining wall design.

3.2 Recommendations

3.2.1 An intrusive Phase 2 Investigation is recommended to determine the geotechnical and geoenvironmental risks associated with the site. It is recommended that this includes:

- Drilling by means of a sonic drilling rig to advance through the Bagshot Formation and provide high quality samples for geotechnical testing. Boreholes to have in-situ testing and some to be installed with groundwater/gas monitoring wells;
- Windowless Sampler Boreholes to increase the sampling coverage and allow sampling of shallow soils. Boreholes to include in-situ geotechnical testing and installation of groundwater/gas monitoring wells;
- In-situ CBR testing for road and pavement design;
- Trial pitting across the site to increase the sampling coverage;
- Foundation inspection pits to confirm the foundations of buildings on top of the slope;
- Soil sampling and laboratory testing including standard contaminant suites (asbestos screening, heavy metals, Total Petroleum Hydrocarbons (TPH), Polyaromatic Hydrocarbons (PAH), Total Organic Carbon (TOC), phenol and cyanide.
- Geotechnical laboratory testing to be based on geology, but assumed to include Atterberg testing on cohesive deposits, Particle Size Distribution on granular deposits, sulphate testing, and triaxial testing on U100 samples (if recovered);
- Gas and groundwater monitoring; and
- Groundwater testing (if encountered) for a standard contaminant suite, similar to that set out above for the soils.

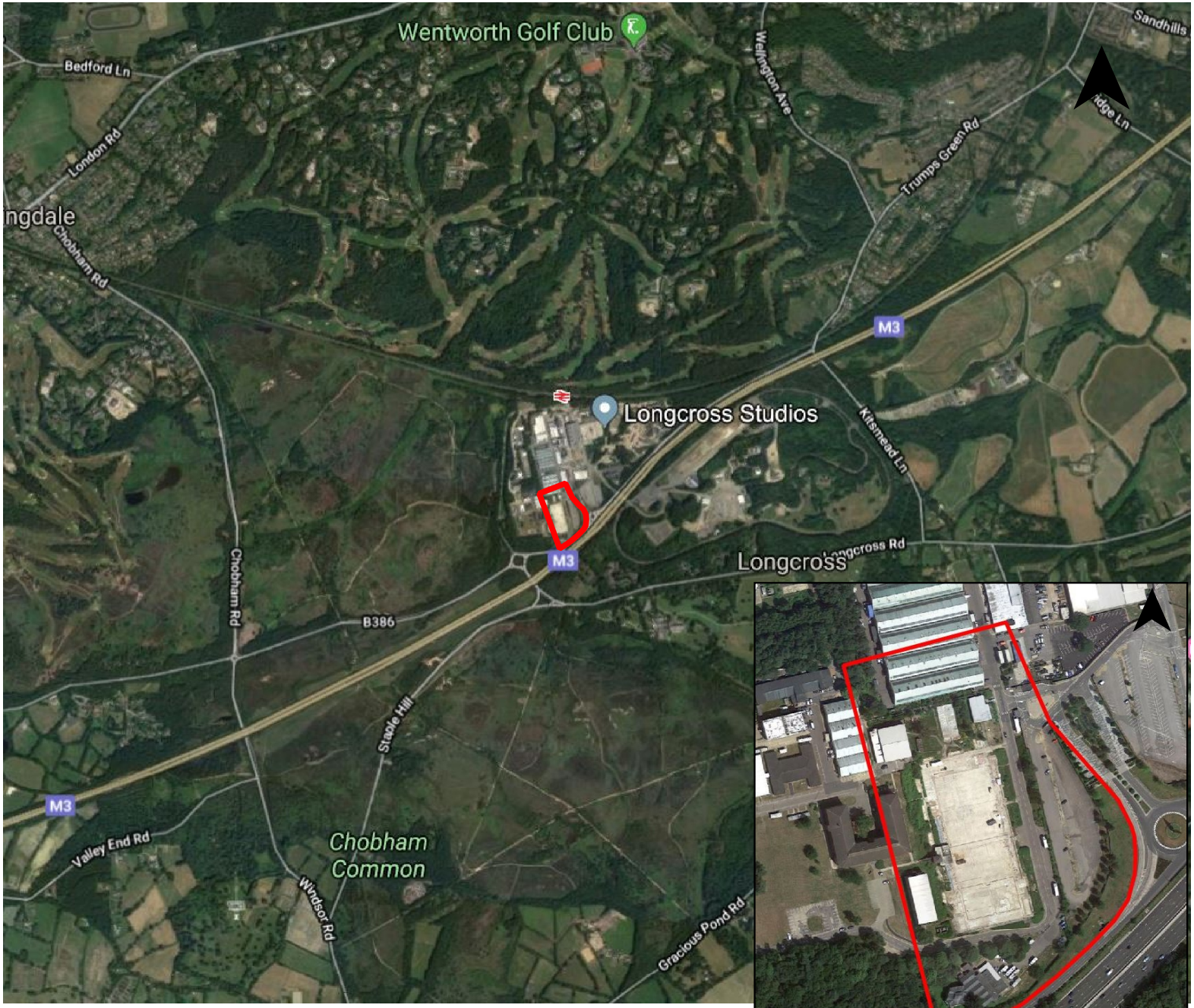
3.3 Regulatory

3.3.1 We would recommend that this report is submitted to the Local Authority for their comments and approval.

4.0 CONFIRMATION OF INSTRUCTIONS

4.1	We have been instructed by Ark Data Centres Limited C/O Hurley Palmer Flatt to undertake a Phase I Environmental Audit of Longcross Film Studios, Chobham Lane, Longcross, Chertsey. The purpose of the report is to highlight environmental considerations with respect to ground conditions as part of the proposed data centre development.

APPENDIX 1: FIGURES



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Key

Site Boundary (Approx)

Rev	Description	Date

Project: Longcross Studios	Scale: See bar
	Drawn by: CB
	Approved By: CK
Title: Site Location Plan	Drawing Number: 1
	Date: 11/07/2020

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Notes

Basemap provided by HPF.

