AGETUR UK LIMITED

Trenchard Circle, Upper Heyford

Remedial Completion Report

Report Ref. 173042/RCR/001

Job No. 173042

February 2018

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Table of Revisions

Issue	Date	Description of status

Contents

1.0 INTRODUCTION

Background

1.1 AA Environmental Limited (AAe) has been appointed by Agetur UK Limited (Agetur) to validate remedial works associated with the redevelopment of land at Trenchard Circle, Upper Heyford, OX25 5HD.

1.2 The site is located on the eastern edge of Upper Heyford approximately 6 km northwest of the town of Bicester. The site occupies an area of approximately 1.2 hectares and is located south of the now disused Upper Heyford Airfield.

1.3 The site was formerly occupied by single storey residential properties and is scheduled for redevelopment for the same end use. At the time of the works the former properties had been demolished and the site comprised a vacant plot awaiting construction of the new residential properties.

1.4 Previous investigation of the site encountered hydrocarbon contamination in the underlying soils and groundwater associated with below-ground heating oil supply pipework which serviced the former properties.

1.5 Planning permission (16/00196/F) was granted by Cherwell District Council on 9th March 2016 for the redevelopment of the site, comprising the demolition of the former residential units and construction of 13 new dwellings with private gardens and associated car parking.

Previous reports and investigation

1.6 The following investigation and reports have been undertaken for the site:

- AAe Phase 2 Environmental Risk Assessment Report Ref: 163408/ERA/001, dated December 2016.
- AAe Remedial Strategy Report Ref: 173042/RS/001, dated February 2017.
- H Fraser Consulting Ltd 2017 Controlled Waters Risk Assessment, Report Ref: 30181R1, dated March 2017.

AAe Phase 2 Environmental Risk Assessment – December 2016

1.7 In November 2016 AAe was commissioned to undertake a preliminary ground investigation and Environmental Risk Assessment (ERA). The findings of the investigation are presented in the AAe Phase 2 ERA Report (Appendix A) and can be summarised as follows:

- Significantly elevated Total Petroleum Hydrocarbons (TPH) were recorded in soils and groundwater surrounding below-ground oil pipes and connections into the former properties (particularly in northern site areas).
- Redevelopment of the site for residential purposes creates a potential risk pathway between any residual contamination and future site users.
- The extent and magnitude of impact on the underlying aquifer in the north of the site could not be fully determined.
- The risk assessment identified a potential high risk to future site users and surrounding receptors (including controlled waters) without further assessment, remediation and/or mitigation.

AAe Remedial Strategy – February 2017

1.8 In February 2017 AAe produced a Remedial Strategy detailing the proposed remedial steps and further works that would be undertaken to ensure human health, the structures on site and wider environment are suitably protected. The Remedial Strategy is presented in Appendix B, with the further works and remedial measures summarised as follows:

- Contaminated soils to be excavated and replaced with acceptable fill materials. The most significantly impacted soils, groundwater, pipework and free-phase hydrocarbons need to be removed.
- To further improve the effects of the natural attenuation an Oxygen Release Compound (ORC) will be placed within the soils in the saturated zone at the base of the remedial excavations.
- Installation of boreholes and groundwater monitoring to inform Detailed Quantitative Risk Assessment (DQRA) to derive remedial target values for soils and groundwater.
- Precautionary full ground gas (VOC) membranes should be installed in the proposed properties, or full ground gas risk assessment.
- The potable water pipe to the new development will be fully replaced with a new supply. The supply will be a 'barrier style' protected pipe, resistant to VOC and hydrocarbon contamination.

H Fraser Consulting Controlled Waters Risk Assessment – March 2017

1.9 Following completion of groundwater monitoring, a controlled waters risk assessment was produced by H Fraser Consulting to derive suitable remedial targets for soils and groundwater. The report is presented in Appendix C, with the derived remedial target values presented below:

Table 1.1 – Derived remedial target values (extract from Table 5.1 of Controlled waters risk assessment)

Determinand	Soil Remedial Target (mg/kg)	Groundwater Remedial Target (mg/l)
Aliphatic TPH >C5-C6	2.5	0.1
Aliphatic TPH >C6-C8	120	5
Aliphatic TPH >C8-C10	500	1
Aliphatic TPH >C10-C12	1900	0.5
Aliphatic TPH >C12-C16	11000	0.1
Aliphatic TPH >C16-C21	560000	0.05
Aliphatic TPH >C21-C35	511000	0.05
Aliphatic TPH >C35-C44	454000	0.05
Aromatic TPH >C5-C7	0.2	0.1
Aromatic TPH >C7-C8	6.0	1.5
Aromatic TPH >C8-C10	30	1
Aromatic TPH >C10-C12	20	0.5
Aromatic TPH >C12-C16	30	0.5
Aromatic TPH >C16-C21	22	0.1
Aromatic TPH >C21-C35	120	0.05
Aromatic TPH >C35-C44	100	0.05

Scope of report

1.10 The purpose of this Remedial Completion Report is to:

- present the remedial works which have been completed and assess validation testing results against the site remedial target values; and
- set out the remaining remedial and design mitigation controls to be implemented during the redevelopment of the site for the protection of future site users and surrounding receptors.

Regulator Notification

1.11 Prior to undertaking the works, Cherwell District Council were notified of the proposed scope of the remediation and further assessment.

2.0 REMEDIAL WORKS

Overview of Remedial Works

2.1 Between 6th October and 3rd November 2017 AAe supervised the removal of petroleum hydrocarbon impacted soils and pipework at the site. Following removal of the grossly impacted soils and former pipework, validation soil samples were collected to demonstrate that all impacted soils had been fully removed. It should be noted that where excavations terminated on solid rock no validation samples could be obtained.

2.2 Due to the presence of shallow groundwater ingress, soils were removed within a series of approximately rectangular validation excavations (VE1 to VE22). Shallow impacted groundwater was pumped from the excavations to facilitate the soil/pipework removal and put through a treatment plant, prior to discharge to ground on the wider site. In addition, 6 verification trial pits were excavated for reassurance purposes in areas where no remedial excavation had taken place. The location of validation sampling within remedial excavations and verification trial pits is shown on Figure 1.

2.3 In conjunction with the removal of impacted soils and associated pipework; two previously unidentified 4500 litre below ground oil tanks were encountered. The tanks were removed by Agetur and the underlying soils inspected/tested.

2.4 Following removal of the grossly impacted soils and collection of validation samples, ORC was placed within the base of the excavations and the voids backfilled with suitable fill material.

2.5 Representative photographs of the works are presented in Appendix D.

Validation Soil Results

2.6 The laboratory certificates of analysis are presented in Appendix E. The results of the validation sampling have been screened against the site remedial target values presented in the controlled waters risk assessment. The consolidated screened validation results are presented in Appendix F.

2.7 A total of six validation samples exceeded the site remedial criteria. These exceedances, including any remedial actions, are summarised in Table 2.1 below.

Table 2.1 Summary of validation exceedances and subsequent remedial action

Sample ID	Depth (m)	Description	Location	Visual and olfactory evidence of contamination	PID (ppm)	Result Total TPH C6-C40	Remedial Action
VS06	1.00-1.50	Natural clay	East face of VE4	Slight staining and hydrocarbon odour	19.8	390	Grossly impacted soils dug out as far as practicable within site without undermining boundary fence.
VS12	1.20-1.40	Natural clay	North face of VE7	Slight hydrocarbon odour	9.9	1200	Grossly impacted soils dug out as far as practicable within site without undermining boundary fence.
VS27	0.50	Natural clay	Base of VE14	Slight staining no odour	-	860	Further excavation - Area removed from site and re-validated (VS75-79)
VS44	1.20	Natural clay	Base of VE19 (pipe trench)	None	-	320	Further excavation - Area removed from site and re-validated (VS67-71)

Sample ID	Depth (m)	Description	Location	Visual and olfactory evidence of contamination	PID (ppm)	Result Total TPH C6-C40	Remedial Action
VS56	1.55-2.00	Natural clay	VE21 North face	Hydrocarbon odour and staining	-	2800	Further excavation - Validation excavation extended and area dug out. Once impacted material removed further validation samples taken (VS73 and VS74)
VS57	1.5500	Natural clay	VE21 East face	Hydrocarbon odour and staining	-	1900	Further excavation - Validation excavation extended and area dug out. Once impacted material removed further validation sample taken (V66)

2.8 All other validation results complied to the site remedial criteria, demonstrating the all unacceptable soils had been fully removed.

2.9 Impacted soil and pipework has been removed from the excavations as far as reasonably practicable. The only exception occurred in the north-east corner of the site. In this area the boundary fence and adjacent watercourse constrained any further material being removed.

2.10 Impacted soils were transferred by dumper trucks to an off-site stockpile within the wider land ownership (Plate 30, Appendix D), proposed by the client for further treatment (biopiling) or off-site transfer. Segregated metal pipework and tanks were transferred off-site for recycling.

2.11 The remedial excavations were backfilled with site-derived clean overburden with no visual or olfactory evidence of contamination. Verification of backfill material used will be reported under a separate cover.

Remedial Constraints

2.12 As previously discussed, due to the presence of the site boundary fence and adjacent watercourse, excavations could not be extended any further in the north-east corner and along the north-east site boundary (Plate 10, Appendix D). In addition, pipework could not be removed south from north-eastern site area (VE5) due to the presence of a road and site boundary (Plate 16, Appendix D).

2.13 Whilst impacted soils above site remedial target values have been removed as far as practicable, there remains some potential residual vapour sources. It is therefore recommended that a precautionary approach is adopted in accordance with the Remedial Strategy and that the proposed properties are installed with ground gas (VOC) protection in the floorslabs.

Groundwater Monitoring and Treatment

2.13 To ascertain whether the recorded soil bound hydrocarbon contamination was impacting the underlying aquifer, six groundwater monitoring boreholes were installed at the site, BH01 - BH06, as presented on Figure 1. Prior to the remedial excavation works, these boreholes were monitoring on three occasions (28/02/17, 09/03/17 and 20/03/17).

2.14 Following completion of remedial works, a round of groundwater monitoring was undertaken on 3rd November 2017. The chemical test results are presented at Appendix E.

2.15 None of the boreholes sampled before or after remedial activities recorded petroleum hydrocarbons above standard laboratory reporting limits, indicating the remedial works had not mobilised residual contaminants or adversely affected the underlying aquifer. The application of

ORC to the top of the saturated zone will serve to further improve shallow groundwater quality through natural attenuation.

2.16 During previous intrusive works, significant quantities of shallow groundwater ingress was noted within excavations. To facilitate the remedial excavation, ingressing shallow groundwater was pumped to a water treatment plant which included a sand/silt separator and granular activated carbon (GAC) pod. The treatment plant removed hydrocarbons, allowing discharge to surface. The approach was agreed with the Environment Agency.

2.17 To verify the effectiveness of the treatment system, samples were collected pre and post-treatment. The laboratory test report is presented in Appendix E. Before entering the GAC water from site excavations recorded total petroleum hydrocarbons at 580 µg/L. Once treated, total petroleum hydrocarbons were below standard laboratory reporting limit of <10 µg/l.

Summary of Remedial Works

2.18 Remedial works were undertaken to remove impacted soils and any remaining pipework/tanks. Validation testing demonstrates that, as far as practicable, impacted soils have been removed and the residual soils are acceptable for retention on site and are not assessed to pose a risk to human health or controlled waters.

3.0 SUMMARY AND CONCLUSIONS

3.1 AA Environmental Limited (AAe) was commissioned by Agetur UK Limited to assist with the validation of remedial works associated with the redevelopment of land at Trenchard Circle, Upper Heyford, OX25 5HD.

3.2 Remedial works were undertaken to remove impacted soils and any remaining pipework/tanks. Validation testing demonstrates that, as far as practicable, impacted soils have been removed and the residual soils are acceptable for retention on site and are not assessed to pose a risk to human health or controlled waters.

3.3 In accordance with the site Remedial Strategy, the following design mitigation measures remain to be implemented in the redevelopment of the site.

- Validation testing of the of backfill material.
- Provision of clean capping layer within areas of proposed soft landscaping.
- Ground gas (VOC) membrane within floorslabs of proposed properties. Membranes to be installed and certified in accordance with BS8485:2015 and CIRIA C735.
- Protection of structures and services (including barrier pipe for potable water supply). Test results to be provided to designer and statutory undertakers to determine are protection for structures and services from recorded ground conditions.

3.4 If any further unexpected contamination is encountered during the redevelopment of the site, then further testing and/or assessment should be completed. On completion of the development a Validation Report should be produced to demonstrate that the remaining design mitigation controls have been completed to the required standard.

173042/RH AA ENVIRONMENTAL LIMITED

February 2018

Figures

KEY

- Site Boundary
- Groundwater monitoring boreholes
- Validation excavations
- Validation samples
- Validation exceedances of material left insitu
- VE1 — Validation Excavation Number
- VS74 — Trial pit with validation sample
- Underground Storage Tank (UST)

Rev.	Details	Drawn / Chkd.	Date

Project
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Scale	Date	Drg. No.	Rev.
NTS	Oct'17	Figure 1	A
	Drawn: RH / Chkd.: JNT		

Appendix A

AAe Phase 2 Environmental Risk Assessment

CONLON LIMITED

Trenchard Circle, Upper Heyford

Phase 2 Environmental Risk Assessment

Report Ref. 163408/ERA/001

Job No. 163408

December 2016

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Table of Revisions

Contents

1.0 INTRODUCTION

Overview

1.1 AA Environmental Limited (AAe) has been commissioned by Conlon Limited (hereafter referred to as the 'Client') to carry out a Phase 2 Environmental Risk Assessment (ERA) and ground investigation for the proposed redevelopment of land at Trenchard Circle, Upper Heyford, Bicester, OX25 5TB. The site is centred at National Grid Reference SP 51839 26059 and is shown on the Site Location Plan (Figure 1).

1.2 The site is located on the eastern edge of Upper Heyford approximately 6 km north-west of Bicester. The site occupies an area of approximately 1.2 hectares on the southern side of Upper Heyford Airfield (disused).

1.3 The site currently comprises a vacant plot of land, with a pumping station in the north-western corner. The site was formerly occupied by 7 pairs of semi-detached residential properties with gardens, which have recently been demolished. The site is bound by the disused airfield to the north and residential properties to the west, east and south. The site is accessed from the south-eastern boundary, connecting to Trenchard Circle.

1.4 Planning permission (16/00196/F) was granted by Cherwell District Council on the 9th March 2016 for the demolition of the former residential units, and construction of 13 new dwellings with private gardens and associated car parking. The approved site layout and a copy of the planning Decision Notice are presented in Appendix B. Condition 10 of the permission addresses contaminated land, as specified below:

If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted a remediation strategy to the local planning authority detailing how this unsuspected contamination shall be dealt with and obtained written approval from the local planning authority. The remediation strategy shall be implemented as approved.

Reason National Planning Policy Framework (NPPF) paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of water pollution. Government policy also states that planning policies and decisions should ensure that adequate site investigation information, prepared by a competent person, is presented (NPPF, paragraph 121).

1.5 No other geo-environmental reports for the site have been made available.

1.6 In November 2016 AAe undertook an intrusive investigation at the site, comprising the excavation of 7 no. Trial Pits and additional verification Trial Pits. Representative soil and water samples were collected and submitted for laboratory analysis.

1.7 The purpose of this report is to provide a summary of the initial desktop study (site history, potential contaminants and baseline setting), present the findings of the site investigation, assess the ground conditions and evaluate the chemical results against current standards. A Conceptual Site Model (CSM) is presented and the need for any further assessment of the site determined, dependent on the presence of any potential pollutant linkages. Potential environmental risks are identified and, if required, further investigation, remediation and mitigation measures to alleviate those risks are specified.

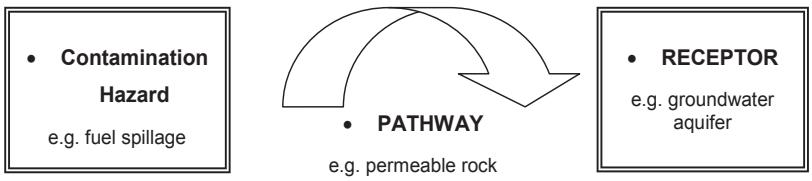
Methodology

1.8 The following legislation and policy has been consulted to provide the basis of the assessment:

- Part 2A of *The Environmental Protection Act 1990 (as amended)* is a legal framework introduced to identify and remediate contaminated land. *The Contaminated Land Statutory Guidance (2012)* issued by Department for Environment, Food and Rural Affairs (DEFRA) should be read in accordance with Part 2A;
- British Standard (BS) *BS 10175:2011 - Investigation of potentially contaminated sites. Code of practice*; and
- *The Model Procedures for the Management of Land Contamination (Contaminated Land Report 11)* have been developed by the Environment Agency (EA) and DEFRA to provide the technical framework for applying a risk management process when dealing with land affected by contamination.

1.9 The potential environmental impacts have been quantitatively assessed by considering the sensitivity of the site in relation to the geology, hydrogeology and general environment. The historical uses of the site have also been considered to inform the environmental risk assessment using contaminant-pathway-receptor-analysis.

1.10 Current guidance in the assessment of contamination risk advocates the use of a CSM, to establish connecting links between a contaminant source and a sensitive receptor, via an exposure pathway. A contamination hazard, a receptor and a pathway can all exist independently. However, a risk is only present when all three elements are linked together so a contaminant impacts upon a receptor via an exposure pathway, termed a pollution linkage. Thus, the mere presence of a contamination hazard at a particular site does not necessarily imply the existence of associated risks. A pollution linkage schematic is presented below.



1.11 If the contaminant and/or sensitivity of the receptor is such that significant harm can occur then the outcome is called a Significant Pollution Linkage (SPL). In such circumstances, the level of contaminant or the available pathway must be modified in some manner to reduce the severity of the impact to an acceptable level. The detailed assessment methodology is set out in Appendix A.

1.12 Evaluation of the existing baseline environment has been assessed through a desk-based study, considering the following sources of information:

- Ordnance Survey (OS) Explorer Map series at 1:25,000 scale, Sheet 191;
- British Geological Survey (BGS) Geology of Britain Viewer (Solid and Drift) (Contains British Geological Survey materials © NERC 2016) accessed October 2016;
- Soil Map of England and Wales Scale 1:250,000 (Soil Survey of England and Wales 1983);
- Radon Atlas of England and Wales (National Radiological Protection Board published 2002);
- Environment Agency (EA) website (*www.environment-agency.gov.uk*) accessed October 2016;
- Multi-Agency Geographic Information for the Countryside website (*www.magic.gov.uk*) accessed October 2016; and
- Envirocheck Report (October 2016).

Project Limitations

1.13 The findings of this report are based upon information from a range of sources which are believed to be reliable. However, AAe do not guarantee the reliability or authenticity of the information taken from third-party data sets.

1.14 Geo-environmental assessments place a significant emphasis on results of chemical analysis, which have been sampled and managed according to established protocols. Whilst the work has been completed in line with industry guidance and quality requirements, it is possible that the ground investigation and assessment carried out does not identify, or fully determine, the extent of conditions beneath the site and the existence of other important contamination sources. The advice given in this report with respect to contamination is based on published guidelines available at the time of writing.

2.0 ENVIRONMENTAL SETTING

Site location and description

2.1 The site is located on the eastern edge of Upper Heyford approximately 6 km north-west of Bicester. The site occupies an area of approximately 1.2 hectares on the southern side of Upper Heyford Airfield (disused). Access to the site is via Trenchard Circle adjoining the south-eastern boundary, connecting to Camp Road approximately 200 m to the south.

2.2 The site currently comprises a vacant plot of land, with a pumping station in the north-western corner. The site was formerly occupied by 7 pairs of semi-detached residential properties with gardens, which have recently been demolished. All hardstanding and structures have been removed. The former site layout is presented on Figure 2.

2.3 The site is bound by the disused airfield to the north and residential properties to the west, east and south. The wider area comprises of agricultural fields to the south and east, the disused airfield to the north and Upper Heyford to the west.

Topography

2.4 The site lies at approximately 123 m Above Ordnance Datum (AOD). The site is generally flat, with a slight gradient from north to south.

Geology

2.5 Reference to BGS maps for the region indicates that the site is underlain by a Bedrock of Limestone (Great Oolite Group comprised of Limestone and argillaceous rocks (interbedded) from the Jurassic Period). There are no Superficial Deposits recorded at the site.

2.6 The site does not contain any features of international or national geological importance. The site is not within a coal mining affected area.

2.7 There are no BGS Borehole Logs on the site. There are 16 BGS Borehole Logs listed within 500 m of the site. Details of the four nearest Borehole Logs are presented in Table 2.1.

Table 2.1 BGS Recorded Borehole Logs

Location	ID	Distance from site (m)	Depth (m BGL)	Notes
RAF Upper Heyford, Oxfordshire.	SP52NW274	250 N	1.47	No groundwater encountered. Recorded geology of Made Ground to 0.15 m BGL; over weathered limestone to 1.10 m BGL; over oolite limestone to 1.5 m BGL.
RAF Upper Heyford, Oxfordshire.	SP52NW273	300 E	1.51	No groundwater encountered. Recorded geology of Made Ground to 0.80 m BGL; over weathered limestone to 1.40 m BGL; over oolite limestone to 1.5 m BGL.
Property Services Agency, Upper Heyford RAF.	SP52NW184	300 SW	2.00	Recorded as a Trial Pit. Slight seepage of groundwater recorded at 2.20 m BGL. Recorded geology of Made Ground to 0.6 m BGL; silty sandy clay to 0.90 m BGL; over weathered to 1.30 m BGL; over clayey silty sand to 2.20 m BGL; over limestone to 2.30 m BGL.
Property Services Agency, Upper Heyford RAF.	SP52NW186	300 SW	1.00	Recorded as a Trial Pit. No groundwater encountered. Geology recorded as Made Ground to 0.2 m BGL; over sandy clay to 0.5 m BGL; over limestone to 1.4 m BGL.

Soil

2.8 The Soil Map of England and Wales has been consulted to classify and describe the near-surface soil (namely topsoil and sub-soil):

- Aberford (511a) – Permian. Jurassic and Eocene limestone - Shallow, locally brashy, well drained calcareous fine loamy soils over limestone. Some deeper calcareous clayey soils.

2.9 It is considered likely that any naturally occurring topsoil onsite would have been removed or reworked according to the current and historical land uses.

Hydrogeology

2.10 The Bedrock is classified by the Environment Agency as a 'Principal Aquifer'. These are defined as '*…layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer*.' It is considered likely that groundwater is present beneath the site.

2.11 There are no water abstractions on the site. The nearest registered water abstraction is located approximately 1100 m south-east of the site, registered to 'Mr CF Hilsdon' for the abstraction of groundwater for general agriculture and domestic use. There is no given end date for the licence and is therefore assumed to be active.

2.12 There are no Groundwater Source Protection Zones (GSPZ) located on or within 1 km of the site.

2.13 There are no springs or wells shown at or within 1 km of the site on the Ordnance Survey Maps.

Hydrology and Fluvial Flood Risk

2.14 The nearest surface water features to the site are a ditch running along the northern boundary of the site and a series of ponds to the north-east. The site walkover identified the drainage ditch to be positioned at a higher level than the site, indicating the channel is possibly lined. The ditch was observed to be flowing from west to east. The nearest main watercourse is the River Cherwell approximately 2 km west of the site

2.15 The site is located outwith Flood Zones 2 & 3, as identified by the EA flood map for planning (rivers and sea). The site is not considered at risk of fluvial flooding.

2.16 There are no active discharges on-site. The Envirocheck Report identifies that there are six registered discharge permits within 1 km of the site. The nearest three discharge consents are detailed in Table 2.2

Table 2.2. EA Discharge consents

Location	Start/end date	Distance from site (m)	Discharge	Receiving water
Letchmere Farm Cottage	17th July 2006/not supplied	38 NE	Sewage discharges – final/treated effluent	Leys Farm Ditch
Heyford Leys Mobile Park Home	30th June 1995/not supplied	464 S	Sewage discharges – final/treated effluent	Leys Farm Ditch
Heyford Park	27th March 1997/not supplied	663 S	Sewage and trade combined - unspecific	Gallows Brook

Recorded pollution incidents

2.17 The Envirocheck Report shows no pollution incidents to controlled waters registered to the site. There have been six pollution incidents to controlled waters within 1 km of the site. The closest three are detailed in Table 2.3

Table 2.3. EA Pollution Incidents to Controlled Waters

Location	Incident date	Distance from site (m)	Pollutant	Receiving water	Incident Severity
Upper Heyford	22nd August 1994	43 N	Oils - unknown	Not given	Category 2 – Significant Incident
Upper Heyford	21st January 1991	48 N	Oils - unknown	Not given	Category 3 – Minor Incident
RAF, Upper Heyford	24th October 1991	135 S	Chemicals - unknown	Not given	Category 3 - Minor

Ecosystems

2.18 There are no statutory ecological destinations (Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) or Special Protection Area (SPA)) on or within 1 km of the site.

Surrounding receptors

2.19 The closest residential receptors are located adjacent to the western, southern and eastern boundaries of the site.

2.20 There are no Public Rights of Way on or near to the site.

2.21 The nearest school is approximately 1.1 km south-west of the site.

Other matters (mining affected area, landfill and radon)

2.22 The site has been assessed for the potential presence of radon. The radon database shows that 1-3% of homes within the area are above the Action Level. Under the relevant guidance, there is no specific mitigation necessary for radon.

2.23 There are no historical or active landfill sites at or within 1 km of the site.

2.24 Asbestos is a known carcinogen, and if present could pose a health risk to the site occupiers if inappropriately controlled. It was used extensively as a building material in the UK from the 1950's through to the mid 1980's. Given the age of the buildings, it is possible that some of the former buildings and Made Ground could have contained Asbestos Containing Material (ACM).

3.0 POTENTIAL SOURCES OF CONTAMINATION

Historical Land Use

3.1 Historic maps in relation to the proposed development site have been reviewed, with a summary of the findings presented in Table 3.1. Extracts of the historical maps are presented in Appendix C.

Table 3.1 Notable Historical Site Uses

Date (Scale)	On site	Off site
1881 (1:2,500)	The site comprises part an agricultural field.	The site is bound by woodland (Gorse Cover) to the west, by a farm access track and agricultural fields to the east and by agricultural fields to the north and south. North Leys Farm is located 100 m to the north-east of the site. There is a small quarry located within woodland, approximately 50 m south-west of the site.
1884-1885 (1:10,560)	As above.	The wider are comprises agricultural fields and scattered woodland.
1900 (1:2,500)	As above.	A pump is marked adjacent to the north-east corner of the site. A second pump is marked at North Leys Farm, 100 m north of the site. A well is marked approximately 150 m west of the site within Gorse Cover.
1900 (1:10,560)	As above.	There are four quarries within 1 km of the site, to the south-west, north-west and east. The closest is approximately 50 m south-west of the site.
1922 (1:2,500)	As above.	Two small buildings have been built immediately to the north-east of the site. The use is unknown.
1923 (1:10,560)	As above.	There is a spring approximately 1.1 km east of the site.
1955 (1:10,560)	As above.	Land to the north of the site is labelled as 'Airfield' but no features are shown on the map.
1966 (1:10,000)	As above.	Upper Heyford Airfield has expanded to the north and west of the site, with the main hangars and buildings located approximately 500 m to the west. There has been residential development 100 m south and 500 m south-west of the site. The farm to the north-east of the site is now called as 'Letchmere Farm'.
1975-1976 (1:2,500)	The site comprises the former site layout – 7 pairs of semi-detached houses on Trenchard Circle, a pumping station in the north-west corner, and an electrical substation in the south-east.	The buildings immediately north-east of the site are labelled 'North Leys Cottage'. A small pond is shown immediately north-east of the site. Immediately west of the site is a industrial site/warehouse, with residential developments to the south and east of the site.
1993 (1:10,000)	As above.	The wider area comprises what is largely the current day layout of Upper Heyford, including commercial, industrial and residential premises, including a shopping centre.
2016 (1:10,000)	As above.	A series of surface water features (ponds) are shown approximately 100 m east of the site at Letchmere Farm, adjacent to a drainage ditch.

3.2 The historical maps show that the site was first developed around the 1970s as residential housing associated with Upper Heyford Airfield, prior to which the site comprised open agricultural land. The wider surrounding areas were predominantly agricultural fields prior to the development of Upper Heyford Airfield around the 1950's.

3.3 The maps shown that land immediately west of the site was used for industrial/commercial purposes from the 1970s through to the 2010s. The industrial site was redeveloped for residential use in the last few years.

3.4 A number of former small quarries were located within the area. These features are not shown on current mapping and may have been infilled.

Consultation

3.5 As part of the desk-top study, Cherwell District Council (CDC) was consulted to undertake a contaminated land and pollution incident search. The full consultation response is presented in Appendix D and summarised as follows:

- There are no recorded pollution incidents at the site;
- Site is underlain by Limestone (Major Aquifer of High Groundwater Vulnerability);
- No wells, private wells or abstractions within 50 m of site;
- Site identified as residential land;
- Quarry activity and 'infilled ground' identified within 50 m of south-west of site; and
- Site is identified as 'Military Land'.

Site Uses

3.6 At the time of the site walkover and investigation on 1st November 2016 all former buildings and structures had been demolished and removed. The concrete base of an above-ground fuel storage tank was still present in the south-west corner of the site, along with some manhole structures to the rear of the former properties.

3.7 It is understood that the former residential properties were connected to a shallow (within upper 0.2 m BGL) oil pipe which passed along the northern and western perimeter of the site. This pipe had been removed during the demolition works, with some minor staining observed at surface.

Potentially Contaminating Land Uses

3.8 Potential contaminants associated with current and former land uses at the site are presented in Table 3.2.

Table 3.2. Potential contaminants associated with the current and historic site land uses

Land uses	Key Potential Contaminants
Residential Properties (Airforce Accommodation) **On-Site (historic/ current)**	• *PAHs (Polycyclic Aromatic Hydrocarbons)* – Products of burning and combustion, including bonfires. • *Hydrocarbons (Total Petroleum Hydrocarbons)* – Small-scale storage for residential use, vehicle storage. Heating oils from pipes. • *Heavy metals and non-metals* – Reworked ground, small-scale land-raise and levelling using waste and ash. • *Asbestos* – Present in buildings and structures, incorporation of ACM into Made Ground.
Industrial Works **Off-site (historic)**	• *Hydrocarbons (oils and fuels)* – Spills and leaks by former storage tanks/pipes, or vehicles using the site. • *Metals and metalloids* – Potential residues and by-products of processes/storage and disposal of ashes/wastes. • *PAHs (Polycyclic Aromatic Hydrocarbons)* – Products of burning and combustion.
Airfield and Industrial Uses (fuelling, de-icing, aircraft servicing and maintenance, fire control) **Off-site (historic/current)**	• *Asbestos* – Associated with buildings and pipelines. Materials may have been removed during the life of the airport and disposed off-site. • *Metals and metalloids* – Typical contaminants associated with Made Ground and fill materials. • *Hydrocarbons (Total Petroleum Hydrocarbons)* – From fuelling of aircraft, vehicles, plant and machinery, leaks and spills from on-site storage and transfer. • *PAHs (Polycyclic Aromatic Hydrocarbons)* – Products of burning and combustion. Boilers and bonfires, dispersal of ashes. • *Herbicides* – Used to remove and prevent the growth of vegetation in paved areas. • *Organic Solvents (toluene, SVOCs, fluorinated surfactants)* - From hydraulic and cleaning fluids, cleaning chemicals and organic solvent use in ancillary works. • *Anti-freeze and de-icing agents (glycerol, urea and acetate-based formulations)* – Applied to runways and aircraft to prevent and remove ice.

4.0 SITE INVESTIGATION AND TESTING

Methodology

4.1 An intrusive environmental investigation was undertaken by AAe at the site on 1st and 3rd November 2016. The site investigation locations are presented on Figure 3. The investigation comprised the following:

- 7 no. Trial Pits (TP01-TP07) to provide good coverage across the site.
- 30 no. Verification Pits (TP08-TP37) to delineate pipework and hydrocarbon impacted soils.

4.2 The Trial Pits were constructed using an excavator. Upon completion of the Trial Pits the excavations were backfilled in sequence.

4.3 The Trial Pits were logged by AAe to record the depth and types of strata, any groundwater ingress, and any visual or olfactory evidence of contamination.

4.4 Representative soil samples were collected from the Trial Pits in accordance with quality control requirements and submitted to Chemtest, a UKAS accredited laboratory, for chemical analysis. The samples were tested for a full environmental suite, including speciated Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH), metals, other inorganics and an asbestos screen. Selected samples were tested for TPH only.

4.5 Headspace tests were undertaken using a Photo-Ionisation Detector (PID) to measure VOC concentrations within soil samples.

Geology

4.6 The Site Investigation Logs are presented in Appendix E. The geology encountered in the Trial Pits was generally consistent, comprising Made Ground, over sandy gravelly clay (weathered Limestone), over fractured Limestone bedrock.

Visual and Olfactory Contamination

4.7 No visual or olfactory evidence was recorded in Trial Pits TP01 and TP03-TP07.

4.8 Within Trial Pit TP02 visual staining and a hydrocarbon odour (PID 4.4 ppm) was observed within the limestone at 1.80-2.00 m BGL. Following the identification of the suspected hydrocarbons, additional verification Trial Pits (TP08-TP37) were then excavated to attempt to identify potential sources (pipework) and determine the extent of impacted soils. The investigation locations and observations are presented on Figure 3.

4.9 Table 4.1 sets out the visual evidence of contamination and PID results observed during the verification investigation to identify pipework and impacted soils

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Table 4.1 Visual evidence of contamination during investigation

Location	PID Result (Depth – m BGL))	Observations
TP08	0.6 ppm (2.00 m)	Minor hydrocarbon odour.
TP09	31.1 ppm (1.10 m)	Hydrocarbon odour.
TP10	52.5 ppm (0.60 m)	Oil pipes at 0.5 m, surrounded by staining and odour.
TP11	0.3 ppm (1.80 m)	Minor hydrocarbon odour.
TP12	91.4 ppm (1.00 m)	Stained gravels 0.8-1.2 m.
TP13	4.6 ppm (1.00 m)	Minor hydrocarbon odour.
TP14	0.2 ppm (1.00 m)	No visual or olfactory evidence of hydrocarbons.
TP15	0.0 ppm (1.00 m)	No visual or olfactory evidence of hydrocarbons.
TP16	0.2 ppm (1.80 m)	No visual or olfactory evidence of hydrocarbons.
TP17	0.0 ppm (1.50 m)	No visual or olfactory evidence of hydrocarbons.
TP18	71.4 ppm (0-0.10 m) 132.3 ppm (0.90 m)	Staining at surface. Oil pipes at 0.9 m, surrounded by staining and odour.

Table 4.1 Visual evidence of contamination during investigation		
Location	**PID Result (Depth – m BGL))**	**Observations**
TP19	6.2 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP20	2.4 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP21	3.3 ppm (0.80 m)	Excavation though old manhole. Perched water with free-phase oils – PID reading ambient level immediately above water surface.
TP22	69.5 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP23	28.4 ppm (1.10 m)	Hydrocarbon odour.
TP24	n/t	Perched water encountered at 0.90 m surrounding pipes, with some free-phase hydrocarbons.
TP25	24.7 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP26	1.7 ppm (1.60 m)	No visual or olfactory evidence of hydrocarbons.
TP27	0.2 ppm (1.50 m)	No visual or olfactory evidence of hydrocarbons.
TP28	n/t	Pipes and perched water encountered at 1.10 m, some free-phase hydrocarbons on water.
TP29	232.4 ppm (1.30 m)	Pipes at 0.90 m. Stained soils next to manhole.
TP30	n/t	Pipes at 1.20 m
TP31	n/t	Pipes at 1.20 m
TP32	12.6 ppm (1.50 m)	Pipes at 1.20 m
TP33	40.2 ppm (1.30 m)	Pipes at 1.30 m
TP34	4.1 ppm (1.30 m)	Pipes at 1.30 m
TP35	n/t	Pipes at 1.30 m
TP36	n/t	Pipes at 1.30 m
TP37	0.0 ppm (0.60 m)	Adjacent to former tank base. No visual or olfactory contamination.

4.10 The investigation identified a buried fuel line (comprising 2 metal pipes) located to the rear of the former properties at approximately 0.50 to 1.30 m BGL. The fuel lines pass along the northern and western areas perimeter of the site, connecting to the former properties via feeder lines and the manholes. The approximate position of the fuel lines is shown on Figure 3. Hydrocarbon staining and odour was observed around the pipes and manholes.

Hydrogeology

4.11 Groundwater ingress was encountered at approximately 1.80 m in TP02 on the north of the site. The water was observed to have a hydrocarbon odour and sheen. What appeared to be perched groundwater was encountered around the pipes and manholes to the rear of the former properties. Some free-phase oils were observed on the perched water surrounding these features. It is not known whether the groundwater encountered in TP02 was perched or in connectivity with the aquifer in the limestone strata.

Chemical Analysis

4.12 Table 4.2 sets out the chemical analysis and laboratory testing which has been undertaken.

Table 4.2. Summary of environmental chemical testing – soils and water		
Location	**Number**	**Chemical Analysis**
TP01-TP07	10	Full Environmental Solids Suite (including Asbestos Screen, Inorganics, Metals, TOC, Speciated TPH Ali/Aro, Speciated PAH 16 and Phenols)
TP02	1	Full Environmental Water Suite (pH, Inorganics incl. Metals, TPH CWG, PAH USEPA, BTEX, Total Phenols)
TP08-TP18, TP29 and TP37	14	Speciated TPH Ali/Aro (solids)
TP21	1	Speciated TPH Ali/Aro (waters)

4.13 The Certificates of Analysis are presented in Appendix F. The soil results have been consolidated as presented in Appendix G.

Assessment of Results – Soils (Human Health)

4.14 It is proposed that the site will be redeveloped for residential use including private gardens. Therefore, the proposed land use scenario is 'Residential with Homegrown Produce' and the respective Tier 1 Soil Guidance Values will be adopted.

4.15 The results have been compared against the Tier 1 SGVs for 'Residential with Homegrown Produce' land use scenario (as presented in Appendix H). These guidance values have been sourced from industry-accepted models and standards, including the latest 2014 LQM/CIEH S4UL Generic Assessment Criteria (GAC) and the DEFRA C4SL threshold values. Where available, the most stringent LQM/CIEH GAC by organic matter content has been used. The use of guidance values is considered a conservative level of assessment to determine whether further work is required.

4.16 The investigation has identified two distinct datasets at the site:

- Soils representative of wider site – TP01-07; and
- Soils representative of hydrocarbon impacted soils around pipework – TP08-TP37.

Tier 1 Assessment – General Site

4.17 The results show that there are no exceedances recorded within the general Trial Pits (TP01-TP07) across the site. Outwith the known areas of hydrocarbon contamination, the recorded shallow soils and natural strata are not considered to pose a risk to future site users. No specific remediation of mitigation is required.

Tier 1 Assessment – Hydrocarbon impacted soils around pipework

4.18 The results show that there are exceedances of the Tier 1 SGVs for TPHs in the soils surrounding the oil pipes and connecting manholes. Table 4.3 present the Tier 1 SGV exceedances.

Table 4.3. Tier 1 SGV Exceedances (around pipework)

Determinant	Tier 1 SGV (mg/kg)	No. of Exceedances	Max Concentration (mg/kg)	Locations (m BGL)
Aliphatic TPH >C6-C8	100	1	390	TP18 (0-0.1)
Aliphatic TPH >C8-C10	27	4	2100	TP10 (0.6) TP18 (0-0.1) TP18 (0.9) TP29 (1.3)
Aliphatic TPH >C10-12	130	3	8600	TP10 (0.6) TP18 (0-0.1) TP29 (1.3)
Aliphatic TPH >C12-C16	1100	3	47000	TP10 (0.6) TP18 (0-0.1) TP29 (1.3)
Aromatic TPH >C8-C10	34	2	77	TP18 (0-0.1) TP29 (1.3)
Aromatic TPH >C10-C12	74	3	2100	TP10 (0.6) TP18 (0-0.1) TP29 (1.3)
Aromatic TPH >C12-C16	140	3	15000	TP10 (0.6) TP18 (0-0.1) TP29 (1.3)
Aromatic TPH >C16-C21	260	3	11000	TP10 (0.6) TP18 (0-0.1) TP29 (1.3)
Aromatic TPH >C21-C35	1100	1	3700	TP18 (0-0.1)

4.19 The Tier 1 SGV TPH exceedances are recorded at TP10 (0.6 m BGL), TP18 (0-0.1 m BGL), TP18 (0.9 m BGL) and TP29 (1.3 m BGL). These samples are considered to be representative of impacted soils around the pipework and manholes that remain at the site.

Contaminants of Potential Concern – Human Health – Hydrocarbon impacted soils around pipework

4.20 The chemical analysis and Tier 1 screen has identified the following Contaminants of Potential Concern (COPCs) within the impacted soils surrounding oil pipes and manholes:

- Aliphatic TPH >C6-C8
- Aliphatic TPH > C8-C10
- Aliphatic TPH >C10-C12
- Aliphatic TPH >C12-C16
- Aromatic TPH >C8-C10
- Aromatic TPH >C10-C12
- Aromatic TPH >C12-C16
- Aromatic TPH >C16-C21
- Aromatic TPH >C21-C35

4.21 As these COPCs are recorded within defined areas of the site ('hotspots') it was not considered appropriate to undertaken statistical analysis (95th Percentile and Outlier Test) with the entire dataset (results from TP01-TP07) as this would not have been representative of the wider site condition.

Assessment of Results – Controlled Waters

4.22 Groundwater was encountered within the Trial Pits on the north of the site. Whilst some of the water was considered to be perched surrounding the pipes and manholes, it cannot be fully determined whether groundwater encountered within limestone at TP02 was part of the underlying bedrock aquifer. Representative groundwater samples were collected from TP02 and TP21 and submitted to the laboratory for chemical analysis. The Certificated of Analysis are presented in Appendix F.

4.23 The results have been compared against the World Health Organization (WHO) Guidelines for Drinking Water Quality (1984) and the UK Drinking Water Standards (UKDWS) for Water Supply Regulations (SI 2000/3184) 2000. Aliphatic TPH band fractions between EC12-35 are considered below the solubility for assessment under the WHO guidance values and are therefore not assessed as it is unlikely for them to dissolve into the groundwater. The use of guidance values is considered a conservative level of assessment to determine whether further work is required. Table 4.4 presents the assessment of groundwater results.

Table 4.4 Controlled Waters Assessment						
Determinant	Units	LOD	Guidance Values		Results	
			UKDWS	WHO	TP02 (2.00 m)	TP21 (0.80 m)
pH		N/A	-	-	8.2	-
Sulphate	mg/l	1.0	250	-	42	-
Cyanide (Total)	mg/l	0.050	0.05	-	< 0.050	-
Magnesium	mg/l	0.50	50	-	48	-
Arsenic (Dissolved)	µg/l	1.0	10	-	1.3	-
Boron (Dissolved)	µg/l	20	1000	-	49	-
Cadmium (Dissolved)	µg/l	0.080	5	-	< 0.080	-
Copper (Dissolved)	µg/l	1.0	2000	-	< 1.0	-
Mercury (Dissolved)	µg/l	0.50	1	-	< 0.50	-
Nickel (Dissolved)	µg/l	1.0	20	-	1.9	-
Lead (Dissolved)	µg/l	1.0	10	-	< 1.0	-
Selenium (Dissolved)	µg/l	1.0	10	-	< 1.0	-
Vanadium (Dissolved)	µg/l	1.0	-	-	< 1.0	-
Zinc (Dissolved)	µg/l	1.0	5000	-	1.1	-
Chromium (Total)	µg/l	1.0	50	-	1.4	-
Chromium (Hexavalent)	µg/l	20	-	-	< 20	-
Aliphatic TPH >C5-C6	µg/l	0.10	-	-	< 0.10	< 0.10
Aliphatic TPH >C6-C8	µg/l	0.10	-	1500	< 0.10	< 0.10
Aliphatic TPH >C8-C10	µg/l	0.10	-	300	1200	410000
Aliphatic TPH >C10-C12	µg/l	0.10	-	300	9700	1200000
Aliphatic TPH >C12-C16	µg/l	0.10	-	-	49000	3600000
Aliphatic TPH >C16-C21	µg/l	0.10	-	-	59000	2200000
Aliphatic TPH >C21-C35	µg/l	0.10	-	-	3200	1400000
Aliphatic TPH >C35-C44	µg/l	0.10	-	-	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	µg/l	5.0	-	-	120000	8800000
Aromatic TPH >C5-C7	µg/l	0.10	-	-	< 0.10	< 0.10
Aromatic TPH >C7-C8	µg/l	0.10	-	-	< 0.10	< 0.10
Aromatic TPH >C8-C10	µg/l	0.10	-	300	190	150000
Aromatic TPH >C10-C12	µg/l	0.10	-	100	1300	400000
Aromatic TPH >C12-C16	µg/l	0.10	-	100	15000	1500000
Aromatic TPH >C16-C21	µg/l	0.10	-	90	11000	1500000
Aromatic TPH >C21-C35	µg/l	0.10	-	90	860	190000
Aromatic TPH >C35-C44	µg/l	0.10	-	-	73	3200
Total Aromatic Hydrocarbons	µg/l	5.0	-	-	28000	3700000
Total Petroleum Hydrocarbons	µg/l	10	10	-	150000	13000000
Naphthalene	µg/l	0.10	-	-	< 0.10	-
Acenaphthylene	µg/l	0.10	-	-	< 0.10	-
Acenaphthene	µg/l	0.10	-	-	< 0.10	-
Fluorene	µg/l	0.10	-	-	< 0.10	-
Phenanthrene	µg/l	0.10	-	-	< 0.10	-
Anthracene	µg/l	0.10	-	-	< 0.10	-
Fluoranthene	µg/l	0.10	-	-	< 0.10	-
Pyrene	µg/l	0.10	-	-	< 0.10	-
Benzo[a]anthracene	µg/l	0.10	-	-	< 0.10	-
Chrysene	µg/l	0.10	-	-	< 0.10	-
Benzo[b]fluoranthene	µg/l	0.10	-	-	< 0.10	-
Benzo[k]fluoranthene	µg/l	0.10	-	-	< 0.10	-
Benzo[a]pyrene	µg/l	0.10	-	0.07	< 0.10	-
Indeno(1,2,3-c,d)Pyrene	µg/l	0.10	-	-	< 0.10	-
Dibenz(a,h)Anthracene	µg/l	0.10	-	-	< 0.10	-
Benzo[g,h,i]perylene	µg/l	0.10	-	-	< 0.10	-
Total Of 16 PAH's	µg/l	2.0	0.1	-	< 2.0	-
Benzene	µg/l	1.0	1	10	< 1.0	-
Toluene	µg/l	1.0	-	700	< 1.0	-
Ethylbenzene	µg/l	1.0	-	300	< 1.0	-
m & p-Xylene	µg/l	1.0	-	500	< 1.0	-
o-Xylene	µg/l	1.0	-	500	< 1.0	-
Total Phenols	mg/l	0.030	0.0005	-	< 0.030	-

Exceedance of DWS/WHO Guidance Values

4.24 The chemical results for the groundwater from TP02 and TP21 record significant elevations of TPH in exceedance of UK DWS and WHO guidance values for groundwater. It is considered likely that this is representative of the groundwater quality at the site where leaks from the underground fuel pipes have contaminated perched groundwater. The sample from TP02 indicates that there may have been downward migration to the bedrock aquifer; however, the exact depth of groundwater within the underlying aquifer is not known. It is considered that further assessment and investigation is required to determine the impact on groundwater and assess the risk to controlled waters.

Phytotoxic Assessment – Risk to Plants

4.25 The results for the shallow soils (TP01-TP07) have been screened against published industry-accepted assessment criteria and natural background concentrations for phytotoxic elements (MAFF Code of Good Agricultural Practice for the Protection of Soil [1998] and BS3882:2007). Table 4.5 presents the phytotoxic assessment.

Table 4.5. Phytotoxic Element SGV Exceedances - Soils

Determinant	SGV (mg/kg	Source	No. of Exceedances	Concentration (mg/kg)	Location
Nickel	110	BS3882:2007	0	N/A	N/A
Arsenic	250	MAFF: 1998	0	N/A	N/A
Chromium	400	MAFF: 1998	0	N/A	N/A
Copper	200	BS3882:2007	0	N/A	N/A
Zinc	300	BS3882:2007	0	N/A	N/A

4.26 The recorded soil concentrations within the shallow soils at the site are unlikely to pose a risk to planting schemes and introduced plants. The chemical analysis for the site should be provided to the Landscape Designer.

Services Assessment – Risk to Potable Supply Pipes

4.27 The results have been screened against the specification for 'non-barrier' polyethylene water supply pipes presented in UKWIR Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites. Table 4.6 presents the assessment.

Table 4.6 Potable supply assessment

Determinant	Threshold Standard PE Pipe (mg/kg)	Maximum Recorded Site Level (mg/kg)
SVOC (includes PAH)	2	2 (PAH total)
Phenols	2	<0.03
TPH C11-C20	10	47000
TPH C21-C40	500	3700

4.28 Based on the above assessment it is considered that a polyethylene barrier pipe (with aluminium barrier layer) will be required for potable water supply pipes to the new properties due to elevations of TPHs recorded within the ground. This should be confirmed with the Designer and Statutory Undertakers.

5.0 CONCEPTUAL SITE MODEL AND SIGNIFICANT POLLUTION LINKAGES

Introduction

5.1 The risks that potential contamination within the underlying strata pose to the current and futures uses of the site and the wider environment are assessed within this section of the report.

5.2 The assessment is undertaken in accordance with the standard methodology set out in Appendix A.

5.3 Table 5.1 sets out the potential receptors at, and surrounding, the site from the information from Section 2 'Baseline Setting' and the available pathways. These are subsequently evaluated as the potential Significant Pollutant Linkages (SPL).

Table 5.1. Summary of receptors and available pathways

Receptor	Pathways
A. Human health	
• On-site usage (Proposed Residential)	Dermal contact Ingestion of soil Inhalation of fugitive dusts and gases Puncture Dermal contact with ground water
• Off-site land uses (Residential)	Inhalation of vapours and gases. Dermal contact (following migration) Ingestion of soil (following migration)
• Construction worker – in the event of excavation and groundworks	Dermal contact Ingestion of soil Inhalation of fugitive dusts and gases Puncture Dermal contact of ground water
B. Ecology	
• On site planting	Direct absorption of phytotoxic compounds from soils
C. Controlled waters	
• Groundwater • Surface Water	Leaching of contaminants from the soil matrix
D. Buildings and Services	
• Concrete • Services • Potable pipes	Contact with aggressive soil conditions

5.4 Table 5.2 sets out the potential SPL and assesses the consequences on the receptor of the pollution linkages. The table provides the Conceptual Model for the site.

