Sources	Potential pollutant	Receptor	Pathway	Hazard severity	Likelihood of occurrence	Risk / Significance	Comment & control measures
Nursery (offsite)	Pesticides	Residents & Site Users	Lateral migration of groundwater transporting contaminants to soil/made ground on site	Mild	Low likelihood	Low risk	No further action required
		Construction & Maintenance Operatives		Mild	Unlikely	Very Low risk	
		Residents & Site Users	Drinking water supply impacted by groundwater transporting contaminants to site	Mild	Low likelihood	Low risk	

Any visual or olfactory evidence of contamination noted during works should be investigated by a suitably qualified person and their recommendations implemented.

11 SITE WORK

11.1 Investigations

11.1.1 In order to determine if the current or former usage of the property is a potential cause of contamination it is recommended that some site investigation should be undertaken based upon the requirements of BS 10175: 2001 which is the code of practice for the investigation of potentially contaminated sites. It is proposed that soil samples be taken from representative locations around the site and tested for a typical range of determinands, comprising asbestos, heavy metals, pH, speciated aromatic and aliphatic hydrocarbons and speciated PAHs and PCBs.

11.1.2 Due to the unknown nature of fill material on-site & off site monitoring for ground gas should be undertaken, in accordance with BS 8576, in order to determine if gas has migrated to the property. Furthermore, if the site has been filled in the past monitoring will determine if ground gas is being generated by the fill material.

11.2 Site Preparation

During the works a watching brief should be maintained by an experienced person. Should any visual or olfactory evidence of contamination be noted during the Chelmer Site Investigation Laboratories Ltd and the local authority Environmental Health Officer (EHO) should be contacted. Chelmer Site Investigation Laboratories Ltd shall assess if further intrusive investigation and remediation is required. Proposals will be issued to the EHO for comment prior to undertaking the additional investigation or implementing the remediation strategy.

The form of investigation proposed in 11.1.1 will indicate if there is any contamination present and if it is necessary will enable remedial works to be formulated.

If any potentially contaminated spoil is to be removed from site, the Waste Acceptance Criteria (WAC) testing should be agreed with the facility to which the spoil is being transported. It is recommended that consideration is given to this testing as part of the phase 2 investigation. Guidance can be obtained from Environment Agency document *Waste Sampling and Testing for Disposal to Landfill*.

11.3 External Works

In regard to water supply reference should be made to the UK Water Industry Research (UKWIR) publication *"Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites"* (Ref 10/WM/03/21; the *'UKWIR Guidance')*. This document provides guidance to ensure that water quality is safeguarded by identifying suitable pipe materials and components to be used below ground in potentially contaminated sites. It is not considered that an upgraded water supply pipe is required, however it is recommended that this report is provided to the water supplier for their comment.

12 SITE DEVELOPMENT CONSIDERATIONS

During the course of the site visit and preparation of this report the following items, whilst not within the scope of this report, have come to our attention and should be considered. This is not necessarily an exhaustive list.

12.1 An intrusive geotechnical investigation may be required to provide detailed information about the engineering nature of the ground, in order to allow the most suitable foundations in terms of economy and performance to be designed. This should follow the recommendations of BS 5930, the Code of Practice for site investigations with tests carried out to satisfy the requirements of BS 1377, the Code of Practice for methods of tests for soils for civil engineering purposes. It is recommended that this includes testing for sulphates.

12.2 As redevelopment of the property is proposed it is recommended that a full topographical survey is undertaken, if one is not available. This should identify all relevant features, boundaries and levels relating to the site and should also include ground levels on the adjacent properties and roads.

12.3 If it is proposed to make use of the existing drainage system, or any existing connections to the mains sewers. A CCTV survey should be considered in order to determine both the general condition and suitability for the proposed use.

12.4 If any excavation works are proposed, it is recommended that all the relevant utility companies are contacted to ascertain what pipes, cables, wires, lines and other apparatus exist close to where the work is to take place.

12.5 An asbestos survey of existing structures and infrastructure (as defined under Section 5(a) of the Control of Asbestos Regulations 2012) was beyond the brief of this report. Advice should be sought regarding the potential presence and management of asbestos within existing structures and infrastructure.