Rev	Description	Date

Project
Longcross Studios

Scale N/A

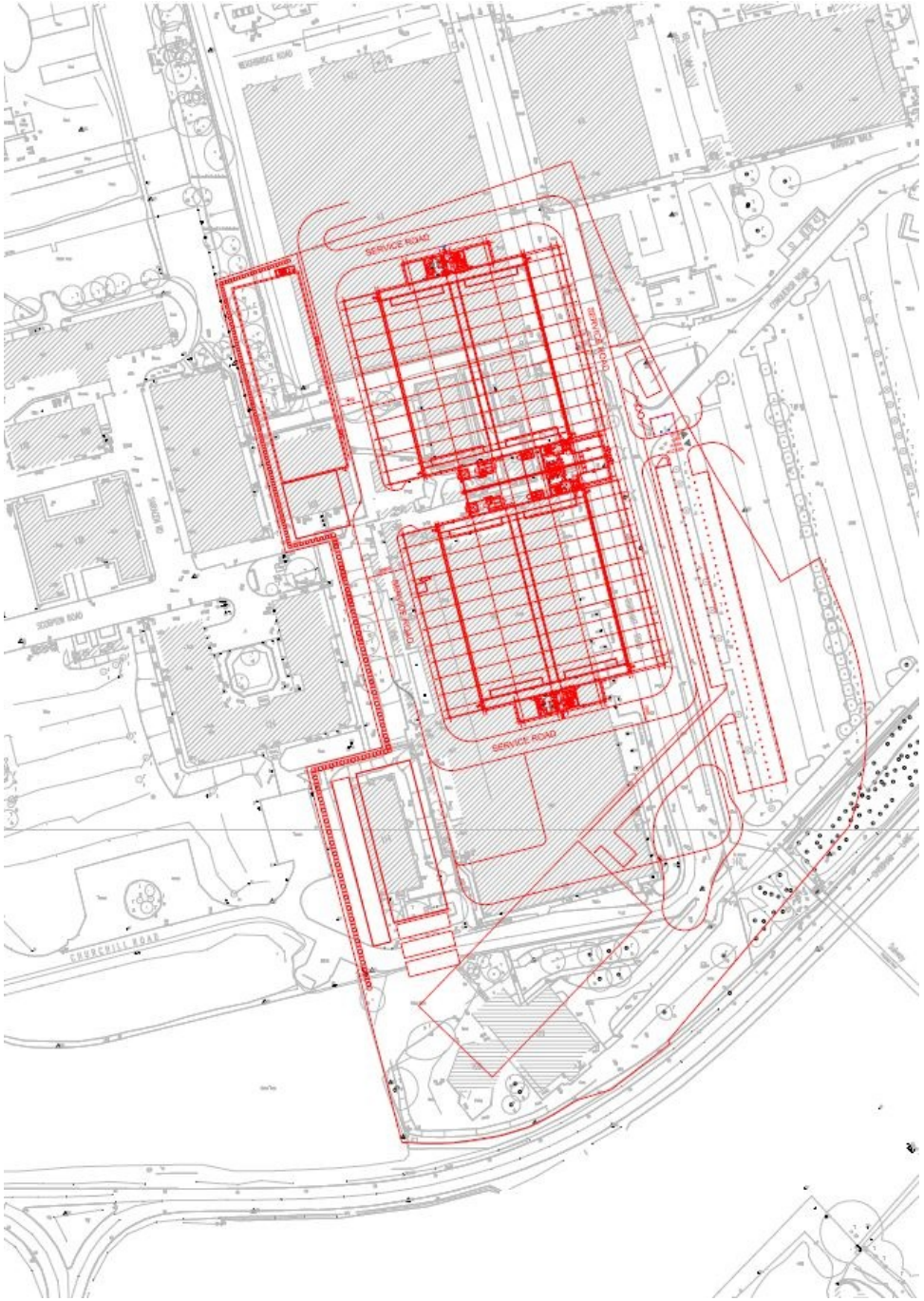
Drawn by CB

Approved By CK

Drawing Title
Existing Layout Plan

Drawing Number 2

Date 17/07/2020



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Notes

Basemap provided by HPF.

Rev	Description	Date

Project
Longcross Studios

Scale N/A

Drawn by CB

Approved By CK

Drawing Title
Proposed Layout Plan

Drawing Number 3

Date 17/07/2020

APPENDIX 2: SITE DESCRIPTION

2.0 SITE DESCRIPTION

2.1	**Site Description and Location**
2.1.1	The site is located at Longcross Studios, Chobham Ln, Longcross, Chertsey KT16 0EE. The site is centred around National Grid Reference 497740, 165682.
2.1.2	The development site is part of the wider extents of the Longcross Film Studios. The site is situated in the south-western part of the studios and is formed of an area of hardstanding and recently demolished buildings formerly used by the studios.
2.1.3	The site is immediately surrounded by other buildings associated with the film studio to the north and access to the studios and a large housing development is present to the east. The M3 is located to the south and other buildings associated with the studios are present to the west. Beyond the studios to the west is Chobham Common which is a biological Site of Special Scientific Interest, a Nature Conservation Review site, Grade I and a National Nature Reserve.
2.1.4	A site location map and photographs are provided as below.
2.2	**Current Land Use/Site Activities**
2.2.1	The subject site comprises buildings and land associated with the Longcross Film Studios. An inspection of the site was undertaken on 11 June 2020. The following key details were noted.
2.2.2	The central part of the site is an area of hardstanding where building 99 had been demolished. To the north of the hardstanding is are area of hardstanding on a higher elevation which formerly housed Buildings 60 and 61. The eastern part of the site is an access road and car park. The southern part of the site includes a studio canteen building (Building 100 and 101) and soft landscaping with a number of trees. The canteen building has now been demolished. To the west of the hardstanding is a steep slope with two buildings (Building 114 and 124) at the top. Building 114 has recently been demolished.
2.3	**Potential Contaminative Sources**
2.3.1	During the walkover a number of drums and Intermediate Bulk Containers (IBCs) of substances such as paints and varnishes were identified, however this area was vacant and undergoing demolition. No obvious evidence or equipment was noted on the surface of the site that indicates the presence of any underground storage tanks (USTs).
2.3.2	Based on the current and historical land uses, it is likely that the following contaminants could be identified on site: • Total Petroleum Hydrocarbons; • Polycyclic Aromatic Hydrocarbons; • Heavy Metals; • Asbestos; and • Ground gas.