Table 5.2. Conceptual Site Model					
Hazard source (Chemical of concern where known)	**Pathway**	**Receptor**	**Effect**	**Risk Classification**	**Discussion, remediation or mitigation solution**
Contaminants present in underlying soils (TPHs).	Dermal contact, ingestion of contaminated soils, puncture and inhalation of fugitive dusts via air.	Humans (future users of the site).	Toxic, carcinogenic or hazardous to human health.	Significance: Severe Likelihood: Possible Risk: **High**	Contamination can give rise to human health concerns if users of the site come into direct contact with affected soil, ingest contaminated particles or inhale fugitive dusts which include contaminated particles. Whilst the majority of existing soils are not assessed to pose a risk to future users, the site investigation and chemical analysis has identified hotspots of elevated TPHs in soils surrounding pipework which exceed the Tier 1 SGVs for the proposed land use scenario. The proposed redevelopment to residential properties with private gardens creates a potential risk pathway between contaminants and humans through the ingestion of soil particles, inhalation of dusts and/or dermal contact. Without relevant controls, there is a risk to residents of the site from the residual contaminants and the risk is considered to be **High.** **Controls & Mitigation** 1. Removal of pipework and remedial excavation or treatment of impacted soils (including free-phase hydrocarbons) to acceptable standards to remove/treat the primary source of residual contaminants. Validation testing to demonstrate quality of residual soils. 2. It is recommended that a clean-cover system is incorporated into the proposed design to protect future users from any residual contaminants. All residual soils to be capped by buildings, hardstanding or acceptable clean imported soils over a geotextile demarcation layer. 3. In areas of soft landscaping the capping thickness should be 250 mm within shared amenity areas or 600 mm in private garden areas. 4. Imported soils to comply with specification set out in Appendix H. **Residual Risk** **Low** – Subject to remedial excavation works and implementation of mitigation controls.

Table 5.2. Conceptual Site Model					
Hazard source (Chemical of concern where known)	**Pathway**	**Receptor**	**Effect**	**Risk Classification**	**Discussion, remediation or mitigation solution**
Ground Gas and VOC present in underlying soils and groundwater (TPH)	Inhalation of vapours and ground gases via contaminated soils and air.	Humans (users of the site).	Toxic, carcinogenic, hazardous to human health.	Significance: Severe Likelihood: Possible Risk: **High**	Re-worked ground (Made Ground), soils with high organic matter, hydrocarbon contamination, landfills, brownfield sites and those sites that are underlain by naturally occurring alluvial strata can pose a risk from ground gases (including carbon dioxide). If these accumulate in enclosed spaces, there is a risk to future site users. The site investigation and chemical analysis has recorded a shallow layer of variable Made Ground (typically less than 1.0 m BGL), overlying weathered Limestone. Chemical analysis has recorded TOC in the underlying soils to a maximum of 5.1%. The investigation has identified hotspots of hydrocarbon contamination surrounding former oil pipes, with maximum recorded PID value of 232.4 ppm and maximum TPH Total concentration of 140,000 mg/kg. It is possible that ground gases and vapours could pose a risk to future site users and the overall risk is assessed to be **High** without further assessment and control. **Controls & Mitigation** 1. Removal of pipework and remedial excavation or treatment of impacted soils (including free-phase hydrocarbons) to acceptable standards to remove/treat the primary source of residual contaminants and vapours. 2. Validation testing and monitoring of residual soils as part of a Ground Gas Risk Assessment to determine if a VOC-resistant membrane and/or ground gas protection measures are required in the floorslabs of proposed properties. **Residual Risk** **Low –** Subject to further assessment and mitigation.

Table 5.2. Conceptual Site Model					
Hazard source (Chemical of concern where known)	**Pathway**	**Receptor**	**Effect**	**Risk Classification**	**Discussion, remediation or mitigation solution**
Contaminants present in underlying soils and groundwater (TPHs).	Dermal contact with soils/groundwater, ingestion of contaminated soils, puncture and inhalation of fugitive dusts or vapours via air.	Humans (construction workers).	Toxic, carcinogenic or hazardous to human health.	Significance: Severe Likelihood: Possible Risk: **High**	Contamination can give rise to human health concerns if construction workers come into direct contact with affected soil, ingest contaminated particles or inhale fugitive dusts which include contaminated particles. The site investigation and chemical analysis has identified elevations of TPH surrounding former pipework. During the construction phase, excavation of the underlying strata for groundworks and to create foundations for the proposed development could create a potential linkage between construction workers and any residual contamination; therefore, the risk is deemed **High** without control and mitigation. **Controls & Mitigation** 1. Removal of pipework and remedial excavation or treatment of impacted soils (including free-phase hydrocarbons) to acceptable standards to remove/treat the primary source of residual contaminants. 2. All contractors associated with remedial works should ensure suitable Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE) is worn by operatives to prevent against skin puncture, inhalation of dusts and vapours, ingestion of contaminants and dermal contact. 3. Test results to be provided to all follow-on contractors to ensure suitable PPE and RPE controls are applied for working in residual soils. 4. It should be noted that the presence of unexpected contaminants cannot be fully discounted, and further assessment may be necessary if suspected contamination is recorded during the redevelopment. **Residual Risk** **Low –** Subject to use suitable PPE and RPE.

Table 5.2. Conceptual Site Model					
Hazard source (Chemical of concern where known)	**Pathway**	**Receptor**	**Effect**	**Risk Classification**	**Discussion, remediation or mitigation solution**
Contaminants present in underlying soils and groundwater (TPHs).	Dermal contact and ingestion (following migration in soil or by contaminants in groundwater). Inhalation of vapours, fugitive dusts and ground gases via contaminated soils and air.	Humans (users of adjacent land).	Toxic, carcinogenic, hazardous to human health.	Significance: Moderate Likelihood: Possible Risk: **Medium**	Contaminants can pose a risk to adjacent land users if they migrate through soils or be transported by groundwater. The site investigation and chemical analysis has identified some elevations of TPH surrounding former pipework. The Trial Pitting indicates that the areas of hydrocarbon contamination are localised to soils and perched water surrounding the pipework and connections into the former properties; however, the extent and magnitude of impact on groundwater in the underlying aquifer on the north of the site is not fully known. The nearest residential properties are located immediately east and west of the site. The site is unsurfaced which does not restrict infiltration and the investigation has recorded some shallow groundwater which could potentially mobilise residual contaminants. The risk to adjacent land users is assessed to be **Medium** without control. **Controls & Mitigation** 1. Removal of pipework and remedial excavation or treatment of impacted soils and groundwater (including free-phase hydrocarbons) to acceptable standards to remove/treat the primary source of residual contaminants and vapours. Validation testing to demonstrate quality of residual soils. 2. Installation of groundwater monitoring boreholes to determine the quality, depth and flow-direction of groundwater within the underlying limestone aquifer. 3. Suitable controls to be applied during the construction and groundworks phase to minimise potential low-level fugitive emissions of asbestos fibres from soils. **Residual Risk** **Low** – Subject to further assessment and implementation of suitable controls.

Table 5.2. Conceptual Site Model					
Hazard source (Chemical of concern where known)	**Pathway**	**Receptor**	**Effect**	**Risk Classification**	**Discussion, remediation or mitigation solution**
Contaminants present in underlying soils and groundwater (TPHs).	Leaching and migration through soil to groundwater and surface water.	Controlled waters – Surface water and groundwater.	Contamination of a controlled water.	Significance: Severe Likelihood: Possible Risk: **High**	Contaminants can pose a risk to controlled waters if they migrate through soils, enter surface watercourses or are transported by groundwater. The site is underlain by shallow Made Ground, over weathered cohesive limestone, which overlies a bedrock geology of Limestone (Principal Aquifer). Although there are no main rivers or groundwater abstractions within 1 km of the site, there are a series of drainage ditches and surface water features to the north and east. The site investigation and chemical analysis has identified some significant elevations of TPH in soils and groundwater surrounding oil pipework and connections into former properties. Some free-phase hydrocarbons were observed in perched water surrounding manhole structures. Chemical analysis of water samples recorded elevations of TPH above DWS and WHO guidance values. It cannot be fully determined whether contaminated groundwater encountered within limestone at TP02 was part of the underlying bedrock aquifer and the extent and magnitude of impact on groundwater in the underlying aquifer on the north of the site is not fully known. The risk to controlled waters is assessed to be **High** without further assessment and control. **Controls & Mitigation**. 1. Removal of pipework and remedial excavation or treatment of impacted soils and groundwater (including free-phase hydrocarbons) to acceptable standards to remove/treat the primary source of residual contaminants. Validation testing to demonstrate quality of residual soils and groundwater. 2. Installation of groundwater monitoring boreholes to determine the quality, depth and flow-direction of groundwater within the underlying limestone aquifer, including Detailed Hydrogeological Risk Assessment to evaluate risk to controlled waters and derive acceptable remedial target values for soils and groundwater. **Residual Risk** **Low –** subject to further assessment and implementation of remedial controls.

Table 5.2. Conceptual Site Model					
Hazard source (Chemical of concern where known)	**Pathway**	**Receptor**	**Effect**	**Risk Classification**	**Discussion, remediation or mitigation solution**
Contaminants present in underlying soils and groundwater (TPHs).	Uptake by roots from soil and groundwater.	Ecology (introduced planting and landscaping)	Damage and restrictive growth.	Significance: Moderate Likelihood: Unlikely Risk: **Low**	The site investigation and chemical analysis have not recorded any known phytotoxic contaminants within the Made Ground or Natural Strata underlying the site; therefore, the risk to planting and landscaping is assessed to be **Low** without control and mitigation. Some hotspots of residual hydrocarbon contamination have been recorded however it is recommended that these are excavated for the protection of human health and surrounding receptors. **Controls & Mitigation** 1. Existing test results to be provided to Designer to ensure suitable design controls for introduced planting and landscaping. **Residual Risk** **Low** – Subject to suitable design controls.
Contaminants present in underlying soils and groundwater (TPHs).	Contact with contaminated soil.	Services and structures in the underlying ground.	Damage to services and structures.	Significance: Severe Likelihood: Possible Risk: **High**	Site investigation and chemical analysis has recorded some significant elevations of TPH in residual soils which may necessitate the use of a barrier pipe for potable water supply to the proposed properties. In addition, the recorded ground conditions could potentially pose aggressive ground conditions to structures and foundations. The risk to structures and services is assessed to be **High** without control and mitigation. **Controls & Mitigation** 1. Test results to be provided to Designer and Statutory Undertakers to ensure structures and services are suitably protected from ground conditions. 2. Removal of pipework and remedial excavation or treatment of impacted soils and groundwater (including free-phase hydrocarbons) to acceptable standards to remove/treat the primary source of residual contaminants. Validation testing to demonstrate quality of residual soils. **Residual Risk** **Low** – Subject to suitable design controls.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 AA Environmental Limited (AAe) has been commissioned by Conlon Limited to carry out a Phase 2 Environmental Risk Assessment (ERA) and ground investigation for the proposed redevelopment of land at Trenchard Circle, Upper Heyford.

6.2 The site currently comprises a vacant plot of land, with a pumping station in the north-western corner. The site was formerly occupied by 7 pairs of semi-detached residential properties with gardens, which have recently been demolished. Planning permission (16/00196/F) was granted by Cherwell District Council on the 9th March 2016 for the demolition of the former residential units, and construction of 13 new dwellings with private gardens and associated car parking.

6.3 The site has been subject to a desktop study and an intrusive ground investigation to review the site history and uses, inspect the underlying strata, check for evidence of residual contamination and collect soil samples for laboratory chemical analysis. The investigation comprised the construction of 7 no. Trial Pits and 30 no. Verification Pits across the site on 1st and 3rd November 2016.

6.4 Although the investigation has not recorded any residual contaminants across much of the site, the investigation and chemical analysis has recorded some hotspots of significantly elevated Total Petroleum Hydrocarbons (TPH) in soils and groundwater surround oil pipes and connections into the former properties. A series of Verification Pits (TP08-TP37) were excavated to trace the route of pipework and delineate the impacted soils, with a focus on the north of the site. The proposed redevelopment of the land for residential purposes creates a potential risk pathway between any residual contamination and future site users. The site is underlain by limestone (Principal Aquifer) and shallow groundwater has been recorded. The extent and magnitude of impact on the underlying aquifer in the north of the site could not be fully determined by the current investigation and assessment. The risk assessment identified a potential high risk to future site users and surrounding receptors (including controlled waters) without further assessment, remediation and/or mitigation.

6.5 Table 6.1 presents a summary of the recommended further works, remediation and/or mitigation controls during the redevelopment. This should be read in conjunction with the Remedial Plan (Figure 4).

Table 6.1. Summary of remediation and mitigation controls

Ref	Item	Description/Requirements
1	Installation of Boreholes and Hydrogeological Risk Assessment	Installation of groundwater monitoring boreholes to determine the quality, depth and flow-direction of groundwater within the underlying limestone aquifer, including Detailed Hydrogeological Risk Assessment to evaluate risk to controlled waters and derive acceptable remedial target values for soils and groundwater.
2	Remedial Plan	Development of a Remedial Plan based on the findings of the Detailed Hydrogeological Risk Assessment to determine strategy for the removal or treatment of impacted soils and groundwater to acceptable target values.
3	Pipe Removal and Excavation or Treatment of Impacted Soils/Perched Groundwater	Removal of pipework and remedial excavation or treatment of impacted soils and groundwater (including free-phase hydrocarbons) to acceptable standards to remove/treat the primary source of residual contaminants and vapours. Soils to be transferred off-site (for recovery, treatment or disposal) in accordance with waste regulatory regime. Perched groundwater impacted by hydrocarbons to be treated in-situ or pumped to a holding tank and transferred off-site in accordance with waste regulatory regime. Subject to the Remedial Plan, validation testing to demonstrate the quality of residual soils.

Table 6.1. Summary of remediation and mitigation controls		
Ref	**Item**	**Description/Requirements**
4	Ground Gas Risk Assessment	In conjunction with groundwater monitoring it is recommended that ground gas monitoring is undertaken on boreholes to inform a Ground Gas Risk Assessment to determine the requirements for ground-gas protection measures in floorslabs of the properties. Post-remedial excavation testing and VOC monitoring to determine requirement for a hydrocarbon-resistant membrane in the floorslabs of the properties.
5	Capping of Site	Subject to the Remedial Plan, a clean-cover system may need to be incorporated into the proposed design to protect future users from any residual contaminants following the remedial works. All residual soils to be capped by buildings, hardstanding or acceptable clean imported soils over a geotextile demarcation layer. In areas of soft landscaping the capping thickness should be 250 mm within shared amenity areas or 600 mm in private garden areas. Imported soils to comply with specification set out in Appendix H.
6	Protection of Landscaping, Scheme and Plants	Test results to be provided to Designer to ensure suitable design controls for introduced planting and landscaping
7	Protection of Structures and Services	Test results to be provided to Designer and Statutory Undertakers to ensure structures and services are suitably protected from ground conditions. Installation of barrier pipe for potable water supply to all new properties.
8	Unexpected Contamination	If any unexpected contamination is encountered during the development of the site, then further testing and/or assessment should be completed.
9	Waste Disposal	All soils and groundwater transferred off-site as part of the remedial and/or construction phase should be suitably characterised in accordance with the waste regulatory regime and Duty of Care requirements. Transfer Notes for all wastes transferred off-site should be maintained.

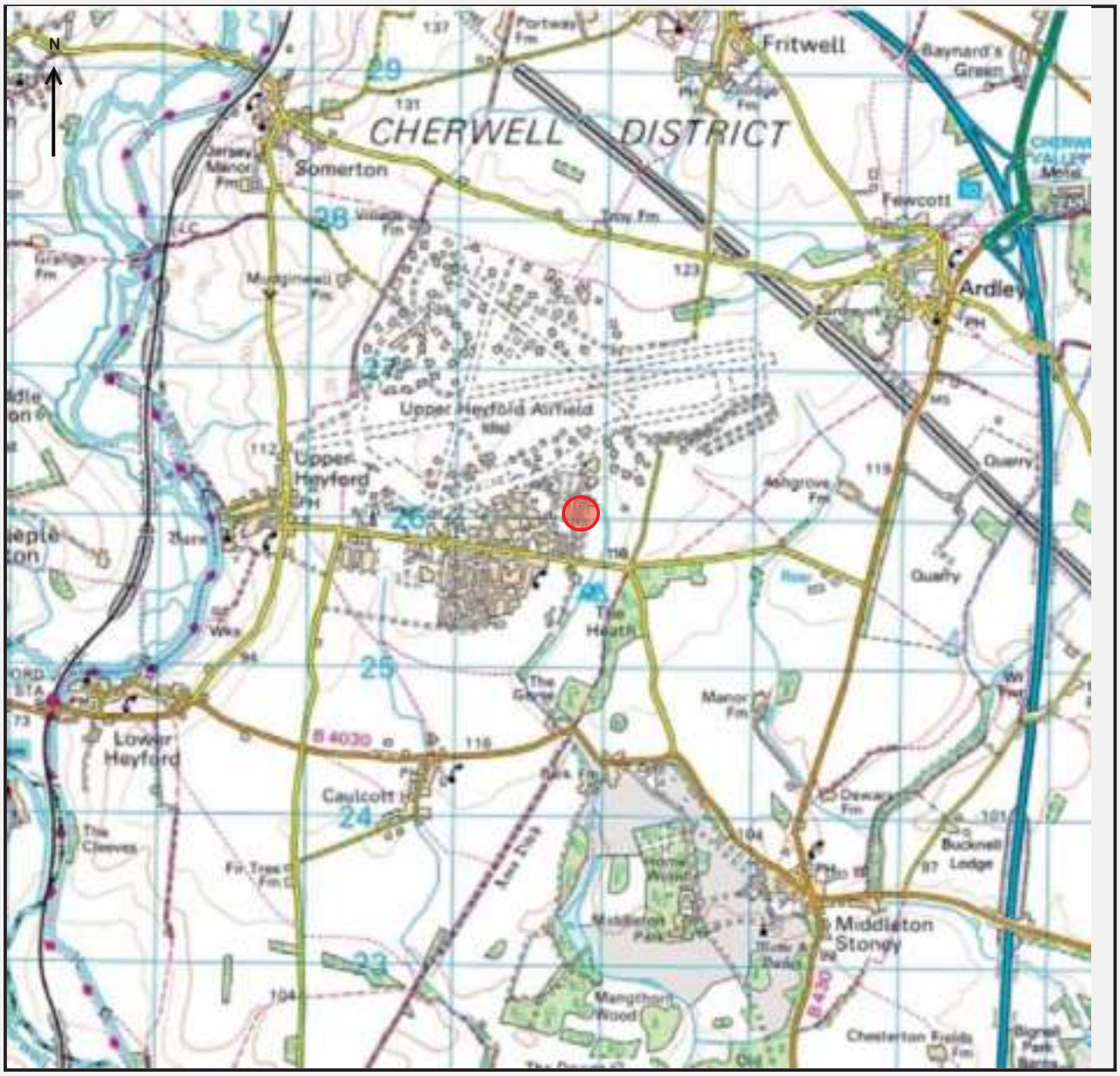
Summary

6.7 The Environmental Risk Assessment undertaken by AAe has identified sources of residual contamination which could pose a risk to future site users and surrounding receptors without control. It is recommended that the further works, remediation, mitigation and design controls specified within this report are adopted for the protection of human health and surrounding receptors. Through these controls it is anticipated that all environmental risks can be suitably managed without adversely affecting the proposed development. A Remedial Strategy should be developed and the proposed remedial and mitigation solutions agreed with the Local Authority and Regulators.

163408/JNT AA ENVIRONMENTAL LIMITED

December 2016

Figures



KEY	
Site Location:	UK Location:
Explorer™	
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Rev.	Details	Drawn / Chkd.	Date

AA Environmental Ltd
Units 4-8
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Oxon OX13 6HX

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F: 01235 523849
info@aae-llp.com
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Project
163408
Trenchard Circle
Upper Heyford
OX25 5TB

Title
Site Location Plan

Scale	Date	Drawn	Chkd.	Drg. No.	Rev.
NTS	November' 16	SM	JNT	Figure 1	

KEY

Site Boundary

Rev.	Details	Drawn / Chkd.	Date

PROJECT

163408
Trenchard Circle
Upper Heyford

TITLE

Former Site Layout

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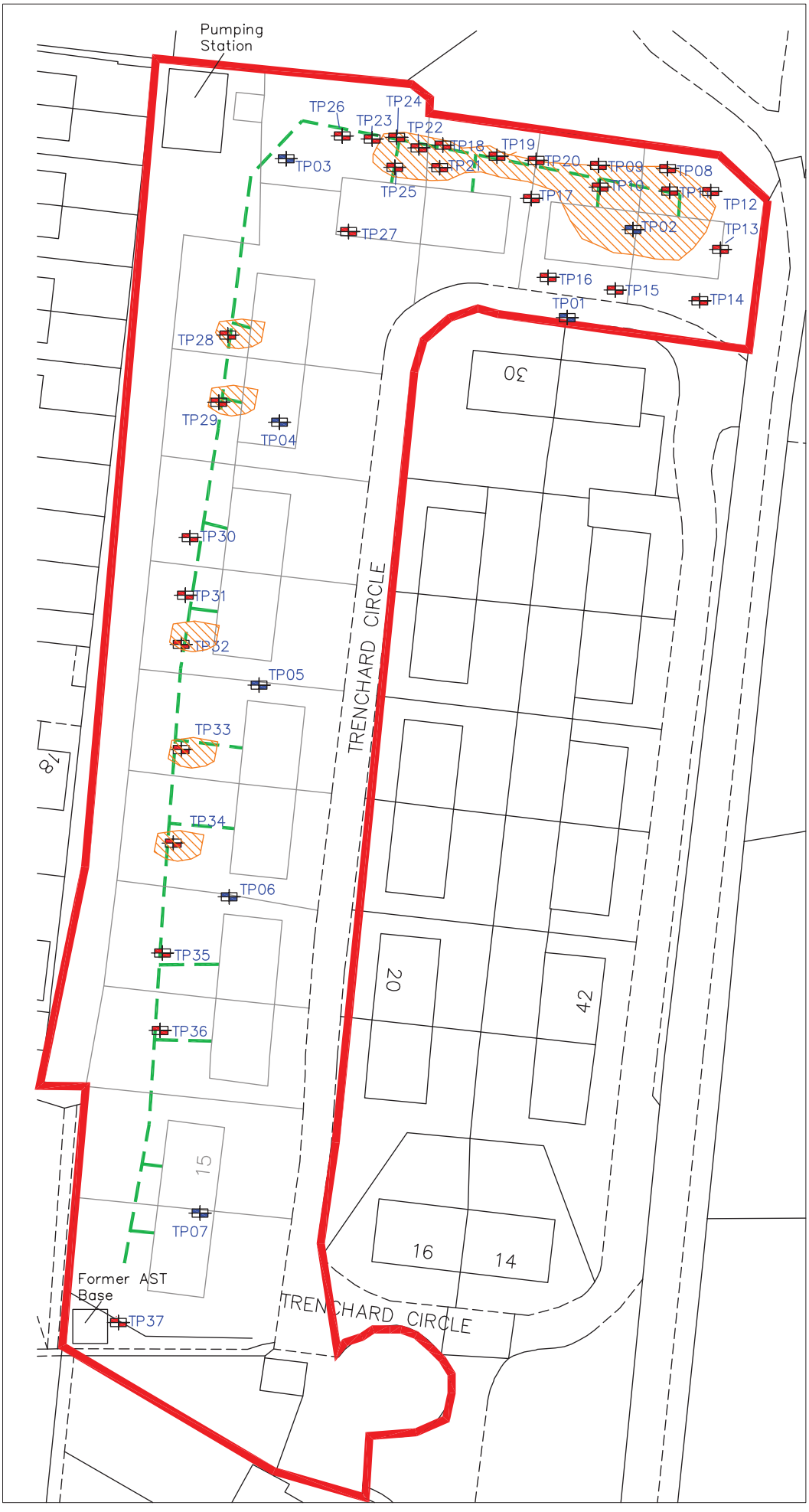
Scale	Date	Drg No.	Rev.
NTS	Nov'16	Figure 2	
	Drawn: SM / Chkd.: JNT		



KEY

- Site Boundary
- Trial Pits (TP01-07)
- Verification Pits (TP08-37)
- Indicative areas of recorded hydrocarbon contamination
- Indicative position of below-ground oil pipes

Rev.	Details	Drawn / Chkd.	Date

Project

163408
Techard Circle
Upper Heyford

Title

Site Investigation Plan

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Scale	Date	Drg. No.	Rev.
NTS	Nov'16	Figure 3	
	Drawn: SM / Chkd.: JNT		

KEY

- Site Boundary
- Indicative position of below-ground oil pipes to be removed.
- Impacted soils around pipework to be segregated and treated/excavated. Validation testing of residual soils.

Rev.	Details	Drawn / Chkd.	Date

Project
163408
Techard Circle
Upper Heyford

Title
Remedial Plan

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Scale	Date	Drg. No.	Rev.
NTS	Nov'16	Figure 4	
	Drawn: SM / Chkd: JNT		

APPENDIX A
Conceptual Site Model Methodology

APPENDIX A - Conceptual Site Model Methodology

Introduction

A.1 To determine the Significant Pollution Linkages (SPL) at a site requires the review of potential contaminants, the associated available pathways and the characteristics of the associated receptors. The review of all the SPL is determined is termed as the development of a Conceptual Site Model (CSM).

A.2 The CSM for the site is presented in Chapter 5. The method for its development has been undertaken in accordance with this Appendix. Chapter 5 also determines the potential for any remediation/mitigation works required to make the site suitable for the proposed use.

Methodology

A.3 A series of potential receptors are assessed, together with linking pathways and suspected contaminant sources. Table A1 sets out the potential consequences of the pollution linkage and the associated classification of the effect. Typical receptors evaluated are as follows:

- Human health
- Proposed/current usage:
    - Open spaces;
    - Residential with gardens;
    - Residential without gardens;
    - Commercial;
    - Industrial;
    - Off-site human health (linked to the typical land uses as defined above);
    - Construction workers;
- Ecological resource:
    - Current habitats and species;
    - proposed habitats and species;
- Controlled waters:
    - Surface waters;
    - Groundwater;
- Buildings and structures:
    - Aggressive ground conditions creating corrosion or impairment to building/structure.

Table A1. Potential Consequence of Pollution Linkage

Classification	Human Health	Controlled water	Built Environment	Ecosystems
Severe	Irreversible damage to human health.	Significant pollution to a sensitive or important controlled water.	Damage to a building or structure that would require repair or remedial measures in excess of £20,000.	Irreversible change to an existing ecological species, habitat or ecosystem. Prohibit proposed growth of species, ecosystem or habitat.
Moderate	Reversible long-term damage to human health.	Pollution to a controlled water.	Damage to a building or structure that would require repair or remedial measures below £20,000.	Will impair the development of an existing species, ecosystem or habitat. Permit limited growth of a proposed species, ecosystem or habitat.
Mild	Reversible but short-term damage to human health.	Minor pollution to a non-sensitive controlled water.	Repairable damage to building or structures which would not require excessive cost.	Minor change or effects of development on species or habitat but does create long term effects on ecosystem.

Classification	Human Health	Controlled water	Built Environment	Ecosystems
Negligible	No discernible damage to human health.	No discernible pollution likely to a non-sensitive controlled water.	Insubstantial damage not requiring repair.	No significant effects on existing or proposed species, habitats or ecosystems.

A.4 The risk assessment examines impact of a contaminant on a receptor against the likelihood of its occurrence. The likelihood is rated accordingly:

Certain: > 90% of contaminant receptor linkage
Likely: 60-90% of contaminant receptor linkage
Possible: 30-60% of contaminant receptor linkage
Unlikely: 15-30% of contaminant receptor linkage
Very unlikely 2.5-15% of a contaminant receptor linkage
Negligible: <2.5% of contaminant receptor linkage

A.5 The available pathways are considered as follows:

- Human health
  - Dermal contact
  - Ingestion
  - Inhalation
  - Explosion
  - Puncture
- Ecology
  - Absorption of contaminants through roots and leaves;
- Controlled waters
  - Direct ingress of contaminants;
  - Leaching of contaminants from soils;
- Buildings
  - Direct contact with contaminated water or soils

A.6 Using the information derived about the availability of a contaminant to a receptor, a risk classification is then undertaken in accordance with Table A2.

Table A2. Risk Classification

Potential consequence of contaminant linkage

Likelihood of contaminant receptor linkage	Severe	Moderate	Mild	Negligible
Certain	High	High	Medium	Very low
Likely	High	High	Low	Negligible
Possible	High	Medium	Low	Negligible
Unlikely	Medium	Low	Very low	Negligible
Very Unlikely	Low	Very low	Very low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

A.7 The assessed risk classification definitions are:

High: it is likely that the contaminant source could cause harm to a designated receptor and harm would be significant.
Medium: it is possible that the contaminant source could cause harm to a designated receptor, but it is unlikely that the harm would be significant.
Low: it is possible that the contaminant source could cause significant harm to a designated receptor, however it is likely to be mild.
Very low: it is considered unlikely that significant harm could be caused and any impact would be mild.
Negligible: the potential contaminant source cannot cause significant harm to the receptor.

Appendix B
Planning Documents

Application No.: 16/00196/F

DISTRICT COUNCIL
NORTH OXFORDSHIRE

NOTICE OF DECISION

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

Name and Address of Agent/Applicant:

Heyford Residential Ltd
c/o Pegasus Group
Mr Paul Burrell
Pegasus House
Querns Business Centre
Whitworth Road
Cirencester
Gloucestershire
GL7 1RT

Date Registered: 9th March 2016

Proposal: Demolition of existing bungalows and erection of 13 dwellings with associated car parking and landscaping

Location: 13 - 39 (Odds Numbers Only), Trenchard Circle, Upper Heyford,

Parish(es): Upper Heyford

PERMISSION FOR DEVELOPMENT SUBJECT TO CONDITIONS

The Cherwell District Council, as Local Planning Authority, hereby **GRANTS** planning permission for the development described in the above-mentioned application, the accompanying plans and drawings and any clarifying or amending information **SUBJECT TO THE CONDITIONS SET OUT IN THE ATTACHED SCHEDULE.**

The reason for the imposition of each of the conditions is also set out in the schedule.

Cherwell District Council
Bodicote House
Bodicote
Banbury
Oxon
OX15 4AA

Cherwell District Council
Certified a true copy

Head of Public Protection &
Development Management

Date of Decision: 17 August 2016

Head of Public Protection & Development Management

SCHEDULE OF CONDITIONS

1 Except where otherwise stipulated by condition, the application shall be carried out strictly in accordance with the following documents: Application forms , Planning, Heritage and Design Statement, Aboricultural Impact assessment and Protection Plan, Construction Specification, Parking Matrix, Habitat and Bat Survey and Flooding Risk and Drainage Assessment, and drawings numbered:

Location Plan	0521 TR 101
External Works Layout	0521 TR 104-Rev G
Planning Layout	0521 TR Rev H
Adoption Plan	0521 TR 107 Rev G
Tracking Layout 1 of 2	0521 TR 105 RevF
Tracking Layout 2 of 2	0521 TR 105 Rev B
Materials Layout	0521 TR 108 Rev H
Refuse Plan	0521 TR 111 Ref F
Detailed Planting Proposals 1 of 2	1619 A4 13
Detailed Planting Proposals 2 of 2	1619 A4 21
Housetype booklet	0521 TR HTB Issue 8

Reason - For the avoidance of doubt, to ensure that the development is carried out only as approved by the Local Planning Authority and to comply with Government guidance contained within the National Planning Policy Framework.

2 The development to which this permission relates shall be begun not later than the expiration of three years beginning with the date of this permission.

Reason - To comply with the provisions of Section 91 of the Town and Country Planning Act 1990, as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

3 No materials other than those as shown on plan No. 0521 TR 108 Rev H are to be used in the new development. There shall be no variation of these materials without the prior written consent of the Local Planning Authority. The development shall be carried out in accordance with the approved schedule.

Reason - To ensure the satisfactory appearance of the completed development and to comply with Policy C28 of the adopted Cherwell Local Plan and Government guidance contained within the National Planning Policy Framework.

4 All planting, seeding or turfing comprised in the approved details of landscaping shall be carried out in accordance with BS 4428:1989 Code of Practice for general landscape operations (excluding hard surfaces), or the most up to date and current British Standard, in the first planting and seeding seasons following the occupation of the building(s) or on the completion of the development, whichever is the sooner. Any trees, herbaceous planting and shrubs which, within a period of five years from the completion of the development die, are removed or become seriously damaged or diseased shall be replaced in the current/next planting season with others of similar size and species.

Reason - In the interests of the visual amenities of the area, to ensure the creation of a pleasant environment for the development and to comply with Policy C28 of the adopted Cherwell Local Plan and Government guidance contained within the National Planning Policy Framework.

5 That all enclosures along all boundaries of the site shall be as shown on the approved plans and such means of enclosure shall be erected prior to the occupation of any dwelling.

Reason - To ensure the satisfactory appearance of the completed development, to safeguard the privacy of the occupants of the existing and proposed dwellings and to comply with Policies C28 and C30 of the adopted Cherwell Local Plan.

6 Prior to the first occupation of any of the dwellings hereby approved, all of the estate roads, footpaths (except for the final surfacing thereof) and parking shall be laid out, constructed, lit and drained in accordance with Oxfordshire County Council's 'Conditions and Specifications for the Construction of Roads' and its subsequent amendments.

Reason: In the interests of highway safety, to ensure a satisfactory standard of construction and layout for the development and to comply with Government guidance contained within the National Planning Policy Framework.

7 Prior to first occupation of any dwelling hereby approved, a Travel Information Pack shall be submitted to and approved by the Local Planning Authority. The first residents of each dwelling shall be provided with a copy of the approved Travel Information Pack.

Reason - In the interests of sustainability, to ensure a satisfactory form of development and to comply with Government guidance contained within the National Planning Policy Framework.

8 Prior to the commencement of the development hereby approved, and notwithstanding the application details, full details of refuse, fire tender and pantechnicon turning within the site shall be submitted to and approved in writing by the Local Planning Authority. Thereafter, the development shall be carried out in accordance with the approved details.

Reason - In the interests of highway safety and to comply with Government guidance contained within the National Planning Policy Framework

9 The development permitted by this planning permission shall be carried out in accordance with the approved Flood Risk Assessment (Version 4. Woods Hardwick, April 2016), and the following mitigation measures detailed within the FRA.
o Limiting the surface water run-off generated by the 1 in 100 year critical storm so that it will not exceed the run-off from the developed site and not increase the risk of flooding off-site.
o Permeable Paving extent to be approved by LPA (para 2.5 of FRA).
o The attenuation tanks and filter drains as shown on drawing No.HEYF-5-903 D.
The mitigation measures shall be fully implemented prior to occupation and subsequently in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the local planning authority.
The drainage scheme shall also include for the maintenance and management of SUDS features to be presented in the form of a Site SUDS Management Plan.

Reason - To protect the development and its occupants from the increased risk of flooding and in order to comply with Government guidance contained within the National Planning Policy Framework.

10 If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted a remediation strategy to the local planning authority detailing how this unsuspected contamination shall be dealt with and obtained written approval from the local planning authority. The remediation strategy shall be implemented as approved.

Reason National Planning Policy Framework (NPPF) paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of water pollution. Government policy also states that planning policies and decisions should ensure that adequate site investigation information, prepared by a competent person, is presented (NPPF, paragraph 121).

11 Prior to the first occupation of the development hereby approved, a Landscape and Ecology Management Plan (LEMP) shall be submitted to and approved in writing by the Local Planning Authority. Thereafter, the LEMP shall be carried out in accordance with the approved details.

Reason -To protect habitats of importance to biodiversity conservation from any loss or damage in accordance with Policy C2 of the adopted Cherwell Local Plan and Government guidance contained within the National Planning Policy Framework.

PLANNING NOTES

1 The Advance Payments Code (APC), Sections 219 -225 of the Highways Act, is in force in the county to ensure financial security from the developer to off-set the frontage owners' liability for private street works, typically in the form of a cash deposit or bond. Should a developer wish for a street or estate to remain private then to secure exemption from the APC procedure a 'Private Road Agreement' must be entered into with the County Council to protect the interests of prospective frontage owners. Alternatively the developer may wish to consider adoption of the estate road under Section 38 of the Highways Act.

Prior to commencement of development, a separate consent must be obtained from OCC Road Agreements Team for any highway works under S278 of the Highway Act. Contact: 01865 815700; RoadAgreements@oxfordshire.gov.uk.

2 In accordance with the Town and Country Planning (Development Management Procedure) (England) (Amendment No 2) Order 2012 and paragraphs 186 and 187 of the National Planning Policy Framework (March 2012), this decision has been taken by the Council having worked with the applicant/agent in a positive and proactive way as set out in the application report. Since submission the details have been revised several times as part of a positive engagement between applicant and Local Planning Authority. Layouts have been modified to reflect character, comply with the design code and to create space for more trees and to create an opportunity for more street planting on the main tertiary road. The layout and design closely follows the Design Codes and advice has been given on the plans and house types following formal written pre application advice. On the back of these comments the design has evolved and a number of changes have been made.

STATEMENT OF ENGAGEMENT

In accordance with the Town and Country Planning (Development Management Procedure) (England) Order 2015 and paragraphs 186 and 187 of the National Planning Policy Framework (March 2012), the Council has worked positively and proactively to determine this application within the agreed timescales, having worked with the applicant/agent where necessary and possible within the scope of the application (as set on in the case officer's report) to resolve any concerns that have arisen, in the interests of achieving more appropriate and sustainable development proposals. Consent has been granted accordingly.

The case officer's report and recommendation in respect of this application provides a detailed assessment of the merits of the application when considered against current planning policy and guidance, including consideration of the issues raised by the comments received from consultees and members of the public. This report is available to view online at:

http://www.cherwell.gov.uk/viewplanningapp.

Cherwell
DISTRICT COUNCIL
NORTH OXFORDSHIRE

NOTICE OF DECISION

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

NOTES TO THE APPLICANT

TIME LIMITS FOR APPLICATIONS

By virtue of Sections 91-96 of the Town and Country Planning Act 1990, as amended by Section 51 of the Planning and Compulsory Purchase Act 2004, planning permissions are subject to time limits. If a condition imposing a time limit has been expressly included as part of the permission, then that condition must be observed. Otherwise, one or other of the following time limits will apply:

Where planning permission is given in outline subject to a condition reserving certain matters for subsequent approval, application for approval of such matters reserved must be made not later than the expiration of 3 years beginning with the date of the outline planning permission and further the development to which the permission relates must be begun not later than the expiration of 2 years from the final approval of the reserved matters or, in the case of approval on different dates, the final approval of the last reserved matters to be approved.

Where the planning permission is complete and is not in outline, the development must be begun not later than the expiration of 3 years from the date on which permission was granted.

OTHER NECESSARY CONSENTS

This document only conveys permission or approval for the proposed development under Part III of the Town and Country Planning Act 1990 and you must also comply with all the bye-laws, regulations and statutory provisions in force in the District and secure such other approvals and permissions as may be necessary under other parts of the Town and Country Planning Act 1990 or other legislation.

In particular you are reminded of the following matters:

- The need in appropriate cases to obtain approval under the Building Regulations. **The Building Regulations may be applicable to this proposal. You are therefore advised to contact the District Council's Building Control Manager before starting work on site.**

- The need to obtain an appropriate Order if the proposal involves the stopping up or diversion of a public footpath.

- Data supplied by the National Radiological Protection Board (NRPB) and the British Geological Survey (BGS) suggests that the site of this application falls within an area which is potentially at risk from radon. This may require protective measures in order to comply with the Building Regulations if your consent relates to a new dwelling or house extension. Further advice on whether protective measures are required under the Building Regulations can be obtained by contacting the Building Control Manager on 0300 003 0200, fax 0300 003 0201 or E-mail at building.control@cherwellandsouthnorthants.gov.uk

- The need to obtain a separate "Listed Building Consent" for the demolition, alteration or extension of any listed building of architectural or historic interest from the Local Planning Authority.

- The need to make any appropriate arrangements under the Highways Act in respect of any works within the limits of a public highway. The address of the Highway Authority is Oxfordshire County Council, Speedwell House, Speedwell Street, Oxford, OX1 1NE.

- It is the responsibility of the applicant to ascertain whether his/her development affects any public right of way, highway or listed building.

APPEALS TO THE SECRETARY OF STATE

If you are aggrieved by the decision of the Local Planning Authority to refuse to grant planning permission or grant planning permission subject to conditions, you can appeal to the Secretary of State in accordance with Section 78(1) of the Town and Country Planning Act 1990.

If you wish to appeal then;

- For **Householder** applications you must do so within **12 weeks** of the date of the decision
- For **Minor Commercial** applications you must do so within **12 weeks** of the date of the decision
- For **all other types** of planning applications you must do so within **6 Months** of the date of the decision

Unless;

- The decision on the application relates to the same or substantially the same land and the development is already the **subject of an enforcement notice** then you must appeal within **28 days** of the date of the Local Planning Authority's decision on the planning application.
- If an **enforcement notice is served** relating to the same or substantially the same land and development as in your application and if you want to appeal the decision, then you must do so within **28 days** of the service of the enforcement notice, or 6 months (12 weeks for householder and minor commercial) of the date of this decision which ever is the sooner

Forms can be obtained from the **Planning Inspectorate, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6PN. Tel (0303 444 5000. Or online at www.planningportal.gov.uk/pcs.** The Secretary of State can allow a longer period for giving notice of an appeal, but he will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

The Secretary of State need not consider an appeal if it seems to him that permission or approval for the proposed development could not have been so granted otherwise than subject to the conditions imposed by the Local Planning Authority, having regard to the statutory requirements, to the provisions of the development order and to any directions given under the order.

In practice, the Secretary of State does not refuse to consider appeals solely because the Local Planning Authority based its decision on a direction given by him.

PURCHASE NOTICES

If either the Local Planning Authority or the First Secretary of State grants permission or approval for the development of land subject to conditions, the owner may claim that he/she can neither put the land to a reasonably beneficial use in its existing state nor render the land capable of a reasonably beneficial use by the carrying out of any development which has been or would be permitted.

In these circumstances the owner may serve a purchase notice on the District Council. This notice will require the Council to purchase his/her interest in the land in accordance with the provisions of Part VI of the Town and Country Planning Act 1990.

COMPENSATION

In certain circumstances compensation may be claimed from the Local Planning Authority if permission is granted subject to conditions by the Secretary of State on appeal or on reference of the application to him.

These circumstances are set out in the Town and Country Planning Act 1990 as amended by the Planning and Compensation Act 1991.

TRENCHARD, HEYFORD PARK, UPPER HEYFORD, BICESTER

REVISIONS:

A. 2015-12-03. Layout amended at client request. DW
B. 2016-01-12. Patio length updated for Type 2, HT6, Type 4A, HT5 housetypes as per client request. SO
C. 2016-01-18. Plots 343-350 repositioned at client request. Legend updated. DW
D. 2016-04-21. Plots 336-339 replanned. Railings on dwarf wall added on unit frontages. Plot 352's driveway to be permeable paving in lieu of grasscrete. Close board fences added around foul pump and electrical sub-stations. All in-fill as per local authority request. DJE
E. 2016-05-09. Additional fence added to the south of plot 343 at client request. MED
F. 2016-05-11. Pumping station and front boundary enclosures amended, additional landscaping indicated all in accordance with Urban Design comments. MED
G. 2016-06-27. Number of plots reduced to 13 as per Clients request. HT5 and HT6 house types amended to reflect WDs. DW/MED

LEGEND

EXTERNAL WORKS LAYOUT

SCALE: 1:200 @ A0
DATE: JULY 2015
DRAWN: PVA
DRAWING TITLE: EXTERNAL WORKS LAYOUT
DRAWING NO: 0521-TR-104

LANDSCAPE SPECIFICATION

SITE PREPARATION

Topsoil

Existing topsoil shall be stripped before building works begin. Imported topsoil shall be to BS3882: 2007 Specification for Topsoil and Requirements for Use. Topsoil shall be multi-purpose grade, of medium texture, with a high proportion of fertile loamy material. It shall be free from subsoil, rubbish, rubble, contamination, roots of perennial weeds and other materials injurious to plant growth. The maximum stone content of the soil shall be 20%, with the maximum size of stone 25mm in any one dimension. All topsoil shall be stacked in heaps, not exceeding 2m high. During storage, topsoil heaps shall be kept free from compaction, contamination and weeds.

Excavation

Excavation shall NOT be undertaken within the root protection area of any existing trees or shrubs to be retained. Unless otherwise indicated areas to be planted / seeded shall be cleared of all surface rubbish and excavated to the dimensions below finished level as follows, when the soil is not waterlogged or frozen. Ensure the location of all services is known before any excavation operations.

Tree pits:	1000 x 1000 x 800mm deep unless otherwise shown
Shrub and hedge pit / trench:	450mm deep
Grass areas:	300mm deep

The base of excavated areas shall be forked or otherwise cultivated to a depth of 150mm to facilitate drainage and all bricks, stones and other debris, etc. over 75mm in any one dimension shall be removed. Similarly, areas trafficked by construction vehicles shall be ripped to a depth of 150-300mm to relieve compaction.

Backfilling with Subsoil

Where excavated areas are lower than the required depths, excavations shall be backfilled with selected subsoil and lightly consolidated to make up levels. Selected subsoil shall be friable, second quality topsoil or similar and be free of rubbish, roots, stones over 75mm in any one dimension, perennial weeds or other materials injurious to plant growth.

Backfilling with Topsoil

Tree, shrub and hedge pit / trench excavations shall be backfilled, in layers, with clean topsoil (as specified above) thoroughly mixed with planting compost e.g. 'Melcourt Topgrow' compost at a rate of 20 litres/m². An approved tree and shrub fertilizer shall be added to topsoil, prior to backfilling tree-pits. Grass areas shall be backfilled with topsoil in layers of 150mm depth.

Cultivation

Prior to cultivation if planting / seeding areas are weed infested, weed growth to be strimmed, the arisings removed and re-growth treated with an approved herbicide ie Glyphosate. Treatment to be undertaken in the growing season preceding planting, at a minimum 4 weeks prior to works to allow for repeat treatment if necessary.

Cultivation shall not be undertaken within the root protection area of any trees / shrubs to be retained, without prior agreement from the Local Planning Authority. Topsoil shall be cultivated by hand or machine prior to planting, with minimal compaction by machine. Cultivate to the following depths and tilth, removing all rubbish, vegetation, perennial weeds, roots, stones over 25mm in any one dimension and rake to even levels.

Planting areas:	300mm deep cultivation to medium tilth
Grass seeding areas:	150mm deep cultivation to fine tilth raked to a smooth evenly firmed bed
Turf areas:	150mm deep cultivation to medium tilth raked to a smooth evenly firmed bed

PLANTING

Plant Stock and Timing

Plant material and operations shall conform to BS8545 : 2014, BS 3936 Nursery Stock (Parts 1-10), BS 4428 : 1989, BS 4043 : 1989 and BS 5837 : 2012. The planting season shall be from the 1st October to the 31st March. Container grown stock may be planted outside this season if accompanied by daily watering, or as necessary to ensure healthy establishment. Planting shall not be carried out during periods of frost, drought, cold drying winds or when the soil is waterlogged or frozen.

Planting

All planting that is within the root protection area of existing trees/shrubs to be retained, shall be undertaken by hand and positions altered should tree roots be encountered, in order to avoid damage to the root system.

All plants shall be set out evenly over the areas as indicated, to the density and quantities shown. All plants shall be planted upright at the same depth as the nursery soil level and evenly spaced, leaving room for growth. All restrictive containers shall be removed with roots not twisted. Immediately following planting, all plants shall be watered-in to field capacity.

Container grown and root balled plants shall be planted in a planting pit sufficient to accommodate the plant without causing root damage, with a minimum 50mm backfill beyond the root ball extent. Plants to be firmed, watered-in and dead, damaged or lopsided branches shall be removed after planting. Bare-root plants shall be slit planted, incorporating an approved high phosphate, slow-release fertilizer.

Tree Planting and Support

Trees planted in landscape areas shall be installed as specified.
All trees to be firmed in after planting. All trees shall have irrigation / aeration system units fitted to fully surround the root ball.

Hedge Planting

Hedges shall be planted in a double staggered row as per detail. Dead, damaged or straggly branches shall be removed after planting. All transplants in hedge and native mixes shall be fitted with individual protection ie shrub shelters, spiral guards as specified, or alternatively the planting areas shall be protected with rabbit-proof fencing. All shrub shelters / spiral guards shall be black or green, adequately supported and installed to allow for expansion.

Mulching

Prior to the application of mulch the planting areas shall be completely weed free and watered sufficiently to achieve field capacity. The surface of the planting areas shall be mulched with a minimum 75mm depth layer of 15-65mm nominal particle size, dark, matured woodchip mulch, ensuring that the low branches of trees, shrubs and/or herbaceous plants are NOT smothered.

Mulch shall be an approved product and completely weed and weed seed free. The mulch shall be topped-up to maintain, after settlement, a depth of not less than 50mm. Trees in grass areas shall be planted centrally within a 1m diameter mulch bed, to be mulched to 75mm deep. The surface of mulch to be 10mm below the surface of adjacent lawn / hard surface.

GRASS AREAS

Turf

Turf shall accord with BS 3969: 1998, it shall be good quality meadow / cultivated, amenity turf free from weeds and be laid on even, prepared ground (as detailed above), during periods of suitable warm and moist weather conditions. Pre-turfing fertiliser shall be applied to manufacturer's recommendations and turf shall be laid in accordance with BS 4428: 1989.

Turf shall be laid with broken joints well-butted up, working from timber planks to avoid damaging turf when laying. Water as necessary to avoid shrinkage and achieve satisfactory establishment. Undertake good horticultural practice to ensure establishment of a healthy grass sward.

Grass Seeding

Areas of amenity grass shall be seeded with a general amenity grass mix as specified during the period March to May or September to October,during periods of moist, warm weather conditions without significant wind. Pre-seeding fertiliser shall be applied to manufacturer's recommendations. Seed shall be sown on even, prepared ground (as detailed above), at a rate of 35g/m2 or as specified, in two transverse operations. Lightly roll seed bed after sowing. Water as necessary to avoid shrinkage and achieve satisfactory establishment. Undertake good horticultural practice to ensure establishment of a healthy grass sward.

AFTERCARE PERIOD

Regular Visits

During the specified Aftercare Period maintenance visits shall be carried out, at least monthly from April to September and twice during the dormant season to carry out the following operations to establish healthy growing plants / grass in weed free areas: watering, firming-up, removal of litter, pest and disease control, general pruning, checking guards, ties and stakes, weed control, grass cutting and autumn tidying. All arisings shall be carted away and the site shall be left clean and tidy at all times.