13 CONCLUSIONS

Based upon the information currently available, there would in principle, appear to be some significant contamination issues associated with the site, however, the following should be considered at this stage. It is considered that provided the recommendations of this report are implemented there is no increased risk to human health from redevelopment of the site for the proposed residential and commercial use.

13.1 There is potential contamination of the site from its uses as a car park, lock up garages and electricity substations and from demolition debris and imported hard core below ground slabs and paved areas.

13.2 It is recommended that some preliminary intrusive environmental site investigation is undertaken to determine if contamination is present on the property.

13.3 Study of the historical maps indicate that there is potential for the site to have been impacted by nearby commercial activities.

13.4 Due to the unknown nature of fill material on-site & off site, monitoring of potential ground gases, over a suitable period of time, will be required in order to determinate the requirements for gas mitigation measures. Information to be contained in Health & Safety Plan.

13.5 It is not considered that an upgraded water supply pipe is required, however it is recommended that this report is provided to the water supplier for their comment.

13.6 Should any visual or olfactory evidence of contamination be noted during the works this should be investigated by a suitably qualified person and their recommendations implemented.

13.7 If any potentially contaminated spoil is to be removed from site, the Waste Acceptance Criteria (WAC) testing should be agreed with the facility to which the spoil is being transported.

14 REFERENCES

Card, G. B., Wilson, S., & Mortimer, S. (2012). *A Pragmatic Approach to Ground Gas Risk Assessment*. London, UK: Contaminated Land: Applications in Real Environments.

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UK Water Industry Research Ltd. (2010). *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites.* UKWIR.

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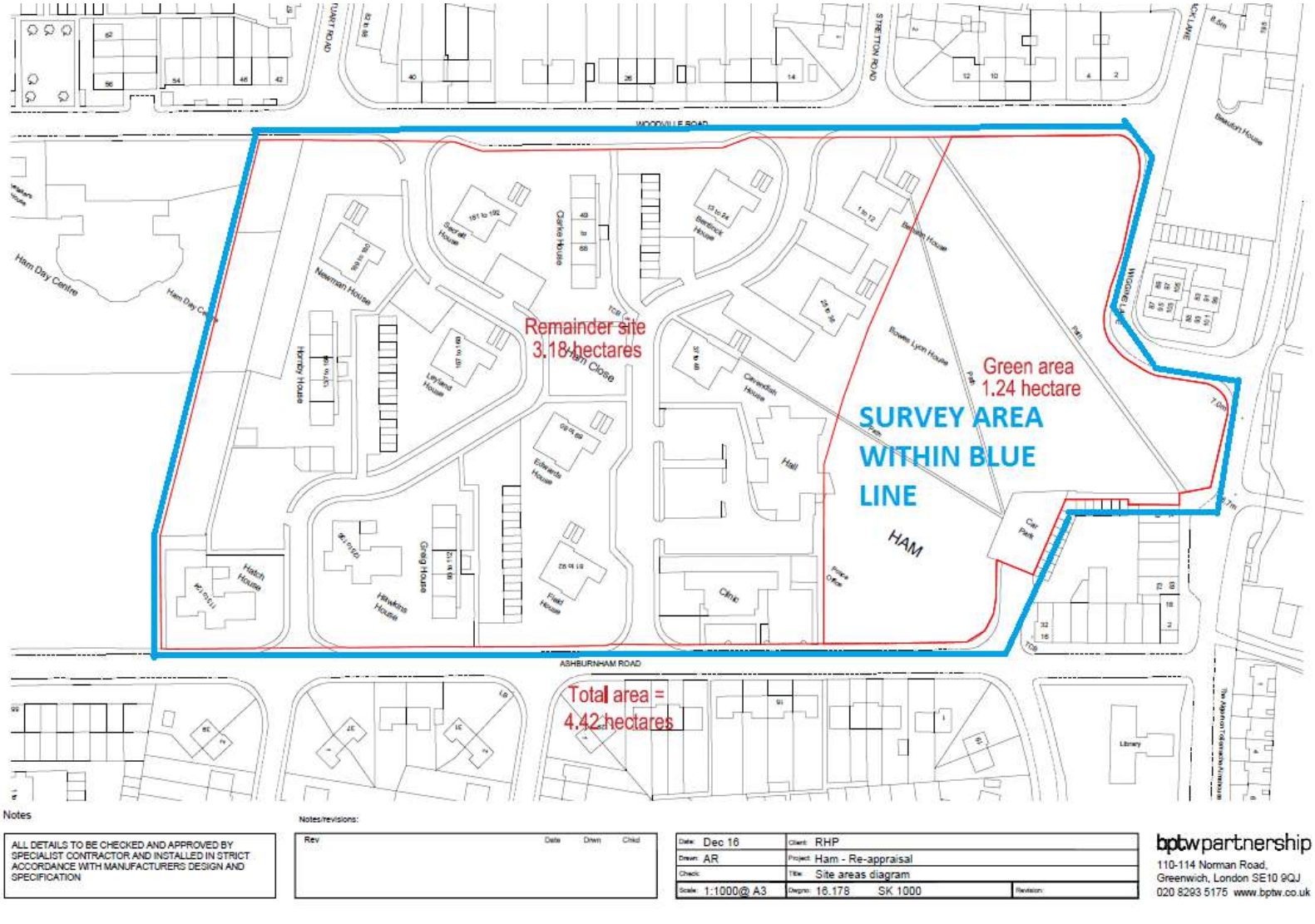
This document has been prepared for the titled project and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and the prior written authority of Chelmer Site Investigation Laboratories Ltd being obtained. No responsibility or liability is accepted for the consequences of this document being used for a purpose other than that for which it was commissioned. Any person using or relying on this document for such other purpose will by such use or reliance be taken to confirm his agreement to indemnify Chelmer Site Investigation Laboratories Ltd for all loss or damage resulting therefrom. Chelmer Site Investigation Laboratories Ltd accepts no responsibility or liability for this document to any party other than Richmond Housing Partnership by whom it was commissioned.