2.3.3	Polychlorinated Biphenyls (PCBs), vapours, Volatile Organic Compounds (VOCs), and explosive residues have not been listed as a potential source as these were not identified within the development area in the previous investigation by Entec (1999).

Title: Site Layout Plan

01: Access road

02: View from the top of the slope (northeast)

03: View from the top of the slope (southeast)

04: View Building 124

05: Hardstanding of building 60/61

06: Hardstanding of building 60/61

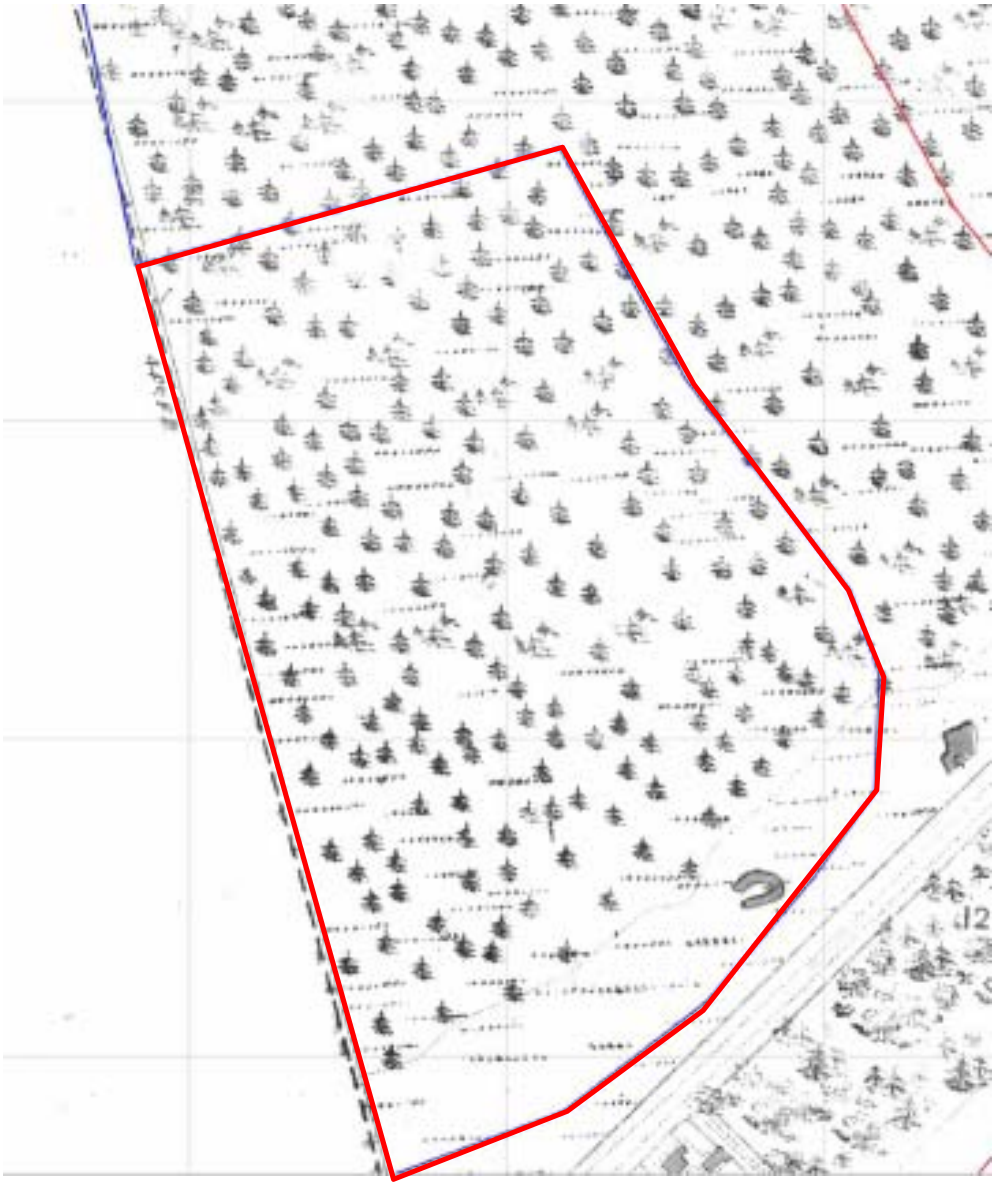
07: Area in the north east part of the site

08: Former Canteen (Building 100, 101)

APPENDIX 3: LAND USE

3.0 LAND USE

3.1	**Former Land Uses**
3.1.1	A study of historical Ordnance Survey maps, the site's planning history and local history information has been undertaken to identify any potentially contaminative former land uses.
3.1.2	A selection of historical mapping extracts are included below.
3.2	**Planning History**
3.2.1	No significant information has been identified from a review of the Runnymede Council website.