Watering

All planting and grass areas shall not be allowed to dry out and shall be kept well watered during the growing season, ensuring the soil is kept moist at all times but avoiding waterlogging.

Replacement Planting

During each August within the Aftercare Period an inspection shall be made and all plants that have died, are missing, damaged or have failed to thrive, shall be noted and replaced in the following planting season.

Grass Cutting

During the first and subsequent growing seasons amenity grass shall be kept at a height of 25mm to 50mm. Any bare patches are to be resown. Selective weed control shall be undertaken as necessary once the sward is sufficiently established.

Heyford Trenchard Planting Palette

TREES

Number	Plant Name	Height	Girth	Specification
8 No.	Tilia cordata 'Greenspire'	400-450cm	16-18cm	Extra Heavy Standard: 3x: RB: Clear Stem min. 200cm
4 No.	Betula pendula 'Fastigiata'	400-450cm	14-16cm	Extra Heavy Standard: 5 brks 3x: RB: Clear Stem 175-200cm

Total :12 No.

HEDGING

Number	Plant Name	Height	Container	Specification	Density
276 No.	Viburnum tinus 'Eve Price'	30-40cm	5L	Bushy: 5 brks: C	3/m

Total 276 No.

SHRUBS

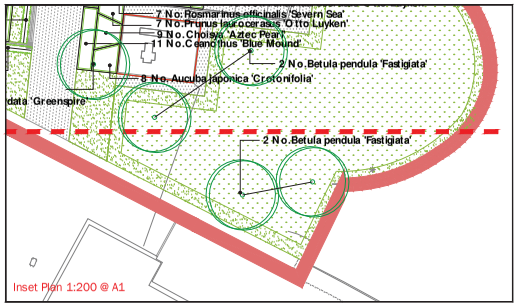
Number	Plant Name	Height	Container	Specification	Density
31 No.	Aucuba japonica 'Crotonifolia'	40-60cm	5L	Bushy: 3 brks: C	2/m²
39 No.	Ceanothus 'Blue Mound'		5L	Bushy: 6 brks: C	2/m²
37 No.	Choisya 'Aztec Pearl'	30-40cm	5L	Bushy: 6 brks: C	2/m²
37 No.	Euonymus fortunei 'Emerald Gaiety'	25-30cm	5-7.5L	Bushy: 9 brks: C	2/m²
9 No.	Hebe 'Autumn Glory'	30-40cm	5L	Bushy: 7 brks: C	3/m²
55 No.	Lavandula angustifolia 'Hidcote'	20-30cm	5L	Bushy: 7 brks: C	2/m²
30 No.	Lonicera pileata		5L	Bushy: 8 brks: C	3/m²
17 No.	Prunus laurocerasus 'Otto Luyken'	40-60cm	5-7.5L	Bushy: 5 brks: C	2/m²
18 No.	Rosmarinus officinalis 'Severn Sea'	40-60cm	5L	Bushy: 5 brks: C	2/m²

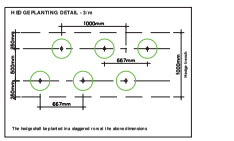
Total :273 No.

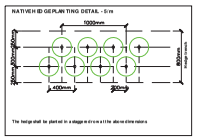
HERBACEOUS

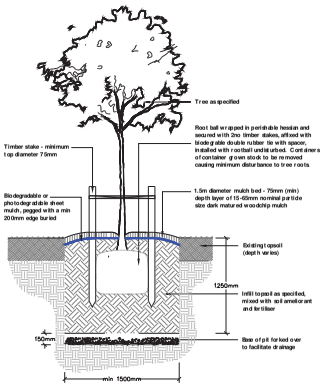
Number	Plant Name	Container	Specification	Density
23 No.	Agapanthus Headbourne Hybrids	3L	Full Pot: C	4/m²
13 No.	Bergenia 'Silberlicht'	3L	Full Pot: C	5/m²
31 No.	Nepeta nervosa	3L	Full Pot: C	4/m²
96 No.	Salvia officinalis 'Tricolor'	3L	Full Pot: C	4/m²
25 No.	Sedum 'Ruby Glow'	3L	Full Pot: C	5/m²

Total :148 No.









TREE IN SOFT LANDSCAPE PLANTING DETAIL – Double stake fixing within existing soft landscape

LEGEND

- Proposed Tree
- Planting beds
- Grass
- Hedge planting
- Grass: Wildflower

GENERAL NOTES

This drawing is to be used for planting information only, and is subject to alteration through changes to the site layout or until approved by the area designer.

Any species substitution by the contractor must be verified with the Landscape Architect through the Job Architect.

This layout must be checked in accordance with NHBC Standards 2013 (Chapter 4.2 - Building Near Trees & Chapter 9.2 Drives, Paths and Landscaping) by the Regional Engineer prior to implementation.

Excavations: Contractors must ensure that they have full information relating to service and drainage positions before undertaking any excavations.

Root barriers to be used in association with tree planting adjacent to kerbs / services / footpaths etc. (Greenleaf ReRoot products or similar application, in accordance with manufacturer's instructions).

Rev	Date	Description
A	25.09.15	Architectural base changed
B	14.12.15	Architectural base changed
C	19.01.16	Architectural base changed
D	08.02.16	Architectural base changed
E	18.04.16	Architectural base changed
F	20.04.16	Comments amended
G	22.04.16	Comments amended
H	22.04.16	Substation path addition
I	17.05.16	Architectural base changed

Title:	Detailed Planting Proposals 2 of 2
Project:	Heyford Trenchard
Client:	Dorchester
Date:	September 2015
Scale:	1:200 @ A1
Drawing No:	1619 A4 02
Rev:	I

T: +44 (0) 1279 647044 E: office@lizlake.com www.lizlake.com

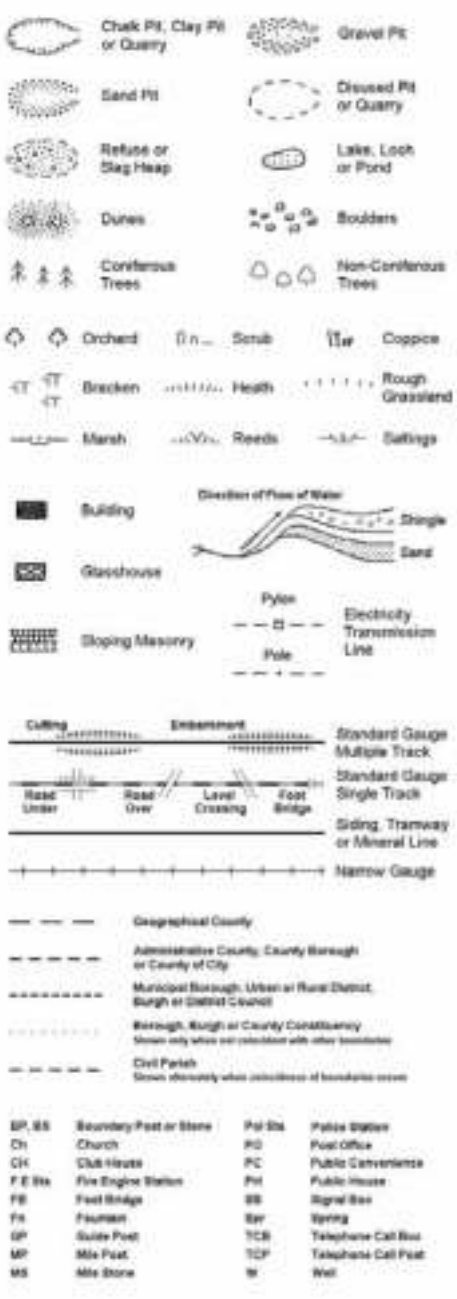
LIZ LAKE ASSOCIATES

Appendix C
Historic Map Extracts

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Ordnance Survey Plan 1:10,000



1:10,000 Raster Mapping

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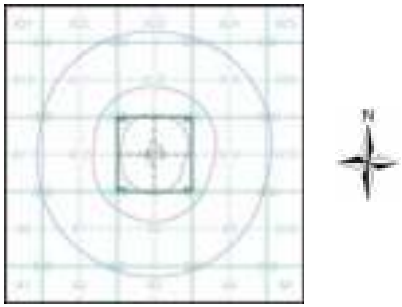
LANDMARK INFORMATION GROUP

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Oxfordshire	1:10,560	1884 - 1885	2
Oxfordshire	1:10,560	1900	3
Oxfordshire	1:10,560	1923	4
Historical Aerial Photography	1:10,560	1947	5
Ordnance Survey Plan	1:10,000	1955	6
Ordnance Survey Plan	1:10,000	1966	7
Ordnance Survey Plan	1:10,000	1982	8
Ordnance Survey Plan	1:10,000	1993	9
10K Raster Mapping	1:10,000	1999	10
10K Raster Mapping	1:10,000	2006	11
VectorMap Local	1:10,000	2016	12

Historical Map - Slice A



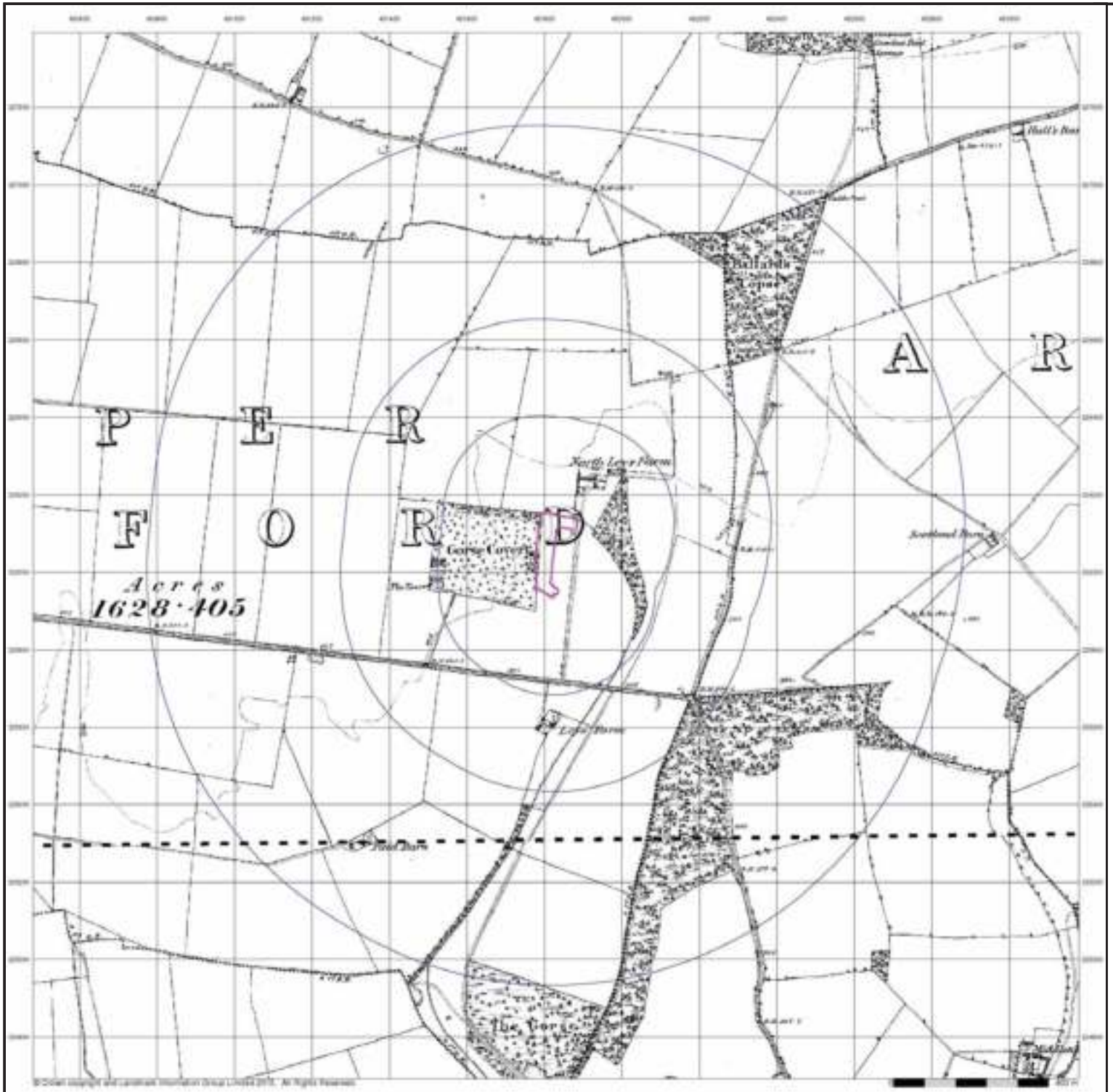
Order Details

Order Number: 102671679_1_1
Customer Ref: 163408
National Grid Reference: 451820, 226050
Slice: A
Site Area (Ha): 1.1
Search Buffer (m): 1000

Site Details

13 Trenchard Circle, Upper Heyford, BICESTER, Oxfordshire, OX25 5TB

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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LANDMARK INFORMATION GROUP®

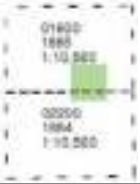
Oxfordshire

Published 1884 - 1885

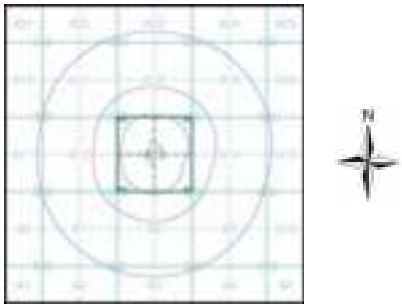
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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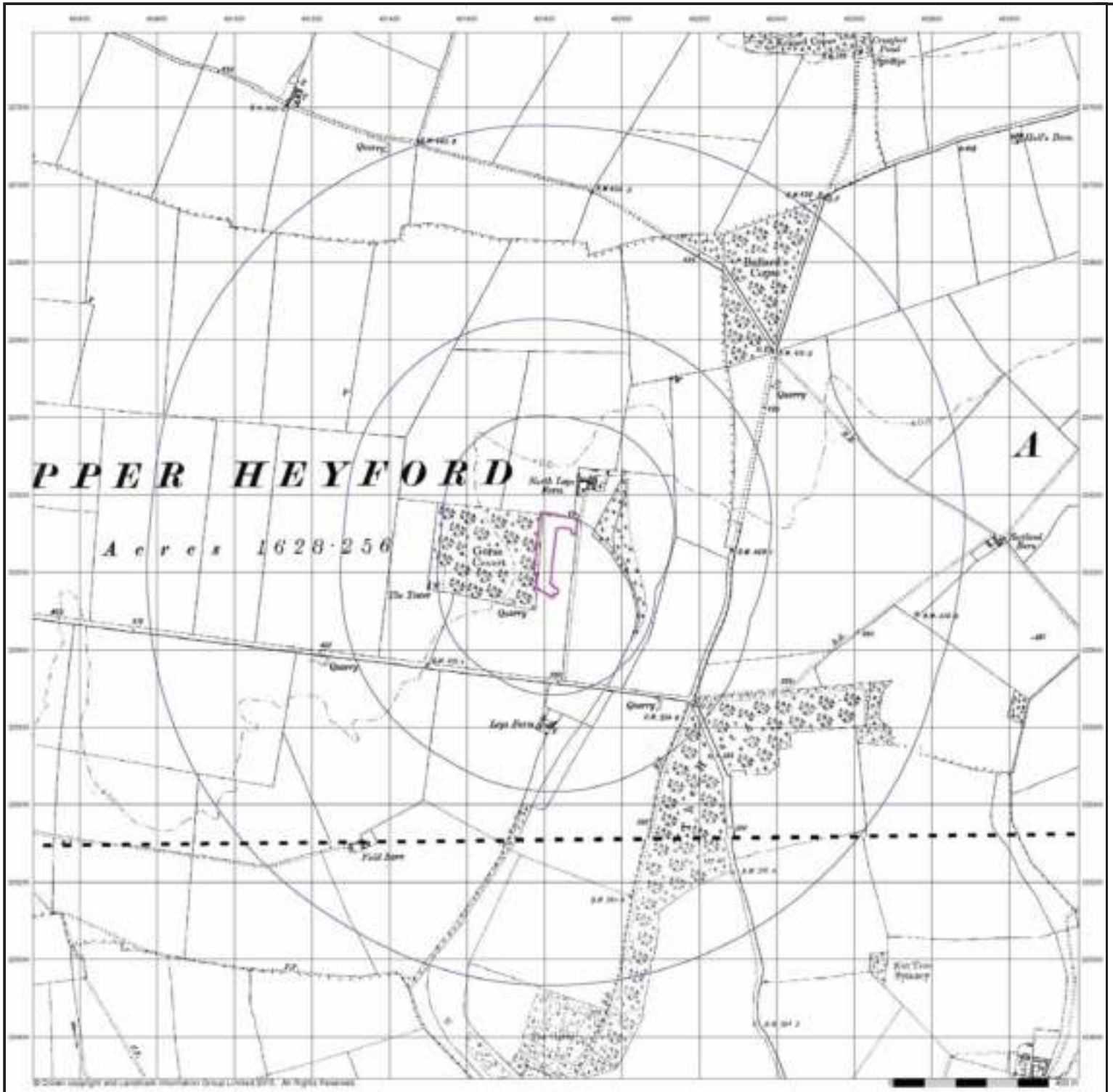

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Oxfordshire

Published 1900

Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

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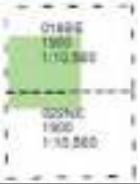
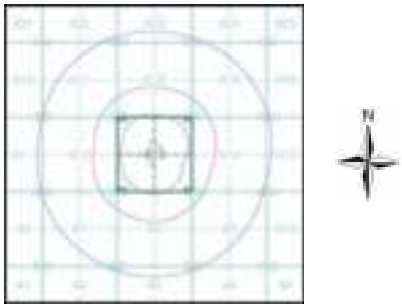


Historical Map - Slice A



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Order Number:	102671679_1_1
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Site Area (Ha):	1.1
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13 Trenchard Circle, Upper Heyford, BICESTER, Oxfordshire, OX25 5TB

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Oxfordshire

Published 1923

Source map scale - 1:10,560

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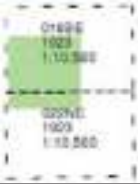
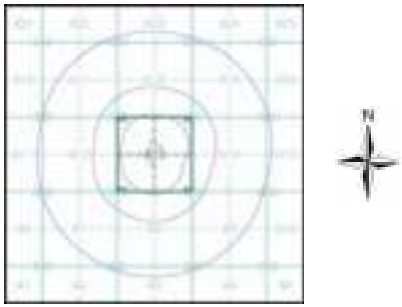
Map Name(s) and Date(s)



Historical Map - Slice A

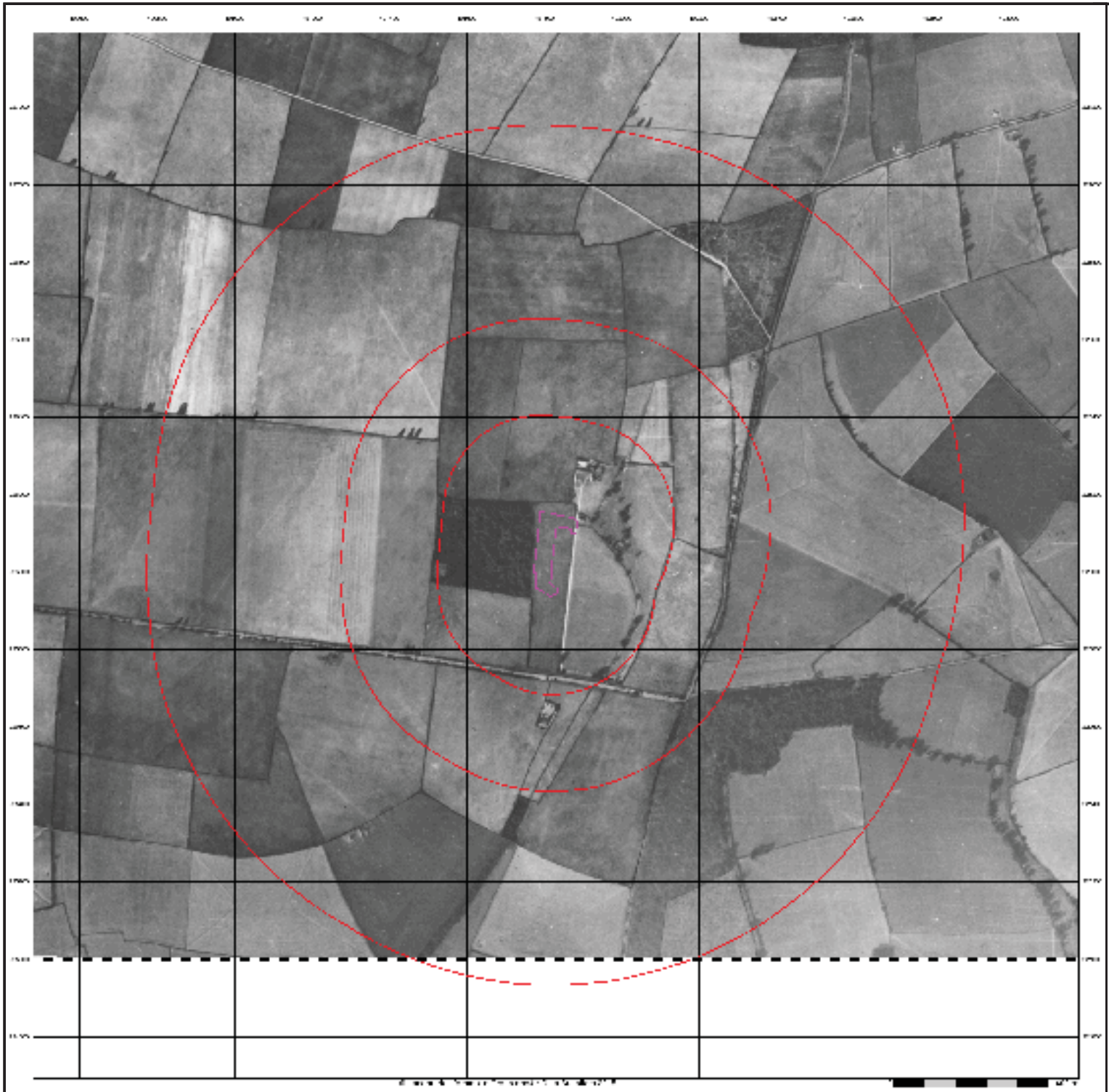


Order Details

Order Number:	102671679_1_1
Customer Ref:	163408
National Grid Reference:	451820, 226050
Slice:	A
Site Area (Ha):	1.1
Search Buffer (m):	1000

Site Details

13 Trenchard Circle, Upper Heyford, BICESTER, Oxfordshire, OX25 5TB



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LANDMARK INFORMATION GROUP

Historical Aerial Photography
Published 1947
Source map scale - 1:10,560

The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

Map Name(s) and Date(s)

Historical Aerial Photography - Slice A

Order Details

Order Number:	102671679_1_1
Customer Ref:	163408
National Grid Reference:	451820, 226050
Slice:	A
Site Area (Ha):	1.1
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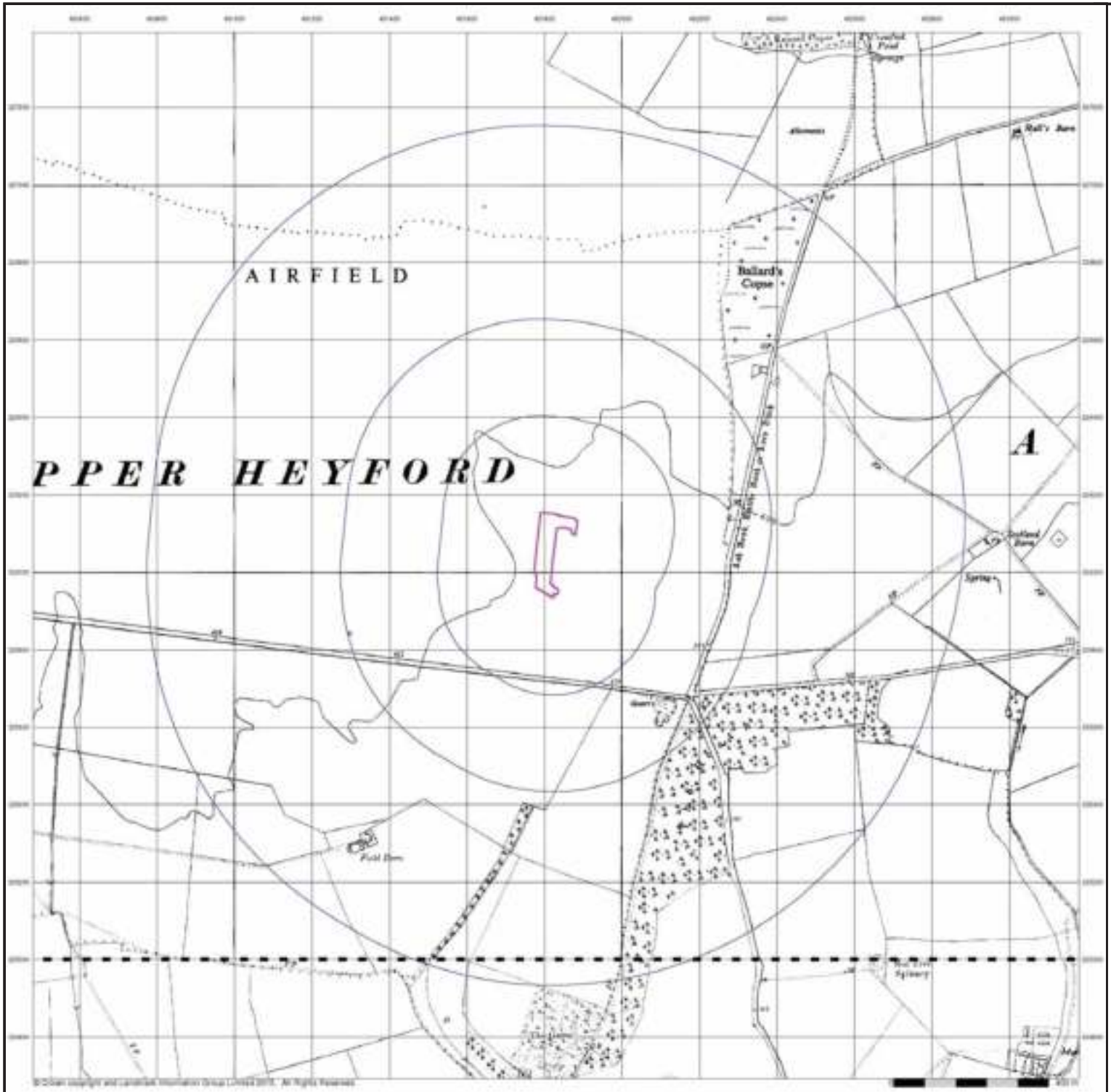
Site Details

13 Trenchard Circle, Upper Heyford, BICESTER, Oxfordshire, OX25 5TB

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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Ordnance Survey Plan
Published 1955
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

Order Number:	102671679_1_1
Customer Ref:	163408
National Grid Reference:	451820, 226050
Slice:	A
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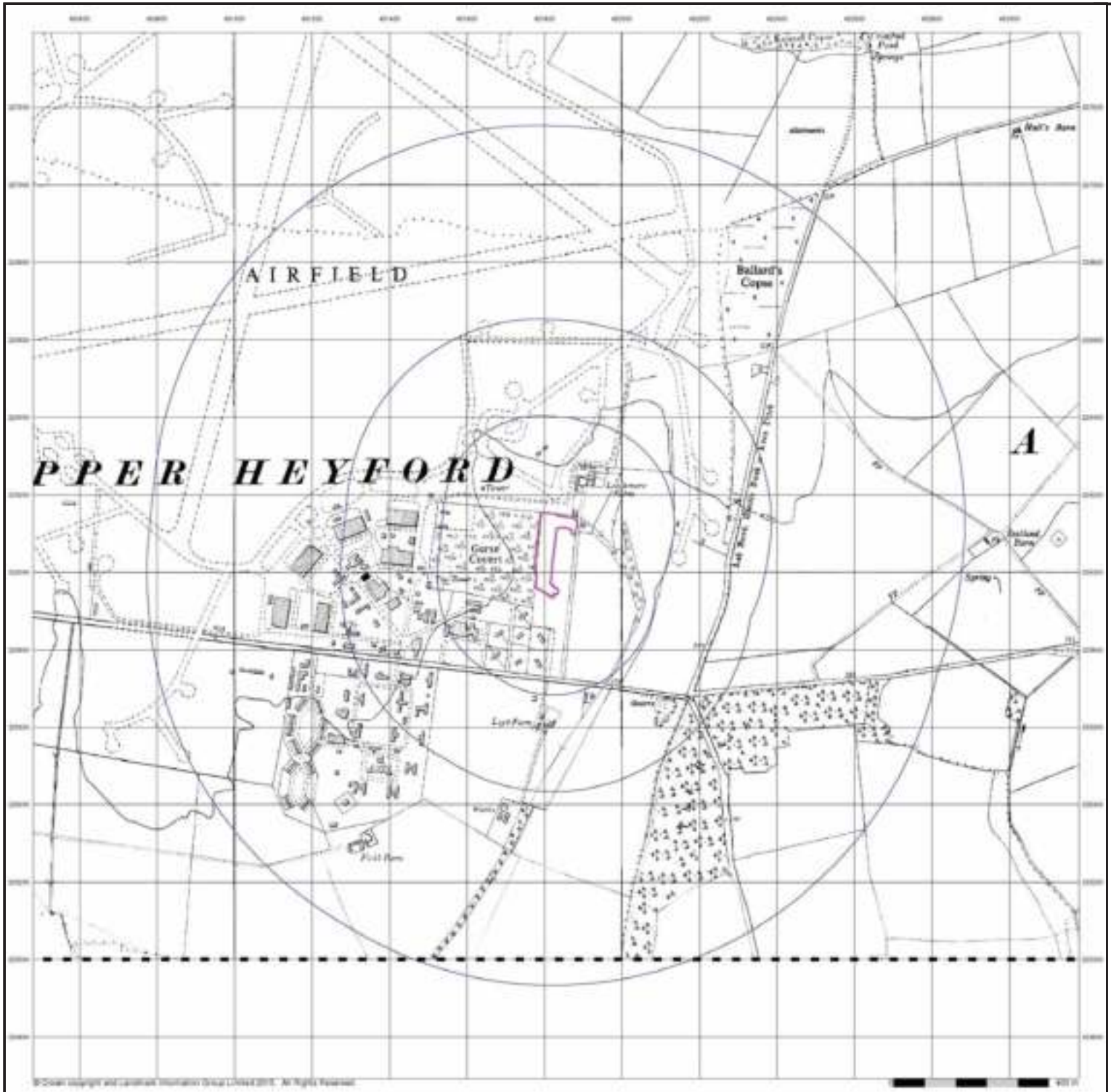


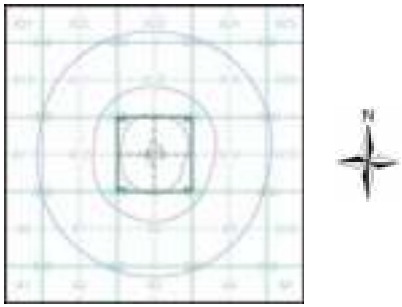
Envirocheck®
LANDMARK INFORMATION GROUP

Ordnance Survey Plan
Published 1966
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

Historical Map - Slice A



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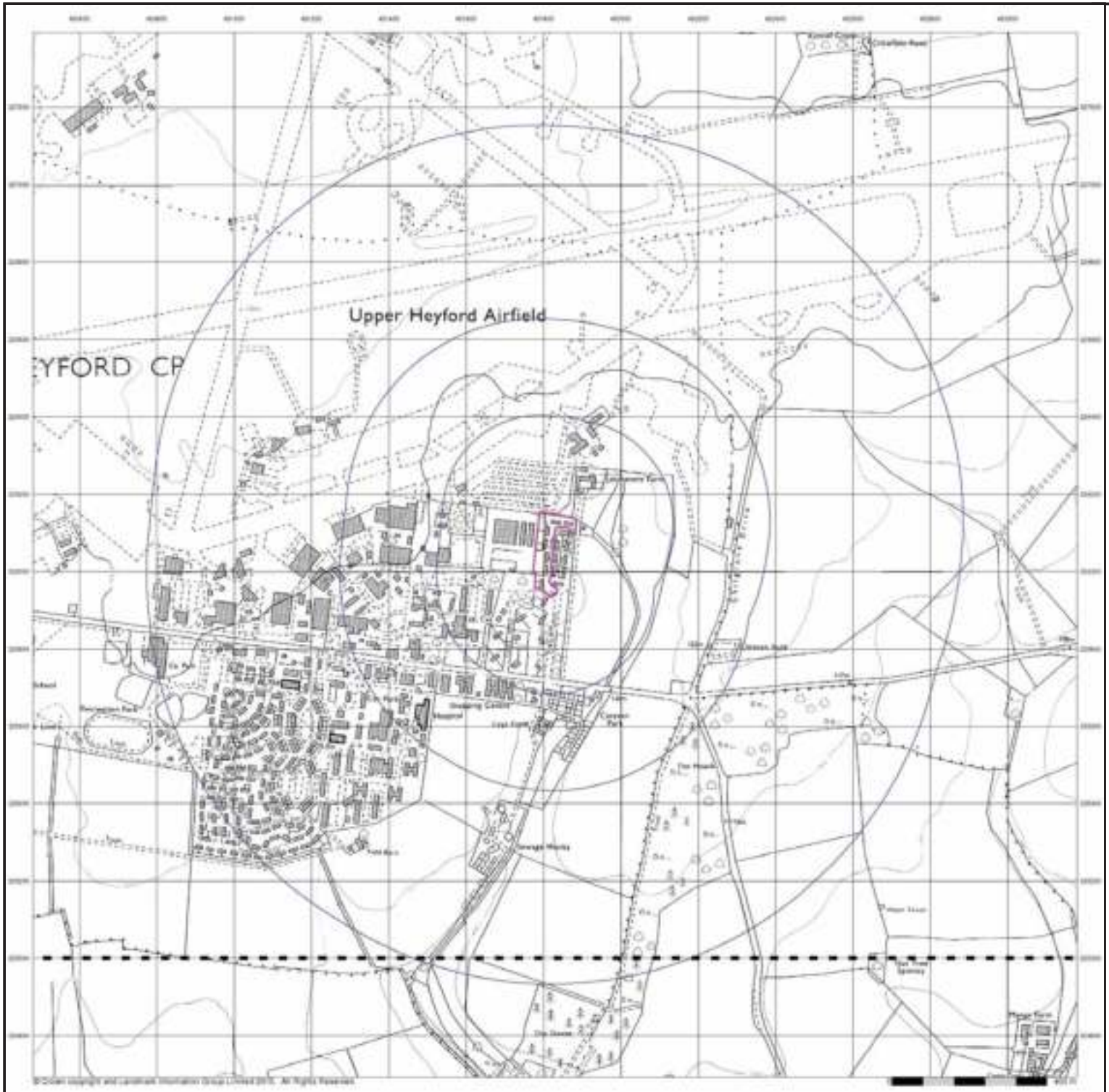


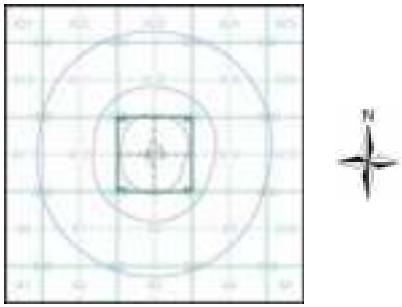
Envirocheck®
LANDMARK INFORMATION GROUP®

Ordnance Survey Plan
Published 1982
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

Historical Map - Slice A



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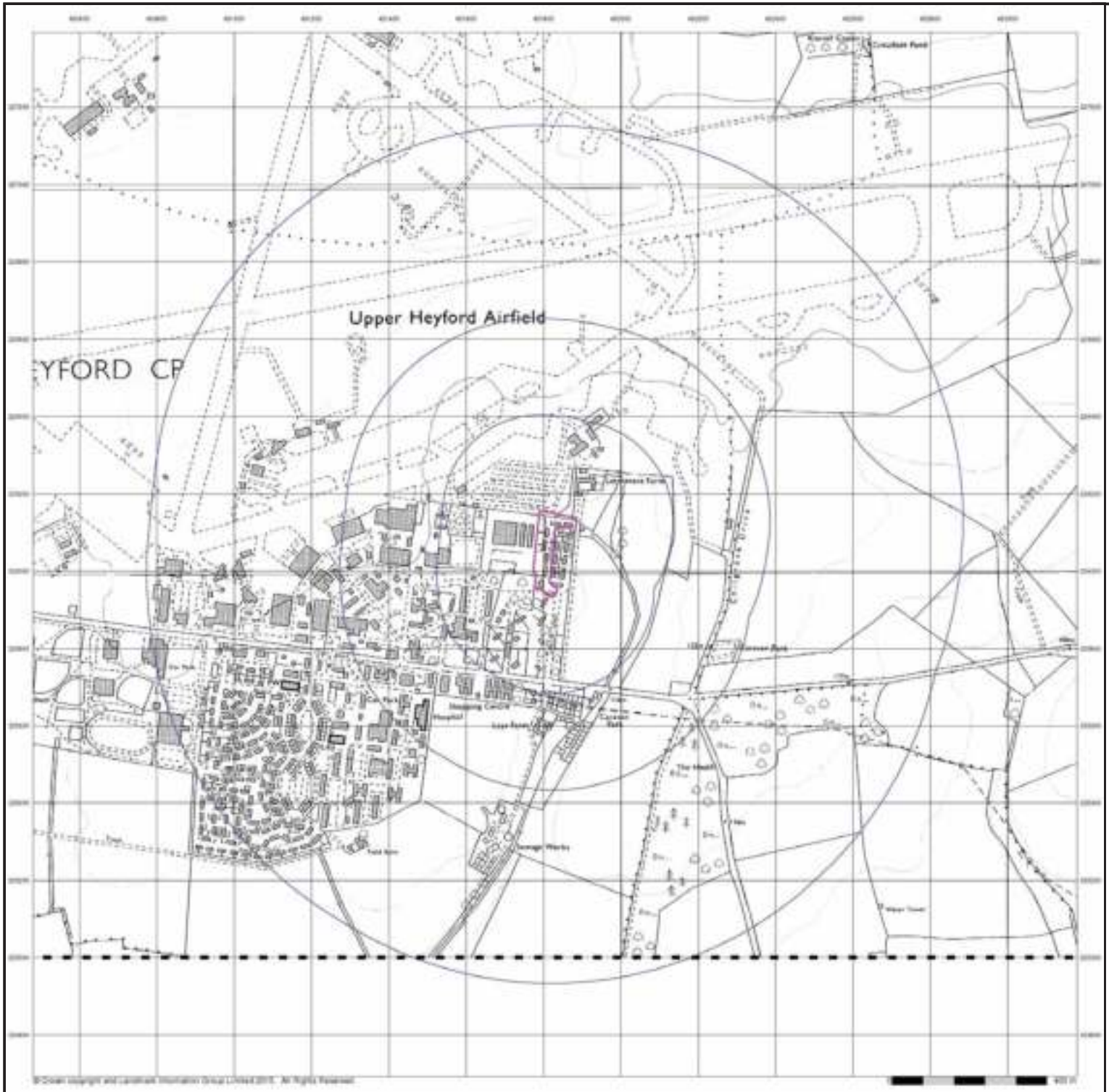

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Ordnance Survey Plan
Published 1993
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

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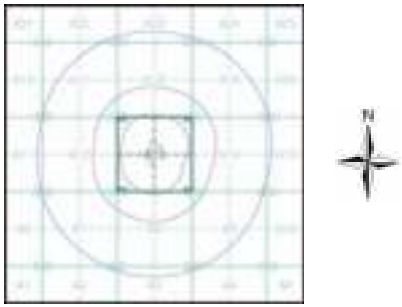
Historical Map - Slice A



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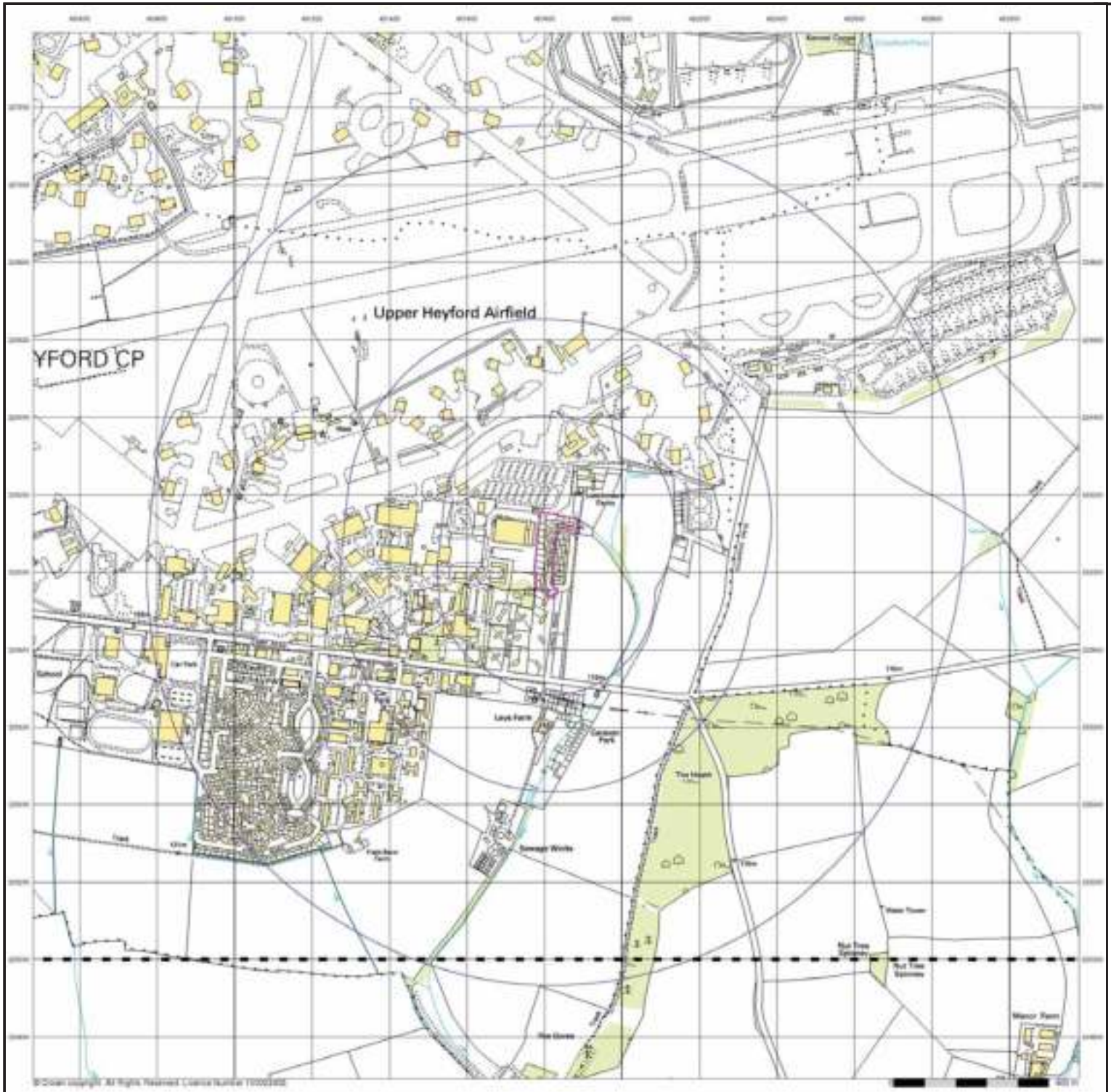

Envirocheck

LANDMARK INFORMATION GROUP

10k Raster Mapping

Published 1999

Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

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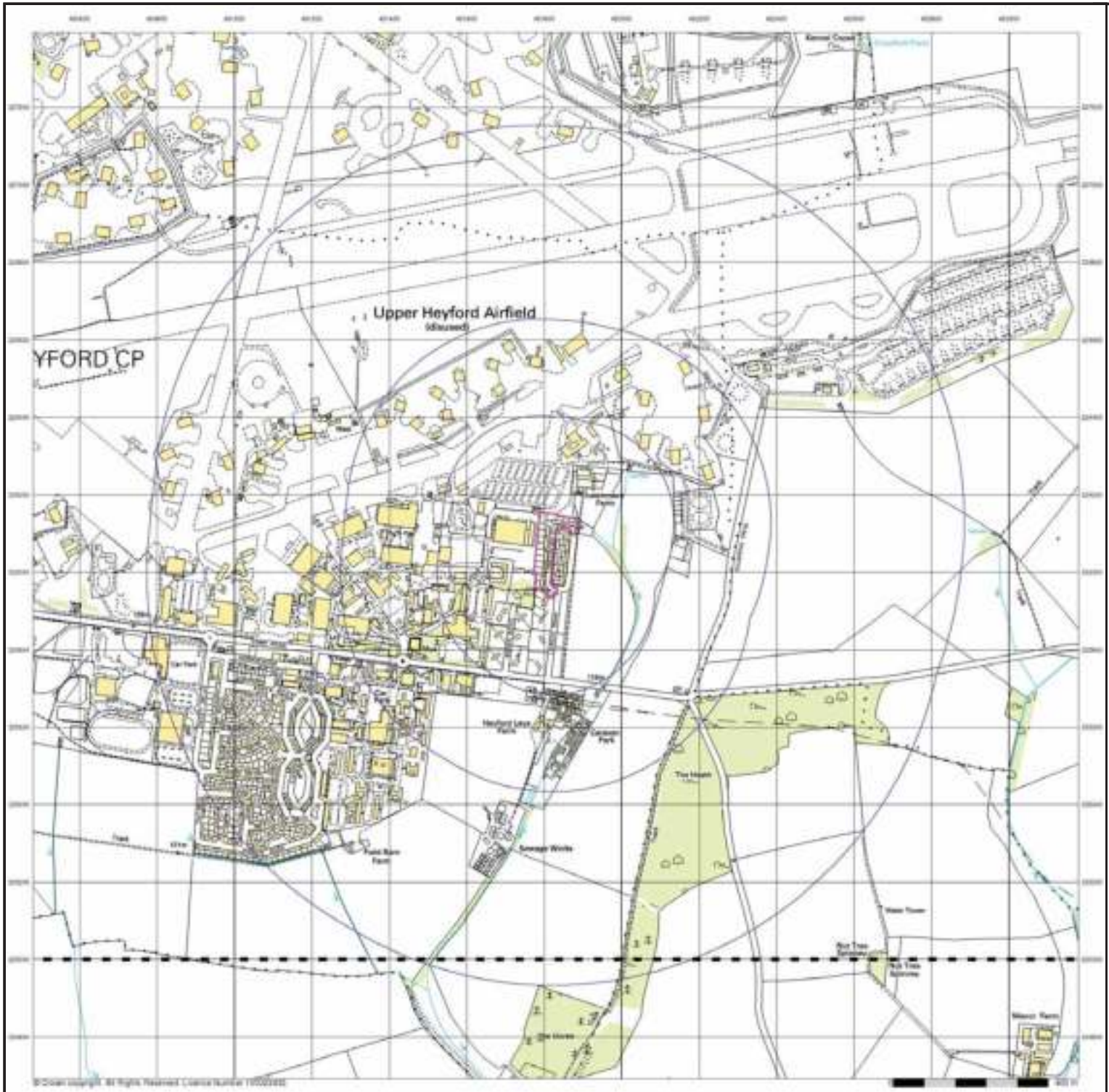

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LANDMARK INFORMATION GROUP

10k Raster Mapping

Published 2006

Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

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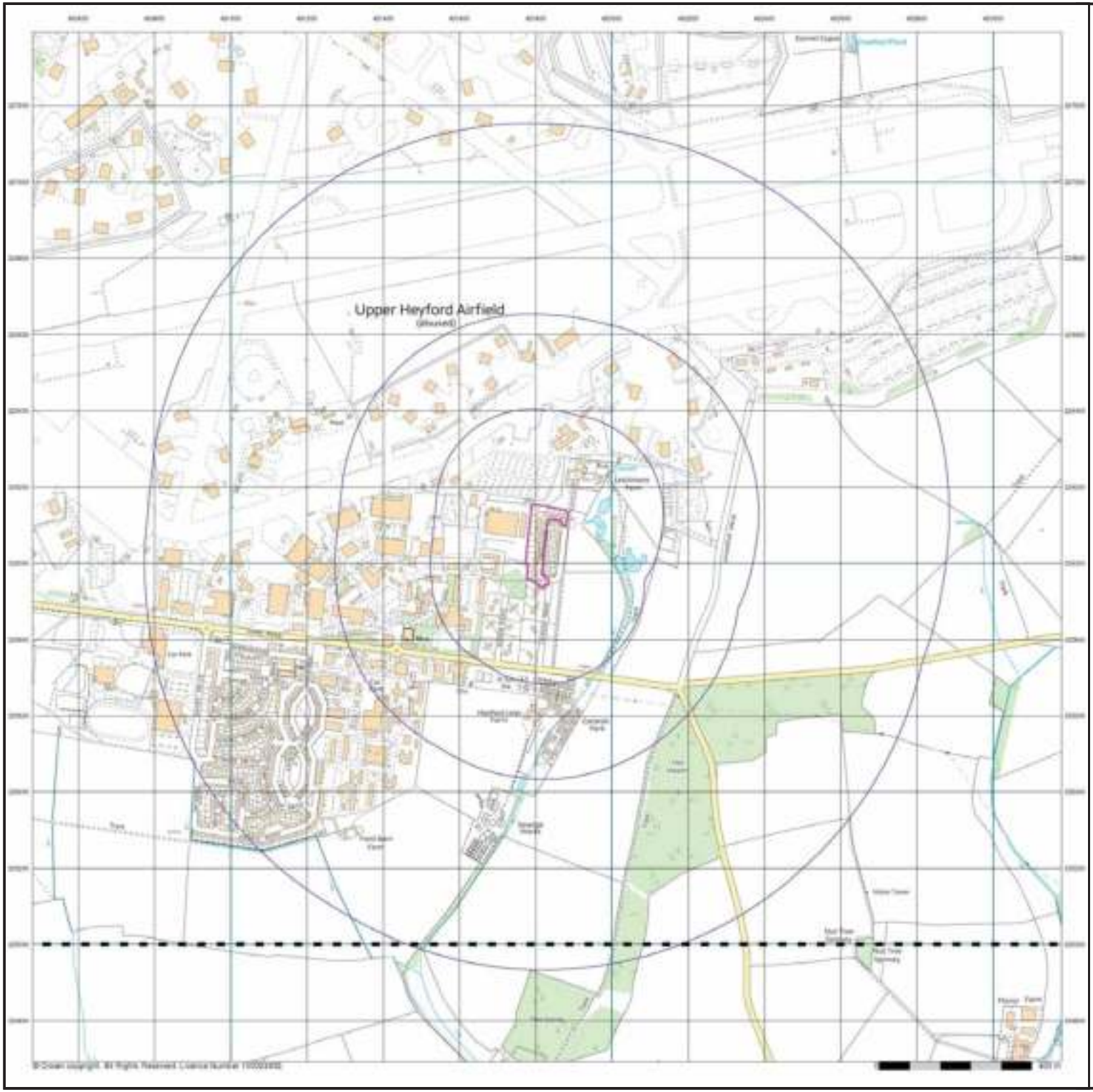

Envirocheck

LANDMARK INFORMATION GROUP

VectorMap Local

Published 2016

Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

Order Number:	102671679_1_1
Customer Ref:	163408
National Grid Reference:	451820, 226050
Slice:	A
Site Area (Ha):	1.1
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Site Details

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Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Appendix D
Council Correspondence

Community Services

Jackie Fitzsimons – Public Protection Manager

Cherwell DISTRICT COUNCIL NORTH OXFORDSHIRE

Samantha Muir
AA Environmental Limited
4 to 8 Cholswell Court
Shippon
Abingdon
OX13 6HX

Bodicote House
Bodicote
Banbury
Oxfordshire
OX15 4AA

www.cherwell.gov.uk

Please ask for:	Sean Gregory	Direct Dial:	01295 221622
Email:	sean.gregory@cherwell-dc.gov.uk	Our Ref:	sg 11 TrchdCrcl ES CL

16 November 2016

Dear Samantha,

RE: 13 – 39 TRENCHARD CIRCLE, UPPER HEYFORD

Thank you for your enquiry. I have included information that we hold relating to this site in the report below.