Appendix A – Site Location Plan



Notes

ALL DETAILS TO BE CHECKED AND APPROVED BY SPECIALIST CONTRACTOR AND INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS DESIGN AND SPECIFICATION

Notes/revisions:

Rev	Date	Drwn	Chkd

Date: Dec 16	Client: RHP		
Drwn: AR	Project: Ham - Re-appraisal		
Check:	Title: Site areas diagram		
Scale: 1:1000@ A3	Dwgno: 16.178 SK 1000	Revision:	

bptwpartnership
110-114 Norman Road,
Greenwich, London SE10 9QJ
020 8293 5175 www.bptw.co.uk

9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership

Appendix B – Photographs

View across site from northwest corner

View across site from the east

Appendix C – Landmark Report Extracts

Where the overview indicates that no data has been found the relevant detail report sections may have been omitted.

Agency & Hydrological

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A13NW (W)	0	1	517160 172357
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (SE)	0	1	517200 172300
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NE (E)	88	1	517400 172450
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A8NW (S)	257	1	517050 171950
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A12NE (W)	322	1	516700 172450
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A14NW (E)	431	1	517750 172400
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A12NE (NW)	475	1	516600 172600
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A12NE (W)	480	1	516550 172500
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A14SW (E)	482	1	517750 172200
1	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: PUMPING STATION ON SEWERAGE NETWORK (WATER COMPANY) Location: Ham Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp 1082 Permit Version: 2 Effective Date: 3rd September 2010 Issued Date: 3rd September 2010 Revocation Date: 13th October 2015 Discharge Type: Sewage Discharges - Pumping Station - Water Company Discharge Environment: Saline Estuary Receiving Water: Tidal Thames **Status: Surrendered under EPR 2010** Positional Accuracy: Located by supplier to within 100m	A13SE (SE)	214	2	517300 172100
1	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: PUMPING STATION ON SEWERAGE NETWORK (WATER COMPANY) Location: Ham Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp.1082 Permit Version: 1 Effective Date: 2nd November 1989 Issued Date: 2nd November 1989 Revocation Date: 2nd September 2010 Discharge Type: Sewage Discharges - Pumping Station - Water Company Discharge Environment: Saline Estuary Receiving Water: Tidal Thames **Status: Temporary Consents (Water Act 1989, Section 113)** Positional Accuracy: Located by supplier to within 100m	A13SE (SE)	214	2	517300 172100