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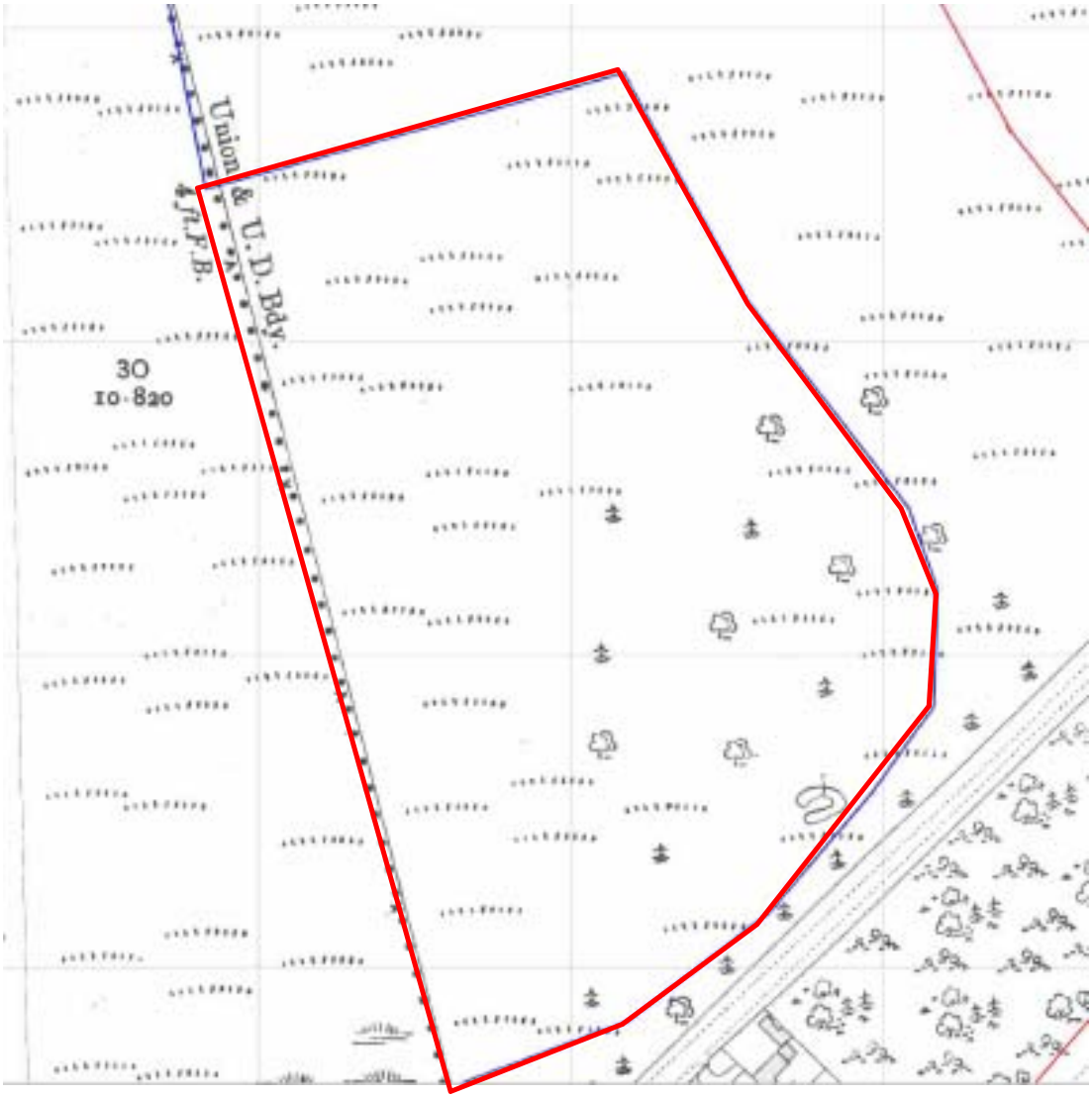

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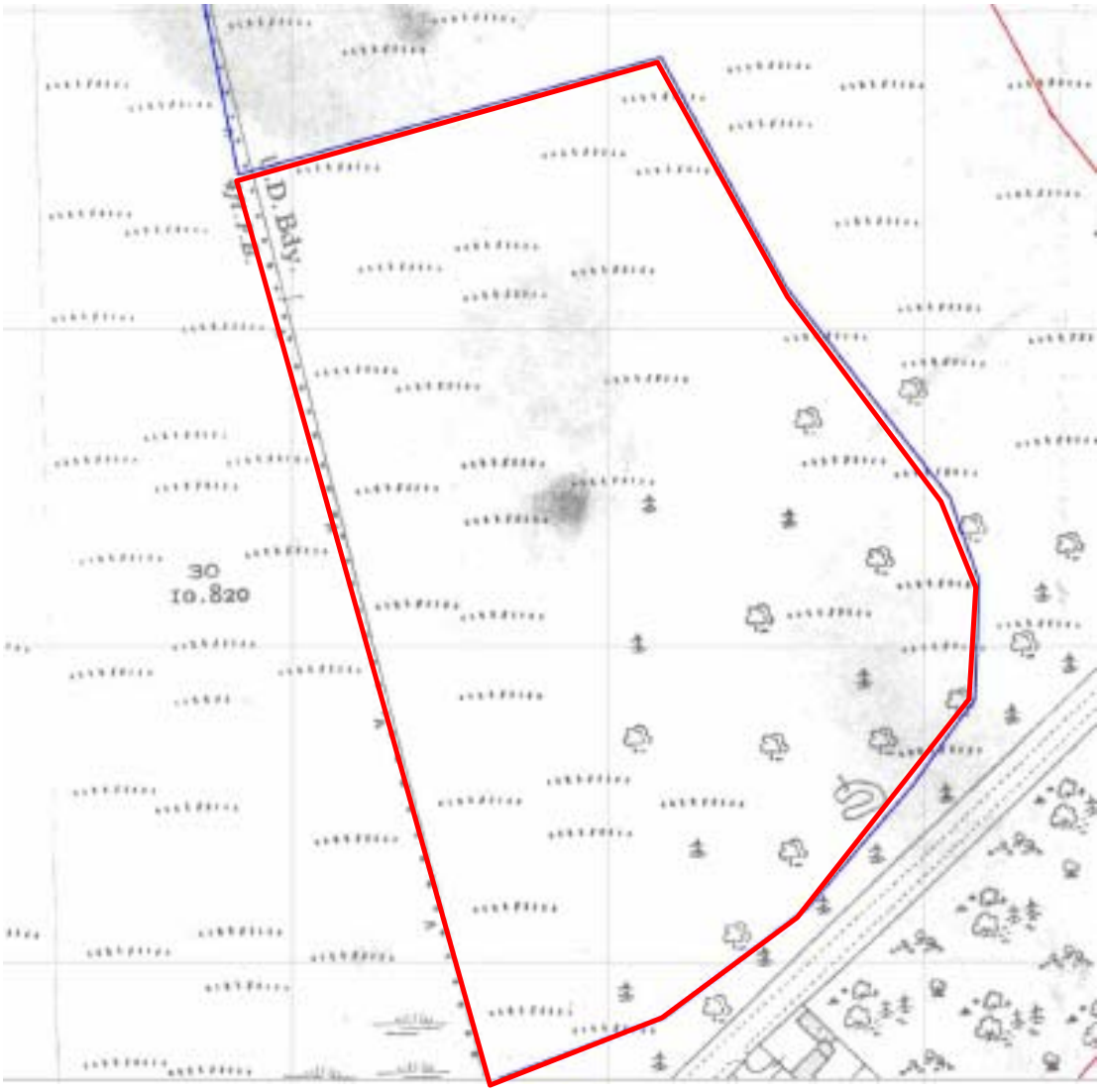