There are contaminated land assessment works which relate to the nearby land which can be found on our planning portal at the Cherwell District Council website under the "associated documents" tab for planning application 10/01642/out.

I have searched our incident reporting system, UNIFORM, for recent contaminated land or pollution incidents (not referred to in the report below) relating to Trenchard Circle. There were none identified.

The information included here is gathered, in part, from the Councils access to data supplied by Landmark and the British Geological Survey and is current up to 01/04/07. All other information has been obtained from a search of records held within the Environmental Services Department.

I trust this information is sufficient for your purposes.

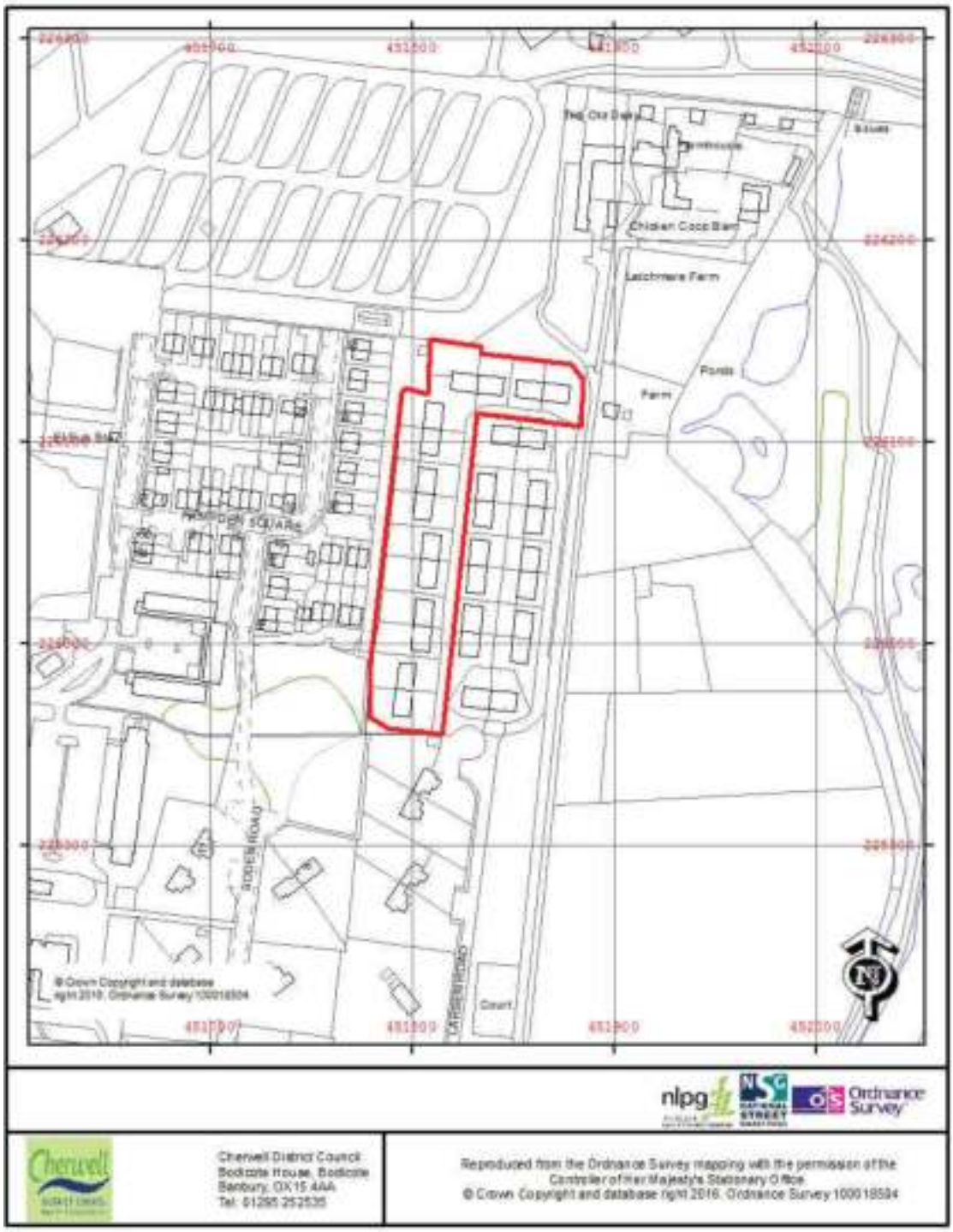
Yours sincerely

[redacted]

Sean Gregory
Environmental Protection Officer

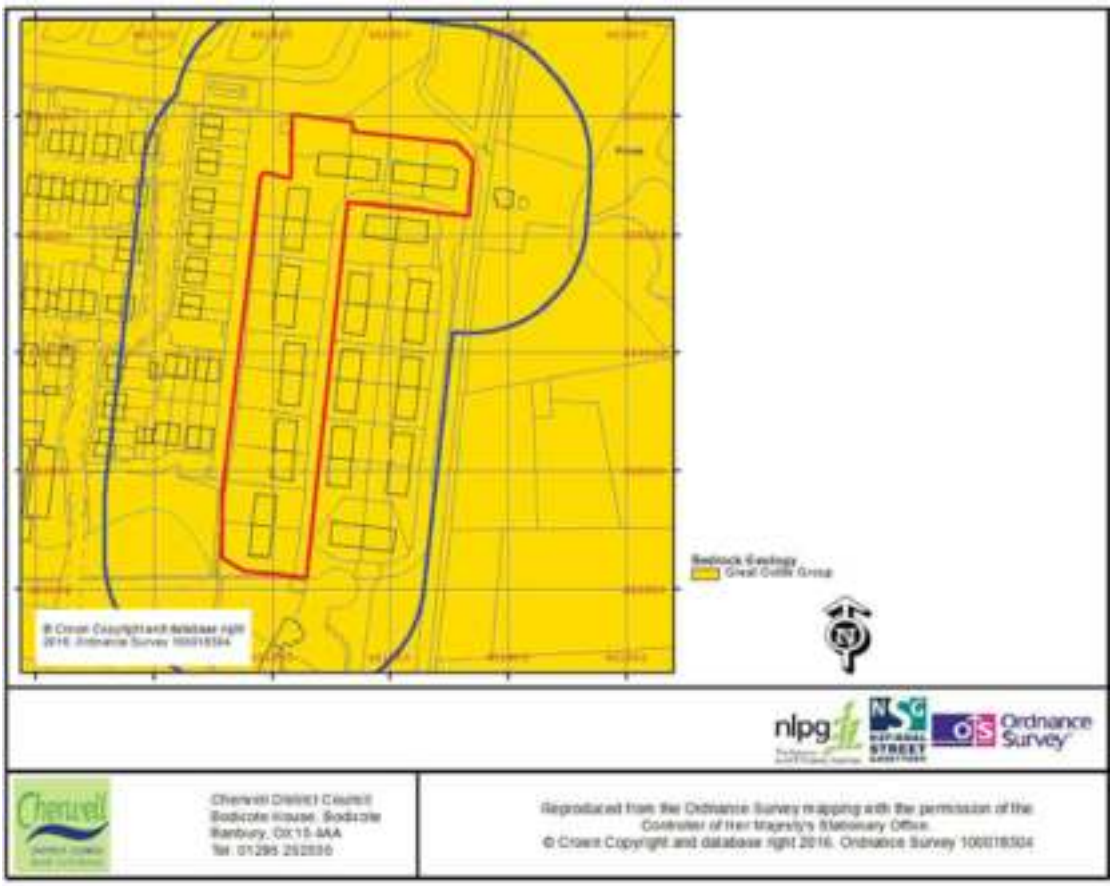
Site report

Report Name: Trenchard Circle Environmental Search (Centred at 451815, 226063)
Report Number: sg 11 TrchdCrcl ES CL



Geology

Bedrock Geology



Geological Map, British Geological Survey © NERC

The map shows the site (red) and a search radius of 50 meters (blue).

Geological maps have been extracted from the 1:50000 map series produced by the British Geological Survey.

Bedrock geology is a term used for the main mass of rocks forming the Earth's bedrock and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water. They have formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

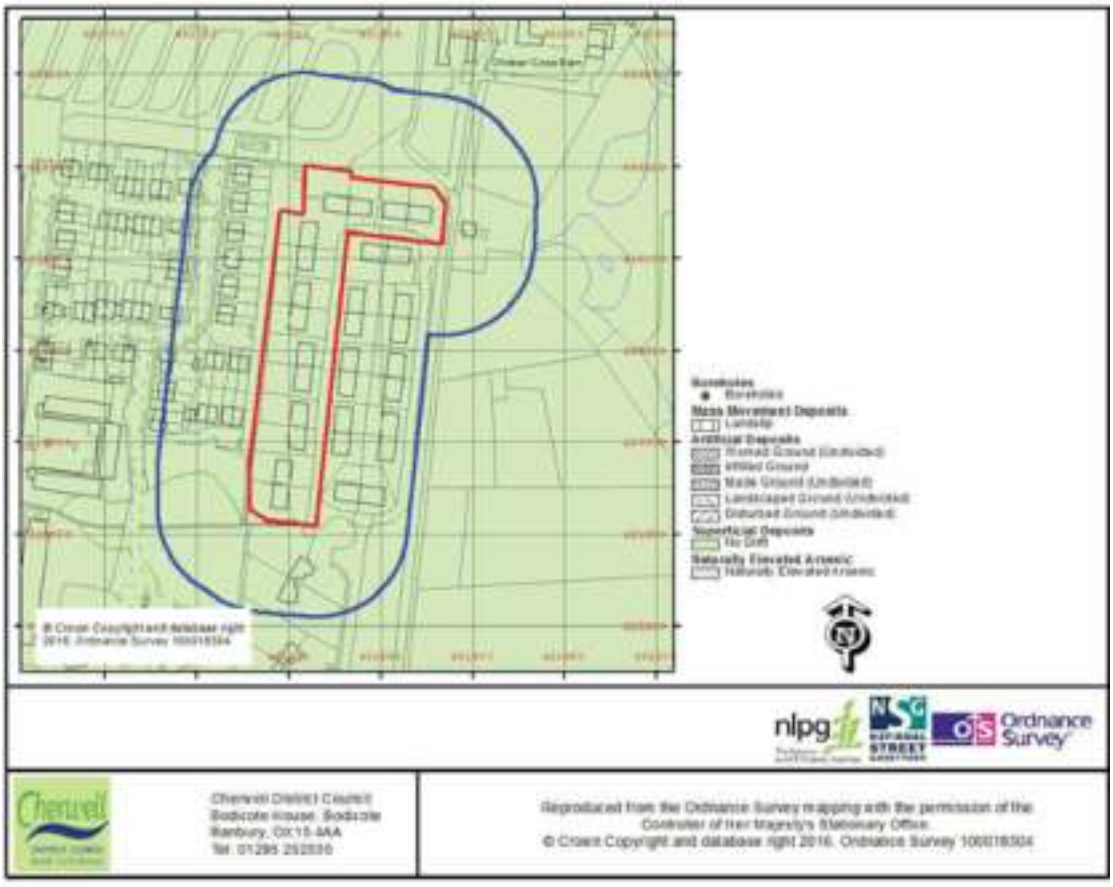
Site Results

Rock Type
GREAT OOLITE GROUP (LIMESTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED)

Search Radius Results

Rock Type
GREAT OOLITE GROUP (LIMESTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED)

Superficial, Artificial, Mass Movement Deposits, Boreholes and Naturally Occurring Arsenic



Geological Map, British Geological Survey © NERC

The map shows the site (red) and a search radius of 50 meters (blue).

Geological maps have been extracted from the 1:50000 map series produced by the British Geological Survey.

Superficial deposits is a term used by the BGS for natural deposits formed during the most recent period of geological time, the Quaternary, which extends 1.8 million years back from the present.

Artificial deposits is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Whilst artificial or man-made deposits are not part of the 'real geology' of solid and superficial deposits it does affect them and needs recording because the near surface ground conditions are important to human activities and economic development.

Borehole information has been extracted from the British Geological Survey register of boreholes.

Superficial Deposits

Site Results

Deposit Type
NO DRIFT

Search Radius Results

Deposit Type
NO DRIFT

Artificial Deposits

Site Results

No artificial deposits at the site

Search Radius Results

No artificial deposits in the search radius

Mass Movement Deposits

Site Results

No mass movement deposits at the site

Search Radius Results

No mass movement deposits in the search radius

Faults

Site Results

No faults at the site

Search Radius Results

No faults in the search radius

Boreholes

Site Results

No boreholes at the site

Search Radius Results

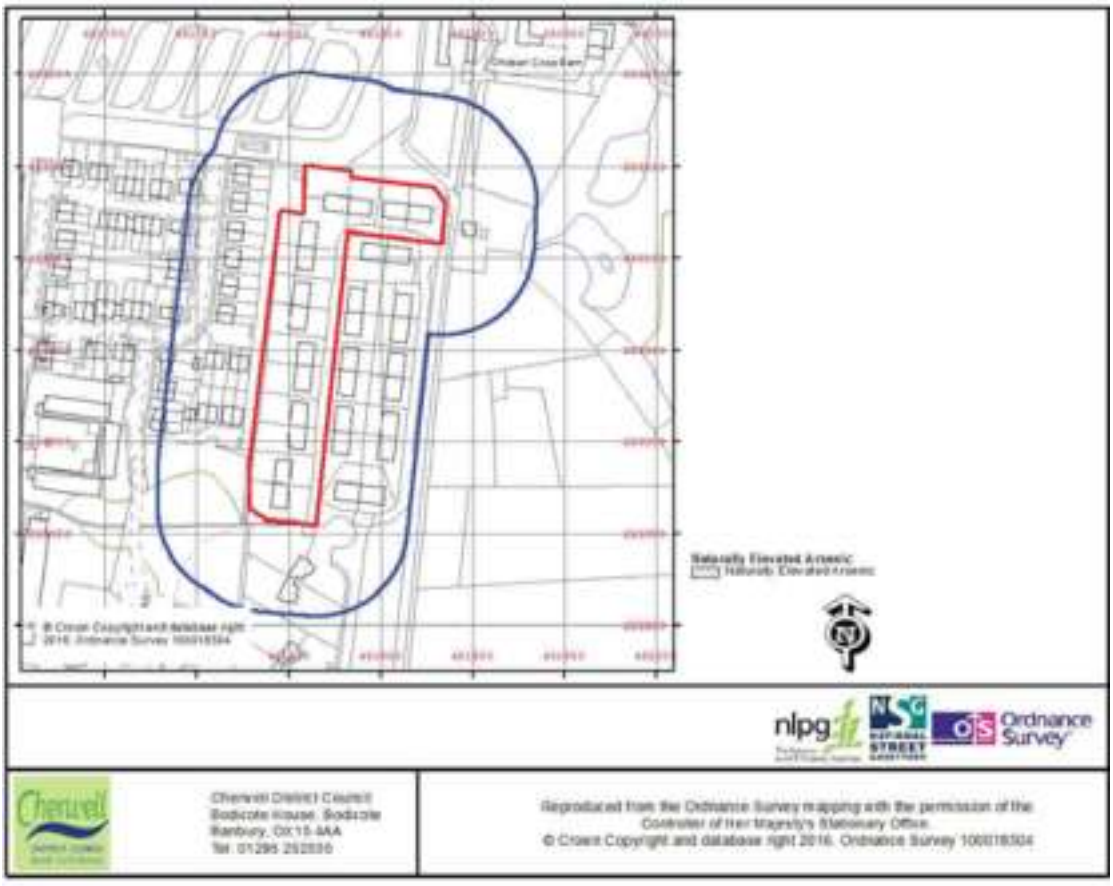
No boreholes in the search radius

For more information on a particular borehole contact:

Borehole Records Enquiries
British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Tel: 0115 9363109
http://www.bgs.ac.uk/enquiries/bharch.html

All depths are in metres. A depth of '-1' indicates that either the depth is unknown or that the borehole is confidential.

Naturally Occurring Arsenic



Geological Map, British Geological Survey © NERC

The map shows the site (red) and a search radius of 50 meters (blue).

The map showing areas of naturally elevated arsenic was derived from the BGS Bedrock Geology map.

Naturally Elevated Arsenic

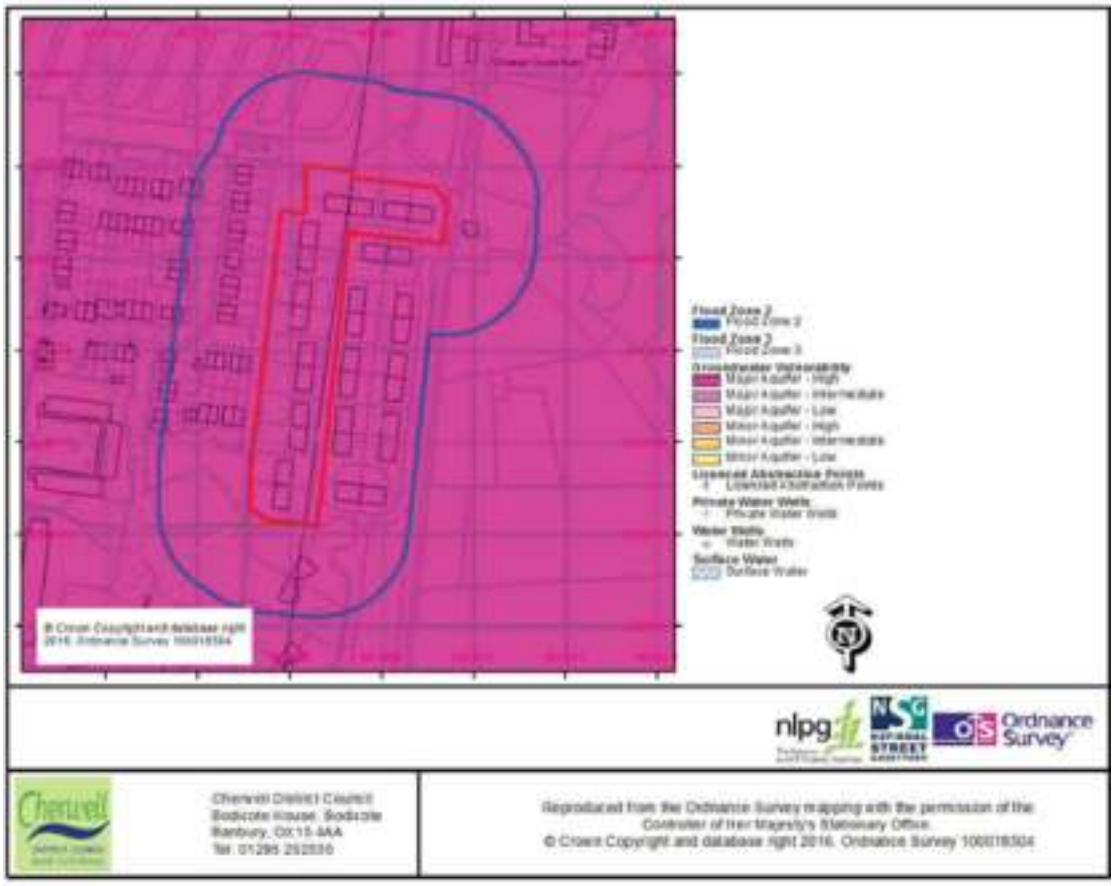
Site Results

No naturally elevated arsenic at the site

Search Radius Results

No naturally elevated arsenic in the search radius

Hydrology



Groundwater Vulnerability and Water Abstraction Licences © Environment Agency

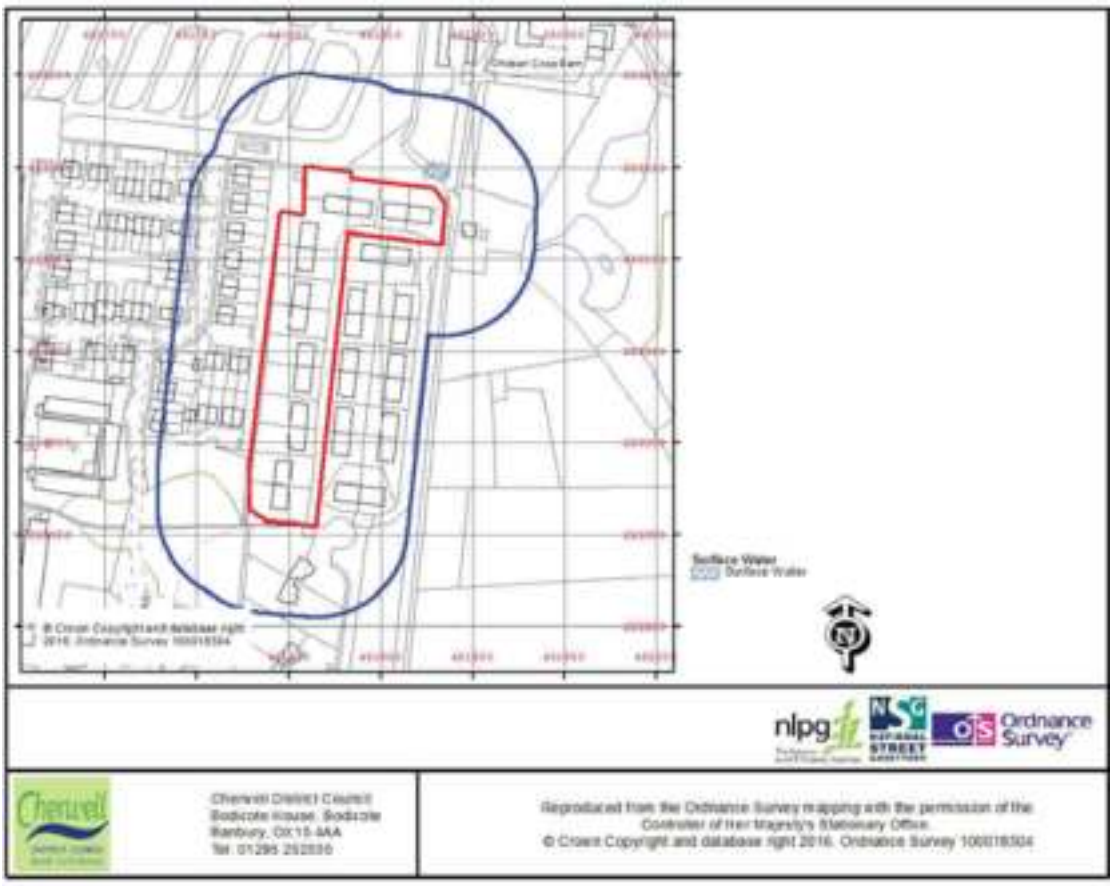
The map shows the site (red) and a search radius of 50 meters (blue).

The British Geological Survey holds a register of both used and disused water wells at it's office in Wallingford, Oxfordshire which date back over 150 years. This register has been interrogated to produce the water well information. Depth information recorded for water wells is measured in metres.

Surface water information was derived from Os MasterMap.

Groundwater vulnerability and Water Abstractions Licenses information comes from the Environment Agency.

Surface Water



Surface Water data © Environment Agency

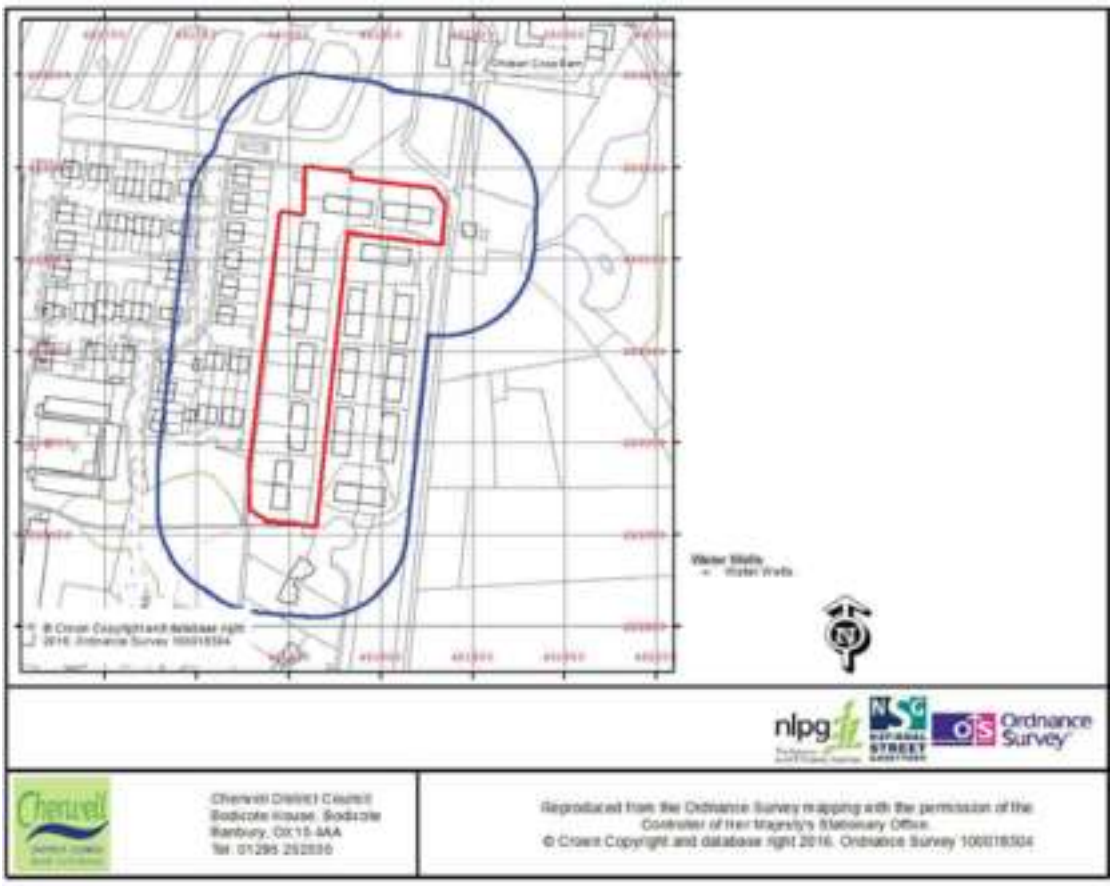
Site Results

No surface water present at the site

Search Radius Results

Description
Inland Water

Water Wells



Water Well data © Environment Agency

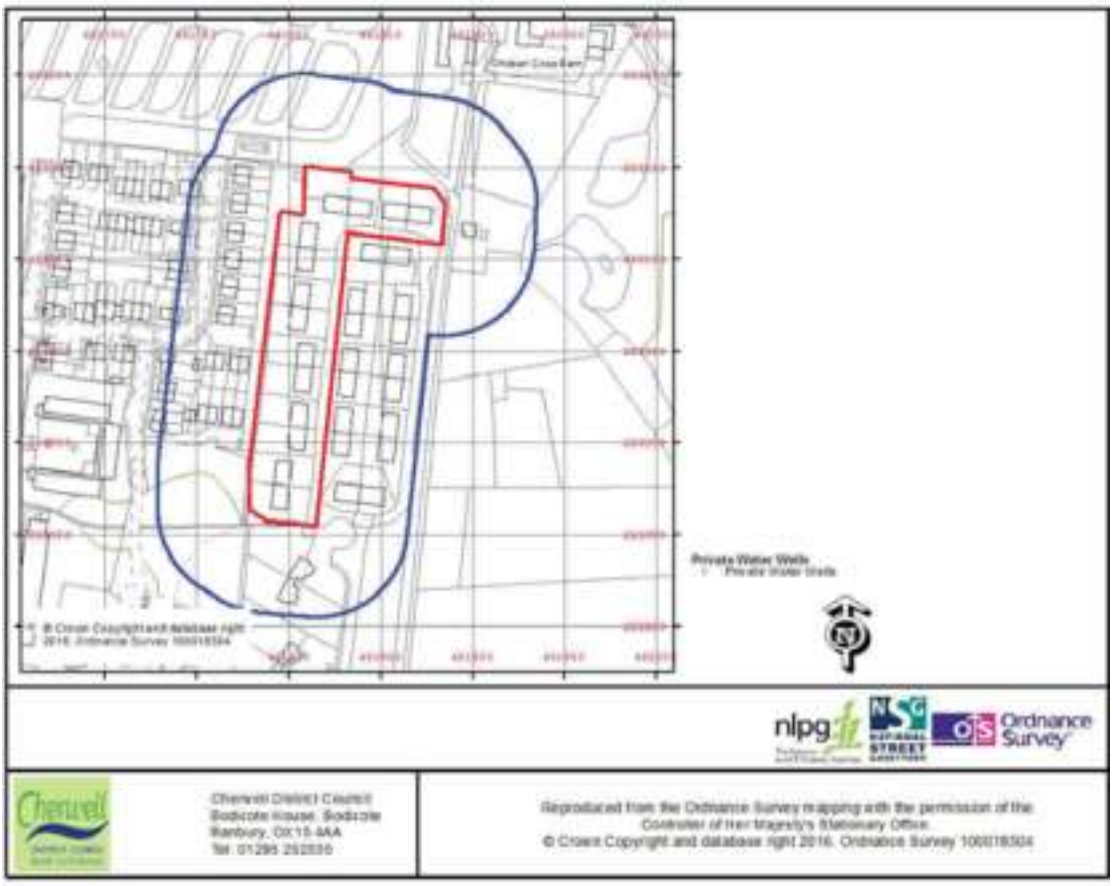
Site Results

No water wells present at the site

Search Radius Results

No water wells present in the search radius

Private Water Wells



Site Results

No private water wells present at the site

Search Radius Results

No private water wells present in the search radius

Licenced Abstraction Points

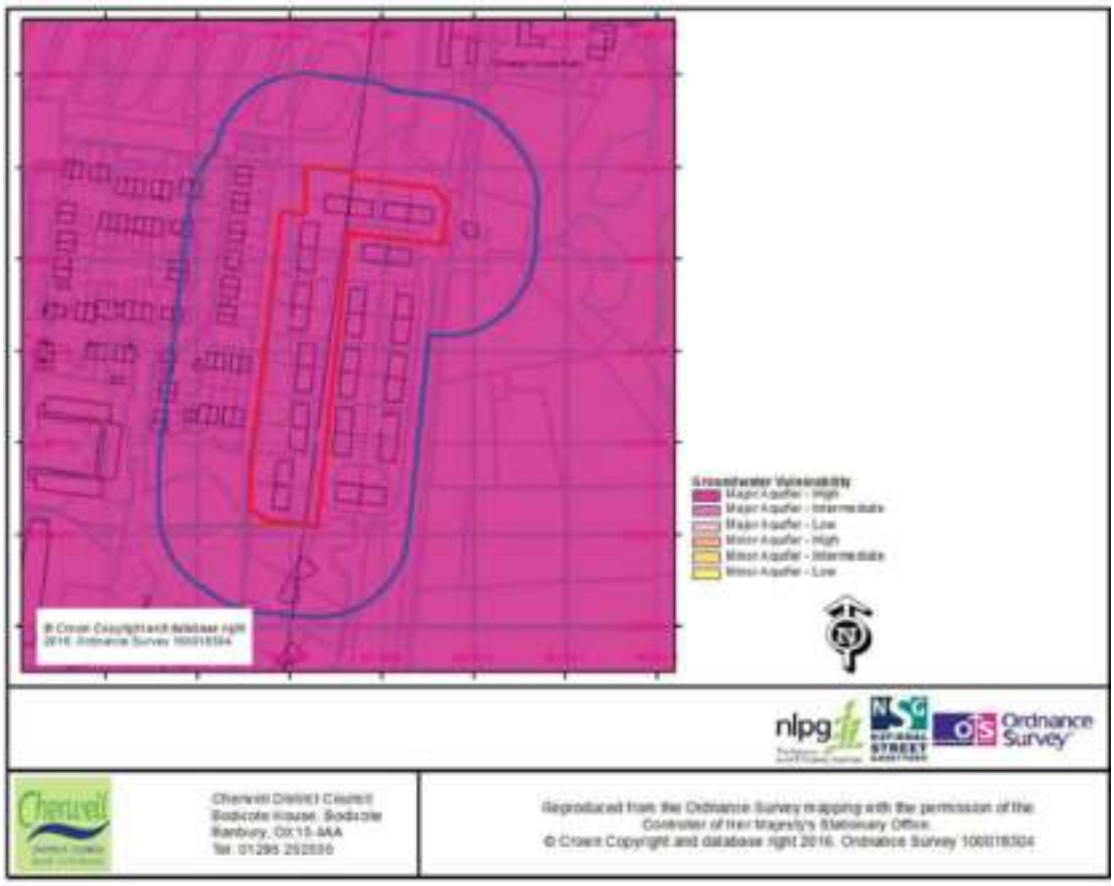
Site Results

No EA licensed water abstraction sites at the site

Search Radius Results

No EA licensed water abstraction sites in the search radius

Groundwater Vulnerability



Groundwater Vulnerability data © Environment Agency

The map shows the site (red) and a search radius of 50 meters (blue).

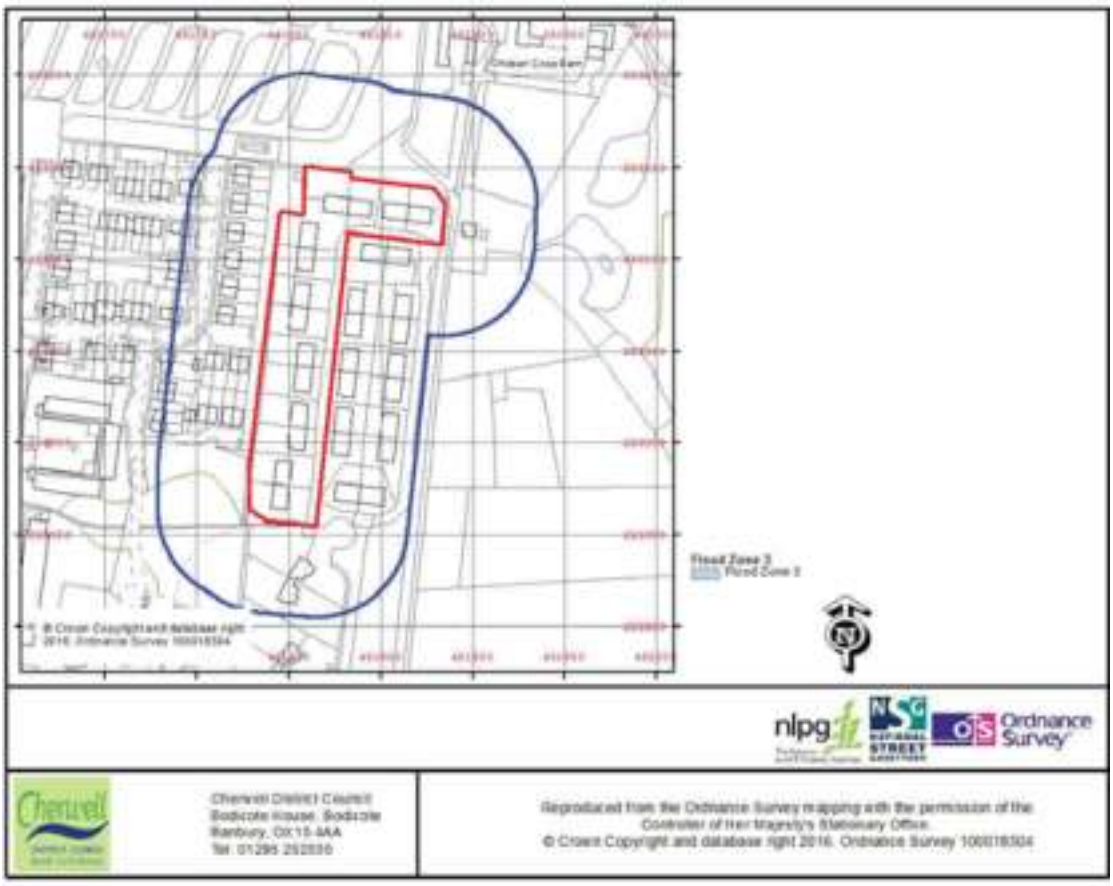
Site Results

Classification
Major Aquifer - High Urban
Major Aquifer - High 3

Search Radius Results

Classification
Major Aquifer - High Urban
Major Aquifer - High 3

Flood Zone 3



Flood Zone data © Environment Agency

The map shows the site (red) and a search radius of 50 meters (blue).

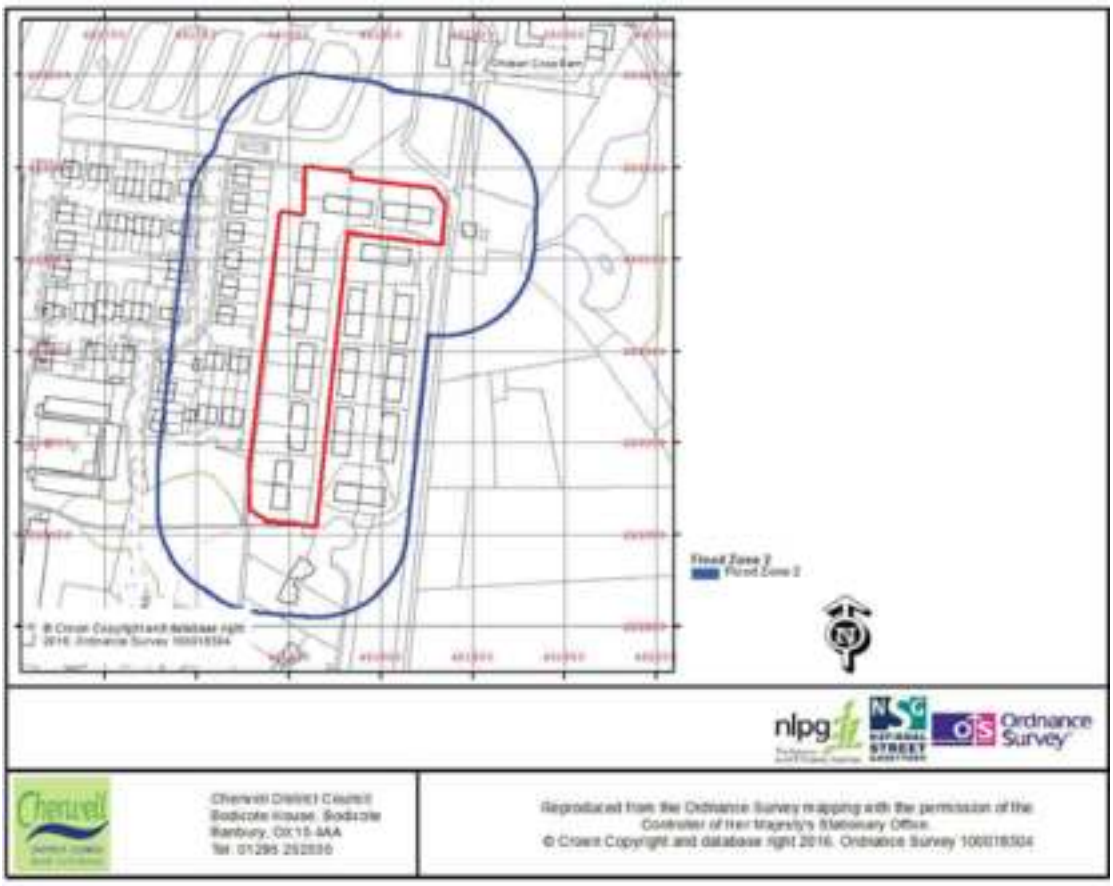
Site Results

No Flood Zone map at this location

Search Radius Results

No Flood Zone map at this location

Flood Zone 2



Flood Zone data © Environment Agency

The map shows the site (red) and a search radius of 50 meters (blue).

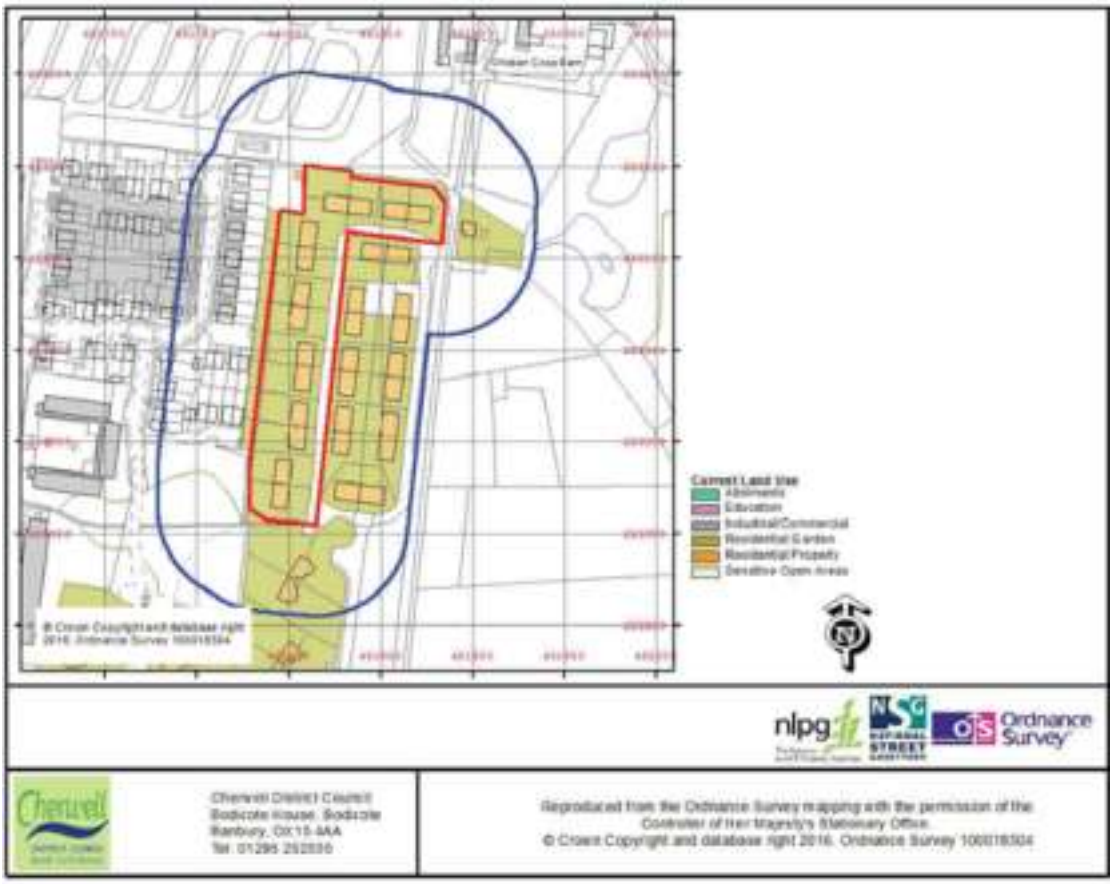
Site Results

No Flood Zone map at this location

Search Radius Results

No Flood Zone map at this location

Current Land Use



The map shows the site (red) and a search radius of 50 meters (blue).

The current land use (c.2005) information is based on information from OS MasterMap, OS Address Point and Aerial photographs.

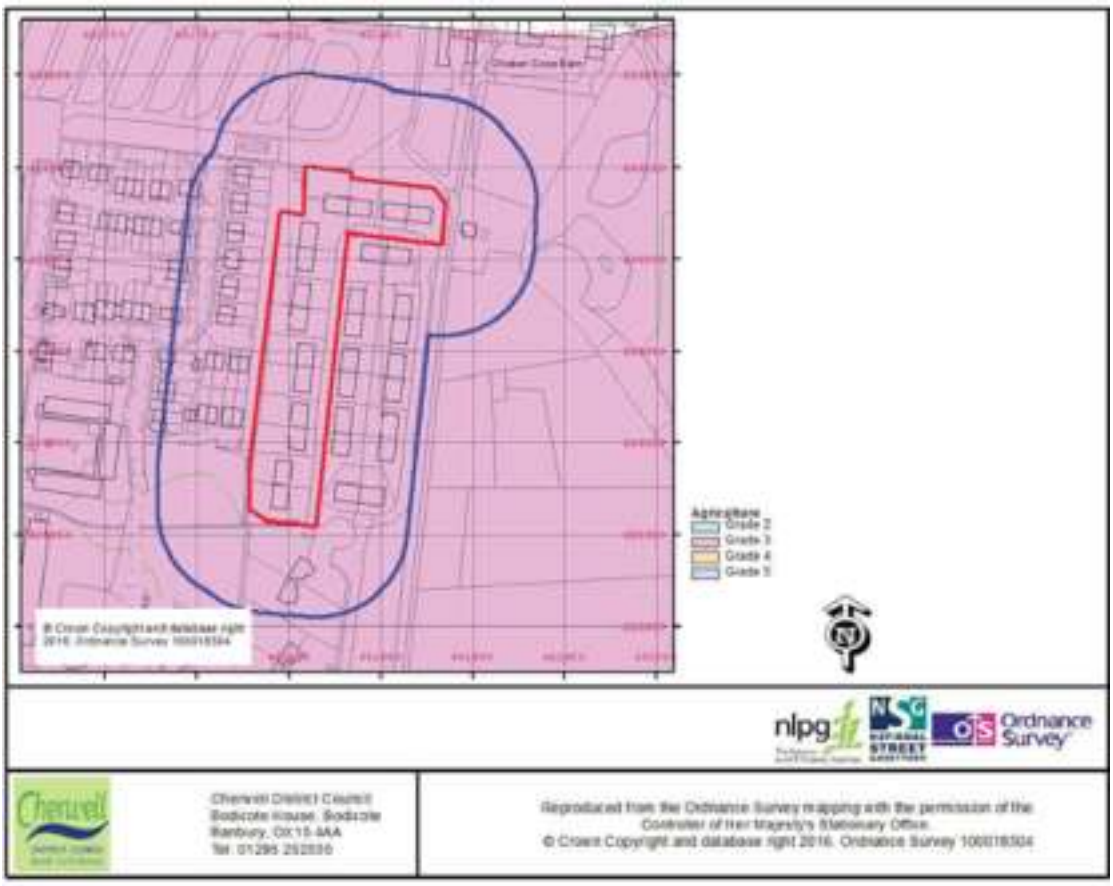
Site Results

Land use
Residential Garden
Residential Property

Search Radius Results

Land use
Industrial/Commercial
Residential Garden
Residential Property

Agriculture



The map shows the site (red) and a search radius of 50 meters (blue).

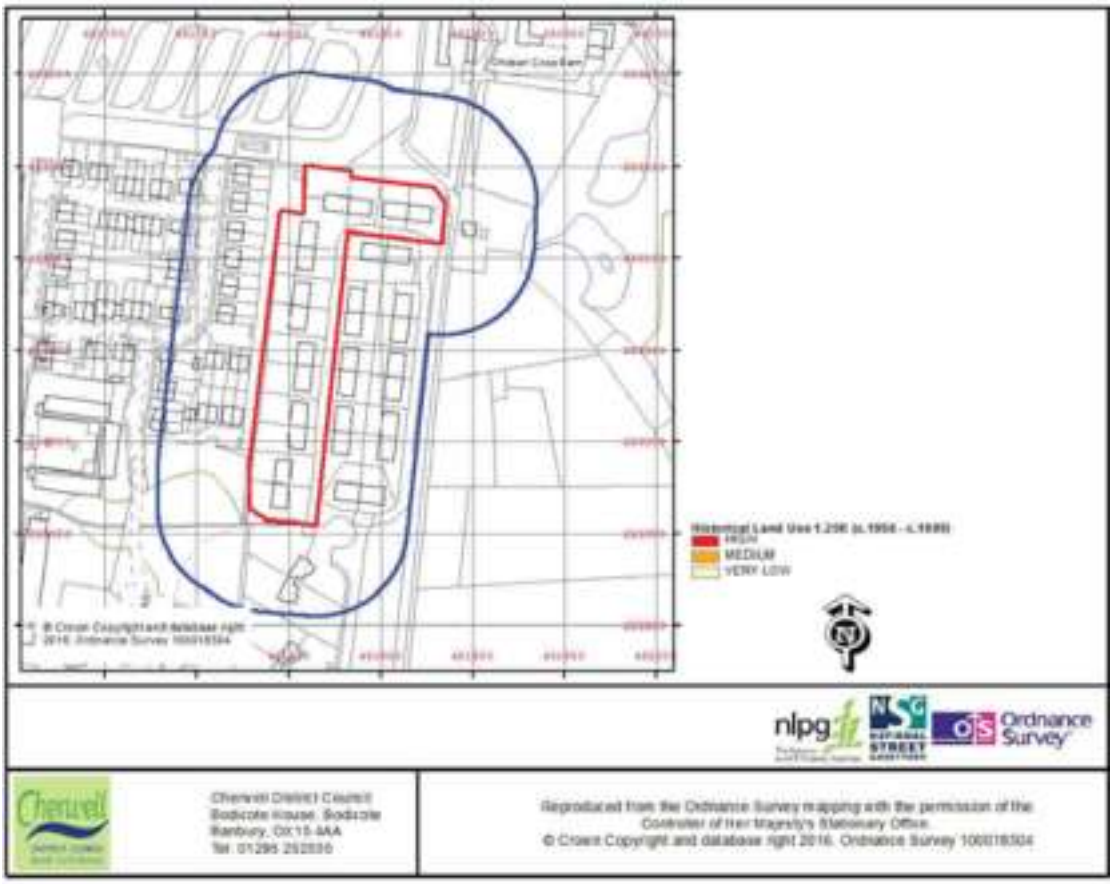
Site Results

Description
GRADE 3

Search Radius Results

Description
GRADE 3

Historical Land Use 1.25K (c.1956 - c.1989)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 1.25K (c.1956 - c.1989) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1956 - 1989.