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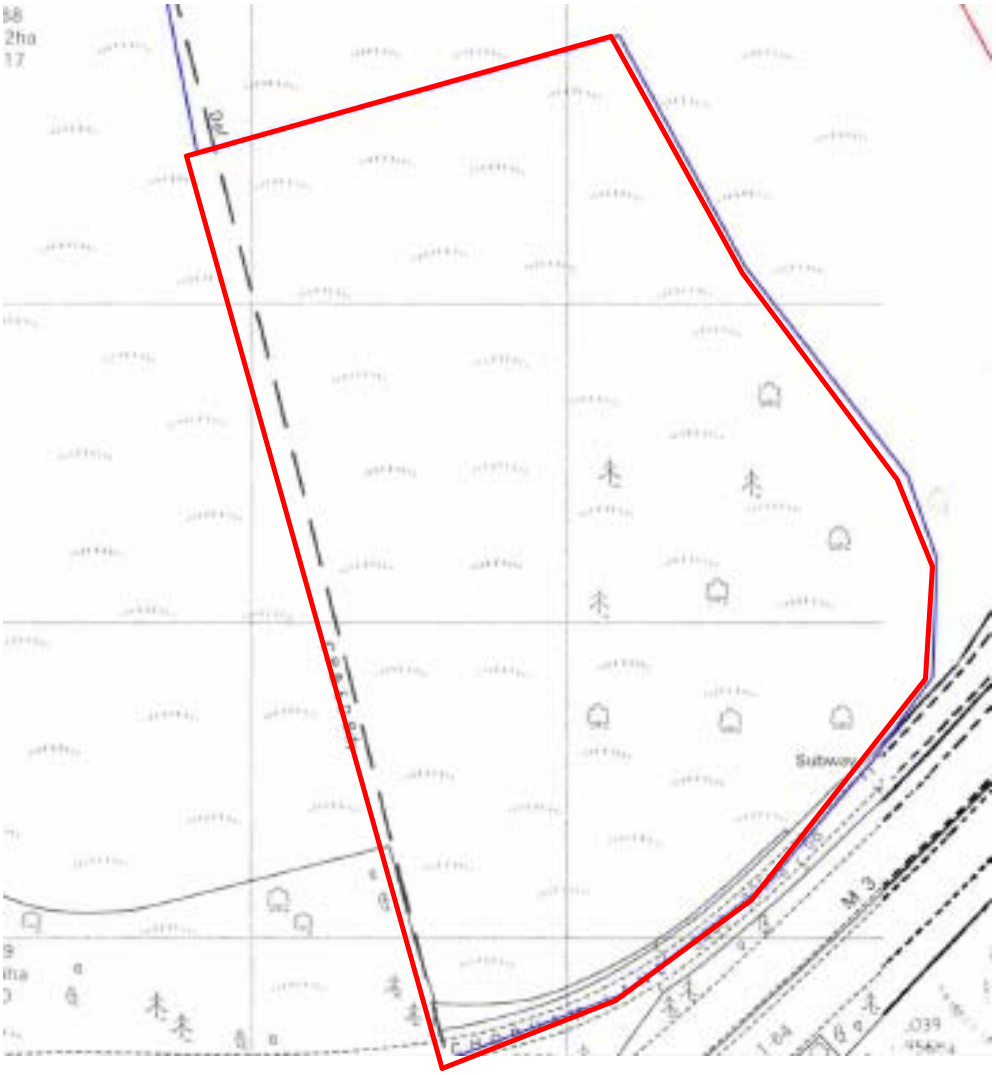

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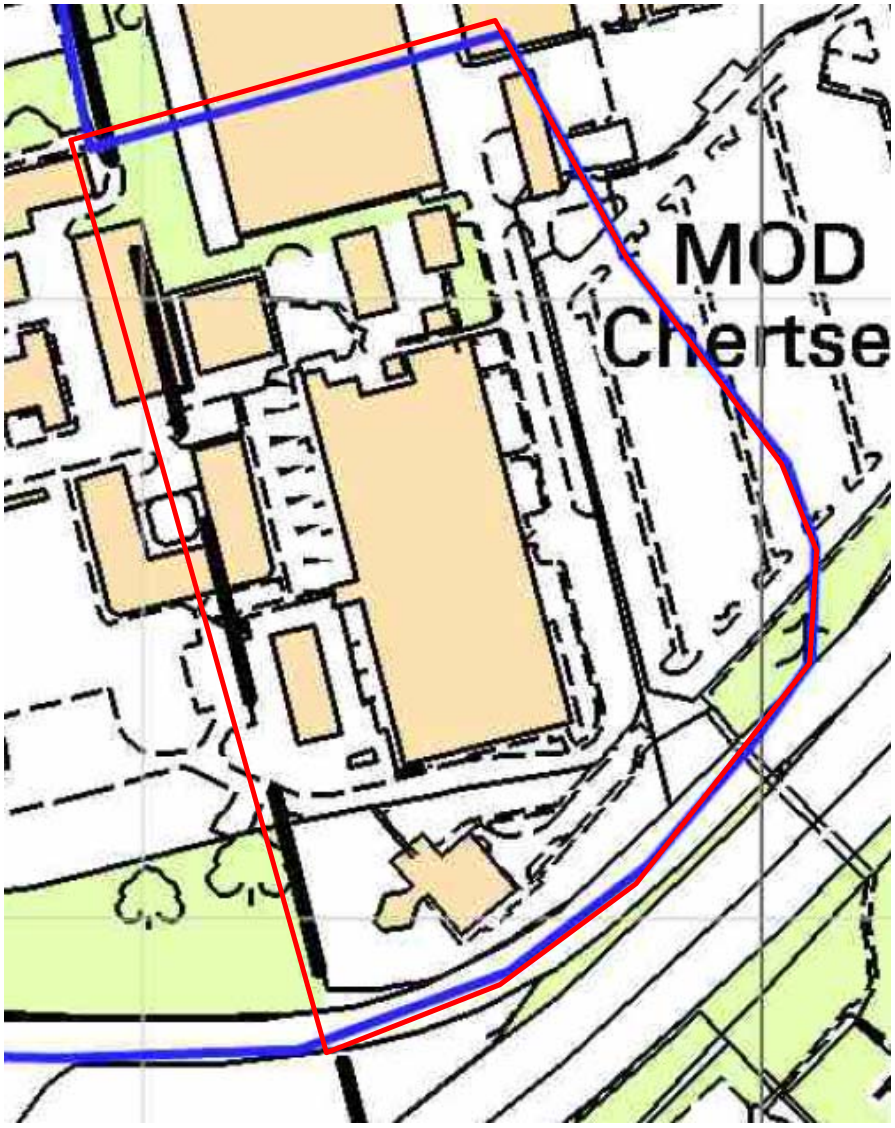
Title: 1992



Title: 2002

Title: 2014

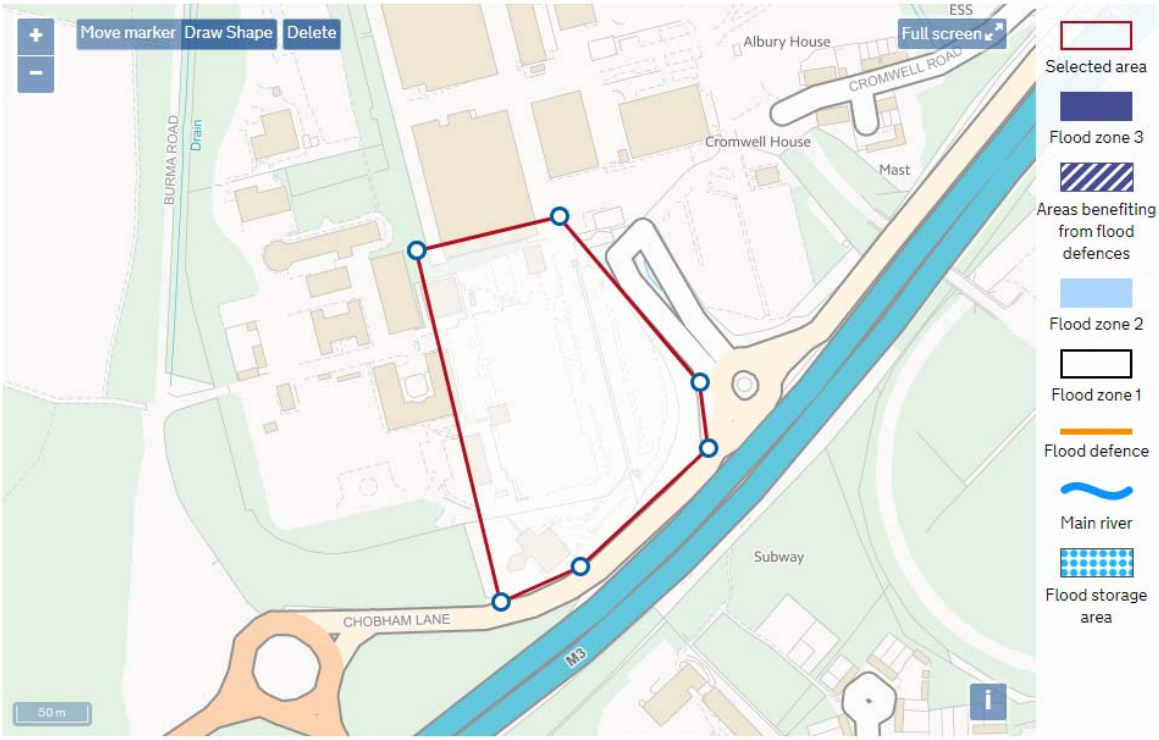
APPENDIX 4: ENVIRONMENTAL DATA

4.0 ENVIRONMENTAL DATA

4.1 Environmental Data

4.1.1 The following information has been ascertained from publicly available Environment Agency, BGS, Local Authority and NRPB records.

Environmental Records	On site	0-250m	Description
Pollution Incidents to controlled waters	0	0	N/A
Registered landfill or other waste disposal sites	0	1	A landfill has been identified 450m northwest of the site. The record indicates that the landfill received industrial, commercial and household waste between 1960 and 1978. The potential for ground gas to migrate onto site from the landfill is limited due to the distance, however ground gas monitoring was recommended to be completed as part of future investigations as a precautionary measure and due the likelihood of Made Ground being present.
Waste transfer sites	0	0	N/A
Part A(2) and B activities	0	0	N/A
Integrated Pollution Prevention and Control authorisations	0	0	N/A
Licensed radioactive substances	0	0	N/A
Enforcements, prohibitions or prosecutions	0	0	N/A
Fuel sites	0	0	N/A
Is the site in an area where there is a known risk of subsidence?			Records indicate that the area in general has a low risk of subsidence hazards.
Other geotechnical hazards			A slope has been identified in the western part of the site. The slope falls steeply eastwards. Recommendations have been made for intrusive investigations around the slope.
Is the site in a radon-affected area?			Less than 1% of homes are above the radon action levels, as such, no radon protection measures are considered necessary.
Are there any overhead transmission lines, masts or pylons for electricity on or within 250 metres of the site?			There are no obvious masts or pylons within 250 metres of the subject site.

4.2	**Environment Agency**
4.2.1	The Environment Agency website indicates that the flood risk at the site is less than 1 in 1,000 in any year.
4.2.2	

APPENDIX 5: ENVIRONMENTAL CONTEXT

5.0 ENVIRONMENTAL CONTEXT

5.1 Geology/Hydrogeology

5.1.1 Geological mapping from the BGS website and environmental data from Groundsure shows the geological sequence outlined below. Reference has been made to the Environment Agency (EA) Groundwater Vulnerability Map and Regional Appendices, to provide the following aquifer status descriptions.

Formation	Aquifer Designation	Hydrogeological Significance
River Terrace Deposits	Secondary (A) Aquifer	Potential to support small scale local abstractions and important in supplying base flow to rivers.
Windlesham Formation	Secondary (A) Aquifer	Potential to support small scale local abstractions and important in supplying base flow to rivers.
Bagshot Formation	Secondary (A) Aquifer	Potential to support small scale local abstractions and important in supplying base flow to rivers.