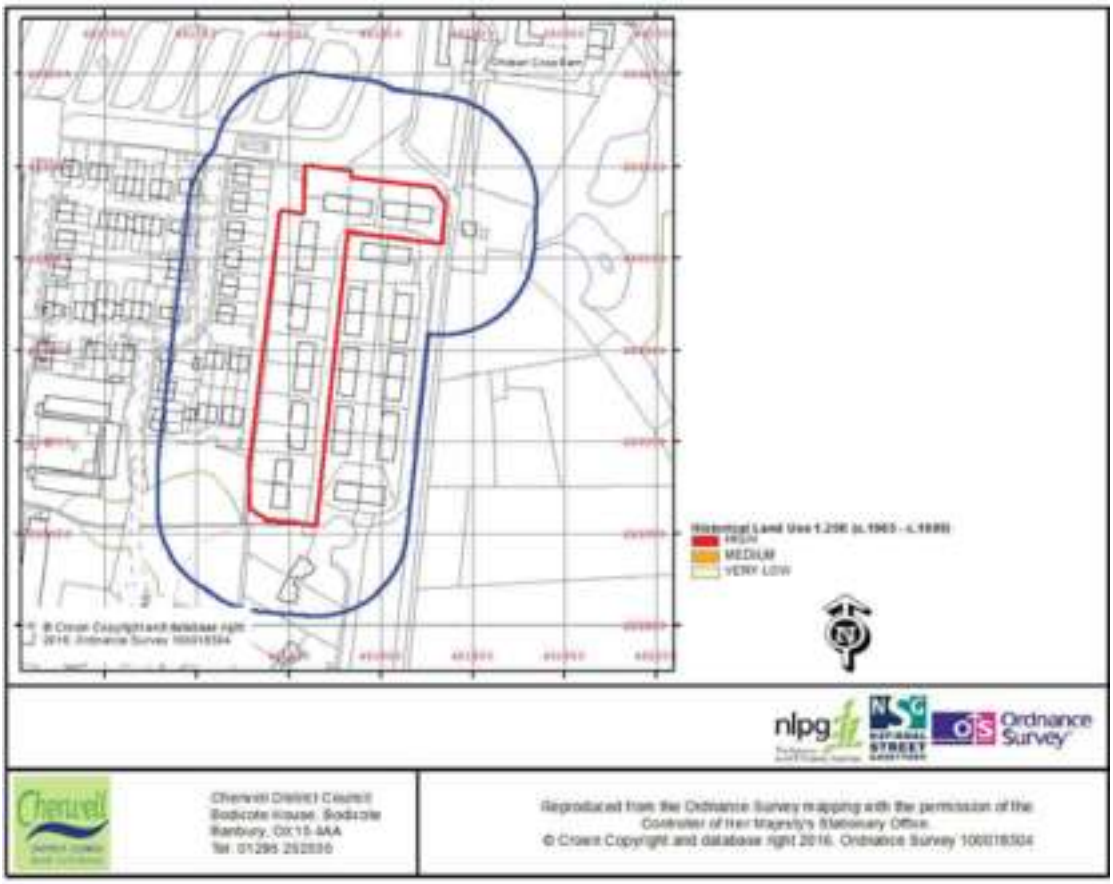
Site Results

No historical land use 1.25K (c.1956 - c.1989) mapped at the site

Search Radius Results

No historical land use 1.25K (c.1956 - c.1989) mapped in the search radius

Historical Land Use 1.25K (c.1965 - c.1989)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 1.25K (c.1965 - c.1989) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1965 - 1989.

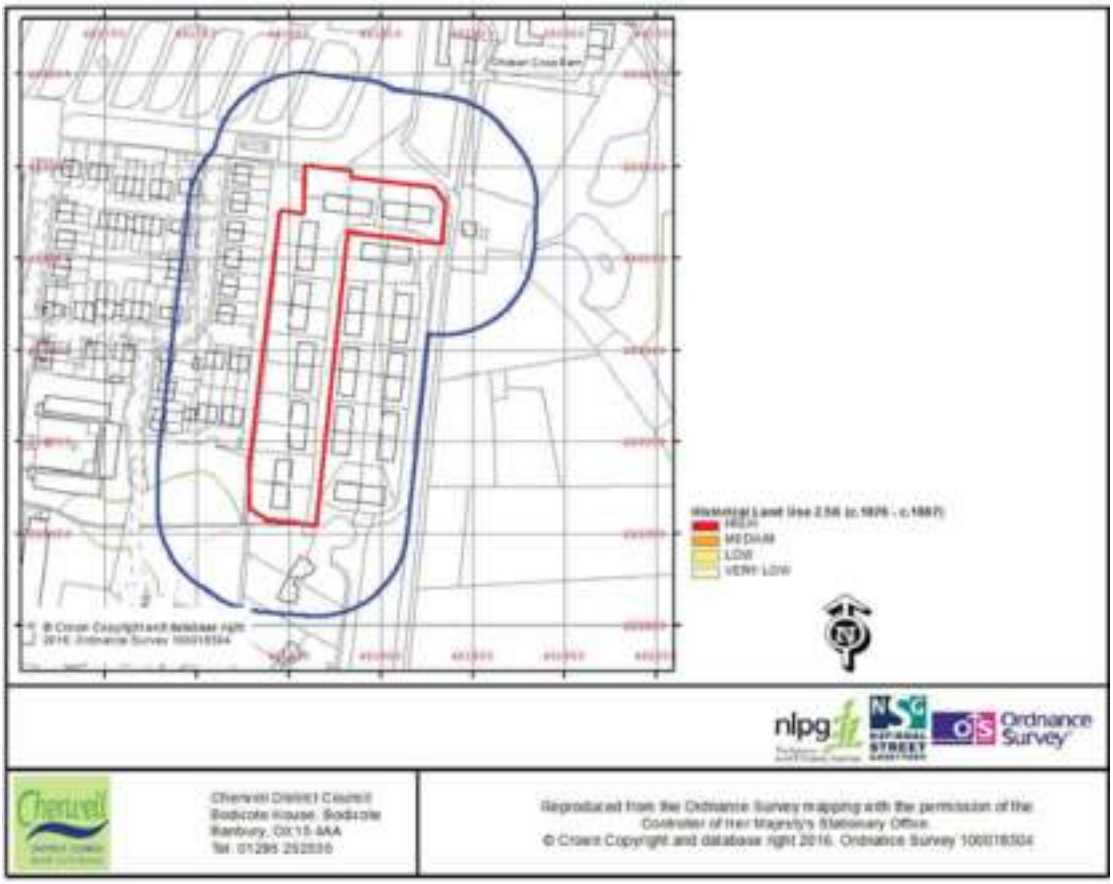
Site Results

No historical land use 1.25K (c.1965 - c.1989) mapped at the site

Search Radius Results

No historical land use 1.25K (c.1965 - c.1989) mapped in the search radius

Historical Land Use 2.5K (c.1876 - c.1887)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1876 - c.1887) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1876 -1887.

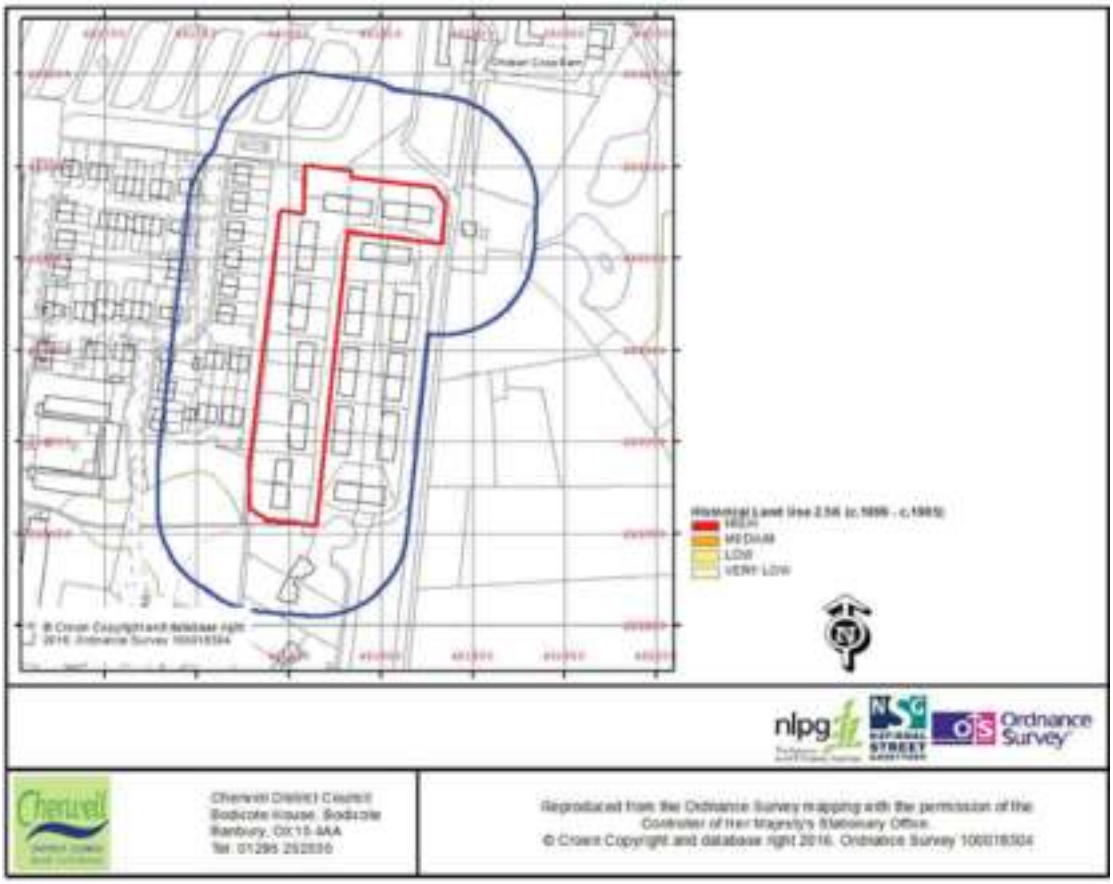
Site Results

No historical land use 2.5K (c.1876 - c.1887) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1876 - c.1887) mapped in the search radius

Historical Land Use 2.5K (c.1899 - c.1905)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1899 - c.1905) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1899 -1905.

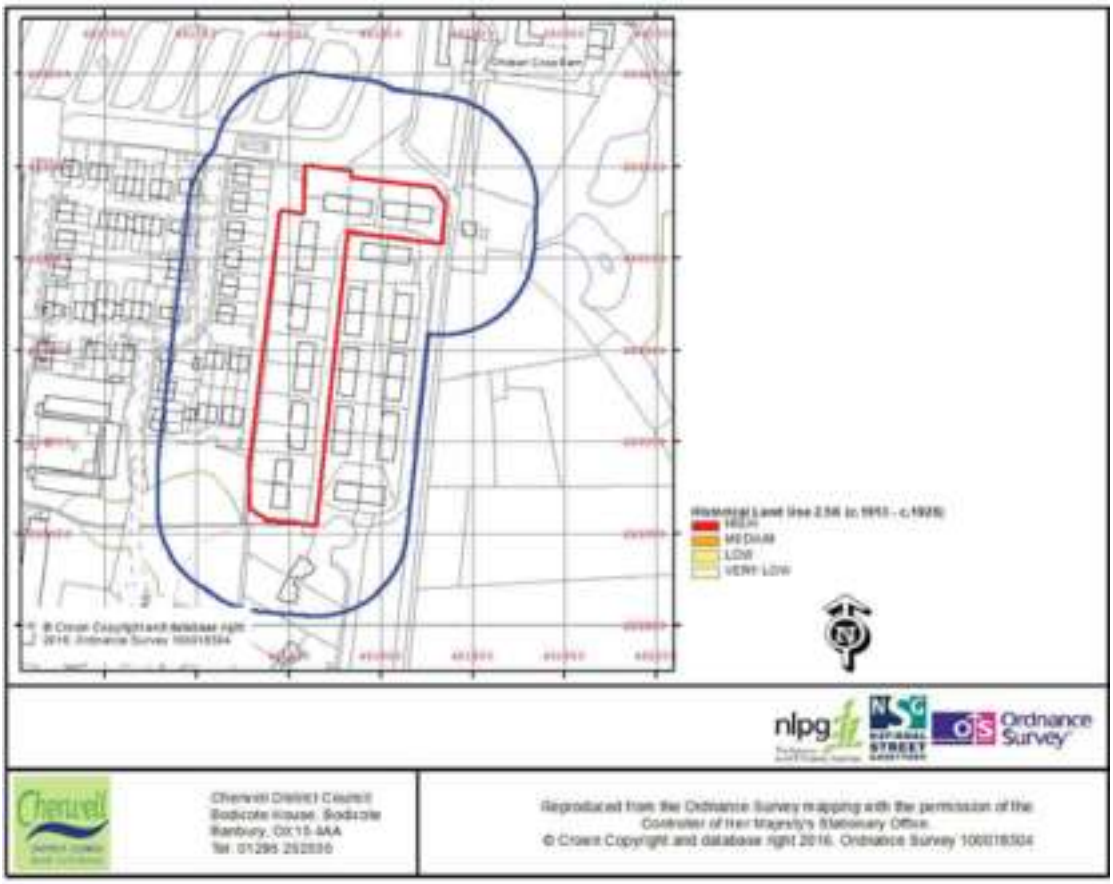
Site Results

No historical land use 2.5K (c.1899 - c.1905) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1899 - c.1905) mapped in the search radius

Historical Land Use 2.5K (c.1913 - c.1926)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1913 - c.1926) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1913 -1926.

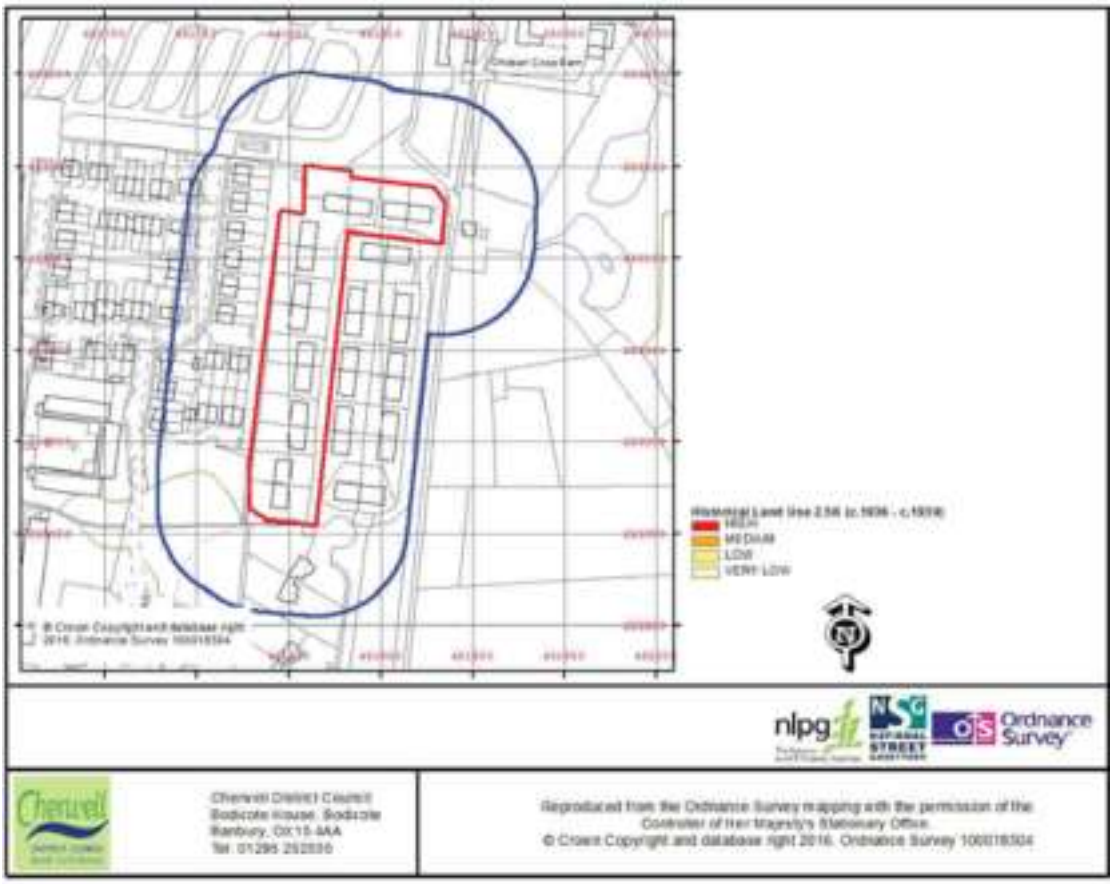
Site Results

No historical land use 2.5K (c.1913 - c.1926) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1913 - c.1926) mapped in the search radius

Historical Land Use 2.5K (c.1936 - c.1939)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1936 - c.1939) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1936 -1939.

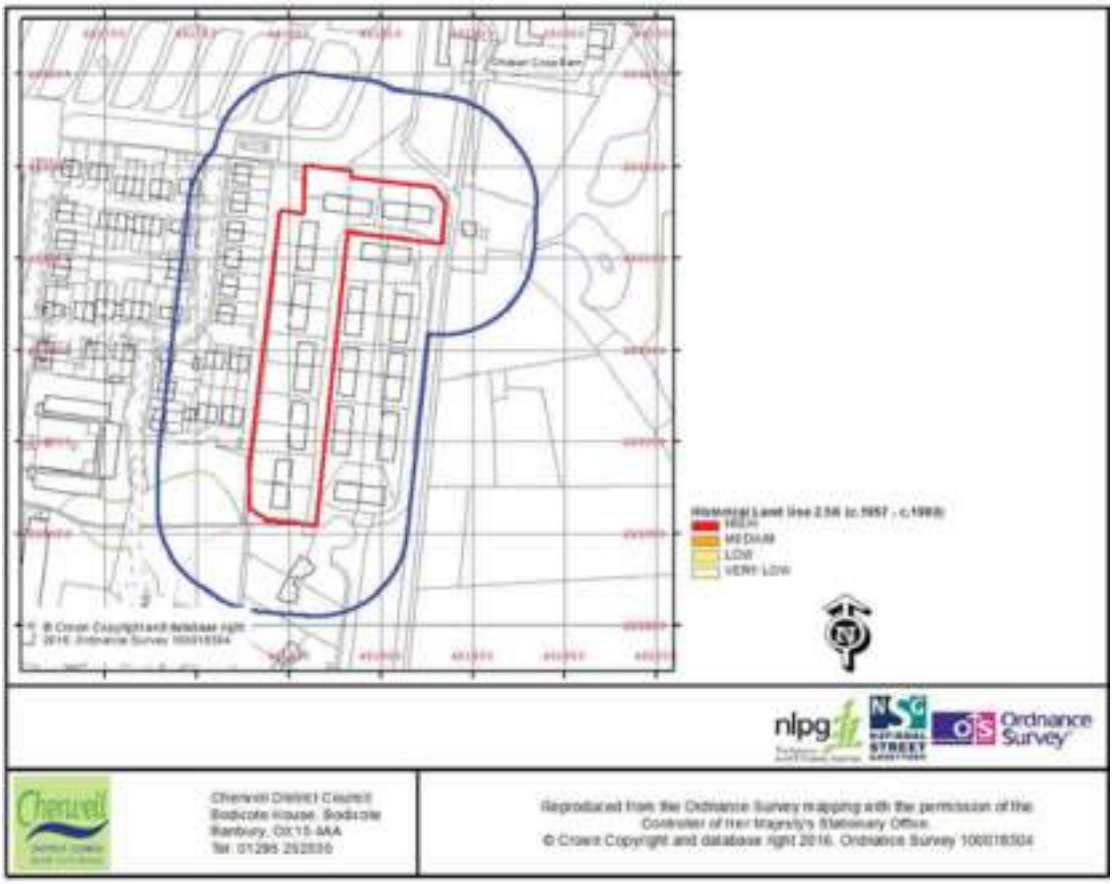
Site Results

No historical land use 2.5K (c.1936 - c.1939) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1936 - c.1939) mapped in the search radius

Historical Land Use 2.5K (c.1957 - c.1980)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1957 - c.1980) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1957 -1980.

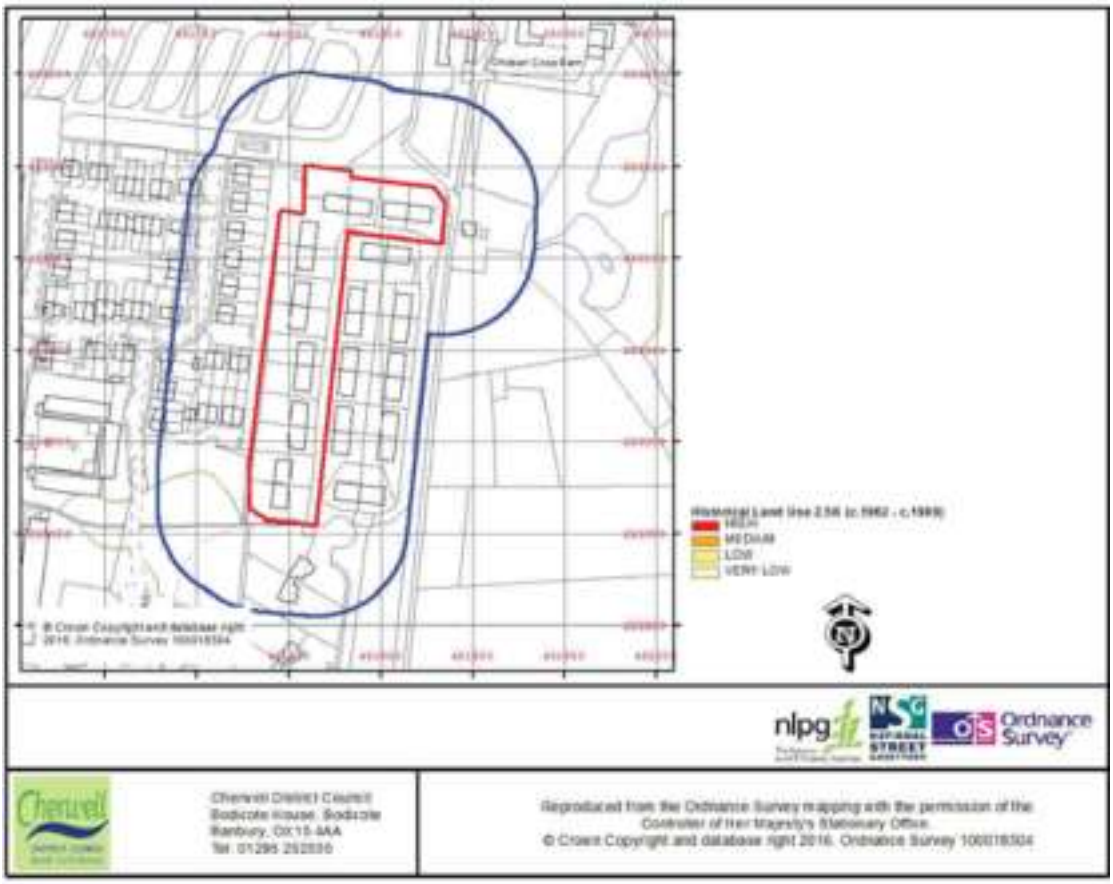
Site Results

No historical land use 2.5K (c.1957 - c.1980) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1957 - c.1980) mapped in the search radius

Historical Land Use 2.5K (c.1962 - c.1989)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1962 - c.1989) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1962 -1989.

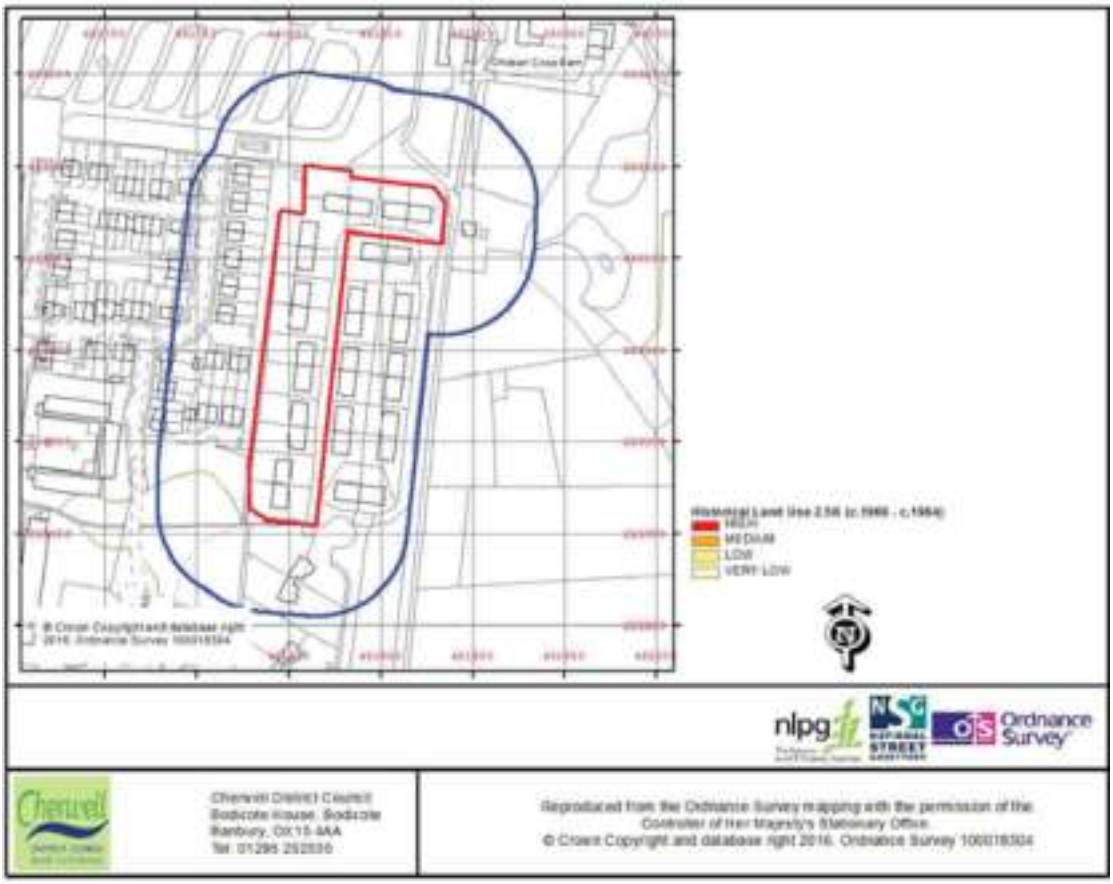
Site Results

No historical land use 2.5K (c.1962 - c.1989) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1962 - c.1989) mapped in the search radius

Historical Land Use 2.5K (c.1969 - c.1984)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1969 - c.1984) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1969 -1984.

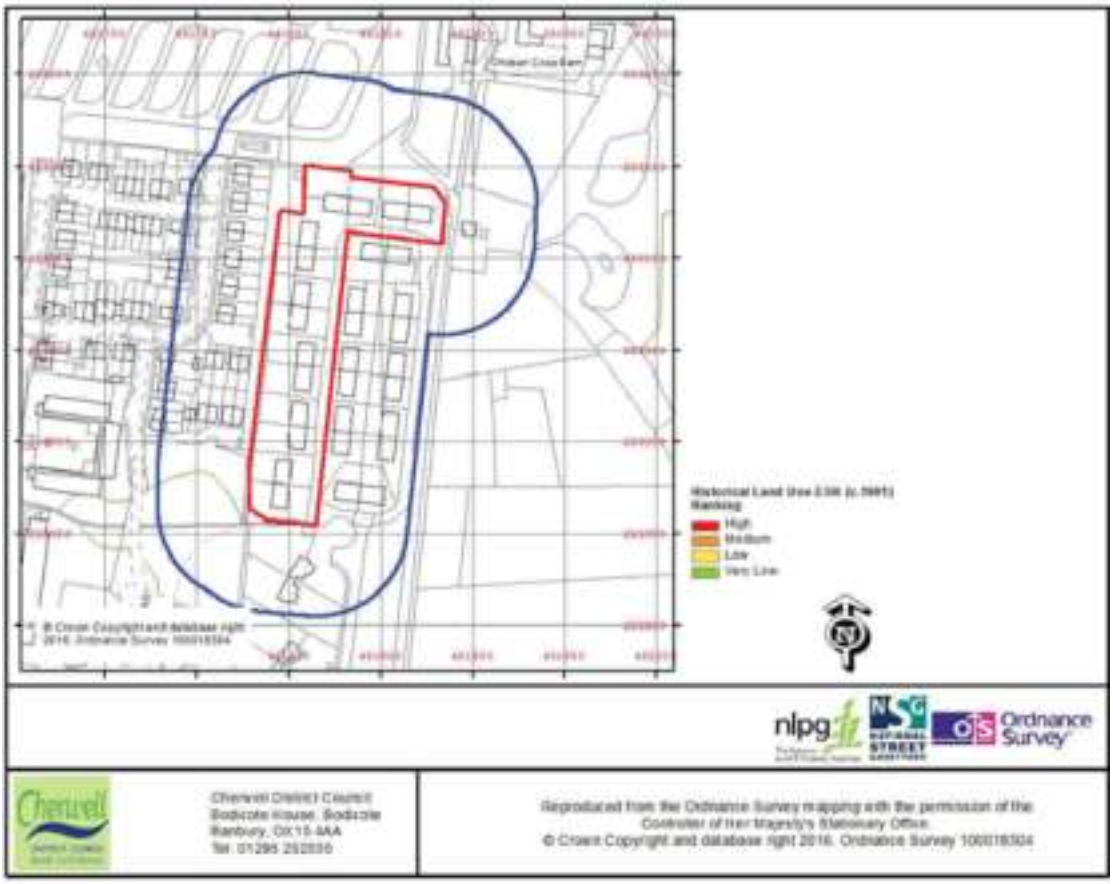
Site Results

No historical land use 2.5K (c.1969 - c.1984) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1969 - c.1984) mapped in the search radius

Historical Land Use 2.5K (c.1991)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use 2.5K (c.1991) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1991.

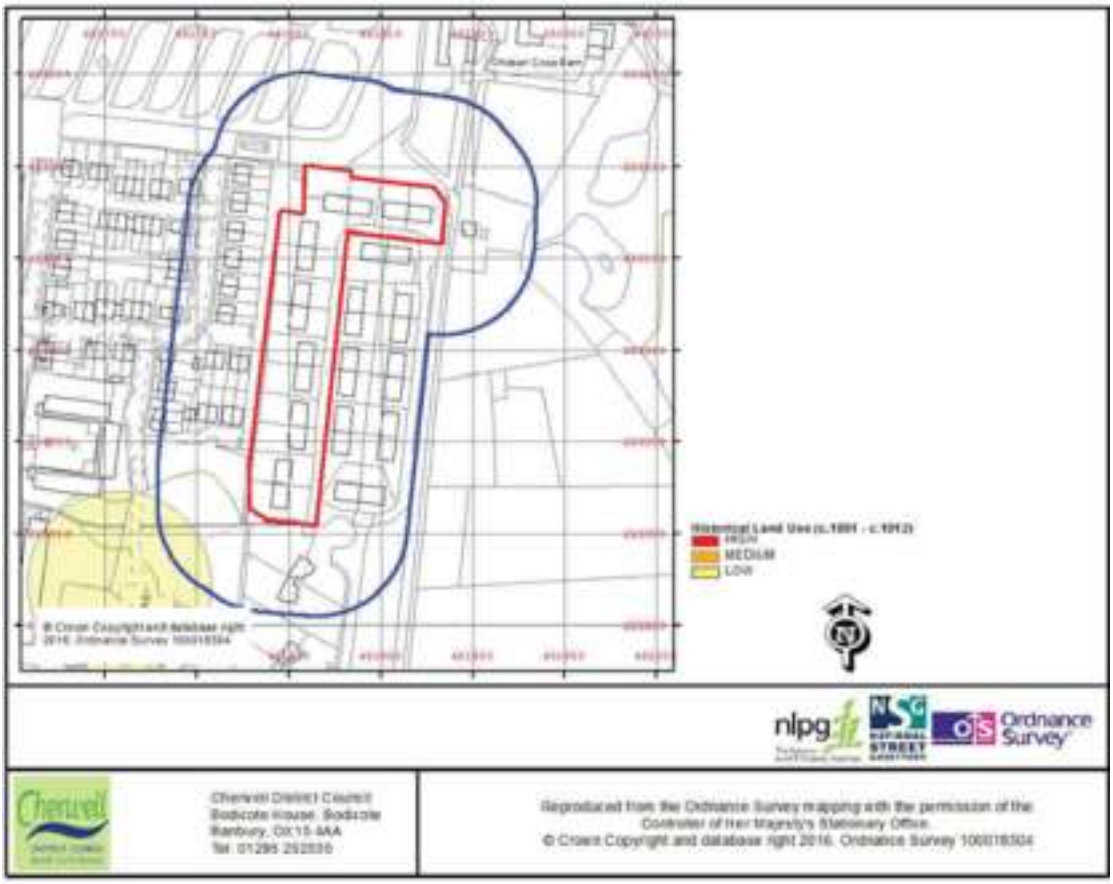
Site Results

No historical land use 2.5K (c.1991) mapped at the site

Search Radius Results

No historical land use 2.5K (c.1991) mapped in the search radius

Historical Land Use (c.1891 - c.1912)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use (c.1891 - c.1912) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1891-1912.

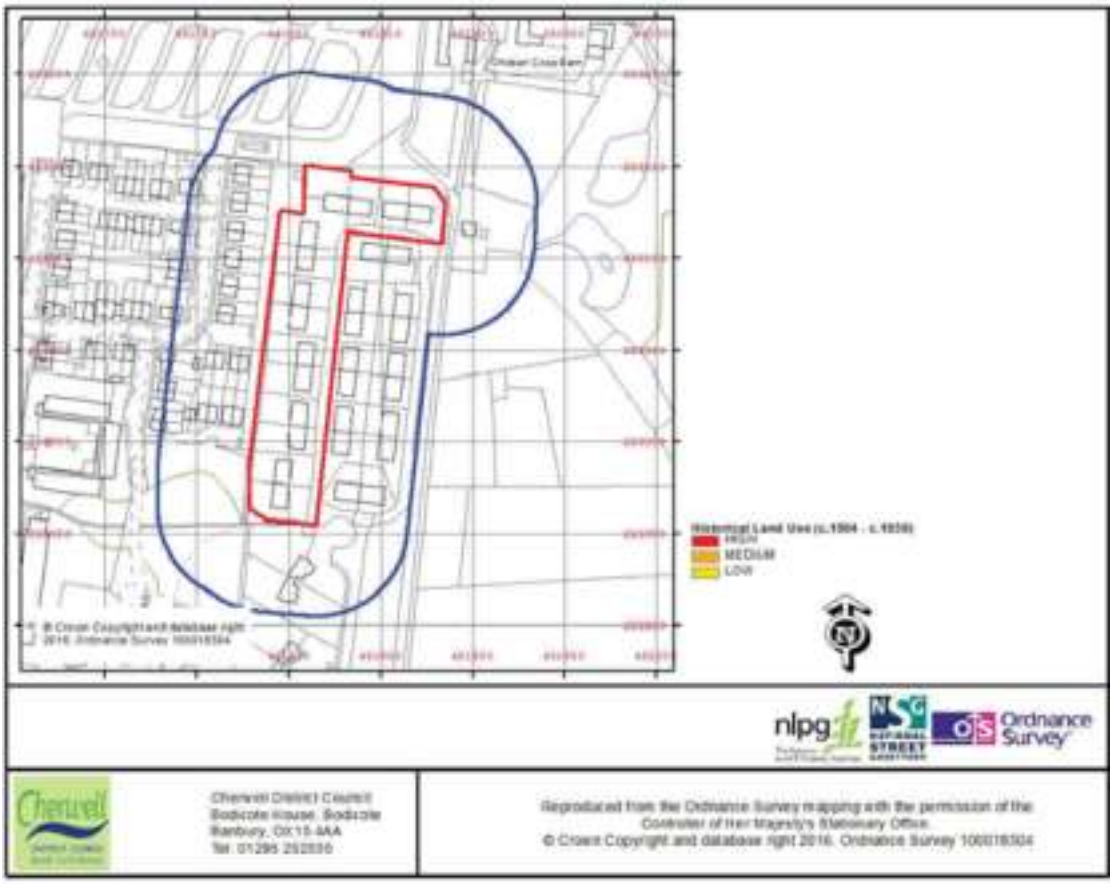
Site Results

No historical land use (c.1891 - c.1912) mapped at the site

Search Radius Results

Description
General quarrying

Historical Land Use (c.1904 - c.1939)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use (c.1904 - c.1939) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1904-1939.

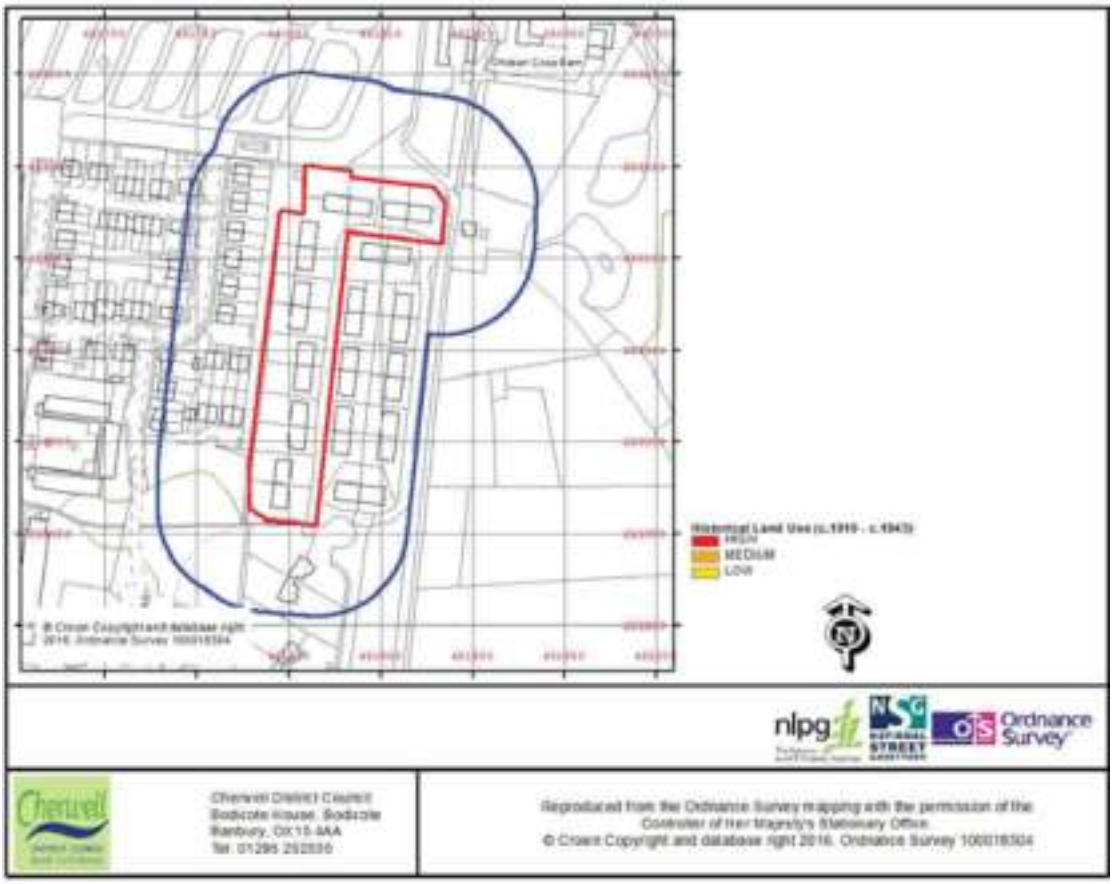
Site Results

No historical land use (c.1904 - c.1939) mapped at the site

Search Radius Results

No historical land use (c.1904 - c.1939) mapped in the search radius

Historical Land Use (c.1919 - c.1943)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use (c.1919 - c.1943) information is based on County Series maps of the entire Cherwell District at a scale of 6 inches to one mile, which were mapped in the period 1919-1943.

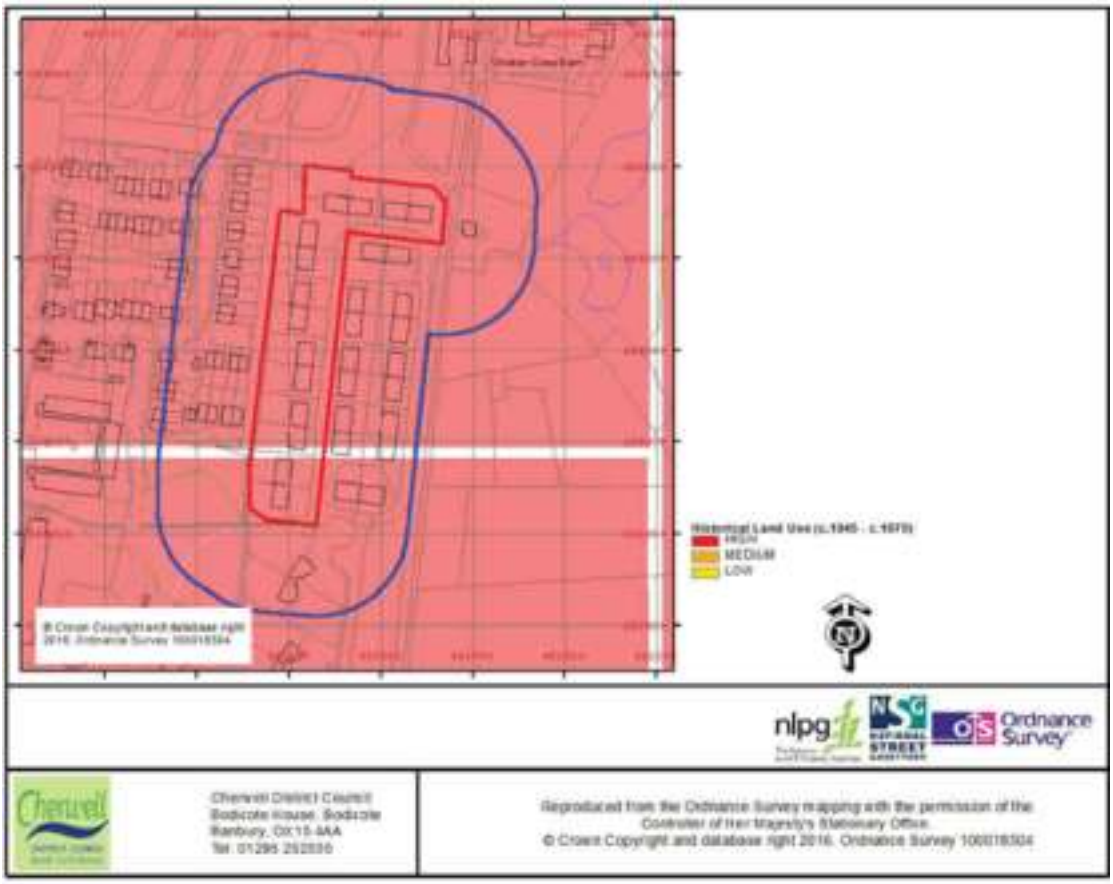
Site Results

No historical land use (c.1919 - c.1943) mapped at the site

Search Radius Results

No historical land use (c.1919 - c.1943) mapped in the search radius

Historical Land Use (c.1945 - c.1970)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use (c.1945 - c.1970) information is based on Ordnance Survey National Grid maps of the entire Cherwell District at a scale of 1:10 000, which were mapped in the period 1945-1970.

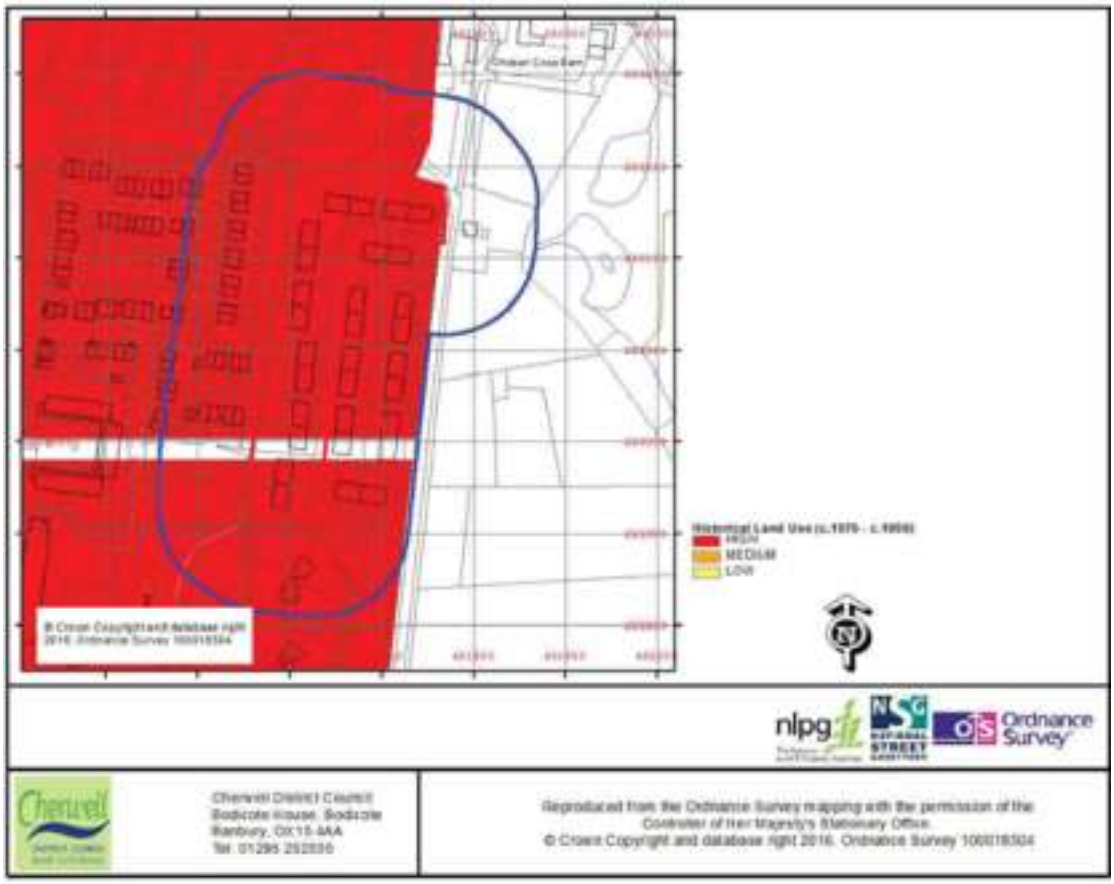
Site Results

Description
Military Land
Military Land

Search Radius Results

Description
Military Land
Military Land

Historical Land Use (c.1970 - c.1996)



The map shows the site (red) and a search radius of 50 meters (blue).

The historical land use (c.1970 - c.1996) information is based on Ordnance Survey National Grid maps of the entire Cherwell District at a scale of 1:10 000, which were mapped in the period 1970-1996.

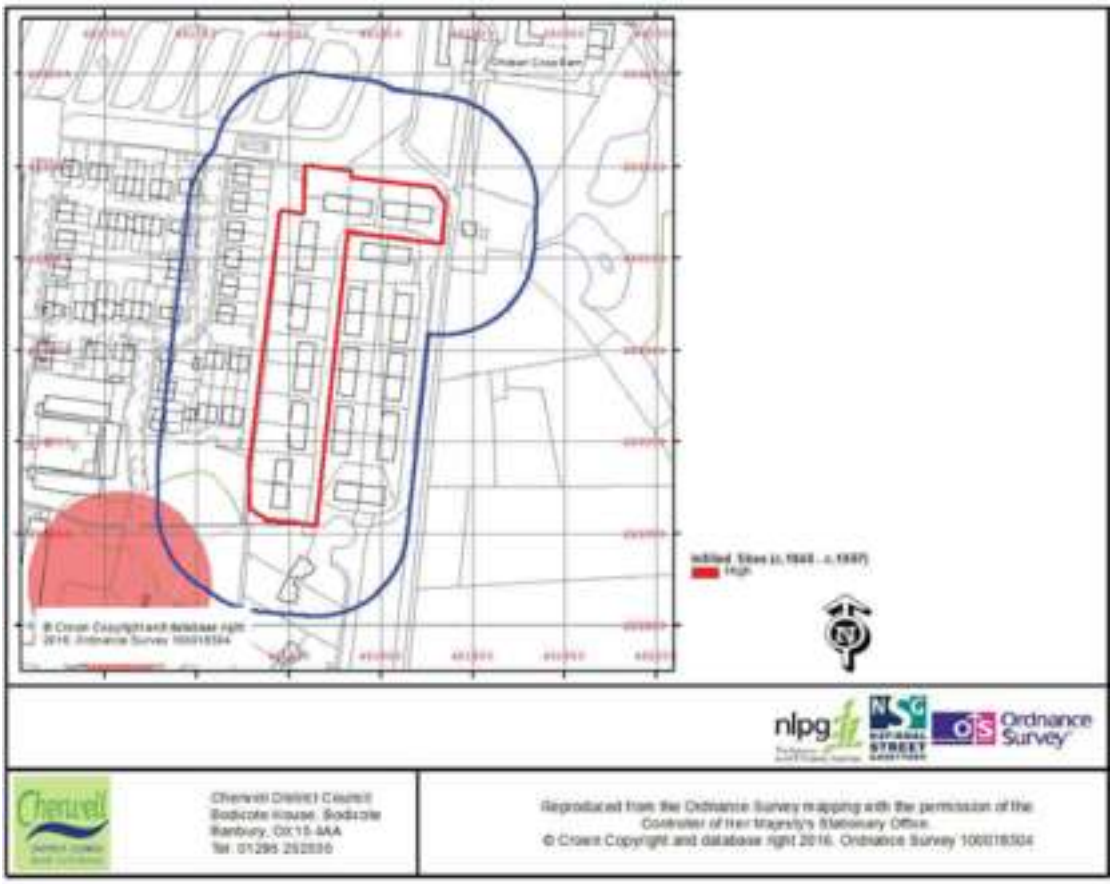
Site Results

Description
Military Land
Military Land

Search Radius Results

Description
Military Land
Military Land

Infilled Sites (c.1840 - c.1997)



The map shows the site (red) and a search radius of 50 meters (blue).