5.1.2 A number of borehole records have been obtained from BGS records that are situated within 50m of the site. The records indicate the ground conditions comprise Made Ground to 3m bgl over Sand, described as 'peaty, black with layers of brown/green silty Sand and stones and roots', over the Bagshot Beds, described as 'orange-brown, grey-green silty and clayey with stones', to the base of the borehole at 15m. Groundwater was noted at 3m.

5.1.3 There are reportedly no licensed groundwater abstractions within 1km of the subject site.

5.1.4 The site is not located within a groundwater Source Protection Zone (SPZ) as designated by the Environment Agency.

5.2 Hydrology

5.2.1 The nearest surface water feature is an unnamed inland river approximately 180m west of the site.

5.2.2 No licensed surface water abstractions have been identified within a 1km radius of the site.

5.3 Surrounding Land Uses

5.3.1 The subject site is surrounded by the wider Longcross Studios to the north and east, the M3 motorway to the south and fields to the west. The southwest part of the site is located within a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Special Protection Area (SPA).

5.4	**Sensitivity Analysis**
5.4.1	The geology beneath the site has been identified as River Terrace Deposits over Sands of the Bagshot Beds and Windlesham Formation. There are no groundwater abstractions within 1km of the site and the site is not located within a source protection zone. Based on the high permeability of the geology beneath the site and nearby river (180m west), the site location is considered to be of low to moderate environmental sensitivity.

APPENDIX 6: PRELIMINARY RISK ASSESSMENT MATRIX

6.0 PRELIMINARY RISK ASSESSMENT MATRIX

6.1 Preliminary Risk Assessment

6.1.1 The method of risk evaluation is a qualitative method taken from CIRIA (2001) Contaminated land risk assessment. A guide to good practice (C552). The risk evaluation process involves the classification of the:

- Magnitude of the potential consequence (severity) of risk occurring , and
- Magnitude of the probability (likelihood) of the risk occurring.

6.2 Classification of Consequence

6.2.1 The potential consequences of contamination risks occurring at the site have been classified in accordance with Table A below, which is adapted from the CIRIA C552 guidance (2001):

Table A Classification of consequence

Classification	Definition	Example
Severe	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part 2A. Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short term risk to a particular ecosystem, or organism forming part of such ecosystem.	High concentrations of a contaminant at the surface in an area of landscaping / recreation. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse or asphyxiation.
Medium	Chronic damage to human health ("significant harm" as defined by DEFRA, 2012). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.	Concentrations of a contaminant from site exceed the generic, or site specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary Aquifer Death of a species within a designated nature reserve, e.g a SSSI.
Mild	Pollution of non-sensitive water resources. Significant damage to buildings/structures and crops ("significant harm" as defined by DEFRA, 2012). Damage to sensitive buildings/structures or the environment.	Pollution of non-classified groundwater. Damage to the building rendering it unsafe to occupy (e.g foundation damage resulting in instability).

6.2.2 ***Table A Classification of consequence cont'd…***

Classification	Definition	Example
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as Personal Protective Clothing, etc.). Easily repairable effects of damage to buildings/structures.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

6.3 Classification of Probability

6.3.1 The process of risk assessment is an evaluation of the probability of harm, and comprises the identification of sources of contamination, receptors that may be affected by the contamination and pathways by which the receptors may be harmed.

6.3.2 The classification of probability, which is adapted from the CIRIA C552 guidance (2001), is set out in Table B below.

Table B Classification of probability

Classification	Definition
High Likelihood	There is a pollution linkage and an event which would either appear very likely in the short term and almost inevitable over the long term, or, there is evidence at the receptor of harm or pollution.
Moderate Likelihood	There is a pollution linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

6.4 Risk Matrix

6.4.1 Once the likelihood of an event occurring and its severity have been classified, a risk category can be assigned from Table C below, adapted from CIRIA (2001).

6.4.2 ***Table C Consequence against probability***

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low likelihood	Moderate risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

6.5 Risk Descriptions

6.5.1 Definitions of the risk categories are as shown in Table D, adapted from C552, with an assessment of the further work that might be required:

Table D Description of the classified risks and likely action required

Classification	Definition
Very High Risk	There is a high probability that severe harm could occur or there is evidence harm is currently happening. This risk, if realised, could result in substantial liability and urgent investigation and remediation are likely to be required.
High Risk	Harm is likely to occur. Realisation of the risk is likely to present a substantial liability and urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate Risk	It is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term.
Low Risk	It is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild.
Very Low Risk	There is a low possibility that harm could occur and if realised the harm is not likely to be severe.
No Potential Risk	There is no potential risk if no pollution linkage has been established. The pollutant linkage will be discounted from the final Conceptual Site Model.

6.5.2 In some cases there may be some pollutant linkages that have a degree of risk that is considered between the classifications above, for example, low to moderate and moderate to high. In this scenario, Paragon would apply a precautionary principle and assess the risk in relation to the more conservative aspect of the risk until further data can be obtained to make an informed judgement of the risk.

6.6 Preliminary Conceptual Site Model (CSM)

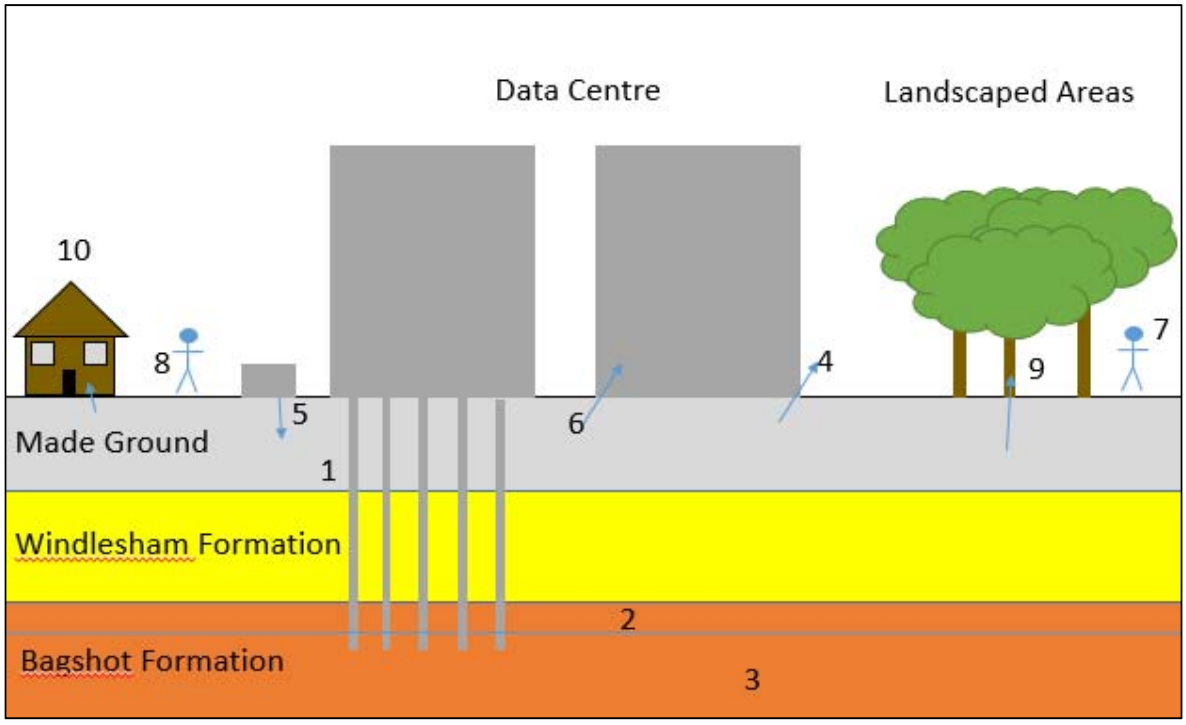
6.6.1 Using the foregoing approach, a risk based assessment has been completed to assess the potential pollutant linkages associated with the development to assess the need for further action (if any).

6.6.2 The detailed conceptual site model is provided in Table 1 (Section 2) of the main report. A simplified diagrammatic representation is provided below.

APPENDIX 7: PRELIMINARY CONCEPTUAL SITE MODEL

7.0 PRELIMINARY CONCEPTUAL SITE MODEL

7.1



7.2

1. Residually contaminated Made Ground from historical land uses may be mobilised by deep piles to the underlying Secondary (A) Aquifer.
2. Leaching of mobile contaminants through soil pore space to the shallow water table.
3. Vertical migration of dissolved phase contaminants through hydraulic continuity of shallow and deep aquifers
4. Migration of gasses along service pipes into building fabric or permeation of contaminants to pipework materials, structural elements.
5. Potential contamination from storage of chemicals leaching into underlying soils. Direct contact with building materials and buried services with contaminated soils and groundwater.
6. Migration of gases through soil pore space and to the surface and / or via service entry points to the buildings.
7. Ingestion, inhalation and dermal contact with contaminated soils by the site users arising from potentially contaminated Made Ground exposed via soft landscaped areas.
8. Ingestion, inhalation and dermal contact with contaminated soils and gas by site workers.
9. Uptake of contaminants to vegetation onsite.
10. Impact on offsite residential properties through migration of contaminants from the site within the shallow Made Ground and underlying natural geology.

APPENDIX 7: EXTENT OF SURVEY AND LIMITATIONS

EXTENT OF SURVEY AND LIMITATIONS

The report has been designed to identify potential source, pathway and receptor pollutant linkages by assessing the following:

- Current, former and proposed land uses on site including an inspection of the site and the immediate environs, information provided by the client on the current use of the site and a review of historical data;
- Environmental sensitivity of the site location as determined by factors including geology, hydrogeology, surface watercourses and neighbouring land uses; and
- Pertinent information provided by environmental regulators.

The environmental risk assessment will be undertaken with due regard to Contaminated Land Guidance documents (available and relevant at the time of issuing our report) issued by (but not limited to) the Environmental Protection Act Part IIA 1990, Department for Environment, Food and Rural Affairs (DEFRA) and its predecessors, the Environment Agency (and its devolved equivalents), British Standards Institute (BSi), the Royal Institution of Chartered Surveyors (RICS) and the American Society for Testing and Materials (ASTM) Standard E 1527-00. No liability can be accepted for the effects of any future changes to such guidelines and legislation. In the event that guidance / legislation changes it may be necessary for Paragon to update or modify reports.

Specific comment is made regarding the site's status under Part 2A of the Environmental Protection Act (EPA) 1990, which provides a statutory definition of Contaminated Land and as revised under The Contaminated Land (England) (Amendment) Regulations 2012. Unless specifically stated as relating to this definition, references to 'contamination' and 'contaminants' relate in general terms to the presence of potentially hazardous substances in, on or under the site.

The risk assessment is dictated by the finite data on which it is based and is relevant only for the purpose of which the report is commissioned. If additional information or data becomes available which may affect the opinions expressed in our report, we reserve the right to review such information and, if warranted, to modify the risk assessment accordingly. We reserve the right to charge an additional fee for un-anticipated second opinion reviewing of previous reports. A site inspection was not carried out within the scope of this assessment.

Paragon has been able to identify perceived risks based on the information reviewed and made available. Our Phase I Environmental Audit will be based on a visual inspection of the site, a review of available historical and environmental setting records, consultations with site representatives, pertinent information provided from the client and regulatory consultations. No samples will be taken as part of this study. No intrusive ground investigation work was carried out and, as such, actual risks have not been established. Actual risks can only be assessed following an intrusive investigation of the site.

With regard to flooding our commentary is based on the publicly available mapping only, which is available at the time of writing via the EA, NRW, SEPA and / or the BGS. We cannot accept any liability where the information is updated following the issue of our report. No inspection or comment is made on the below ground drainage installations or service conduits unless instructed otherwise.

Where budget costs are included in our report, these costs are for guidance purposes only.

Our report will be for the attention and purposes of the Addressee only and consequently we cannot accept any third party liability for the whole or any part thereof. Neither may the whole nor any part of our report, nor any reference thereto, be published in any way nor included in any published document, circulate or statement without our prior written approval of the form and context in which it may appear.