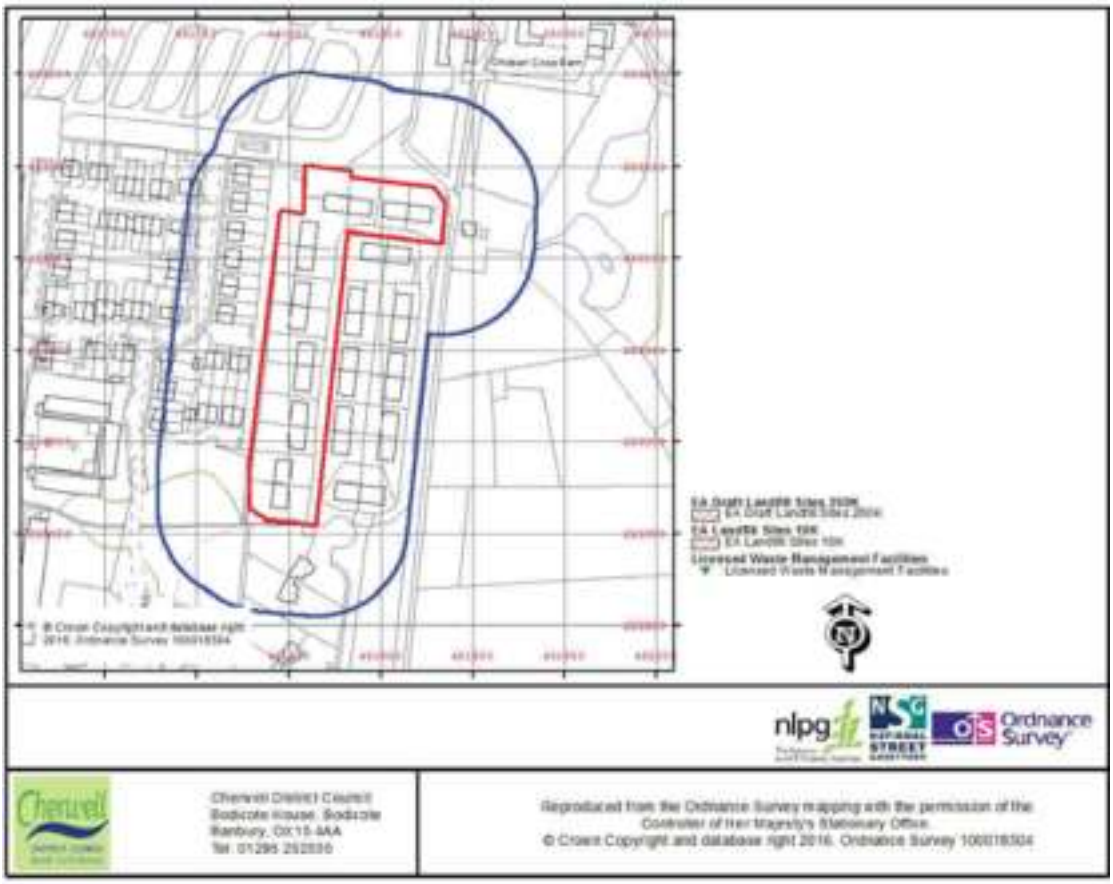
Site Results

No infilled Sites (c.1840 - c.1997) mapped at the site

Search Radius Results

Description
Unknown Filled Ground (Pit, quarry etc)

Landfill Sites and Licensed Waste Management Facilities



The map shows the site (red) and a search radius of 50 meters (blue).

Landfill and waste data derives from Environment Agency data & local knowledge of sites that pre date Environment Agency data.

EA Landfill Sites 10K

Site Results

No EA registered landfills at the site

Search Radius Results

No EA registered landfills in the search radius

EA Draft Landfill Sites 250K

Site Results

No draft landfills at the site

Search Radius Results

No draft landfills in the search radius

Licensed Waste Management Facilities

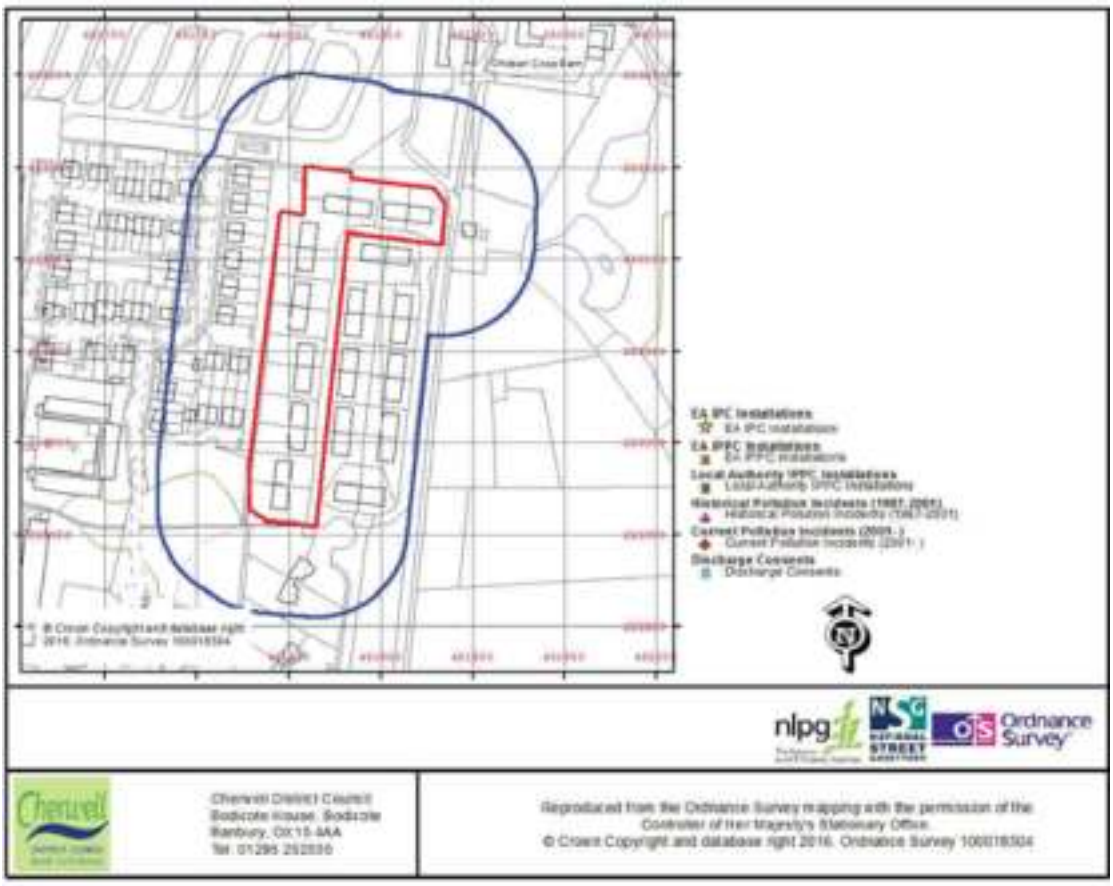
Site Results

No waste sites at the site

Search Radius Results

No waste sites in the search radius

Environmentally Sensitive Data



The map shows the site (red) and a search radius of 50 meters (blue).

All environmentally sensitive data derives from Environment Agency data

EA IPC Installations

Site Results

No IPC Installations at the site

Search Radius Results

No IPC Installations in the search radius

EA IPPC Installations

Site Results

No IPPC Installations at the site

Search Radius Results

No IPPC Installations in the search radius

Local Authority IPPC Installations

Site Results

No IPPC Installations at the site

Search Radius Results

No IPPC Installations in the search radius

Registered Radioactive Substance Sites

Site Results

No Registered Radioactive Substance sites at the site

Search Radius Results

No Registered Radioactive Substance sites in the search radius

Historical Pollution Incidents (1987-2001)

Site Results

No Historical Pollution Incidents (1987-2001) at the site

Search Radius Results

Details	NGR	Major Incident
Oil/Kerosene type/ Not Yet Known/Not Yet Known/NOT KNOWN	SP 518 262 SP518262	No Miss

Current Pollution Incidents (2001-)

Site Results

No Current Pollution Incidents (2001-) at the site

Search Radius Results

No Current Pollution Incidents (2001-)in the search radius

Discharge Consents

Site Results

No discharge consents at the site

Search Radius Results

No discharge consents in the search radius

Important

Appendix E
Site Investigation Logs

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No
TP01
Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire		Dimensions (m): Depth 1.70	Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES	PID=0	0.10			Brown loamy sandy topsoil with occasional brick, concrete and glass. [MADE GROUND]
				0.30			Brown silty sand with occasional roots. [TOPSOIL]
							Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
	1.50	ES	PID=0				
				1.70			End of pit at 1.70 m

1
2
3
4
5

Remarks: METHOD: Machine excavated pit; CONTAMINATION: No visual or olfactory contamination; GROUNDWATER: None encountered; NOTES: None.

Stability: Stable.

AGS

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No
TP02
Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire	Dimensions (m): Depth 2.00		Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES	PID=0	0.30			Brown clayey sands with limestone gravels. [POSSIBLE MADE GROUND]
				1.00			Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
▼	1.80	ES	PID=4	2.00			Damp highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles. *Hydrocarbon staining and odour.* End of pit at 2.00 m

Remarks: METHOD: Machine excavated pit; CONTAMINATION: Hydrocarbon staining and odour 1.8 m; GROUNDWATER: Encountered as a slow seepage 1.8-2.0 m; NOTES: None.

Stability: Stable.

AGS

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No **TP03**

Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire	Dimensions (m): Depth 2.00		Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.30	ES	PID=0	0.40			Brown clayey gravelly sand with occasional brick, wire, concrete and glass. [MADE GROUND]
				0.80			Highly weathered LIMESTONE recovered as limestone gravels and cobbles with silty sands.
	1.20	ES	PID=0	1.80			Highly weathered LIMESTONE recovered as a pale brown silty clay with limestone gravels and cobbles.
▼				2.00			Fractured LIMESTONE recovered as limestone gravels and cobbles.
							End of pit at 2.00 m

1 2 3 4 5

Remarks: METHOD: Machine excavated pit; CONTAMINATION: No visual or olfactory contamination; GROUNDWATER: Slow ingress at 2.0 m; NOTES: None.

Stability: Stable.

AGS

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No **TP04**

Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire	Dimensions (m): Depth 2.10		Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	ES	PID=0	0.30			Brown clayey gravelly sand with occasional brick, roots, wood, wire, concrete and glass. [MADE GROUND]
				1.00			Highly weathered LIMESTONE recovered as a pale brown silty gravelly sand.
▼	1.80 - 2.00	ES	PID=0	2.00			Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
				2.10			Fractured LIMESTONE recovered as limestone gravels and cobbles. End of pit at 2.10 m

Remarks: METHOD: Machine excavated pit; CONTAMINATION: No visual or olfactory contamination; GROUNDWATER: Slow ingress 2.1 m; NOTES: None.

Stability: Stable.

AGS

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No
TP05
Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire		Dimensions (m): Depth 2.40	Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.30 - 0.50	ES	PID=0				Brown clayey gravelly sand with pea gravels fill and occsional brick, roots, wood, wire, concrete and glass. [MADE GROUND]
				1.00			Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
	2.20	ES	PID=0	2.20			Fractured LIMESTONE recovered as limestone gravels and cobbles.
				2.40			End of pit at 2.40 m

Remarks: METHOD: Machine excavated pit; CONTAMINATION: No visual or olfactory contamination; GROUNDWATER: None encountered; NOTES: None.

Stability: Stable.

AGS

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No
TP06
Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire		Dimensions (m): Depth 1.70	Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES	PID=0	0.25			Brown clayey gravelly sand with occasional brick, roots, wood, wire, concrete and glass. [MADE GROUND]
							Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
	1.50	ES	PID=0	1.30			Fractured LIMESTONE recovered as limestone gravels and cobbles.
				1.70			End of pit at 1.70 m

Remarks: METHOD: Machine excavated pit; CONTAMINATION: No visual or olfactory contamination; GROUNDWATER: None encountered; NOTES: None.

Stability: Stable.

AGS

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No
TP07
Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire		Dimensions (m): Depth 1.50	Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES	PID=0	0.20			Brown loamy sandy topsoil with occasional brick, concrete and glass. [MADE GROUND]
			PID=0	1.40			Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
	1.70	ES		1.50			Fractured LIMESTONE recovered as limestone gravels and cobbles.
							End of pit at 1.50 m

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5

Remarks: METHOD: Machine excavated pit; CONTAMINATION: No visual or olfactory contamination; GROUNDWATER: None encountered; NOTES: None.

Stability: Stable.

AGS

Appendix F
Certificates of Analysis

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-26771-1
Initial Date of Issue:	08-Nov-2016
Client	AA Environmental Ltd
Client Address:	Units 4 to 8 Cholswell Court Shippon Abingdon Oxfordshire OX136HX
Contact(s):	Jack Taylor
Project	163408 Conlon - Trenchard Circle, Upper Heyford

Quotation No.:		**Date Received:**	03-Nov-2016
Order No.:		**Date Instructed:**	03-Nov-2016
No. of Samples:	23		
Turnaround (Wkdays):	3	**Results Due:**	07-Nov-2016
Date Approved:	08-Nov-2016		

Approved By:

[redacted]

Details: Keith Jones, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd					Chemtest Job No.:	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771
Quotation No.:					Chemtest Sample ID.:	373987	373989	373990	373992	373994	373995	373996	373998	374000
					Client Sample ID.:	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06	TP07
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.20	0.20	1.80	0.30	0.25	1.80	0.30	0.20	0.20
					Bottom Depth (m):									
					Date Sampled:	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A		-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020		16	16	11	10	11	14	10	8.7	12
pH	U	2010		N/A		8.2	8.1	8.5	8.5	8.2	8.8	8.7	8.4	8.3
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		0.64	0.51	< 0.40	0.51	< 0.40	< 0.40	< 0.40	0.74	1.1
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		< 0.010	0.15	< 0.010	0.019	0.29	< 0.010	< 0.010	0.38	0.18
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50	< 0.50	1.0	1.6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50		1.6	9.8	1.2	2.1	1.1	1.5	1.1	1.1	0.99
Arsenic	U	2450	mg/kg	1.0		21	27	15	24	25	18	25	30	28
Cadmium	U	2450	mg/kg	0.10		0.25	0.16	< 0.10	0.22	0.21	< 0.10	0.10	0.25	0.22
Chromium	U	2450	mg/kg	1.0		36	21	5.0	25	23	4.5	13	25	26
Copper	U	2450	mg/kg	0.50		7.2	6.2	2.3	8.0	7.7	1.3	5.2	8.8	9.0
Mercury	U	2450	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50		22	16	6.1	17	17	4.3	12	20	19
Lead	U	2450	mg/kg	0.50		26	60	3.4	23	24	2.3	14	18	20
Selenium	U	2450	mg/kg	0.20		0.68	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0		63	44	7.5	47	42	12	30	56	60
Zinc	U	2450	mg/kg	0.50		41	30	5.0	38	54	8.4	19	45	38
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20		1.1	0.94	0.61	1.9	3.7	5.1	1.4	2.4	1.5
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd					**Chemtest Job No.:**	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771
Quotation No.:					**Chemtest Sample ID.:**	373987	373989	373990	373992	373994	373995	373996	373998	374000
					Client Sample ID.:	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06	TP07
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.20	0.20	1.80	0.30	0.25	1.80	0.30	0.20	0.20
					Bottom Depth (m):									
					Date Sampled:	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Total Phenols	U	2920	mg/kg	0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd					Chemtest Job No.:	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771
Quotation No.:					Chemtest Sample ID.:	374001	374002	374003	374004	374005	374006	374007	374008	374009
					Client Sample ID.:	TP07	TP08	TP09	TP10	TP11	TP12	TP13	TP14	TP15
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.40	2.00	1.10	0.60	1.80	1.00	1.00	1.00	1.00
					Bottom Depth (m):									
					Date Sampled:	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016
					Asbestos Lab:	COVENTRY								
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A	-									
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected									
Moisture	N	2030	%	0.020	8.5	8.4	15	11	11	12	14	11	12	
pH	U	2010		N/A	8.7									
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40									
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010									
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50									
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50	0.96									
Arsenic	U	2450	mg/kg	1.0	14									
Cadmium	U	2450	mg/kg	0.10	< 0.10									
Chromium	U	2450	mg/kg	1.0	3.3									
Copper	U	2450	mg/kg	0.50	1.2									
Mercury	U	2450	mg/kg	0.10	< 0.10									
Nickel	U	2450	mg/kg	0.50	4.7									
Lead	U	2450	mg/kg	0.50	1.9									
Selenium	U	2450	mg/kg	0.20	< 0.20									
Vanadium	U	2450	mg/kg	5.0	6.6									
Zinc	U	2450	mg/kg	0.50	3.3									
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50									
Total Organic Carbon	U	2625	%	0.20	5.0									
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	17	75	< 1.0	13	4.3	< 1.0	< 1.0	
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	98	570	< 1.0	68	2.4	< 1.0	< 1.0	
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	530	2400	< 1.0	320	34	< 1.0	< 1.0	
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	480	2500	< 1.0	260	35	< 1.0	< 1.0	
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	77	110	< 1.0	69	49	< 1.0	< 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	1200	5600	< 5.0	730	120	< 5.0	< 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	1.1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	12	180	< 1.0	13	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	140	1300	< 1.0	89	3.9	< 1.0	< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	120	760	< 1.0	82	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	34	97	< 1.0	34	4.5	< 1.0	< 1.0	

Results - Soil

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd			**Chemtest Job No.:**		16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771
Quotation No.:			**Chemtest Sample ID.:**		374001	374002	374003	374004	374005	374006	374007	374008	374009
			Client Sample ID.:		TP07	TP08	TP09	TP10	TP11	TP12	TP13	TP14	TP15
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.40	2.00	1.10	0.60	1.80	1.00	1.00	1.00	1.00
			Bottom Depth (m):										
			Date Sampled:		01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016
			Asbestos Lab:		COVENTRY								
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	310	2300	< 5.0	220	8.4	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	< 10	< 10	1500	7900	< 10	950	130	< 10	< 10
Naphthalene	U	2700	mg/kg	0.10	< 0.10								
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10								
Acenaphthene	U	2700	mg/kg	0.10	< 0.10								
Fluorene	U	2700	mg/kg	0.10	< 0.10								
Phenanthrene	U	2700	mg/kg	0.10	< 0.10								
Anthracene	U	2700	mg/kg	0.10	< 0.10								
Fluoranthene	U	2700	mg/kg	0.10	< 0.10								
Pyrene	U	2700	mg/kg	0.10	< 0.10								
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10								
Chrysene	U	2700	mg/kg	0.10	< 0.10								
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10								
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10								
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10								
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10								
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10								
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10								
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0								
Total Phenols	U	2920	mg/kg	0.30	< 0.30								

Results - Soil

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd				Chemtest Job No.:	16-26771	16-26771	16-26771	16-26771
Quotation No.:				Chemtest Sample ID.:	374010	374011	374012	374013
				Client Sample ID.:	TP16	TP17	TP18	TP18
				Sample Type:	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	1.80	1.50	0	0.90
				Bottom Depth (m):			0.10	
				Date Sampled:	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016
				Asbestos Lab:				
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A				
Asbestos Identification	U	2192	%	0.001				
Moisture	N	2030	%	0.020	10	9.8	9.4	9.7
pH	U	2010		N/A				
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40				
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010				
Cyanide (Total)	U	2300	mg/kg	0.50				
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50				
Arsenic	U	2450	mg/kg	1.0				
Cadmium	U	2450	mg/kg	0.10				
Chromium	U	2450	mg/kg	1.0				
Copper	U	2450	mg/kg	0.50				
Mercury	U	2450	mg/kg	0.10				
Nickel	U	2450	mg/kg	0.50				
Lead	U	2450	mg/kg	0.50				
Selenium	U	2450	mg/kg	0.20				
Vanadium	U	2450	mg/kg	5.0				
Zinc	U	2450	mg/kg	0.50				
Chromium (Hexavalent)	N	2490	mg/kg	0.50				
Total Organic Carbon	U	2625	%	0.20				
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	390	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	2100	35
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	8600	98
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	47000	360
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	34000	260
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	14000	110
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	110000	870
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	77	4.2
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	2100	27
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	15000	120
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	11000	63
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	3700	42

Results - Soil

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd			**Chemtest Job No.:**		16-26771	16-26771	16-26771	16-26771
Quotation No.:			**Chemtest Sample ID.:**		374010	374011	374012	374013
			Client Sample ID.:		TP16	TP17	TP18	TP18
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.80	1.50	0	0.90
			Bottom Depth (m):				0.10	
			Date Sampled:		01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016
			Asbestos Lab:					
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	31000	250
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	< 10	< 10	140000	1100
Naphthalene	U	2700	mg/kg	0.10				
Acenaphthylene	U	2700	mg/kg	0.10				
Acenaphthene	U	2700	mg/kg	0.10				
Fluorene	U	2700	mg/kg	0.10				
Phenanthrene	U	2700	mg/kg	0.10				
Anthracene	U	2700	mg/kg	0.10				
Fluoranthene	U	2700	mg/kg	0.10				
Pyrene	U	2700	mg/kg	0.10				
Benzo[a]anthracene	U	2700	mg/kg	0.10				
Chrysene	U	2700	mg/kg	0.10				
Benzo[b]fluoranthene	U	2700	mg/kg	0.10				
Benzo[k]fluoranthene	U	2700	mg/kg	0.10				
Benzo[a]pyrene	U	2700	mg/kg	0.10				
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10				
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10				
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10				
Total Of 16 PAH's	U	2700	mg/kg	2.0				
Total Phenols	U	2920	mg/kg	0.30				

Results - Water

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd			**Chemtest Job No.:**		16-26771
Quotation No.:			**Chemtest Sample ID.:**		373991
			Client Sample ID.:		TP02
			Sample Type:		WATER
			Top Depth (m):		2.00
			Date Sampled:		01-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	U	1010		N/A	8.2
Sulphate	U	1220	mg/l	1.0	42
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050
Magnesium	U	1415	mg/l	0.50	48
Arsenic (Dissolved)	U	1450	µg/l	1.0	1.3
Boron (Dissolved)	U	1450	µg/l	20	49
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080
Copper (Dissolved)	U	1450	µg/l	1.0	< 1.0
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	1.9
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	1.1
Chromium (Total)	U	1450	µg/l	1.0	1.4
Chromium (Hexavalent)	U	1490	µg/l	20	< 20
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	1200
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	9700
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	49000
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	59000
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	3200
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	120000
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	190
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	1300
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	15000
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	11000
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	860
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	73
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	28000
Total Petroleum Hydrocarbons	N	1675	µg/l	10	150000
Naphthalene	U	1700	µg/l	0.10	< 0.10
Acenaphthylene	U	1700	µg/l	0.10	< 0.10
Acenaphthene	U	1700	µg/l	0.10	< 0.10
Fluorene	U	1700	µg/l	0.10	< 0.10

Results - Water

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd			**Chemtest Job No.:**		16-26771
Quotation No.:			**Chemtest Sample ID.:**		373991
			Client Sample ID.:		TP02
			Sample Type:		WATER
			Top Depth (m):		2.00
			Date Sampled:		01-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Phenanthrene	U	1700	µg/l	0.10	< 0.10
Anthracene	U	1700	µg/l	0.10	< 0.10
Fluoranthene	U	1700	µg/l	0.10	< 0.10
Pyrene	U	1700	µg/l	0.10	< 0.10
Benzo[a]anthracene	U	1700	µg/l	0.10	< 0.10
Chrysene	U	1700	µg/l	0.10	< 0.10
Benzo[b]fluoranthene	U	1700	µg/l	0.10	< 0.10
Benzo[k]fluoranthene	U	1700	µg/l	0.10	< 0.10
Benzo[a]pyrene	U	1700	µg/l	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1700	µg/l	0.10	< 0.10
Dibenz(a,h)Anthracene	U	1700	µg/l	0.10	< 0.10
Benzo[g,h,i]perylene	U	1700	µg/l	0.10	< 0.10
Total Of 16 PAH's	U	1700	µg/l	2.0	< 2.0
Benzene	U	1760	µg/l	1.0	< 1.0
Toluene	U	1760	µg/l	1.0	< 1.0
Ethylbenzene	U	1760	µg/l	1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0
Total Phenols	U	1920	mg/l	0.030	< 0.030

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GC FID detection
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.

Test Methods

SOP	Title	Parameters included	Method summary
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-26968-1
Initial Date of Issue:	08-Nov-2016
Client	AA Environmental Ltd
Client Address:	Units 4 to 8 Cholswell Court Shippon Abingdon Oxfordshire OX136HX
Contact(s):	Carrie Lorton Ed Brown Jack Taylor Mark Anderson Matthew Lawman Penny Hearn Richard Heath Sam Muir
Project	163408 Conlon - Trenchard Circle, Upper Heyford

Quotation No.:		**Date Received:**	04-Nov-2016
Order No.:		**Date Instructed:**	04-Nov-2016
No. of Samples:	3		
Turnaround (Wkdays):	3	**Results Due:**	08-Nov-2016
Date Approved:	08-Nov-2016		
Approved By:			

[redacted]

Details: Keith Jones, Technical Manager

Results - Soil

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd			**Chemtest Job No.:**		16-26968	16-26968
Quotation No.:			**Chemtest Sample ID.:**		374543	374547
			Client Sample ID.:		TP29	TP37
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.30	0.60
			Date Sampled:		03-Nov-2016	03-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Moisture	N	2030	%	0.020	9.3	7.4
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	81	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	920	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	4800	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	3800	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	470	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	10000	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	71	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	430	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	940	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	360	< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	30	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	1800	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	12000	< 10

Results - Water

Project: 163408 Conlon - Trenchard Circle, Upper Heyford

Client: AA Environmental Ltd			**Chemtest Job No.:**		16-26968
Quotation No.:			**Chemtest Sample ID.:**		374536
			Client Sample ID.:		TP21
			Sample Type:		WATER
			Top Depth (m):		0.80
			Date Sampled:		03-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	410000
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	1200000
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	3600000
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	2200000
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	1400000
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	8800000
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	150000
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	400000
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	1500000
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	1500000
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	190000
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	3200
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	3700000
Total Petroleum Hydrocarbons	N	1675	µg/l	10	13000000

Test Methods

SOP	Title	Parameters included	Method summary
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection

Report Information

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The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
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All soil samples will be retained for a period of 45 days from the date of receipt
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If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix G
Consolidated Soil Results

Consolidated Soil Results - Residential with Homegrown Produce

Site: Trenchard Circle, Upper Heyford
Project Reference: 163408
Client: Conlon
Strata: ALL Strata
Notes:

KEY
Exceedance of SGV
Below Limit of Detection

Determinant	Units	LOD	SGV	Max	Number	No. Exceedances	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06	TP07	TP07	TP08	TP09
Sample Location							TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06	TP07	TP07	TP08	TP09
Sample Ref							373987	373989	373990	373992	373994	373995	373996	373998	374000	374001	374002	374003
Depth (top)							0.20	0.20	1.80	0.30	0.25	1.80	0.30	0.20	0.20	1.40	2.00	1.10
Depth (bottom)																		
Lab Report							16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771
Sample Date							1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16
Originator							AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe
Strata																		
pH	pH unit	0.1	6 to 9	8.8	10		8.2	8.1	8.5	8.5	8.2	8.8	8.7	8.4	8.3	8.7		
Boron (Hot Water Soluble)	mg/kg	0.4	290	1.1	10		0.64	0.51	*0.4*	0.51	*0.4*	*0.4*	*0.4*	0.74	1.1	*0.4*		
Cyanide (Total)	mg/kg	0.5	20	1.6	10		*0.5*	*0.5*	1	1.6	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*		
Sulphide (Easily Liberatable)	mg/kg	0.5		9.8	10		1.6	9.8	1.2	2.1	1.1	1.5	1.1	1.1	0.99	0.96		
Arsenic	mg/kg	1	37	30	10		21	27	15	24	25	18	25	30	28	14		
Cadmium	mg/kg	0.1	11	0.25	10		0.25	0.16	*0.1*	0.22	0.21	*0.1*	*0.1*	0.25	0.22	*0.1*		
Chromium	mg/kg	1	910	36	10		36	21	5	25	23	4.5	13	25	26	3.3		
Copper	mg/kg	0.5	2400	9	10		7.2	6.2	2.3	8	7.7	1.3	5.2	8.8	9	1.2		
Mercury	mg/kg	0.1	1.2	0.19	10		*0.1*	*0.1*	*0.1*	*0.1*	0.19	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*		
Nickel	mg/kg	0.5	180	22	10		22	16	6.1	17	17	4.3	12	20	19	4.7		
Lead	mg/kg	0.5	200	60	10		26	60	3.4	23	24	2.3	14	18	20	1.9		
Selenium	mg/kg	0.2	250	0.68	10		0.68	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*		
Vanadium	mg/kg	5	410	63	10		63	44	7.5	47	42	12	30	56	60	6.6		
Zinc	mg/kg	0.5	3700	54	10		41	30	5	38	54	8.4	19	45	38	3.3		
Chromium (Hexavalent)	mg/kg	0.5	6	0.5	10		*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*		
Total Organic Carbon	%	0.2	3	5.1	10	3	1.1	0.94	0.61	1.9	3.7	5.1	1.4	2.4	1.5	5		
Aliphatic TPH >C5-C6	mg/kg	0.1	42	1	24		1	1	1	1	1	1	1	1	1	1	1	1
Aliphatic TPH >C6-C8	mg/kg	0.1	100	390	24	1	1	1	1	1	1	1	1	1	1	1	1	1
Aliphatic TPH >C8-C10	mg/kg	0.1	27	2100	24	4	1	1	1	1	1	1	1	1	1	1	1	17
Aliphatic TPH >C10-C12	mg/kg	1	130	8600	24	3	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	98
Aliphatic TPH >C12-C16	mg/kg	1	1100	47000	24	3	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	530
Aliphatic TPH >C16-C21	mg/kg	1	65000	34000	24		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	480
Aliphatic TPH >C21-C35	mg/kg	1	65000	14000	24		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	77
Aliphatic TPH >C35-C44	mg/kg	1	65000	1	24		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Total Aliphatic Hydrocarbons	mg/kg	5		110000	24		*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	1200
Aromatic TPH >C5-C7	mg/kg	0.1	70	1	24		1	1	1	1	1	1	1	1	1	1	1	1
Aromatic TPH >C7-C8	mg/kg	0.1	130	1	24		1	1	1	1	1	1	1	1	1	1	1	1
Aromatic TPH >C8-C10	mg/kg	0.1	34	77	24	2	1	1	1	1	1	1	1	1	1	1	1	1
Aromatic TPH >C10-C12	mg/kg	1	74	2100	24	3	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	12
Aromatic TPH >C12-C16	mg/kg	1	140	15000	24	3	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	140
Aromatic TPH >C16-C21	mg/kg	1	260	11000	24	3	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	120
Aromatic TPH >C21-C35	mg/kg	1	1100	3700	24	1	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	34
Aromatic TPH >C35-C44	mg/kg	1	1100	1	24		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Total Aromatic Hydrocarbons	mg/kg	5		31000	24		*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	310
TPH C6-C10	mg/kg	1																
TPH C10-C21	mg/kg	1																
TPH C21-C40	mg/kg	1																
Total Petroleum Hydrocarbons	mg/kg	10		140000	24		*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	1500
Naphthalene	mg/kg	0.1	2.3	0.1	10		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*		

Consolidated Soil Results - Residential with Homegrown Produce

Site: Trenchard Circle, Upper Heyford
Project Reference: 163408
Client: Conlon
Strata: ALL Strata
Notes:

KEY
Exceedance of SGV
Below Limit of Detection

Determinant	Units	LOD	SGV	Max	Number	No. Exceedances	TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06	TP07	TP07	TP08	TP09
Sample Location							TP01	TP02	TP02	TP03	TP04	TP04	TP05	TP06	TP07	TP07	TP08	TP09
Sample Ref							373987	373989	373990	373992	373994	373995	373996	373998	374000	374001	374002	374003
Depth (top)							0.20	0.20	1.80	0.30	0.25	1.80	0.30	0.20	0.20	1.40	2.00	1.10
Depth (bottom)																		
Lab Report							16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771
Sample Date							1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16
Originator							AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe
Strata																		
Acenaphthylene	mg/kg	0.1	170	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Acenaphthene	mg/kg	0.1	210	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Fluorene	mg/kg	0.1	170	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Phenanthrene	mg/kg	0.1	95	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Anthracene	mg/kg	0.1	2400	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Fluoranthene	mg/kg	0.1	280	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Pyrene	mg/kg	0.1	620	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Benzo[a]anthracene	mg/kg	0.1	7.2	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Chrysene	mg/kg	0.1	15	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Benzo[b]fluoranthene	mg/kg	0.1	2.6	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Benzo[k]fluoranthene	mg/kg	0.1	77	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Benzo[a]pyrene	mg/kg	0.1	2.2	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.1	27	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Dibenz(a,h)Anthracene	mg/kg	0.1	0.24	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Benzo[g,h,i]perylene	mg/kg	0.1	320	0.1	10		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Total Of 16 PAH's	mg/kg	2		2	10		2	2	2	2	2	2	2	2	2	2		
Total Phenols	mg/kg	0.3	280	0.3	10		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
Asbestos	Type	If present	Detected				NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	N/T	N/T
Asbestos % (if present)	%	0.001																
Benzene	mg/kg	0.1	0.087															
Toluene	mg/kg	0.1	130															
Ethylbenzene	mg/kg	0.1	47															
M-Xylene	mg/kg	0.1	59															
P-Xylene	mg/kg	0.1	56															
O-Xylene	mg/kg	0.1	60															

Consolidated Soil Results - Residential with Homegrown Produce

Site: Trenchard Circle, Upper Heyford
Project Reference: 163408
Client: Conlon
Strata: ALL Strata
Notes:

KEY
Exceedance of SGV
Below Limit of Detection

Determinant	Units	LOD	SGV	Max	Number	No. Exceedances	Sample Location	TP10	TP11	TP12	TP13	TP14	TP15	TP16	TP17	TP18	TP18	TP29	TP37
							Sample Ref	374004	374005	374006	374007	374008	374009	374010	374011	374012	374013	374543	374547
							Depth (top)	0.60	1.80	1.00	1.00	1.00	1.00	1.80	1.50	0	0.90	1.30	0.60
							Depth (bottom)									0.10			
							Lab Report	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26968	16-26968
							Sample Date	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	3/11/16	3/11/16
							Originator	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe
							Strata												
pH	pH unit	0.1	6 to 9	8.8	10														
Boron (Hot Water Soluble)	mg/kg	0.4	290	1.1	10														
Cyanide (Total)	mg/kg	0.5	20	1.6	10														
Sulphide (Easily Liberatable)	mg/kg	0.5		9.8	10														
Arsenic	mg/kg	1	37	30	10														
Cadmium	mg/kg	0.1	11	0.25	10														
Chromium	mg/kg	1	910	36	10														
Copper	mg/kg	0.5	2400	9	10														
Mercury	mg/kg	0.1	1.2	0.19	10														
Nickel	mg/kg	0.5	180	22	10														
Lead	mg/kg	0.5	200	60	10														
Selenium	mg/kg	0.2	250	0.68	10														
Vanadium	mg/kg	5	410	63	10														
Zinc	mg/kg	0.5	3700	54	10														
Chromium (Hexavalent)	mg/kg	0.5	6	0.5	10														
Total Organic Carbon	%	0.2	3	5.1	10	3													
Aliphatic TPH >C5-C6	mg/kg	0.1	42	1	24			1	1	1	1	1	1	1	1	1	1	1	1
Aliphatic TPH >C6-C8	mg/kg	0.1	100	390	24	1		1	1	1	1	1	1	1	1	**390**	1	1	1
Aliphatic TPH >C8-C10	mg/kg	0.1	27	2100	24	4		**75**	1	13	4.3	1	1	1	1	**2100**	**35**	**81**	1
Aliphatic TPH >C10-C12	mg/kg	1	130	8600	24	3		**570**	*1*	68	2.4	*1*	*1*	*1*	*1*	**8600**	98	**920**	*1*
Aliphatic TPH >C12-C16	mg/kg	1	1100	47000	24	3		**2400**	*1*	320	34	*1*	*1*	*1*	*1*	**47000**	360	**4800**	*1*
Aliphatic TPH >C16-C21	mg/kg	1	65000	34000	24			2500	*1*	260	35	*1*	*1*	*1*	*1*	34000	260	3800	*1*
Aliphatic TPH >C21-C35	mg/kg	1	65000	14000	24			110	*1*	69	49	*1*	*1*	*1*	*1*	14000	110	470	*1*
Aliphatic TPH >C35-C44	mg/kg	1	65000	1	24			*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Total Aliphatic Hydrocarbons	mg/kg	5		110000	24			5600	*5*	730	120	*5*	*5*	*5*	*5*	110000	870	10000	*5*
Aromatic TPH >C5-C7	mg/kg	0.1	70	1	24			1	1	1	1	1	1	1	1	1	1	1	1
Aromatic TPH >C7-C8	mg/kg	0.1	130	1	24			1	1	1	1	1	1	1	1	1	1	1	1
Aromatic TPH >C8-C10	mg/kg	0.1	34	77	24	2		1.1	1	1	1	1	1	1	1	77	4.2	71	1
Aromatic TPH >C10-C12	mg/kg	1	74	2100	24	3		180	*1*	13	*1*	*1*	*1*	*1*	*1*	2100	27	430	*1*
Aromatic TPH >C12-C16	mg/kg	1	140	15000	24	3		1300	*1*	89	3.9	*1*	*1*	*1*	*1*	15000	120	940	*1*
Aromatic TPH >C16-C21	mg/kg	1	260	11000	24	3		760	*1*	82	*1*	*1*	*1*	*1*	*1*	11000	63	360	*1*
Aromatic TPH >C21-C35	mg/kg	1	1100	3700	24	1		97	*1*	34	4.5	*1*	*1*	*1*	*1*	3700	42	30	*1*
Aromatic TPH >C35-C44	mg/kg	1	1100	1	24			*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Total Aromatic Hydrocarbons	mg/kg	5		31000	24			2300	*5*	220	8.4	*5*	*5*	*5*	*5*	31000	250	1800	*5*
TPH C6-C10	mg/kg	1																	
TPH C10-C21	mg/kg	1																	
TPH C21-C40	mg/kg	1																	
Total Petroleum Hydrocarbons	mg/kg	10		140000	24			7900	*10*	950	130	*10*	*10*	*10*	*10*	140000	1100	12000	*10*
Naphthalene	mg/kg	0.1	2.3	0.1	10														

Consolidated Soil Results - Residential with Homegrown Produce

Site: Trenchard Circle, Upper Heyford
Project Reference: 163408
Client: Conlon
Strata: ALL Strata
Notes:

KEY
Exceedance of SGV
Below Limit of Detection

Determinant	Units	LOD	SGV	Max	Number	No. Exceedances	TP10	TP11	TP12	TP13	TP14	TP15	TP16	TP17	TP18	TP18	TP29	TP37
Sample Location																		
Sample Ref							374004	374005	374006	374007	374008	374009	374010	374011	374012	374013	374543	374547
Depth (top)							0.60	1.80	1.00	1.00	1.00	1.00	1.80	1.50	0	0.90	1.30	0.60
Depth (bottom)															0.10			
Lab Report							16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26771	16-26968	16-26968
Sample Date							1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	1/11/16	3/11/16	3/11/16
Originator							AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe	AAe
Strata																		
Acenaphthylene	mg/kg	0.1	170	0.1	10													
Acenaphthene	mg/kg	0.1	210	0.1	10													
Fluorene	mg/kg	0.1	170	0.1	10													
Phenanthrene	mg/kg	0.1	95	0.1	10													
Anthracene	mg/kg	0.1	2400	0.1	10													
Fluoranthene	mg/kg	0.1	280	0.1	10													
Pyrene	mg/kg	0.1	620	0.1	10													
Benzo[a]anthracene	mg/kg	0.1	7.2	0.1	10													
Chrysene	mg/kg	0.1	15	0.1	10													
Benzo[b]fluoranthene	mg/kg	0.1	2.6	0.1	10													
Benzo[k]fluoranthene	mg/kg	0.1	77	0.1	10													
Benzo[a]pyrene	mg/kg	0.1	2.2	0.1	10													
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.1	27	0.1	10													
Dibenz(a,h)Anthracene	mg/kg	0.1	0.24	0.1	10													
Benzo[g,h,i]perylene	mg/kg	0.1	320	0.1	10													
Total Of 16 PAH's	mg/kg	2		2	10													
Total Phenols	mg/kg	0.3	280	0.3	10													
Asbestos	Type	If present	Detected				N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T
Asbestos % (if present)	%	0.001																
Benzene	mg/kg	0.1	0.087															
Toluene	mg/kg	0.1	130															
Ethylbenzene	mg/kg	0.1	47															
M-Xylene	mg/kg	0.1	59															
P-Xylene	mg/kg	0.1	56															
O-Xylene	mg/kg	0.1	60															

Appendix H
Tier 1 Soil Guidance Values

AA Environmental Limited – Tier 1 Soil Guidance Values

The following table presents the AA Environmental Tier 1 Soil Guidance Values (SGVs) Revision 002 based on LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment (unless stated otherwise).

	Land-Use Scenario					
Determinant	**Residential with Homegrown Produce**	**Residential without Homegrown Produce**	**Public Open Space (POS) Residential**	**Public Open Space (POS) Park**	**Allotment**	**Commercial and Industrial**
Metals and Metalloids						
Arsenic	37	40	79	170	43	640
Boron	290	11000	21000	46000	45	240000
Cadmium	11	85	120	532	1.9	190
Chromium (Hexavalent)	6	6	7.7	220	1.8	33
Chromium	910	910	1500	33000	18000	8600
Copper	2400	7100	12000	44000	520	68000
Lead (C4SL Criteria)	200	310	630	1300	80	2330
Elemental Mercury	1.2	1.2	16	30	21	58
Inorganic Mercury	40	56	120	240	19	1100
Nickel	180	180	230	3400	230	980
Selenium	250	430	1100	1800	88	12000
Vanadium	410	1200	2000	5000	91	9000
Zinc	3700	40000	81000	170000	620	730000
Other Inorganics						
pH	6-9 Units					
Asbestos	If Detected					
Cyanide (Dutch Intervention Value)	20	20	20	20	20	-
Phenol (based on 1% SOM)						
Phenol (Total)	280	750	760	760	66	760
Total Petroleum Hydrocarbons (TPH) (based on 1% SOM)						
Aliphatic (5-6)	42	42	570000	95000	730	3200
Aliphatic (6-8)	100	100	600000	150000	2300	7800
Aliphatic (8-10)	27	27	13000	14000	320	2000
Aliphatic (10-12)	130	130	13000	21000	2200	9700
Aliphatic (12-16)	1100	1100	13000	25000	11000	59000
Aliphatic (16-35)	65000	65000	250000	450000	260000	1600000
Aliphatic (35-44)	65000	65000	250000	450000	260000	1600000
Aromatic (5-7 benzene)*	0.087(70)	0.38(370)	72(56000)	90(76000)	0.017(13)	27(26000)
Aromatic (7-8 toluene)	130	860	56000	87000	22	56000
Aromatic (8-10)	34	47	5000	7200	8.6	3500
Aromatic (10-12)	74	250	5000	9200	13	16000
Aromatic (12-16)	140	1800	5100	10000	23	36000
Aromatic (16-21)	260	1900	3800	7600	46	28000
Aromatic (21-35)	1100	1900	3800	7800	370	28000
Aromatic (35-44)	1100	1900	3800	7800	370	28000
BTEX (based on 1% SOM)						
Benzene	0.087	0.38	72	90	0.017	27
Toluene	130	880	56000	87000	22	56000
Ethylbenzene	47	83	24000	17000	16	5700
m-Xylene	59	82	41000	17000	31	6200
p-Xylene	56	79	41000	17000	29	5900
o-Xylene	60	88	41000	17000	28	6600

All values in mg/kg unless stated otherwise
* Benzene values to be used as a conservative screen for TPH Aromatic C5-C7 range hydrocarbons if Speciated BTEX results are not available. If Speciated BTEX are available then TPH Aromatic C5-C7 screening value in () can be adopted.

AA Environmental Limited – Tier 1 Soil Guidance Values (Cont.)

	Land-Use Scenario					
Determinant	**Residential with Homegrown Produce**	**Residential without Homegrown Produce**	**Public Open Space (POS) Residential**	**Public Open Space (POS) Park**	**Allotment**	**Commercial and Industrial**
Polycyclic Aromatic Hydrocarbons (PAH) (based on 1% SOM)						
Naphthalene	2.3	2.3	4900	1200	4.1	190
Acenaphthene	210	3000	15000	29000	34	84000
Acenapthylene	170	2900	15000	29000	28	83000
Fluorene	170	2800	9900	20000	27	63000
Anthracene	2400	31000	74000	150000	380	520000
Fluoranthene	280	1500	3100	6300	52	23000
Phenanthrene	95	1300	3100	6200	15	22000
Pyrene	620	3700	7400	15000	110	54000
Benzo(a)anthracene	7.2	11	29	49	2.9	170
Chrysene	15	30	57	93	4.1	350
Benzo(b)fluoranthene	2.6	3.9	7.1	13	0.99	44
Benzo(k)fluoranthene	77	110	190	370	37	1200
Benzo(ghi)perylene	320	360	640	1400	290	3900
Benzo(a)pyrene	2.2	3.2	5.7	11	0.97	35
Dibenzo(ah)anthracene	0.24	0.31	0.57	1.1	0.14	3.5
Indeno(123-cd)pyrene	27	45	82	150	9.5	500

All values in mg/kg unless stated otherwise

References

LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment – Land Quality Management Limited (LQM) and Chartered Institute of Environmental Health (CIEH) Land Quality Press (2015)

SP1010: Development of Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination - Department for Environment, Food and Rural Affairs (2014)

Dutch Target and Intervention Values (the New Dutch List) (2000)

Descriptions of Public Open Space (POS): Section 1.4.2 of The LQM S4UL for Human Health Assessment

POS Residential: Includes the predominantly grassed areas adjacent to high density housing, the central green area on many 1930s-1970s housing estates, and smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is assumed that the close proximity to the place of residence will allow tracking back of soil to occur.

POS Park: An area of open space, usually owned and maintained by the Local Authority, provided for recreational uses including family visits and picnics, children's play area, informal sporting activities such as football (but not a dedicated sports pitch), and dog walking. It is assumed that tracking back of soils into the place of residence will be negligible.

SOM – Soil Organic Matter

Soil Guidance Values for Organics are presented as the most-conservative values based on 1.0% SOM. In the event of exceedance, the actual SOM content of the sample(s) should be reviewed to determine if a higher value based on 2.5% or 6.0% can be adopted.

Appendix B
AAe Remedial Strategy

REMEDIAL STRATEGY:
Residential Development

Document Ref: 173042/RS/001

Report for:
Dorchester Living
Heyford Park House
Heyford Park, Camp Road,
Upper Heyford
OX25 5HD

1. INTRODUCTION

1.1 Overview

AA Environmental Limited (AAe) has been appointed by Agetur UK Limited on behalf of Dorchester Living to assist with management of environmental risks associated with the redevelopment of land at Trenchard Circle, Upper Heyford. The site location is presented on Figure 1.

The site was subject to a ground investigation by AAe in November 2016, with the findings presented in the Phase 2 Environmental Risk Assessment (ERA) – AAe December 2016 (ref: 163408/ERA/001). The ground investigation and laboratory analysis identified residual Total Petroleum Hydrocarbon (TPH) contamination in the soils and groundwater at the site, primarily on the north of the site and surrounding disused below-ground heating oil pipes. The 2016 site investigation plan is presented on Figure 2. The report and Conceptual Site Model (CSM) identified medium and high risks for the redevelopment, as summarised in Table 1.1.

Table 1.1 Summary of 2016 CSM for site

Hazard Source	Pathway	Receptor and impact / effect	Risk Classification Discussion and Mitigation
Residual TPH contamination present in soil and groundwater.	Dermal contact, ingestion contaminated soils and inhalation of fugitive dusts.	Carcinogenic, toxic or hazardous to human health (on-site users).	**Significant Pollution Linkage (SPL) 1.** The site investigation and chemical analysis has identified hotspots of elevated TPH in shallow soils and surrounding pipework which exceed the Tier 1 Soil Guidance Values (SGVs) for the proposed land use scenario. Without remediation or mitigation there is a possible severe pollution linkage. The risk level is High.
	Inhalation of VOC and vapour contamination migrating through soil into enclosed structures. Ground gas (on-site)	Toxic and Carcinogenic to human health (on-site users).	**SPL 2.** The investigation has identified hotspots of hydrocarbon contamination in shallow soils and surrounding former oil pipes, with maximum recorded PID value of 232.4 ppm and maximum TPH Total concentration of 140,000 mg/kg. It is possible that ground gases and vapours could pose a risk to future site users and the overall risk is assessed to be High without control.
	Off-site migration of hydrocarbons and leaching of residual contamination in soil and groundwater. Migration of VOC vapour and ingress into enclosed structures.	Carcinogenic, toxic or hazardous to human health (off-site users).	**SPL 3.** The investigation indicates that the areas of hydrocarbon contamination are localised to soils and perched water surrounding the pipework and connections into the former properties; however, the extent and magnitude of impact on groundwater in the underlying aquifer on the north of the site is not fully known. Elevated VOC vapour levels are recorded in the soils underlying the site. The nearest residential properties are located immediately east and west of the site. The site is unsurfaced which does not restrict infiltration and the investigation has recorded some shallow groundwater which could potentially mobilise residual contaminants. The risk to adjacent land users is assessed to be Medium without control.

Table 1.1 Summary of 2016 CSM for site			
Hazard Source	**Pathway**	**Receptor and impact / effect**	**Risk Classification Discussion and Mitigation**
	Off-site migration of hydrocarbons and leaching of residual contamination in soil and groundwater	Pollution to Controlled Waters (ground and surface)	**SPL 4.** The site investigation and chemical analysis has identified some significant elevations of TPH in soils and groundwater surrounding oil pipework and connections into former properties and within the upper limestone. Some free-phase hydrocarbons were observed in perched water surrounding manhole structures. Chemical analysis of water samples recorded elevations of TPH above DWS and WHO guidance values. It cannot be fully determined whether contaminated groundwater encountered within limestone was part of the underlying bedrock aquifer and the extent and magnitude of impact on groundwater in the underlying aquifer on the north of the site is not fully known. The risk to controlled waters is assessed to be High without further assessment and control.
	Dermal contact, ingestion contaminated soils and inhalation of fugitive dusts.	Carcinogenic, toxic or hazardous to human health (construction workers).	**SPL 5.** During the construction phase, excavation of the underlying strata for groundworks and to create foundations for the proposed development could create a potential linkage between construction workers and any residual contamination; therefore, the risk is deemed High without control and mitigation.
	Uptake in roots	Damage to plant growth	The site investigation and chemical analysis have not recorded any known phytotoxic contaminants within the Made Ground or Natural Strata underlying the site; therefore, the risk to planting and landscaping is assessed to be Low without control and mitigation. Some hotspots of residual hydrocarbon contamination have been recorded however it is proposed that these are excavated/remediated for the protection of human health and surrounding receptors, which will provide a suitable growing matrix for introduced plants (as determined by the Designer and Landscape Architect).
	Contact with aggressive soil and water conditions	Degradation of plastic services and structures.	**SPL 6.** Hydrocarbons in soil can cause deterioration in the quality of potable water services. The use of inappropriate products may cause a risk of pollution of the potable water supply. Hydrocarbons can also potentially pose aggressive soil conditions to structures and concrete. The site investigation and chemical analysis has recorded some significant elevations of TPH in the residual soils. The risk level is assessed as High without control.

1.2 Planning Status

Planning permission (16/00196/F) was granted by Cherwell District Council on the 9th March 2016 for the demolition of the former residential units, and construction of 13 new dwellings with private gardens and associated car parking. The approved site layout and a copy of the planning Decision Notice are presented in Appendix A. Condition 10 of the permission addresses contaminated land, as specified below:

If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted a remediation strategy to the local planning authority detailing how this unsuspected contamination shall be dealt with and obtained written approval from the local planning authority. The remediation strategy shall be implemented as approved.

Reason National Planning Policy Framework (NPPF) paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by

unacceptable levels of water pollution. Government policy also states that planning policies and decisions should ensure that adequate site investigation information, prepared by a competent person, is presented (NPPF, paragraph 121).

1.3 Scope and Limitations

This Remedial Strategy details the remedial steps and further works that will be undertaken to ensure human health, the structures on site and wider environment are suitably protected. This plan should be read in conjunction with 2016 Phase 2 ERA Report. For simplicity this report does not re-present the detail within the 2016 report, but provides an overview of the findings and chemical results.

It should be recognised that geo-environmental assessments place a significant emphasis on the results of chemical analysis, which have been sampled and managed according to established protocols. Whilst the work has been completed in line with industry guidance and quality requirements, it is possible that the ground investigation and assessment carried out does not identify, or fully determine, the extent of conditions beneath the site and the existence of other important contamination sources. The advice given in this report with respect to contamination is based on published guidelines available at the time of writing.

2. BACKGROUND INFORMATION

A full review of the site history and baseline environmental setting is presented with the AAe Phase 2 ERA Report (December 2016 163408/ERA/001).

2.1 Topography

The site lies at approximately 123 m Above Ordnance Datum (AOD). The site is generally flat, with a slight gradient from north to south.

2.2 Geology and Hydrogeology

Reference to BGS maps for the region indicates that the site is underlain by a Bedrock of Limestone (Great Oolite Group comprised of Limestone and argillaceous rocks (interbedded) from the Jurassic Period). There are no Superficial Deposits recorded at the site.

The Bedrock is classified by the Environment Agency as a 'Principal Aquifer'. These are defined as '*…layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer*.' It is considered likely that groundwater is present beneath the site.

There are no water abstractions on the site. The nearest registered water abstraction is located approximately 1100 m south-east of the site. There are no Groundwater Source Protection Zones (GSPZ) located on or within 1 km of the site.

2.3 Ground Investigation and Recorded Contamination

The geology encountered in the 2016 investigation was generally consistent, comprising Made Ground (up to 1.0 m BGL in thickness), over sandy gravelly clay (weathered Limestone), over fractured Limestone bedrock (at <2.0 m BGL).

Groundwater ingress was encountered at approximately 1.80 m in TP02 on the north of the site. The water was observed to have a hydrocarbon odour and sheen. What appeared to be perched groundwater was encountered around the pipes and manholes to the rear of the former properties. Some free-phase oils were observed on the perched water surrounding these features. It is not known whether the groundwater encountered in TP02 was perched or in connectivity with the aquifer in the limestone strata.

Within Trial Pit TP02 visual staining and a hydrocarbon odour (PID 4.4 ppm) was observed within the limestone at 1.80-2.00 m BGL. Following the identification of the suspected hydrocarbons, additional verification Trial Pits (TP08-TP37) were then excavated to attempt to identify potential sources (pipework) and determine the extent of impacted soils. Maximum recorded PID levels were 232.4 ppm (parts per million) and free-phase hydrocarbons observed, as presented in Table 2.1.

Table 2.1 Visual evidence of contamination during 2016 investigation

Location	PID Result (Depth – m BGL))	Observations
TP08	0.6 ppm (2.00 m)	Minor hydrocarbon odour.
TP09	31.1 ppm (1.10 m)	Hydrocarbon odour.
TP10	52.5 ppm (0.60 m)	Oil pipes at 0.5 m, surrounded by staining and odour.
TP11	0.3 ppm (1.80 m)	Minor hydrocarbon odour.
TP12	91.4 ppm (1.00 m)	Stained gravels 0.8-1.2 m.
TP13	4.6 ppm (1.00 m)	Minor hydrocarbon odour.
TP14	0.2 ppm (1.00 m)	No visual or olfactory evidence of hydrocarbons.
TP15	0.0 ppm (1.00 m)	No visual or olfactory evidence of hydrocarbons.
TP16	0.2 ppm (1.80 m)	No visual or olfactory evidence of hydrocarbons.
TP17	0.0 ppm (1.50 m)	No visual or olfactory evidence of hydrocarbons.
TP18	71.4 ppm (0-0.10 m) 132.3 ppm (0.90 m)	Staining at surface. Oil pipes at 0.9 m, surrounded by staining and odour.
TP19	6.2 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP20	2.4 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP21	3.3 ppm (0.80 m)	Excavation though old manhole. Perched water with free-phase oils – PID reading ambient level immediately above water surface.
TP22	69.5 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP23	28.4 ppm (1.10 m)	Hydrocarbon odour.
TP24	n/t	Perched water encountered at 0.90 m surrounding pipes, with some free-phase hydrocarbons.
TP25	24.7 ppm (0.90 m)	Oil pipes at 0.9 m, surrounded by staining and odour.
TP26	1.7 ppm (1.60 m)	No visual or olfactory evidence of hydrocarbons.
TP27	0.2 ppm (1.50 m)	No visual or olfactory evidence of hydrocarbons.
TP28	n/t	Pipes and perched water encountered at 1.10 m, some free-phase hydrocarbons on water.
TP29	232.4 ppm (1.30 m)	Pipes at 0.90 m. Stained soils next to manhole.
TP30	n/t	Pipes at 1.20 m
TP31	n/t	Pipes at 1.20 m
TP32	12.6 ppm (1.50 m)	Pipes at 1.20 m
TP33	40.2 ppm (1.30 m)	Pipes at 1.30 m
TP34	4.1 ppm (1.30 m)	Pipes at 1.30 m
TP35	n/t	Pipes at 1.30 m
TP36	n/t	Pipes at 1.30 m
TP37	0.0 ppm (0.60 m)	Adjacent to former tank base. No visual or olfactory contamination.

2.3.1 Human Health

The investigation and soil testing has recorded maximum TPH soil concentrations of 140,000 mg/kg and some free-phase hydrocarbons around pipework. Elevated soil vapour (VOC) in soils and dissolved-phase hydrocarbons within the water have been recorded. Full test results are presented within the Phase 2 Report.

The soils and groundwater are assessed to pose the following potential risks to human health:

- Dermal contact and ingestion (future users, construction workers)
- Vapour ingress into buildings and inhalation (future users, construction workers)

2.3.2 Controlled Waters

Two water samples were collected from the Trial Pits during the 2016 investigation; TP2 from ingressed groundwater within the upper limestone and TP21 from perched water encountered around pipework. The recorded TPH concentrations were 150,000 µg/l and 13000000* µg/l (*some possible free-phase within sample).

The depth to groundwater (Principal Aquifer) beneath the site has not been determined. Without boreholes, it cannot be fully determined whether contaminated groundwater encountered within limestone was part of the underlying bedrock aquifer and the extent and magnitude of impact on groundwater in the underlying aquifer on the north of the site is not fully known.

The soils and groundwater are assessed to pose the following potential risks to Controlled Waters:

- Pollution of Principal Aquifer and groundwater/surface waters through leaching and migration.

A Detailed Quantitative Risk Assessment (DQRA) is required to assess risks to Controlled Waters and derive acceptable remedial target values.

2.3.3 Built Environment
The hydrocarbons within the soil profile pose a risk to services within the ground, notably potable water pipes. The levels of hydrocarbons contamination within the soil profile exceed accepted industry guidelines.

3. REMEDIAL WORKS

3.1 Overview of proposed development and constraints

The proposed development is shown on plans presented in Appendix A. The proposed development includes 13 new dwellings with private gardens and associated car parking. The properties will be surrounded by a combination of hardstanding (roadways and paths) and permeable soft landscaping (gardens and amenity areas).

3.2 Proposed Remedial Measures

3.2.1 SPL 1 - Human Health (dermal contact and ingestion)

A clean-cover system may need to be incorporated into the proposed design to protect future users from any residual contaminants, subject to validation testing and remedial works. The investigation has recorded Tier 1 SGV exceedances of hydrocarbons within the soils surrounding pipes and hotspot on the north of the site. There are no further identified contamination remedial drivers necessitating clean soils in the garden areas. It is proposed that the contaminated soils will be excavated and replaced with acceptable fill materials. The impacted soils will either be treated through biopiling or transferred off site for treatment. All former oil pipework will be removed and surrounding impacted soils segregated and excavated (refer to section 3.2.3). If validation testing can demonstrate complete removal of the hydrocarbons to below 600 mm, no cover system will be required within areas of soft landscaping.

In the event that unacceptable contaminants remain within the upper 600 mm, all residual soils would need to be capped by buildings, hardstanding or acceptable clean imported soils over a geotextile demarcation layer.

All soils (site derived or imported) within the upper 600 mm of private residential gardens will need to comply with the Soil Guidance Values presented in Appendix B (Residential with homegrown produce specification). Within shared amenity areas the clean capping thickness will need to be at least 250 mm.

3.2.2 SPL 2 - Human Health (inhalation of volatile organics and ground gas)

It is proposed that the contaminated soils will be excavated and replaced with acceptable fill materials. This will remove the principal source of hydrocarbon vapour within the soils; however, any residual contaminated soil or groundwater could pose a source of vapour. Following remedial excavation works, verification testing of the residual soils and groundwater will be undertaken to determine the requirement for the installation of a VOC hydrocarbon vapour resistant membrane within the floorslabs of the properties. Soils and groundwater

results will be assessed against the specification presented in Appendix B (Residential with homegrown produce specification – for soils and Water Screening Values (WSVs) for groundwater). If these values are exceeded then the properties will be installed with a VOC hydrocarbon vapour resistant membrane to supplement the ground gas protection measures presented below. The vapour barrier joints will be overlapped and taped or welded and a construction quality report issued. The barrier design and controlled fitting will prevent ingress of hydrocarbon vapours into the structures.

Subject to agreement with the Local Authority, it is proposed that the precautionary approach of installing full ground gas membranes in the floorslabs will possibly negate the need for a full ground gas risk assessment. It is proposed that the site should be characterised as Gas Characteristic Situation 2 in accordance with BS8485:2015 '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*' and CIRIA C665 '*Assessing risks posed by hazardous ground gases to buildings*'. Protection measures should comply with the requirements of BS8485:2015 and membrane installed and verified accordance with CIRIA C735 '*Good practice on the testing and verification of protection systems for buildings against hazardous ground gases'*.

It is proposed that the following will be installed for the protection of future site users against ground gases and vapours:

- Ground Gas Protection – In line with BS8485:2015 requirements for Gas Characteristic Situation 2 and membrane installed and verified accordance with CIRIA C735.
- Hydrocarbon resistant membrane (subject to post-remediation verification testing of soils and water).

3.2.3 SPL 3 & SPL 4 – Surrounding Receptors (adjacent users and controlled waters)

The ground investigation and chemical analysis has recorded hydrocarbon-impacted soils and some free-phase hydrocarbons surrounding existing pipework which are assessed to pose a source of potential risk to surrounding receptors and controlled waters. It is proposed that the most significantly impacted soils, pipework and free-phase hydrocarbons will be segregated and removed. This will remove the principal source of hydrocarbon contamination at the site. The impacted soils will either be treated through biopiling or transferred off site for treatment. Clean acceptable fill will be used in its place. The removal of hydrocarbon impacted soils and pipework will prevent any potential further leaching from the unsaturated zone which in turn will enhance the natural attenuation.

The remedial earthworks and pipe removal will be supervised and validated by an AAe Consultant. The method of segregation is shown in Table 3.1 and presented on Figure 3.

Table 3.1 Segregation methodology

Technique	Evidence and frequency	Action
Visual impact	Discolouration of soils and free-phase hydrocarbons	Segregation and transfer for biopiling or off site treatment
Olfactory	Strong hydrocarbon odour	
Photo Ionisation Detector (PID) Headspace test (Every horizontal 5 m and 0.5 m vertical of the excavation or trial pit).	PID > 5 ppm	
	PID < 5 ppm, no visual or olfactory signs of impact	Re-use and validation testing.

To further improve the effects of the natural attenuation an Oxygen Release Compound ((ORC) slurry mix) will be mixed within the soils in the saturated zone at the base of the excavation. This will enable oxygen to be slowly released into the plume, increasing microbial activity and reducing hydrocarbon concentrations.

The benefits of reducing the residual contamination at the site and the placement of ORC will be monitored following the completion of the works (see section 3.3).

3.2.4 SPL 5 – Human Health (construction workers)

Test results and remedial completion reports will be provided to the Principal Contractor to ensure suitable Personal Protective Equipment (PPE), Respiratory Protective Equipment (RPE), working controls and risk assessments are adopted for all follow-on groundworks. It should be noted that the presence of unexpected contaminants cannot be fully discounted, and further assessment may be necessary if suspected contamination is recorded during the redevelopment.

3.2.5 SPL 6 - Potable water pipe & structures

The potable water pipe to the new development will be fully replaced with a new supply. The supply will be a 'barrier style' protected pipe, resistant to VOC and hydrocarbon contamination. The pipe will be supplied and fitted in line with quality assured processes. Test results to be provided to Designer and Statutory Undertakers to ensure structures and services are suitably protected from ground conditions.

3.3 Groundwater Monitoring

It is proposed that 6 groundwater monitoring boreholes will be installed by rotary methodology into the limestone aquifer. The proposed locations are presented on Figure 3. The purpose of the boreholes is to:

- Determine depth to groundwater beneath the site;
- Determine groundwater flow direction beneath the site;
- Allow collection of water samples to quantify any residual groundwater contamination beneath the site; and
- Monitor groundwater quality post remedial works.

The findings of the borehole investigation and groundwater monitoring will be presented in a DQRA to assess residual risks to Controlled Waters, determine any further remedial works required and derive acceptable remedial target values.

3.4 Validation

The works on each SPL will be supervised or witnessed by competent personnel and AAe will issue a validation report on completion of the works.

Author: Jack Taylor
Reviewed: Matthew Lawman
Date: 10th February 2017

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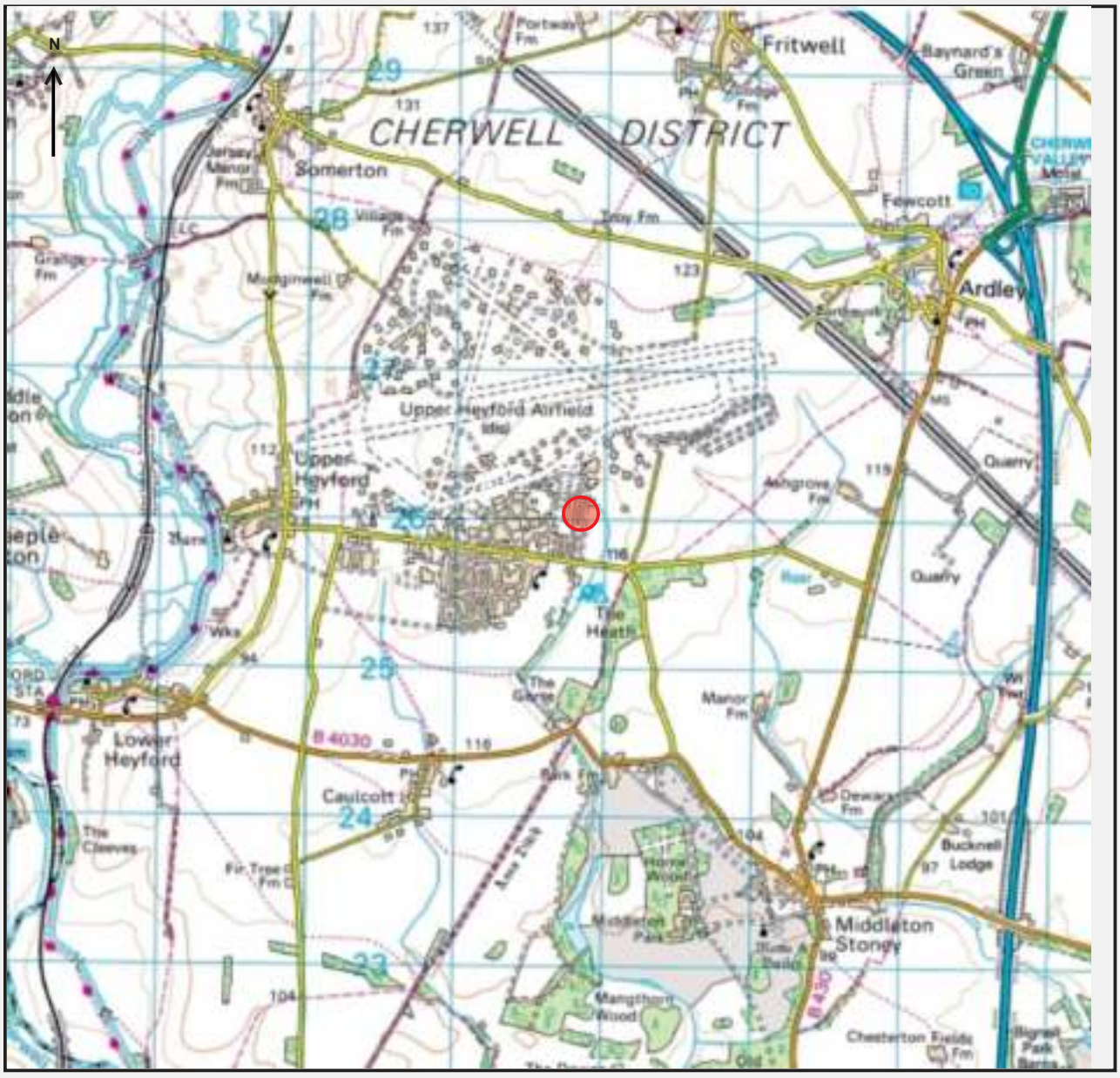
FIGURES



KEY	
Site Location:	**UK Location:**
Explorer™	
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Rev.	Details	Drawn / Chkd.	Date

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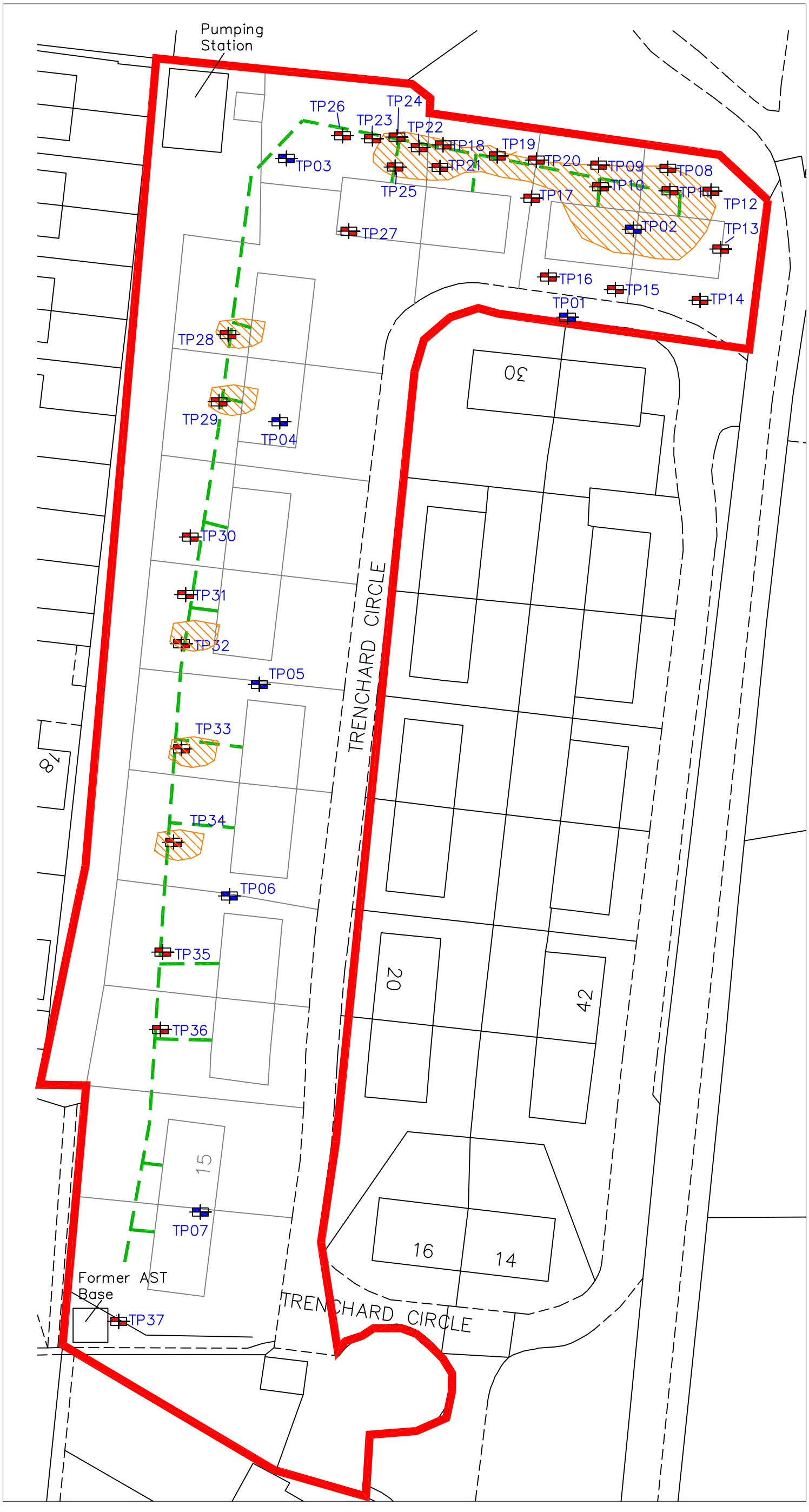
Project
163408
Trenchard Circle
Upper Heyford
OX25 5TB

Title
Site Location Plan

Scale	Date	Drawn	Chkd.	Drg. No.	Rev.
NTS	November' 16	SM	JNT	Figure 1	



KEY

- Site Boundary
- Trial Pits (TP01-07)
- Verification Pits (TP08-37)
- Indicative areas of recorded hydrocarbon contamination
- Indicative position of below-ground oil pipes

Rev.	Details	Drawn / Chkd.	Date

Project

163408
Techard Circle
Upper Heyford

Title

2016 Site Investigation Plan

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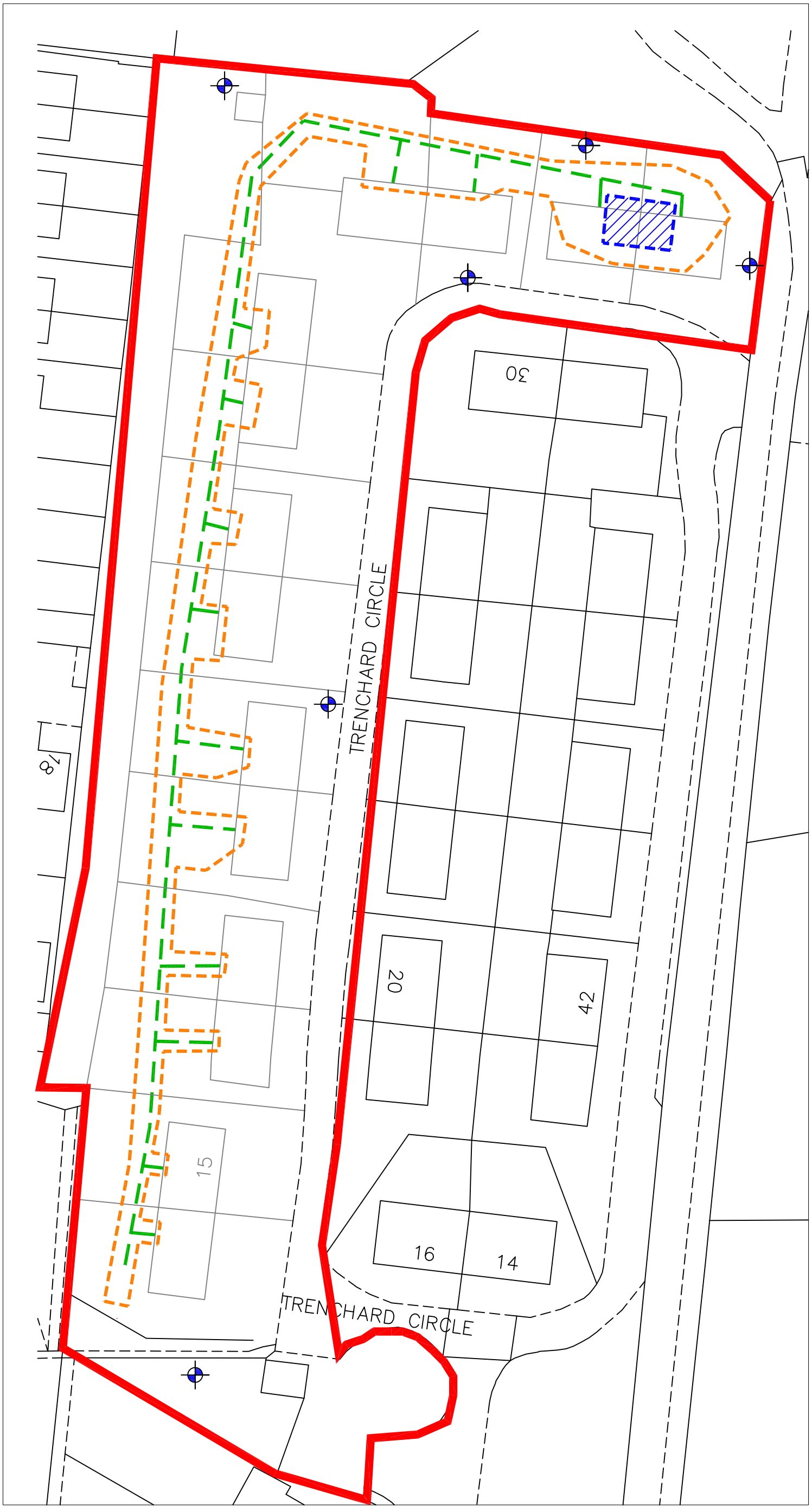
Scale	Date	Drawn	Chkd.	Drg. No.	Rev.
NTS	Nov'16	SM	JNT	Figure 2	



KEY

- Site Boundary
- Indicative position of below-ground oil pipes to be removed.
- Impacted soils around pipework to be segregated and treated/excavated. Validation testing of residual soils.
- ORC Application Area
- Proposed Boreholes - indicative locations to be agreed on site.

Rev.	Details	Drawn / Chkd.	Date

Project

163408
Techard Circle
Upper Heyford

Title

Remedial Plan

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Scale	Date	Drg. No.	Rev.
NTS	Feb'17	Figure 3	

Drawn: SM Chkd.: JNT

APPENDIX A
Planning Documents

Application No.: 16/00196/F

Cherwell
DISTRICT COUNCIL
NORTH OXFORDSHIRE

NOTICE OF DECISION

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

Name and Address of Agent/Applicant:

Heyford Residential Ltd
c/o Pegasus Group
Mr Paul Burrell
Pegasus House
Querns Business Centre
Whitworth Road
Cirencester
Gloucestershire
GL7 1RT

Date Registered: 9th March 2016

Proposal: Demolition of existing bungalows and erection of 13 dwellings with associated car parking and landscaping

Location: 13 - 39 (Odds Numbers Only), Trenchard Circle, Upper Heyford,

Parish(es): Upper Heyford

PERMISSION FOR DEVELOPMENT SUBJECT TO CONDITIONS

The Cherwell District Council, as Local Planning Authority, hereby **GRANTS** planning permission for the development described in the above-mentioned application, the accompanying plans and drawings and any clarifying or amending information **SUBJECT TO THE CONDITIONS SET OUT IN THE ATTACHED SCHEDULE.**

The reason for the imposition of each of the conditions is also set out in the schedule.

Cherwell District Council
Bodicote House
Bodicote
Banbury
Oxon
OX15 4AA

Cherwell District Council
Certified a true copy

Head of Public Protection &
Development Management

Date of Decision: 17 August 2016

Head of Public Protection & Development Management

SCHEDULE OF CONDITIONS

1 Except where otherwise stipulated by condition, the application shall be carried out strictly in accordance with the following documents: Application forms , Planning, Heritage and Design Statement, Aboricultural Impact assessment and Protection Plan, Construction Specification, Parking Matrix, Habitat and Bat Survey and Flooding Risk and Drainage Assessment, and drawings numbered:

Location Plan	0521 TR 101
External Works Layout	0521 TR 104-Rev G
Planning Layout	0521 TR Rev H
Adoption Plan	0521 TR 107 Rev G
Tracking Layout 1 of 2	0521 TR 105 RevF
Tracking Layout 2 of 2	0521 TR 105 Rev B
Materials Layout	0521 TR 108 Rev H
Refuse Plan	0521 TR 111 Ref F
Detailed Planting Proposals 1 of 2	1619 A4 13
Detailed Planting Proposals 2 of 2	1619 A4 21
Housetype booklet	0521 TR HTB Issue 8

Reason - For the avoidance of doubt, to ensure that the development is carried out only as approved by the Local Planning Authority and to comply with Government guidance contained within the National Planning Policy Framework.

2 The development to which this permission relates shall be begun not later than the expiration of three years beginning with the date of this permission.

Reason - To comply with the provisions of Section 91 of the Town and Country Planning Act 1990, as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

3 No materials other than those as shown on plan No. 0521 TR 108 Rev H are to be used in the new development. There shall be no variation of these materials without the prior written consent of the Local Planning Authority. The development shall be carried out in accordance with the approved schedule.

Reason - To ensure the satisfactory appearance of the completed development and to comply with Policy C28 of the adopted Cherwell Local Plan and Government guidance contained within the National Planning Policy Framework.

4 All planting, seeding or turfing comprised in the approved details of landscaping shall be carried out in accordance with BS 4428:1989 Code of Practice for general landscape operations (excluding hard surfaces), or the most up to date and current British Standard, in the first planting and seeding seasons following the occupation of the building(s) or on the completion of the development, whichever is the sooner. Any trees, herbaceous planting and shrubs which, within a period of five years from the completion of the development die, are removed or become seriously damaged or diseased shall be replaced in the current/next planting season with others of similar size and species.

Reason - In the interests of the visual amenities of the area, to ensure the creation of a pleasant environment for the development and to comply with Policy C28 of the adopted Cherwell Local Plan and Government guidance contained within the National Planning Policy Framework.

5 That all enclosures along all boundaries of the site shall be as shown on the approved plans and such means of enclosure shall be erected prior to the occupation of any dwelling.

Reason - To ensure the satisfactory appearance of the completed development, to safeguard the privacy of the occupants of the existing and proposed dwellings and to comply with Policies C28 and C30 of the adopted Cherwell Local Plan.

6 Prior to the first occupation of any of the dwellings hereby approved, all of the estate roads, footpaths (except for the final surfacing thereof) and parking shall be laid out, constructed, lit and drained in accordance with Oxfordshire County Council's 'Conditions and Specifications for the Construction of Roads' and its subsequent amendments.

Reason: In the interests of highway safety, to ensure a satisfactory standard of construction and layout for the development and to comply with Government guidance contained within the National Planning Policy Framework.

7 Prior to first occupation of any dwelling hereby approved, a Travel Information Pack shall be submitted to and approved by the Local Planning Authority. The first residents of each dwelling shall be provided with a copy of the approved Travel Information Pack.

Reason - In the interests of sustainability, to ensure a satisfactory form of development and to comply with Government guidance contained within the National Planning Policy Framework.

8 Prior to the commencement of the development hereby approved, and notwithstanding the application details, full details of refuse, fire tender and pantechnicon turning within the site shall be submitted to and approved in writing by the Local Planning Authority. Thereafter, the development shall be carried out in accordance with the approved details.

Reason - In the interests of highway safety and to comply with Government guidance contained within the National Planning Policy Framework

9 The development permitted by this planning permission shall be carried out in accordance with the approved Flood Risk Assessment (Version 4. Woods Hardwick, April 2016), and the following mitigation measures detailed within the FRA.
o Limiting the surface water run-off generated by the 1 in 100 year critical storm so that it will not exceed the run-off from the developed site and not increase the risk of flooding off-site.
o Permeable Paving extent to be approved by LPA (para 2.5 of FRA).
o The attenuation tanks and filter drains as shown on drawing No.HEYF-5-903 D.
The mitigation measures shall be fully implemented prior to occupation and subsequently in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the local planning authority.
The drainage scheme shall also include for the maintenance and management of SUDS features to be presented in the form of a Site SUDS Management Plan.

Reason - To protect the development and its occupants from the increased risk of flooding and in order to comply with Government guidance contained within the National Planning Policy Framework.

10 If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted a remediation strategy to the local planning authority detailing how this unsuspected contamination shall be dealt with and obtained written approval from the local planning authority. The remediation strategy shall be implemented as approved.

Reason National Planning Policy Framework (NPPF) paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of water pollution. Government policy also states that planning policies and decisions should ensure that adequate site investigation information, prepared by a competent person, is presented (NPPF, paragraph 121).

11 Prior to the first occupation of the development hereby approved, a Landscape and Ecology Management Plan (LEMP) shall be submitted to and approved in writing by the Local Planning Authority. Thereafter, the LEMP shall be carried out in accordance with the approved details.

Reason -To protect habitats of importance to biodiversity conservation from any loss or damage in accordance with Policy C2 of the adopted Cherwell Local Plan and Government guidance contained within the National Planning Policy Framework.

PLANNING NOTES

1 The Advance Payments Code (APC), Sections 219 -225 of the Highways Act, is in force in the county to ensure financial security from the developer to off-set the frontage owners' liability for private street works, typically in the form of a cash deposit or bond. Should a developer wish for a street or estate to remain private then to secure exemption from the APC procedure a 'Private Road Agreement' must be entered into with the County Council to protect the interests of prospective frontage owners. Alternatively the developer may wish to consider adoption of the estate road under Section 38 of the Highways Act.

Prior to commencement of development, a separate consent must be obtained from OCC Road Agreements Team for any highway works under S278 of the Highway Act. Contact: 01865 815700; RoadAgreements@oxfordshire.gov.uk.

2 In accordance with the Town and Country Planning (Development Management Procedure) (England) (Amendment No 2) Order 2012 and paragraphs 186 and 187 of the National Planning Policy Framework (March 2012), this decision has been taken by the Council having worked with the applicant/agent in a positive and proactive way as set out in the application report. Since submission the details have been revised several times as part of a positive engagement between applicant and Local Planning Authority. Layouts have been modified to reflect character, comply with the design code and to create space for more trees and to create an opportunity for more street planting on the main tertiary road. The layout and design closely follows the Design Codes and advice has been given on the plans and house types following formal written pre application advice. On the back of these comments the design has evolved and a number of changes have been made.

STATEMENT OF ENGAGEMENT

In accordance with the Town and Country Planning (Development Management Procedure) (England) Order 2015 and paragraphs 186 and 187 of the National Planning Policy Framework (March 2012), the Council has worked positively and proactively to determine this application within the agreed timescales, having worked with the applicant/agent where necessary and possible within the scope of the application (as set on in the case officer's report) to resolve any concerns that have arisen, in the interests of achieving more appropriate and sustainable development proposals. Consent has been granted accordingly.

The case officer's report and recommendation in respect of this application provides a detailed assessment of the merits of the application when considered against current planning policy and guidance, including consideration of the issues raised by the comments received from consultees and members of the public. This report is available to view online at:

http://www.cherwell.gov.uk/viewplanningapp.

Cherwell
DISTRICT COUNCIL
NORTH OXFORDSHIRE

NOTICE OF DECISION

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

NOTES TO THE APPLICANT

TIME LIMITS FOR APPLICATIONS

By virtue of Sections 91-96 of the Town and Country Planning Act 1990, as amended by Section 51 of the Planning and Compulsory Purchase Act 2004, planning permissions are subject to time limits. If a condition imposing a time limit has been expressly included as part of the permission, then that condition must be observed. Otherwise, one or other of the following time limits will apply:

Where planning permission is given in outline subject to a condition reserving certain matters for subsequent approval, application for approval of such matters reserved must be made not later than the expiration of 3 years beginning with the date of the outline planning permission and further the development to which the permission relates must be begun not later than the expiration of 2 years from the final approval of the reserved matters or, in the case of approval on different dates, the final approval of the last reserved matters to be approved.

Where the planning permission is complete and is not in outline, the development must be begun not later than the expiration of 3 years from the date on which permission was granted.

OTHER NECESSARY CONSENTS

This document only conveys permission or approval for the proposed development under Part III of the Town and Country Planning Act 1990 and you must also comply with all the bye-laws, regulations and statutory provisions in force in the District and secure such other approvals and permissions as may be necessary under other parts of the Town and Country Planning Act 1990 or other legislation.

In particular you are reminded of the following matters:

- The need in appropriate cases to obtain approval under the Building Regulations. **The Building Regulations may be applicable to this proposal. You are therefore advised to contact the District Council's Building Control Manager before starting work on site.**

- The need to obtain an appropriate Order if the proposal involves the stopping up or diversion of a public footpath.

- Data supplied by the National Radiological Protection Board (NRPB) and the British Geological Survey (BGS) suggests that the site of this application falls within an area which is potentially at risk from radon. This may require protective measures in order to comply with the Building Regulations if your consent relates to a new dwelling or house extension. Further advice on whether protective measures are required under the Building Regulations can be obtained by contacting the Building Control Manager on 0300 003 0200, fax 0300 003 0201 or E-mail at building.control@cherwellandsouthnorthants.gov.uk

- The need to obtain a separate "Listed Building Consent" for the demolition, alteration or extension of any listed building of architectural or historic interest from the Local Planning Authority.

- The need to make any appropriate arrangements under the Highways Act in respect of any works within the limits of a public highway. The address of the Highway Authority is Oxfordshire County Council, Speedwell House, Speedwell Street, Oxford, OX1 1NE.

- It is the responsibility of the applicant to ascertain whether his/her development affects any public right of way, highway or listed building.

APPEALS TO THE SECRETARY OF STATE

If you are aggrieved by the decision of the Local Planning Authority to refuse to grant planning permission or grant planning permission subject to conditions, you can appeal to the Secretary of State in accordance with Section 78(1) of the Town and Country Planning Act 1990.

If you wish to appeal then;

- For **Householder** applications you must do so within **12 weeks** of the date of the decision
- For **Minor Commercial** applications you must do so within **12 weeks** of the date of the decision
- For **all other types** of planning applications you must do so within **6 Months** of the date of the decision

Unless;

- The decision on the application relates to the same or substantially the same land and the development is already the **subject of an enforcement notice** then you must appeal within **28 days** of the date of the Local Planning Authority's decision on the planning application.
- If an **enforcement notice is served** relating to the same or substantially the same land and development as in your application and if you want to appeal the decision, then you must do so within **28 days** of the service of the enforcement notice, or 6 months (12 weeks for householder and minor commercial) of the date of this decision which ever is the sooner

Forms can be obtained from the **Planning Inspectorate, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6PN. Tel (0303 444 5000. Or online at www.planningportal.gov.uk/pcs.** The Secretary of State can allow a longer period for giving notice of an appeal, but he will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

The Secretary of State need not consider an appeal if it seems to him that permission or approval for the proposed development could not have been so granted otherwise than subject to the conditions imposed by the Local Planning Authority, having regard to the statutory requirements, to the provisions of the development order and to any directions given under the order.

In practice, the Secretary of State does not refuse to consider appeals solely because the Local Planning Authority based its decision on a direction given by him.

PURCHASE NOTICES

If either the Local Planning Authority or the First Secretary of State grants permission or approval for the development of land subject to conditions, the owner may claim that he/she can neither put the land to a reasonably beneficial use in its existing state nor render the land capable of a reasonably beneficial use by the carrying out of any development which has been or would be permitted.

In these circumstances the owner may serve a purchase notice on the District Council. This notice will require the Council to purchase his/her interest in the land in accordance with the provisions of Part VI of the Town and Country Planning Act 1990.

COMPENSATION

In certain circumstances compensation may be claimed from the Local Planning Authority if permission is granted subject to conditions by the Secretary of State on appeal or on reference of the application to him.

These circumstances are set out in the Town and Country Planning Act 1990 as amended by the Planning and Compensation Act 1991.

TRENCHARD, HEYFORD PARK, UPPER HEYFORD, BICESTER

DORCHESTER GROUP

REVISION/S:

A. 2015-11-11. Proposed adoptable areas revised to be under management company. MED
B. 2015-12-09. Layout and red boundary line amended at client request. DW
C. 2016-01-12. Patio length updated for Type 2, HT6, Type 4A, HT5 housetypes as per client request. SO
D. 2016-01-18. Proposed adoptable areas amended to reflect layout changes. DW
E. 2016-04-16. Layout amended to address LPA comments. MED
F. 2016-05-16. Layout amended to address Urban Design comments. MED
G. 2016-06-27. Number of plots reduced to 13, Red boundary line amended as per Clients request. DW

LEGEND

	APPLICATION BOUNDARY
	HARD LANDSCAPING UNDER MANAGEMENT COMPANY
	SOFT LANDSCAPING UNDER MANAGEMENT COMPANY
	PUMP STATION
	SUB STATION

N

ADOPTION PLAN

SCALE: 1:500 @ A 2 (0 5 10 [m])
DATE: JULY 2015
DRAWN: DJE/SO
DRAWING TITLE: ADOPTION PLAN
DRAWING NO: 0521-TR-107

FOCUS ON DESIGN www.focusdp.com
THE OLD BREWERY, LODWAY, PILL, BRISTOL BS20 0DH
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APPENDIX B
Soil Guidance Values

AA Environmental Limited – Tier 1 Soil Guidance Values

The following table presents the AA Environmental Tier 1 Soil Guidance Values (SGVs) Revision 002 based on LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment (unless stated otherwise).

	Land-Use Scenario					
Determinant	**Residential with Homegrown Produce**	**Residential without Homegrown Produce**	**Public Open Space (POS) Residential**	**Public Open Space (POS) Park**	**Allotment**	**Commercial and Industrial**
Metals and Metalloids						
Arsenic	37	40	79	170	43	640
Boron	290	11000	21000	46000	45	240000
Cadmium	11	85	120	532	1.9	190
Chromium (Hexavalent)	6	6	7.7	220	1.8	33
Chromium	910	910	1500	33000	18000	8600
Copper	2400	7100	12000	44000	520	68000
Lead (C4SL Criteria)	200	310	630	1300	80	2330
Elemental Mercury	1.2	1.2	16	30	21	58
Inorganic Mercury	40	56	120	240	19	1100
Nickel	180	180	230	3400	230	980
Selenium	250	430	1100	1800	88	12000
Vanadium	410	1200	2000	5000	91	9000
Zinc	3700	40000	81000	170000	620	730000
Other Inorganics						
pH	6-9 Units					
Asbestos	If Detected					
Cyanide (Dutch Intervention Value)	20	20	20	20	20	-
Phenol (based on 1% SOM)						
Phenol (Total)	280	750	760	760	66	760
Total Petroleum Hydrocarbons (TPH) (based on 1% SOM)						
Aliphatic (5-6)	42	42	570000	95000	730	3200
Aliphatic (6-8)	100	100	600000	150000	2300	7800
Aliphatic (8-10)	27	27	13000	14000	320	2000
Aliphatic (10-12)	130	130	13000	21000	2200	9700
Aliphatic (12-16)	1100	1100	13000	25000	11000	59000
Aliphatic (16-35)	65000	65000	250000	450000	260000	1600000
Aliphatic (35-44)	65000	65000	250000	450000	260000	1600000
Aromatic (5-7 benzene)*	0.087(70)	0.38(370)	72(56000)	90(76000)	0.017(13)	27(26000)
Aromatic (7-8 toluene)	130	860	56000	87000	22	56000
Aromatic (8-10)	34	47	5000	7200	8.6	3500
Aromatic (10-12)	74	250	5000	9200	13	16000
Aromatic (12-16)	140	1800	5100	10000	23	36000
Aromatic (16-21)	260	1900	3800	7600	46	28000
Aromatic (21-35)	1100	1900	3800	7800	370	28000
Aromatic (35-44)	1100	1900	3800	7800	370	28000
BTEX (based on 1% SOM)						
Benzene	0.087	0.38	72	90	0.017	27
Toluene	130	880	56000	87000	22	56000
Ethylbenzene	47	83	24000	17000	16	5700
m-Xylene	59	82	41000	17000	31	6200
p-Xylene	56	79	41000	17000	29	5900
o-Xylene	60	88	41000	17000	28	6600

All values in mg/kg unless stated otherwise
* Benzene values to be used as a conservative screen for TPH Aromatic C5-C7 range hydrocarbons if Speciated BTEX results are not available. If Speciated BTEX are available then TPH Aromatic C5-C7 screening value in () can be adopted.

AA Environmental Limited – Tier 1 Soil Guidance Values (Cont.)

Determinant	Land-Use Scenario: Residential with Homegrown Produce	Residential without Homegrown Produce	Public Open Space (POS) Residential	Public Open Space (POS) Park	Allotment	Commercial and Industrial
Polycyclic Aromatic Hydrocarbons (PAH) (based on 1% SOM)						
Naphthalene	2.3	2.3	4900	1200	4.1	190
Acenaphthene	210	3000	15000	29000	34	84000
Acenapthylene	170	2900	15000	29000	28	83000
Fluorene	170	2800	9900	20000	27	63000
Anthracene	2400	31000	74000	150000	380	520000
Fluoranthene	280	1500	3100	6300	52	23000
Phenanthrene	95	1300	3100	6200	15	22000
Pyrene	620	3700	7400	15000	110	54000
Benzo(a)anthracene	7.2	11	29	49	2.9	170
Chrysene	15	30	57	93	4.1	350
Benzo(b)fluoranthene	2.6	3.9	7.1	13	0.99	44
Benzo(k)fluoranthene	77	110	190	370	37	1200
Benzo(ghi)perylene	320	360	640	1400	290	3900
Benzo(a)pyrene	2.2	3.2	5.7	11	0.97	35
Dibenzo(ah)anthracene	0.24	0.31	0.57	1.1	0.14	3.5
Indeno(123-cd)pyrene	27	45	82	150	9.5	500

All values in mg/kg unless stated otherwise

References

LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment – Land Quality Management Limited (LQM) and Chartered Institute of Environmental Health (CIEH) Land Quality Press (2015)

SP1010: Development of Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination - Department for Environment, Food and Rural Affairs (2014)

Dutch Target and Intervention Values (the New Dutch List) (2000)

Descriptions of Public Open Space (POS): Section 1.4.2 of The LQM S4UL for Human Health Assessment

POS Residential: Includes the predominantly grassed areas adjacent to high density housing, the central green area on many 1930s-1970s housing estates, and smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is assumed that the close proximity to the place of residence will allow tracking back of soil to occur.

POS Park: An area of open space, usually owned and maintained by the Local Authority, provided for recreational uses including family visits and picnics, children's play area, informal sporting activities such as football (but not a dedicated sports pitch), and dog walking. It is assumed that tracking back of soils into the place of residence will be negligible.

SOM – Soil Organic Matter

Soil Guidance Values for Organics are presented as the most-conservative values based on 1.0% SOM. In the event of exceedance, the actual SOM content of the sample(s) should be reviewed to determine if a higher value based on 2.5% or 6.0% can be adopted.

Author	Atkins
Revision	1
Date	31/03/2011

Title **WSVs derived using CLEA for a Residential land use**

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Name	Residential WSV (mg/L)		Notes
1,1,2-Trichloroethane	2.23	d	
1,1-Dichloroethane	11.4	c	
1,1-Dichloroethene	0.683	b	
1,2,4-Trimethylbenzene	0.110	b	
1,2-Dichloropropane	0.0969	b	
2,4-Dimethylphenol	291	c	
2,4-Dinitrotoluene	3250	a	
2,6-Dinitrotoluene	921	a	
2-Chloronaphthalene	0.695	c	
2-Methylphenol	11000	c	Users must consider total exposure from all methylphenol isomers and not consider them in isolation. In line with the approach published by EIC when assessing total cresols, the lowest WSV of each methylphenol isomer may be chosen to compare to the total methylphenol concentration.
3-Methylphenol	17900	c	Users must consider total exposure from all methylphenol isomers and not consider them in isolation. In line with the approach published by EIC when assessing total cresols, the lowest WSV of each methylphenol isomer may be chosen to compare to the total methylphenol concentration.
4-Methylphenol	12000	c	Users must consider total exposure from all methylphenol isomers and not consider them in isolation. In line with the approach published by EIC when assessing total cresols, the lowest WSV of each methylphenol isomer may be chosen to compare to the total methylphenol concentration.
Biphenyl	64.4	a	
Bis (2-ethylhexyl) phthalate	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the WSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Bromobenzene	0.941	d	
Bromodichloromethane	0.0725	b	
Bromoform	15.9	c	
Butyl benzyl phthalate	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the WSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Chloroethane	41.5	c	
Chloromethane	0.0531	b	
Cis 1,2 Dichloroethene	0.548	b	
Dichloromethane	13.6	d	
Diethyl Phthalate	4340	a	In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the WSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Di-n-butyl phthalate	230	a	In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the WSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.

Author Atkins
Revision 1
Date 31/03/2011

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Name	Residential WSV (mg/L)		Notes
Di-n-octyl phthalate	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the WSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Hexachloroethane	0.0388	d	
Iso-propy benzene	3.89	c	
Methyl tert-butyl ether	352	c	
Propy benzene	12.3	c	
Styrene	38.6	c	
Trans 1,2 Dichloroethene	0.676	b	
Tributyl tin oxide	0.423	c	
Acenaphthene	375	a	
Anthracene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Benzo(a)anthracene	0.0536	a	
Benzo(a)pyrene	0.0638	a	
Benzo(b)fluoranthene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Benzo(g,h,i)perylene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Benzo(k)fluoranthene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Chrysene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Dibenz(ah)anthracene	0.0237	a	
Fluoranthene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Fluorene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Indeno(1,2,3-cd)pyrene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Pyrene	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
Benzene	0.0888	b	
Toluene	96.4	c	
Ethylbenzene	13.4	c	
o-xylene	5.00	c	Based on information in the Environment Agency Xylene SGV report published in March 2009. Users must consider exposure from all xylene isomers and not consider them in isolation. The lowest xylene WSV could be chosen to compare to the sum of xylene concentrations.

Author Atkins
Revision 1
Date 31/03/2011

Title **WSVs derived using CLEA for a Residential land use**

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Name	Residential WSV (mg/L)		Notes
m-xylene	4.10	c	Based on information in the Environment Agency Xylene SGV report published in March 2009. Users must consider exposure from all xylene isomers and not consider them in isolation. The lowest xylene WSV could be chosen to compare to the sum of xylene concentrations.
p-xylene	4.29	c	Based on information in the Environment Agency Xylene SGV report published in March 2009. Users must consider exposure from all xylene isomers and not consider them in isolation. The lowest xylene WSV could be chosen to compare to the sum of xylene concentrations.
Phenol	1690	d	
Mercury (methyl)	45.5	c	
Mercury (elemental)	0.00463	c	
Naphthalene	0.952	c	
TPH aromatic C5-C7	0.0888	b	Benzene is the only constituent of this fraction (TPHCWG 1997). Based on information within the Environment Agency Benzene SGV report published in March 2009
TPH aromatic C7-C8	96.4	c	Toluene is the only constituent of this fraction (TPHCWG 1997). Based on information within the Environment Agency Toluene SGV report published in March 2009.
TPH aromatic C8-C10	0.985	c	
TPH aromatic C10-C12	3.87	c	
TPH aromatic C12-C16	10.5	a	
TPH aliphatic C5-C6	1.93	c	
TPH aliphatic C6-C8	1.40	c	
TPH aliphatic C8-C10	0.0296	c	
TPH aliphatic C10-C12	0.0228	c	
TPH aliphatic C12-C16	0.00547	a	
1,2-dichloroethane	0.0373	b	
1,1,1-trichloroethane	13.1	c	
1,1,1,2-Tetrachloroethane	1.05	d	
1,1,2,2-Tetrachloroethane	6.89	d	
Carbon tetrachloride	0.0229	b	
Chlorobenzene (mono)	13.7	c	
Tetrachloroethene	1.66	c	
[redacted]	[redacted]	[redacted]	
Vinyl chloride	0.00248	b	
Chloroform/Trichloromethane	3.88	d	
Dinoseb	0.110	d	
Trichloromethylbenzene	0.000690	b	
Nicotine	573	b	
Formaldehyde	21.6	b	
Prochloraz	No WSV	e	The saturation limit has been exceeded in the calculation. At the aqueous solubility limit the hazard quotient for both indoor and outdoor pathways was less than 0.01 and therefore no risk based number is considered appropriate.
2,6-bis(1,1-dimethyl)-4-(1-met	13.2	a	
2,4-Dichloro-o-cresol	1960	a	
Dibromochloromethane	0.394	b	
DDD	7.18	a	

Notes:

a	pathway was considered. If the hazard quotient was greater than 0.01, the hazard quotients were used to calculate a risk based value (not limited by the saturation limit). The calculated indoor and calculated outdoor values have been integrated in line with SNIFFER (2003).
b	Where indoor and outdoor values were presented by RBCA, these have been integrated in line with SNIFFER (2003).
c	Where indoor values were presented by RBCA, and the outdoor values were greater than the saturation limit, the hazard quotient for the outdoor pathway was considered. If the hazard quotient for the outdoor pathway was less than 0.1, the indoor values have

Author	Atkins
Revision	1
Date	31/03/2011

Title **WSVs derived using CLEA for a Residential land use**

PLEASE NOTE

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Name		Residential WSV (mg/L)	Notes
d	Where indoor values were presented by RBCA, and the outdoor values were greater than the saturation limit, the hazard quotient for the outdoor pathway was considered. If the hazard quotient for the outdoor pathway was greater than 0.1 but less than 1, the hazard quotient was used to calculate a risk based value (not limited by the saturation limit). The indoor and calculated outdoor values were integrated in line with SNIFFER (2003).		
e	pathway was considered. The hazard quotient was less than 0.01 and no risk based number is considered appropriate. In this case 'no WSV' is presented.		

Only inhalation exposure pathways are considered as presented within the input parameters.
The potential presence of free product should be assessed to ensure no further risk assessment is required.
TPH >C16 are not considered to be volatile according to TPHCWG. Consequently no WSV have been derived.
All values provided are rounded to 3 significant figures.
In some instances the risk based value may be lower than the laboratory detection limit or the drinking water standard. Please see the Frequently Asked Questions for more advice.

Appendix C

H Fraser Consulting Ltd Controlled Waters Risk Assessment

Controlled Waters Risk Assessment
Trenchard Circle, Upper Heyford

Prepared for: AA Environmental Limited
Units 4 to 8
Cholswell Court
Shippon
Abingdon
Oxfordshire
OX13 6HX

Date: 26/06/2017
Status: Final
Reference: 30181R1

Prepared by: H Fraser Consulting Ltd

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APPENDICES

1 INTRODUCTION

AA Environmental Limited (AAe) has instructed H Fraser Consulting Ltd (HFCL) to provide a controlled waters risk assessment for a site at Trenchard Circle, Upper Heyford.

The site was formerly occupied by residential dwellings, and is scheduled for redevelopment as residential housing. AAe have undertaken site investigations, and have discovered hydrocarbon contamination affecting soil and groundwater, associated with a heating oil supply pipe which serviced the former dwellings.

1.1 Objectives

The objectives of the work proposed here are to develop Assessment Criteria for soil and groundwater that are protective of controlled waters, and may be used as remedial targets. The scope is restricted to assessment of hydrocarbon compounds.

1.2 Scope of work

The following work has been undertaken:

- Review of available information and collation of data to build conceptual model and populate spreadsheet models
- Interpretation of falling head test data to derive hydraulic conductivity values
- Construction of spreadsheet models (remedial targets methodology), and derivation remedial targets for soil and groundwater that are protective of controlled waters, for selected organic species.
- Sensitivity analysis to identify the effects of uncertainty in input parameters
- Reporting, including checking numerical inputs and outputs for accuracy

2 BACKGROUND INFORMATION

Relevant background information is reproduced from AAe's Environmental Risk Assessment Report (AAe, 2016), data supplied by AAe, and other readily available geological and hydrogeological information.

The site is located on the eastern edge of Upper Heyford, approximately 6 km north-west of Bicester. The site occupies an area of approximately 1.2 ha on the southern side of the now disused Upper Heyford Airfield. The site was formerly occupied by 7 pairs of semi-detached properties but currently comprises a vacant plot of land with a pumping station in the northwest corner. An above ground storage tank (AST) was located in the southwest corner of the site. The site lies at approximately 123 m OD, and is generally flat. The site location is shown on Figure 2.1.

There is planning permission for the development of 13 new dwellings with private gardens and car parking on the site.

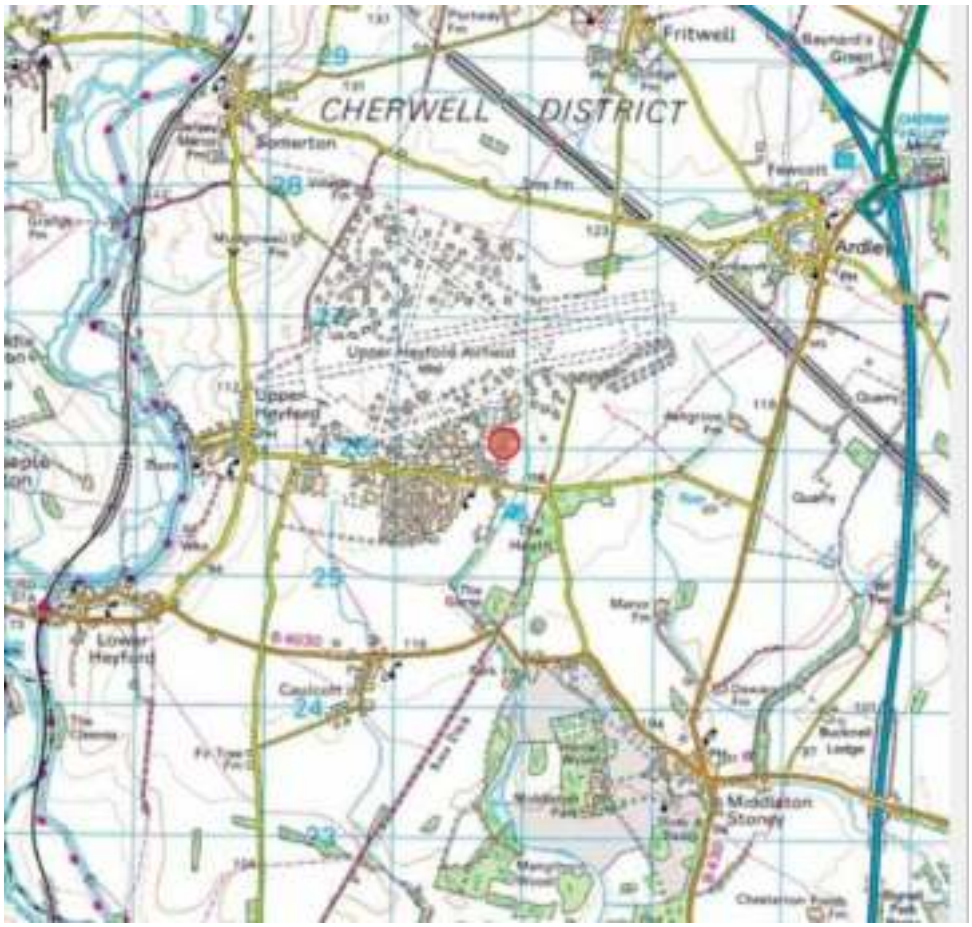

Figure 2.1 Site location

2.1 Site investigations

AAe undertook the following site investigations at the site, as reported in their ERA report:

- trial pitting at 7 locations
- verification trial pitting at 30 locations to delineate pipework and impacted soils
- Soil sampling and testing

- sampling and testing of shallow water seeping into trial pits

Trial pit locations and the location of shallow water samples are shown in Figure 2.2.

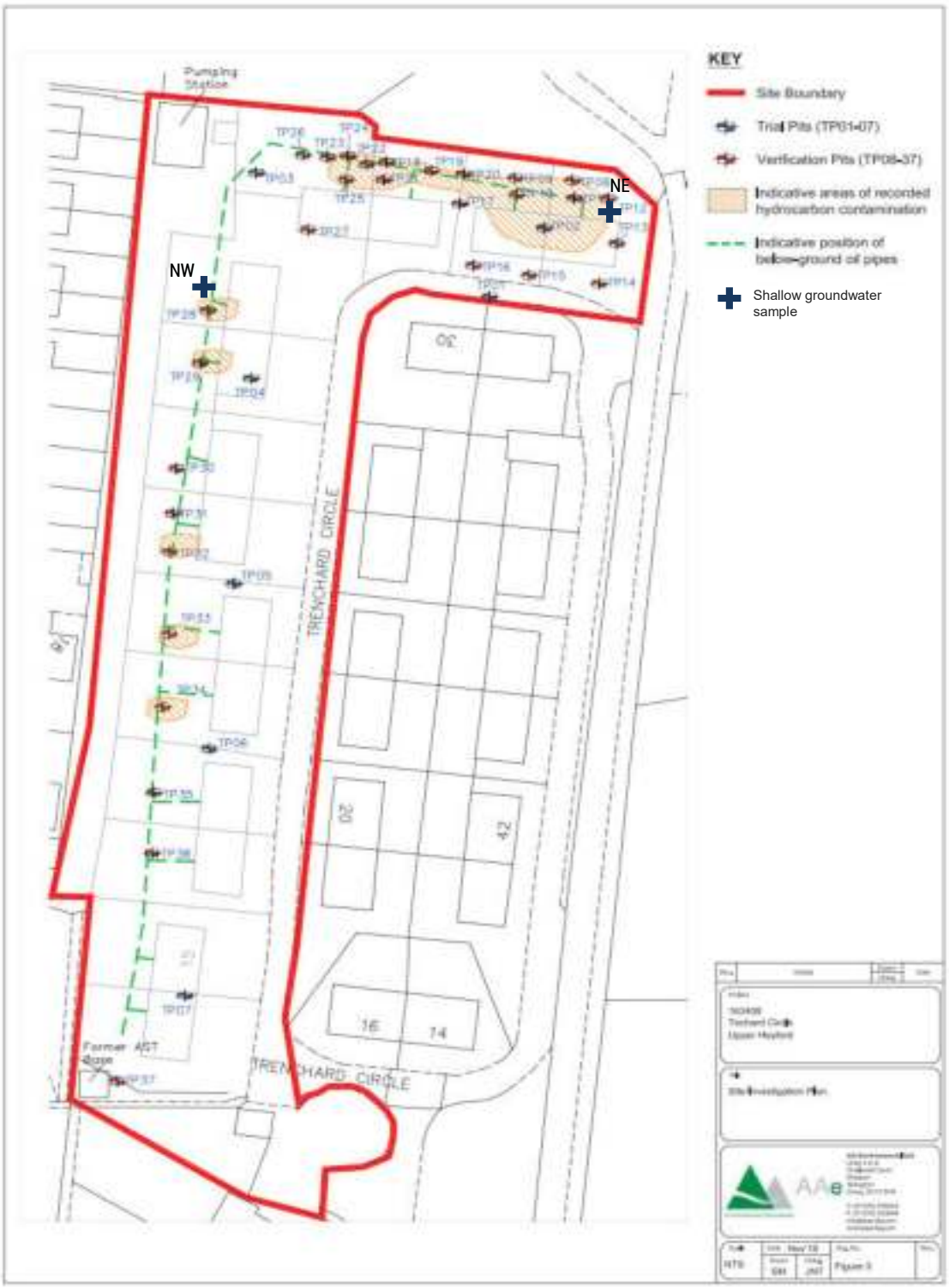

Figure 2.2 Trial pit locations (from AAe, 2016)

Subsequently, six boreholes were drilled at the site, and two rounds of groundwater monitoring and sampling were undertaken. Figure 2.3 shows the borehole locations.

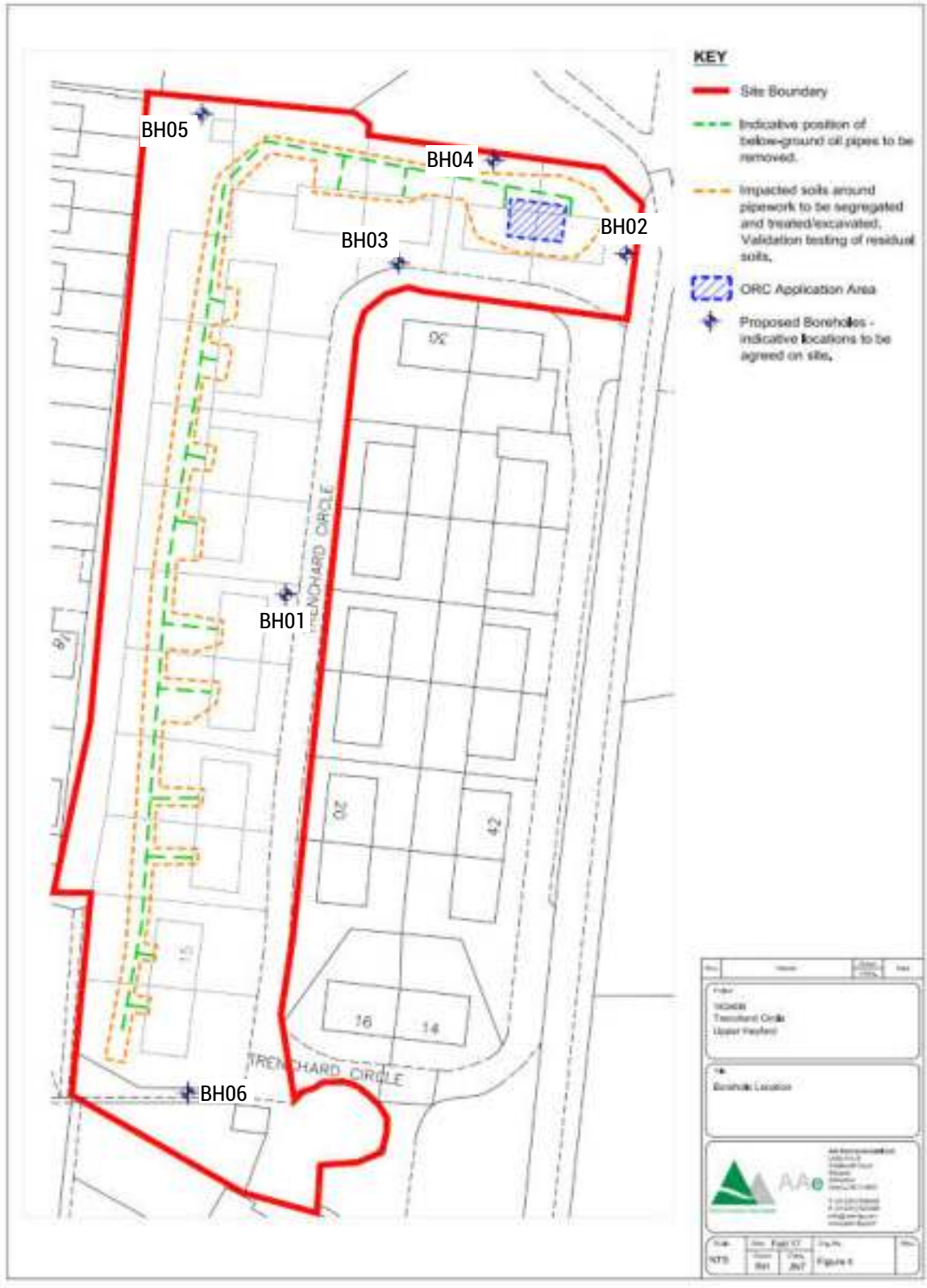

Figure 2.3 Borehole locations (from AAe, 2016)

Trial pit logs and borehole logs are presented in Appendix A.

2.2 Geology

The bedrock geology below the site is the Great Oolite Formation, comprising interbedded limestone and subordinate argillaceous rocks. The Great Oolite is underlain by Inferior Oolite, and Liassic Clays. A BGS record of a borehole (ref SP52NW17) sited approximately 765 m west southwest from the site indicates that the combined Great and Inferior Oolites are approximately 30 m deep at this location, underlain by Clays.

The geology encountered in trial pits was generally consistent, with Made Ground overlying sandy gravelly clay (weathered Limestone) overlying fractured Limestone bedrock.

The six boreholes drilled on the site generally encountered 1.0 m - 1.1 m of clayey topsoil (described as Limestone weathered to a residual soil), underlain by 'yellow Sandstone – destructured Limestone' to 2.5 m bgl, underlain by grey Limestone with weak dark grey clay formations throughout (distinctly weathered Limestone). The exception was BH06, where 'destructured Limestone' was encountered at 0.4 m bgl, and the underlying Limestone was described as mostly strong.

2.3 Hydrogeology

The Great Oolite Formation is classified as a Principal Aquifer by the Environment Agency. A rest water level recorded at borehole SP52NW17 was approximately 11 m bgl (c. 114m OD). The borehole is recorded as being a failure in terms of water supply. There are no BGS records of water wells near the site, and the site is not in or near (within 1 km of) any source protection zones. The nearest registered abstraction is 1100 m south-east of the site, registered to Mr CF Hilsden for the abstraction of groundwater for domestic and agricultural use. There are no springs or wells within 1 km of the site. (AAe, 2016).

Groundwater was encountered between 2 m bgl and – 2.1 m bgl at TP02, TP03 and TP04. TP01, TP06 and TP07 did not encounter groundwater, but were shallower, between 1.5 m bgl and 1.7 m bgl. TP05 was anomalous in that it extended to 2.4 m bgl but did not intercept groundwater.

Groundwater was encountered at around 2 m bgl in each of the six boreholes drilled at the site. Each borehole was installed with a piezometer, with a screened section from approximately 2.6 m bgl to 10 m bgl. Groundwater dips are available from 28th February 2017 and 9th March 2017, as shown in Table 2.1.

Table 2.1 Groundwater data

BH ID	Datum m aOD	09.03.17		28.02.17	
		Dip m below datum	GW level m aOD	Dip m below datum	GW level m aOD
BH01	119.61	1.3	118.31	1.78	117.84
BH02	118.44	0.86	117.58	0.76	117.68
BH03	118.92	0.9	118.02	1.02	117.90
BH04	119.05	1.47	117.58	1.32	117.73
BH05	119.53	0.97	118.56	1.1	118.43
BH06	120.78	2.16	118.62	2.61	118.18

Groundwater contours have been plotted for each date, and the groundwater flow direction and gradient estimated. Groundwater flows eastwards; the gradient was estimated as 0.0088 on 28 February, and 0.01 on 9 March. The average of the two gradients is 0.0097. Figure 2.4 shows the groundwater contours from 9 March 2017.

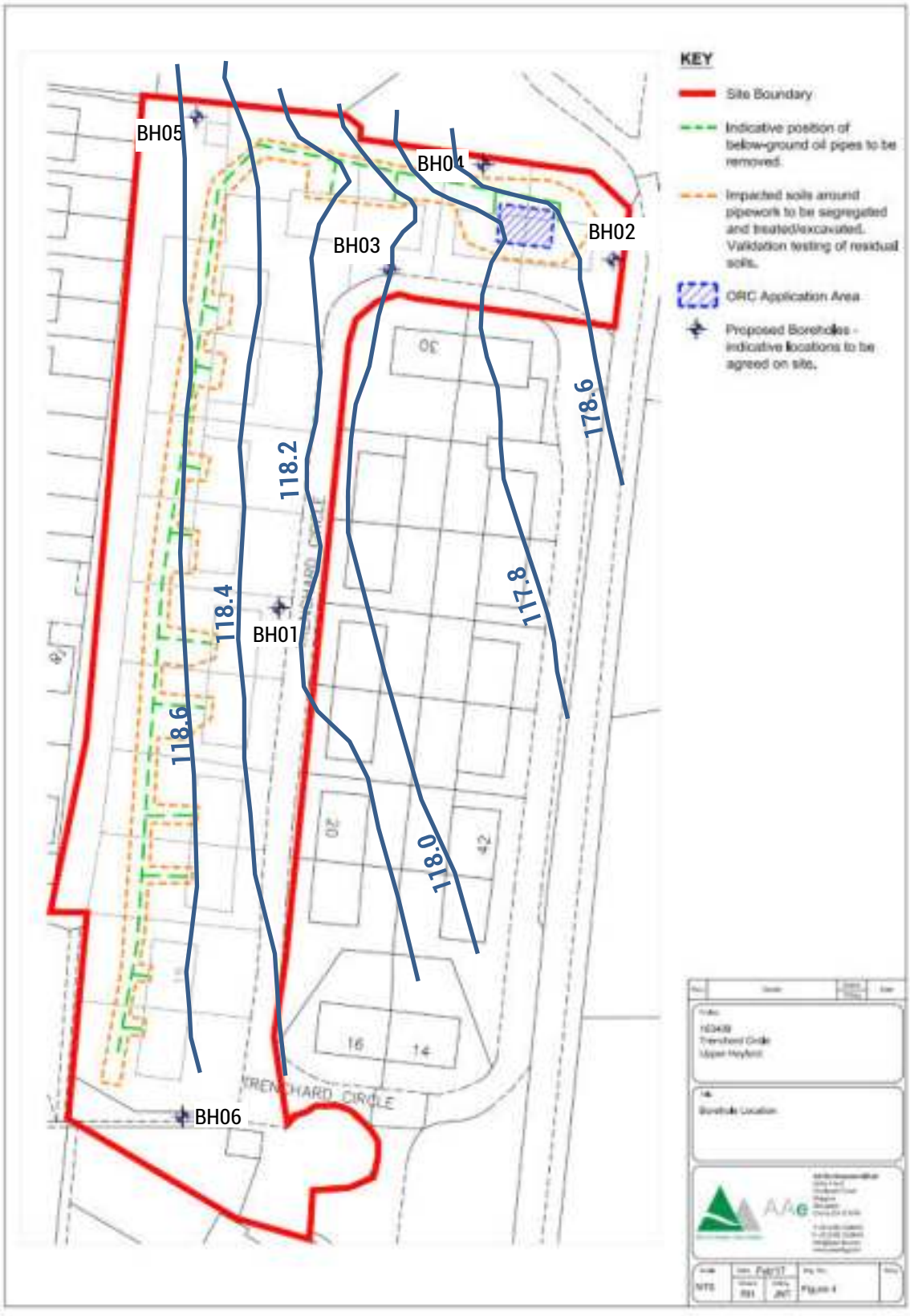

Figure 2.4 Groundwater contours (m a OD) (basemap from AAe, 2016)

Rising head tests were undertaken by AAe at BH02, BH05 and BH06. The data have been supplied to HFCL, as presented in Appendix B. Hvorslev's (1951) method has been used to calculate hydraulic conductivities, as shown in Table 2.2.

Table 2.2 Hydraulic Conductivity results

Borehole	BH02	BH05	BH06	Average
K m/s	1.86E-06	7.64E-07	6.57E-06	3.06E-06
K m/d	0.16	0.07	0.57	0.26

2.4 Hydrology

The nearest surface water features to the site are a ditch running from west to east along the northern boundary, but elevated with respect to the site, and a series of ponds to the north-east. The nearest main watercourse is the River Cherwell 2 km to the west.

2.5 Soil sampling results

The site investigation discovered a buried fuel line located to the rear of the former properties, at depths between 0. 5 m bgl and 1.3 m bgl (AAe, 2016). The approximate location of the fuel line is shown on Figure 2.2. Visual and olfactory evidence of hydrocarbon contamination was observed in the trial pits, as shown on Figure 2.2. PID readings ranged from 0 ppm, to 232 ppm at BH29.

Free phase hydrocarbons were observed floating on water at TP24 and TP28.

Soil samples from TP01 – TP07 were analysed for a range of metals, speciated TPH, speciated PAH, asbestos, and other inorganic species (pH, sulphate sulphide, cyanide, boron, total organic carbon). Samples from TP08 – TP18, TP29 and TP37 were analysed for speciated TPH. Laboratory certificates are presented in Appendix C.

PAHs were not detected in any of the samples. Metals and inorganic species were detected at low concentrations. TPH was recorded above the limit of detection in seven samples from six locations, at concentrations between 130 mg/kg and 140,000 mg/kg. TPH results are presented in Table 2.3 (note that locations where TPH was not detected are not reported, but full results are presented in Appendix C).

Table 2.3 Soil sampling results (mg/kg)

Sample Location	LOD	TP09	TP10	TP12	TP13	TP18	TP18	TP29
Depth (top)		1.10	0.60	1.00	1.00	0	0.90	1.30
Aliphatic TPH >C5-C6	1	nd	nd	nd	nd	nd	nd	nd
Aliphatic TPH >C6-C8	1	nd	nd	nd	nd	**390**	nd	nd
Aliphatic TPH >C8-C10	1	17	75	13	4.3	**2100**	35	81
Aliphatic TPH >C10-C12	1	98	570	68	2.4	**8600**	98	920
Aliphatic TPH >C12-C16	1	530	2400	320	34	**47000**	360	4800
Aliphatic TPH >C16-C21	1	480	2500	260	35	34000	260	3800
Aliphatic TPH >C21-C35	1	77	110	69	49	14000	110	470
Aliphatic TPH >C35-C44	1	nd	nd	nd	nd	nd	nd	nd
Total Aliphatic Hydrocarbons	5	1200	5600	730	120	110000	870	10000
Aromatic TPH >C5-C7	1	nd	nd	nd	nd	nd	nd	nd
Aromatic TPH >C7-C8	1	nd	nd	nd	nd	nd	nd	nd
Aromatic TPH >C8-C10	1	nd	1.1	nd	nd	**77**	4.2	71
Aromatic TPH >C10-C12	1	12	**180**	13	nd	**2100**	**27**	**430**
Aromatic TPH >C12-C16	1	**140**	**1300**	**89**	3.9	**15000**	**120**	**940**
Aromatic TPH >C16-C21	1	**120**	**760**	**82**	nd	**11000**	**63**	**360**
Aromatic TPH >C21-C35	1	34	97	34	4.5	**3700**	42	30
Aromatic TPH >C35-C44	1	nd	nd	nd	nd	nd	nd	nd
Total Aromatic Hydrocarbons	5	310	2300	220	8.4	31000	250	1800
Total Petroleum Hydrocarbons	10	1500	7900	950	130	140000	1100	12000

2.6 Water sampling results

Water samples were taken from TP02 and TP21. Two additional samples WS1 (NW) and WS2 (NE) were also taken. Samples were taken on two occasions from BH1 – BH6. The results are shown in Table 2.4. Results are not shown for locations where no TPH was detected, however full results are presented in Appendix C. It is noted that no BTEX or light (C6-C8) hydrocarbons were detected.

Table 2.4 Groundwater sampling results (mg/l)

Determinand	LOD	TP02	TP21	WS1 (NW)	WS2 (NE)
Aliphatic TPH >C5-C6	0.0001	nd	nd	nd	nd
Aliphatic TPH >C6-C8	0.0001	nd	nd	nd	nd
Aliphatic TPH >C8-C10	0.0001	**1.2**	**410**	nd	nd
Aliphatic TPH >C10-C12	0.0001	**9.7**	**1200**	nd	nd
Aliphatic TPH >C12-C16	0.0001	**49**	**3600**	**0.44**	**0.62**
Aliphatic TPH >C16-C21	0.0001	**59**	**2200**	**0.54**	**1.3**
Aliphatic TPH >C21-C35	0.0001	**3.2**	**1400**	**0.24**	**0.12**
Aliphatic TPH >C35-C44	0.0001	nd	nd	nd	nd
Aromatic TPH >C5-C7	0.0001	nd	nd	nd	nd
Aromatic TPH >C7-C8	0.0001	nd	nd	nd	nd
Aromatic TPH >C8-C10	0.0001	0.19	**150**	nd	nd
Aromatic TPH >C10-C12	0.0001	**1.3**	**400**	nd	nd
Aromatic TPH >C12-C16	0.0001	**15**	**1500**	0.16	0.19
Aromatic TPH >C16-C21	0.0001	**11**	**1500**	**0.36**	**1.3**
Aromatic TPH >C21-C35	0.0001	**0.86**	**190**	**0.19**	**0.53**
Aromatic TPH >C35-C44	0.0001	**0.073**	**3.2**	nd	nd
Total Aliphatic Hydrocarbons	0.005	120	8800	1.2	2.1
Total Aromatic Hydrocarbons	0.005	28	3700	0.71	2
Total Petroleum Hydrocarbons	0.01	150	13000	1.9	4.1

Well head parameters (pH, redox potential, Conductivity, dissolved oxygen and temperature) were measured during sampling. The data are presented in Appendix D and summarised in Table 2.5

Table 2.5 Wellhead parameters

Borehole	pH	ORP mV	Conductivity uS/cm	Dissolved Oxygen mg/l	Temperature ºC
BH1	7.29	43.34	761.87	1.31	9.01
BH2	7.08	44.26	710.66	1	8.22
BH3	7.21	53.63	787.45	2.34	9.31
BH4	7.29	60.1	712.37	1.26	9.53
BH5	7.28	46.04	987.7	6.04	8.87
BH6	7.24	46.8	836.68	4.43	7.83

3 CONCEPTUAL MODEL

For the purposes of constructing a remedial targets spreadsheet, the following conceptual model has been developed:

- The site is underlain by Oolitic Limestone with a permeability of 0.26 m/d and porosity of 16.3%. Groundwater flow is to the east, with a gradient of 0.0097. The permeability and groundwater gradient are well constrained by site measurements
- The source of contamination is an area 60 m by 20 m where shallow soils are impacted by petroleum hydrocarbons.
- The receptor is set as the Great Oolite aquifer 50 m down gradient of the site, in accordance with EA guidance (EA, 2017).
- The processes of attenuation, dispersion, retardation and decay are assumed to operate along the saturated travel pathway.
- Infiltration is conservatively set as 40% of annual average rainfall, as recorded at the Enslow Mill gauging station on the river Cherwell.

Shallow groundwater was observed to be impacted by hydrocarbons in some of the trial pits excavated at the site. Groundwater samples taken from trial pits contained up to 13,000 mg/l of TPH, which is indicative of free product. TPH was not detected in groundwater samples taken from the boreholes. This is likely to be because the screened section of the boreholes was below the water table and therefore unlikely to be affected by free product floating on the water table. The samples were therefore representative of dissolved groundwater quality around the source area, but not directly impacted by free phase hydrocarbons entrained within the samples. It is concluded that a dissolved phase plume has not been detected at the site. The risk assessment will therefore develop remedial targets for impacted soils.

Wellhead parameters indicate that dissolved oxygen is depleted in BH1, BH2, BH3 and BH4, at between 1 mg/l and 2.34 mg/l. Dissolved oxygen concentrations at BH5 and BH6, which are up-hydraulic gradient of the hydrocarbon source are 6.04 mg/l and 4.43 mg/l. Oxygen depletion is commonly observed where microbial decay of hydrocarbons is taking place; the dissolved oxygen therefore data provides evidence that there is active decay of the hydrocarbon contamination at the site.

3.1 Potential pollutant linkages

For an environmental risk to exist there needs to be one or more contaminant-pathway-receptor linkages – "contaminant linkage" – by which a relevant receptor might be affected by the contaminants in question. In other words, for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that pose a hazard, and one or more pathways by which they might affect environmental receptors. Defra (2012) provides the following definitions:

(a) A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.

(b) A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters.

(c) A "pathway" is a route by which a receptor is or might be affected by a contaminant.

The term “contaminant linkage" means the relationship between a contaminant, a pathway and a receptor. All three elements of a contaminant linkage must exist for there to be a risk to the identified receptor.

The conceptual site model describes potential sources, pathways and receptors at the site.

3.1.1 Sources

Sources of potential contamination have been detected at the site as follows:

- Petroleum hydrocarbons in shallow soils
- Free phase hydrocarbons floating on the water table.

3.1.2 Pathways

The following pathways are likely to operate:

- Rainfall infiltration, dissolution and transport in groundwater

3.1.3 Receptors

The following receptors have been identified:

- The Great Oolite Principal Aquifer

3.2 Potential pollutant linkages

The potential pollutant linkages identified at the site are summarised in Table 3.1.

Table 3.1 Potential pollutant linkages

Source	Pathway	Receptors	Comment
TPH in soils	Dissolution and dissolved phase transport	Aquifer	Groundwater samples from boreholes indicated that groundwater quality is not impacted by TPH
Free phase TPH floating on the water table	Migration on the water table	Aquifer	Groundwater samples from boreholes indicated that groundwater quality is not impacted by TPH
	Dissolution and dissolved phase transport		

4 CONTROLLED WATERS RISK ASSESSMENT

The controlled waters risk assessment has been carried out in accordance with Environment Agency technical guidance on assessing risks to controlled waters (Remedial Targets Methodology (2006) and Groundwater protection guidance (2017)).

The Environment Agency's Remedial Targets Methodology (2006) provides a methodology for deriving site-specific remedial targets for contaminated soil and/or groundwater. The methodology is based on a phased approach, with four levels of assessment. A compliance point is identified, at which a compliance concentration should not be exceeded. Each level of assessment predicts with a higher degree of sophistication whether the concentrations on site will result in exceedances of the compliance concentration at the compliance point. The compliance point might be a controlled waters receptor, or a distance from the site as set out by the Environment Agency in their Groundwater protection guidance (2017). For a soil source, the following levels of assessment are undertaken:

- At Level 1 the assessor considers whether contaminant concentrations in 'pore water' in soil are sufficient to impact on the receptor, taking no account of dilution, dispersion or attenuation along the transport pathway.
- At Level 2, the assessor considers the effects of attenuation processes in the soil and unsaturated zone, and predicts the effects of dilution by groundwater flow below the site.
- At Level 3 the assessor considers the effects of attenuation between the site and a down gradient receptor or compliance point. The assessment can include processes such as dilution, dispersion, retardation, degradation or other processes.
- At Level 4 the assessor considers the effects of dilution in the receptor.

At each level of assessment, a remedial target is derived, which is the maximum concentration on site that would not result in exceedances of the compliance concentration at the compliance point. If the remedial target is exceeded, consideration can be given to undertaking another assessment level, to reduce the conservatism in the assessment, or undertaking remediation.

4.1 Input parameters

Input parameters for the spreadsheet model are presented in Table 4.1. Chemical specific input parameters are presented in Table 4.2.

Table 4.1 Input parameters

Parameter	Symbol	Value	Unit	Source
Water filled soil porosity	θ_W	1.00E-01	fraction	Estimate for sand, Manger, 1963
Air filled soil porosity	θ_a	3.00E-01	fraction	Estimate for sand, Manger, 1963
Bulk density of soil zone material	ρ	1.93E+00	g/cm^3	Estimate for sand, Manger, 1963
Fraction organic carbon	f_{oc}	2.37E-02	fraction	Site data
Infiltration	Inf	7.55E-04	m/d	Marsh & Hannaford, 2008*
Area of source	A	1.20E+03	m2	Site data
Length of source	L	6.00E+01	m	Site data
Saturated aquifer thickness	da	2.50E+01	m	BGS borehole SP52NW17
Hydraulic Conductivity of aquifer	K	2.60E-01	m/d	Site data
Hydraulic gradient of water table	i	9.70E-03	fraction	Site data

Parameter	Symbol	Value	Unit	Source
Width of source	w	2.00E+01	m	Site data
Mixing zone thickness	M_z	1.92E+01	m	Calculated
Bulk density of aquifer materials	r	2.25E+00	g/cm^3	Estimate for Oolite, Manger, 1963
Effective porosity of aquifer	n	1.63E-01	fraction	Estimate for Oolite, Manger, 1963
Distance to compliance point	x	5.00E+01	m	EA, 2017
Time	t	1.00E+99	days	

*40% of average annual rainfall (689 mm/a) recorded at station no 39021 Enslow Mill on the Cherwell.

Table 4.2 Chemical specific input parameters

Determinand	Average C_s[1] mg/kg	Koc[2] l/kg	H[2]	$t^1/_2$ [3] d	TC [4] mg/l
Aliphatic TPH >C5-C6	<1	813	21	720	0.01
Aliphatic TPH >C6-C8	50	3802	27.3	210	0.01
Aliphatic TPH >C8-C10	291	30200	41.5	258	0.01
Aliphatic TPH >C10-C12	1295	239884	64	350	0.01
Aliphatic TPH >C12-C16	6931	5370318	171	800	0.01
Aliphatic TPH >C16-C21	5167	575439938	1070	2120	0.01
Aliphatic TPH >C21-C35	1861	575439938	1070	2600	0.01
Aliphatic TPH >C35-C44	<1	575439938	1070	3650	0.01
Aromatic TPH >C5-C7	<1	68	0.116	720	0.01
Aromatic TPH >C7-C8	<1	205	0.115	210	0.01
Aromatic TPH >C8-C10	20	1585	0.253	258	0.01
Aromatic TPH >C10-C12	346	2512	0.0722	350	0.01
Aromatic TPH >C12-C16	2199	5012	0.0126	401.5	0.01
Aromatic TPH >C16-C21	1548	14126	0.000694	1058.5	0.01
Aromatic TPH >C21-C35	493	125893	0.0000428	2372.5	0.01
Aromatic TPH >C35-C44	<1	125893	0.0000428	3650	0.01

1. C_s: soil concentration
2. Nathanail et al, 2015;
3. Howard et al (1991);
4. TC: Target concentration: Former Drinking water standard

4.2 Results for Levels 1 to 3

The results of assessment Levels 1 to 3 are presented in Table 4.3.

Table 4.3 Levels 1, 2 and 3 soils source results

Determinand	Average Cs mg/kg	Max Cs mg/kg	Level 1 RT mg/kg	DF	Level 2 RT mg/kg	RF	AF	Level 3 RT mg/kg	Level 3 RT mg/l
Aliphatic TPH >C5-C6	<1	<1	0.23	2.07	0.47	266	4.85	2	0.100
Aliphatic TPH >C6-C8	50	390	0.94	2.07	1.95	1242	61	120	1.270
Aliphatic TPH >C8-C10	291	2100	7.21	2.07	15	9860	34	507	0.703
Aliphatic TPH >C10-C12	1295	8600	57	2.07	117	78313	16	1911	0.336
Aliphatic TPH >C12-C16	6931	47000	1270	2.07	2626	1753179	4.27	11218	0.088
Aliphatic TPH >C16-C21	5167	34000	136093	2.07	281275	187856429	1.99	560571	0.041
Aliphatic TPH >C21-C35	1861	14000	136093	2.07	281275	187856429	1.82	511305	0.038
Aliphatic TPH >C35-C44	<1	<1	136093	2.07	281275	187856429	1.61	453861	0.033
Aromatic TPH >C5-C7	<1	<1	0.02	2.07	0.03	23	4.85	0	0.100
Aromatic TPH >C7-C8	<1	<1	0.05	2.07	0.10	68	61	6	1.270
Aromatic TPH >C8-C10	20	77	0.38	2.07	0.78	518	219	170	4.527
Aromatic TPH >C10-C12	346	2100	0.59	2.07	1.23	821	16	20	0.336
Aromatic TPH >C12-C16	2199	15000	1.19	2.07	2.45	1637	12	30	0.253
Aromatic TPH >C16-C21	1548	11000	3.34	2.07	6.91	4613	3.20	22	0.066
Aromatic TPH >C21-C35	493	3700	30	2.07	62	41100	1.89	116	0.039
Aromatic TPH >C35-C44	<1	<1	30	2.07	62	41100	1.61	99	0.033

RT= remedial target

The table shows the Level 1 remedial target (RT), the dilution factor (DF), the Level 2 remedial target (RT), the retardation factor (RF), the attenuation factor (AF), and the Level 3 remedial target (RT). The Level 3 remedial target is shown as a soils concentration in mg/kg and as an equivalent groundwater concentration in mg/l. The soil and groundwater concentrations exceeding the Level 3 remedial targets are highlighted in bold in Table 2.3 and Table 2.4 respectively.

4.3 Sensitivity analysis

A sensitivity analysis has been undertaken to examine whether the changing key parameters would change the conclusions drawn from the risk assessment. The results were not sensitive to changes in source length or width, aquifer thickness, bulk density or infiltration rates. Hydraulic conductivity and groundwater gradient are considered to be well constrained by site data, and sensitivity analysis was not undertaken on these parameters.

Section 5.5 of the Environment Agency's Remedial Targets Methodology states that for some highly sorbing compounds (for examples PAHs and some metals), travel times can be very slow, and that in these cases it may be acceptable for no action to be taken when the remedial target is exceeded. Travel times will normally have to exceed 1000 years for this case to be considered.

The Level 3 risk assessment was run a second time with a travel time of 1000 years, to assess whether transport to a 50-m receptor was likely to occur within this timeframe. The results are shown in Table 4.4 for soil and groundwater. If the soil or groundwater concentration exceeds the remedial target, the remedial target is shown in bold. It can be seen that 9 of the 16 TPH species do not reach the receptor within 1000 years. The remedial targets for the remaining 7 species are significantly higher than the observed soil concentrations, indicating that if the soils were left in-situ, the risks to groundwater would be low over a 1000-year time period.

The shallow groundwater concentrations for Aromatic TPH >C8-C10 and Aromatic TPH >C10-C12 exceed the remedial targets derived for a 1000-year travel time.

Table 4.4 Soil source – sensitivity analysis

Determinand	Soil RT (mg/kg) Basecase	Soil RT (mg/kg) t=1000y	Max C_s mg/kg	GW RT (mg/l) Basecase	GW RT (mg/l) t= 1000y	Max shallow C_{gw} mg/l
Aliphatic TPH >C5-C6	2.26	3.60	<1	0.100	0.16	nd
Aliphatic TPH >C6-C8	**120**	906192	390	1.270	9619	nd
Aliphatic TPH >C8-C10	**507**	No impact	2100	**0.703**	No impact	410
Aliphatic TPH >C10-C12	**1911**	No impact	8600	**0.336**	No impact	1200
Aliphatic TPH >C12-C16	**11218**	No impact	47000	**0.088**	No impact	3600
Aliphatic TPH >C16-C21	560571	No impact	34000	**0.041**	No impact	2200
Aliphatic TPH >C21-C35	511305	No impact	14000	**0.038**	No impact	1400
Aliphatic TPH >C35-C44	453861	No impact	<1	0.033	No impact	nd
Aromatic TPH >C5-C7	0.17	0.168	<1	0.100	0.10	nd
Aromatic TPH >C7-C8	6.25	6.25	<1	1.270	1.27	nd
Aromatic TPH >C8-C10	26	170	77	**0.703**	**4.53**	150

Determinand	Soil RT (mg/kg) Basecase	Soil RT (mg/kg) t=1000y	Max C_s mg/kg	GW RT (mg/l) Basecase	GW RT (mg/l) t= 1000y	Max shallow C_{gw} mg/l
Aromatic TPH >C10-C12	**20**	3961	2100	**0.336**	**67**	400
Aromatic TPH >C12-C16	**30**	68371155	15000	**0.253**	576546	1500
Aromatic TPH >C16-C21	**22**	No impact	11000	**0.066**	No impact	1500
Aromatic TPH >C21-C35	**116**	No impact	3700	**0.039**	No impact	190
Aromatic TPH >C35-C44	99	No impact	<1	**0.033**	No impact	3.2

4.4 Discussion

The Environment Agency's (2017) groundwater guidance states that:

'where pollutants are in the soil and haven't entered groundwater, you must take all necessary and reasonable measures to prevent the input of hazardous substances into groundwater'.

Groundwater samples from boreholes indicate that hydrocarbons have not yet entered the groundwater. It is noted that hazardous substances such as BTEX and PAHs have not been detected in soil or groundwater. Dissolved oxygen concentrations indicate that there is active degradation of hydrocarbons. Additionally, the groundwater resource is not used locally, and is unlikely to be used in the future as the area will be residential with mains water supply. Travel times for contamination to reach 50 m are generally above 1000 years. Given the above, the approach taken of setting a travel distance of 50 m is considered to be proportionate and risk averse.

5 CONCLUSIONS

Site investigations have been undertaken by AA Environmental Limited (AAe) at a site in Upper Heyford. The site, which is to the south of the now disused Upper Heyford Airfield, was formerly occupied by housing and is intended to be redeveloped for the same. Site investigations revealed buried fuel lines which previously served the properties on the site. Soils and shallow groundwater were observed to be impacted by hydrocarbons, with soil concentrations of up to 140,000 mg/kg and groundwater concentrations of up to 13,000 mg/l.

The site is underlain by the Great Oolite Formation, comprising limestone interbedded with subordinate mudstones. The Great Oolite Formation is classified by the Environment Agency as a Principal Aquifer, although no groundwater abstractions are known to be present locally.

Six boreholes have been drilled at the site, to assess the impact of the fuel on groundwater. Rising head test have been undertaken and groundwater elevations measured. The hydraulic conductivity of the aquifer is estimated as 0.26 m/d. Groundwater flow is to the east, with a gradient of 0.0097. Two rounds of groundwater sampling have been undertaken, and petroleum hydrocarbons have not been detected in any of the samples.

There is a marked difference between shallow groundwater quality from trial pits and groundwater quality from boreholes. It is considered that the trial pit samples are impacted by free product, whereas the boreholes provide a sample representative of the dissolved phase contamination. The results suggest that a dissolved phase plume has not developed below the site. Dissolved oxygen concentrations provide evidence that active biodegradation of hydrocarbons is taking place.

A controlled waters risk assessment has been undertaken to assess risks arising from hydrocarbon contamination in soils, and to derive remedial targets for soils and shallow groundwater.

It is recommended that remediation works at the site endeavour to remove free product, and that the remedial targets shown in Table 5.1 are adopted for soil and shallow groundwater remediation.

Table 5.1 Remedial targets

Determinand	Soil Remedial Target (mg/kg)	Groundwater Remedial Target (mg/l)
Aliphatic TPH >C5-C6	2.5	0.1
Aliphatic TPH >C6-C8	120	5
Aliphatic TPH >C8-C10	500	1
Aliphatic TPH >C10-C12	1900	0.5
Aliphatic TPH >C12-C16	11000	0.1
Aliphatic TPH >C16-C21	560000	0.05
Aliphatic TPH >C21-C35	511000	0.05
Aliphatic TPH >C35-C44	454000	0.05
Aromatic TPH >C5-C7	0.2	0.1
Aromatic TPH >C7-C8	6.0	1.5
Aromatic TPH >C8-C10	30	1
Aromatic TPH >C10-C12	20	0.5
Aromatic TPH >C12-C16	30	0.5
Aromatic TPH >C16-C21	22	0.1
Aromatic TPH >C21-C35	120	0.05
Aromatic TPH >C35-C44	100	0.05

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APPENDIX A

Borehole logs

AA Environmental Ltd
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Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No **TP01**

Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire	Dimensions (m): Depth 1.70		Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES	PID=0	0.10			Brown loamy sandy topsoil with occasional brick, concrete and glass. [MADE GROUND]
				0.30			Brown silty sand with occasional roots. [TOPSOIL]
	1.50	ES	PID=0				Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
				1.70			End of pit at 1.70 m

1 2 3 4 5

Remarks: METHOD: Machine excavated pit; CONTAMINATION: No visual or olfactory contamination; GROUNDWATER: None encountered; NOTES: None.

Stability: Stable.

AGS

AA Environmental Ltd
Units 4-8 Cholswell Court
Shippon, Abingdon
Oxfordshire
OX13 6HX

Trial Pit Log

Trialpit No
TP02
Sheet 1 of 1

Project Name:	Trenchard Circle	Project No. 163408	Co-ords: - Level:	Date 01/11/2016
Location:	Upper Heyford, Oxfordshire	Dimensions (m): Depth 2.00		Scale 1:25
Client:	Conlon Ltd			Logged JNT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES	PID=0	0.30			Brown clayey sands with limestone gravels. [POSSIBLE MADE GROUND]
				1.00			Highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles.
▼	1.80	ES	PID=4	2.00			Damp highly weathered LIMESTONE recovered as a pale brown silty sand with limestone gravels and cobbles. *Hydrocarbon staining and odour.* End of pit at 2.00 m

Remarks: METHOD: Machine excavated pit; CONTAMINATION: Hydrocarbon staining and odour 1.8 m; GROUNDWATER: Encountered as a slow seepage 1.8-2.0 m; NOTES: None.

Stability: Stable.

AGS