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
2	**Discharge Consents** Operator: Environment Agency Property Type: DOMESTIC PROPERTY (SINGLE) (INCL FARM HOUSE) Location: Teddington Lockteddingtonmiddlesex Authority: Environment Agency, Thames Region Catchment Area: Thames-Teddington/Beverley Brook Reference: Casm.1384 Permit Version: 1 Effective Date: 21st March 2006 Issued Date: 3rd May 2006 Revocation Date: Not Supplied Discharge Type: Sewage Discharges - Final/Treated Effluent - Not Water Company Discharge Environment: Land/Soakaway Receiving Water: Into Land **Status: New Consent, by Application, granted by Secretary of State** Positional Accuracy: Located by supplier to within 10m	A7SE (SW)	768	2	516620 171580
3	**Discharge Consents** Operator: British Aerospace Plc Property Type: MAKING OF OTHER TRANSPORT EQUIP/SHIPS/TRAINS/BIKES Location: British Aerospace Plc, Kingstonupon Thames, Surrey Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Ctcr.1987 Permit Version: 1 Effective Date: 25th April 1983 Issued Date: 25th April 1983 Revocation Date: 17th June 1993 Discharge Type: Trade Effluent Discharge Environment: Freshwater Stream/River Receiving Water: Thames **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A3NE (S)	966	2	517400 171300
4	**Discharge Consents** Operator: J E Perry Property Type: DOMESTIC PROPERTY (SINGLE) (INCL FARM HOUSE) Location: Palm Beach, Eel Pie Island, Twickenham, London Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Ctwc.0573 Permit Version: 1 Effective Date: 20th December 1985 Issued Date: 20th December 1985 Revocation Date: 16th April 1991 Discharge Type: Unknown Discharge Environment: Saline Estuary Receiving Water: River Thames **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A17NE (NW)	983	2	516500 173200
5	**Local Authority Pollution Prevention and Controls** Name: Ks Dry Cleaners Location: 65 Ham Street, Richmond, Tw10 7hw Authority: London Borough of Richmond upon Thames, Environmental Health Department Permit Reference: LBRUT/DC/29 Dated: 29th March 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A13NE (E)	19	3	517314 172389
6	**Local Authority Pollution Prevention and Controls** Name: Divine Dry Cleaners Location: 424 Richmond Road, Ham, Kt2 5pu Authority: London Borough of Richmond upon Thames, Environmental Health Department Permit Reference: LBRUT/DC/08 Dated: 1st April 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A9SW (SE)	935	3	517805 171565

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
7	**Local Authority Pollution Prevention and Controls** Name: Ham Cross Service Station Location: 297 Richmond Road, KINGSTON UPON THAMES, Surrey, KT2 5QU Authority: London Borough of Richmond upon Thames, Environmental Health Department Permit Reference: 16/PVR Dated: 31st December 1998 Process Type: Local Authority Pollution Prevention and Control Description: PG1/14 Petrol filling station **Status: Permitted** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	935	3	517745 171527
	Nearest Surface Water Feature	A12SE (SW)	295	-	516804 172060
8	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Richmond, EEL PIE ISLAND Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed incident Incident Date: 19th February 1999 Incident Reference: THSE1999042077 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 10m	A13NE (E)	182	2	517500 172400
9	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 25th May 1993 Incident Reference: SE930143 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A8SW (S)	628	2	516900 171600
10	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Unknown Note: Not Supplied Incident Date: 3rd February 1996 Incident Reference: SE960049 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7NE (SW)	687	2	516600 171700
11	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Teddinton Lock Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: Not Supplied Incident Reference: SE950308 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	708	2	516700 171600

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
12	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 15th October 1990 Incident Reference: SE900296 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A8SW (S)	709	2	517000 171500
12	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Richmond Upon, TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Miscellaneous - Natural Note: Confirmed incident Incident Date: 30th April 1999 Incident Reference: THSE1999042983 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 10m	A8SW (S)	714	2	517000 171495
13	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: HAM Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Not Supplied Incident Date: 22nd March 1996 Incident Reference: SE960127 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18NW (N)	715	2	517100 173200
14	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Miscellaneous - Unknown Note: Confirmed As A Pollution Incident Incident Date: 26th February 1990 Incident Reference: SE900046 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7NW (SW)	729	2	516400 171900
15	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Chemicals - Unknown Note: Not Supplied Incident Date: 27th March 1996 Incident Reference: SE960135 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	754	2	516800 171500
16	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Ferry Road, TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Chemicals - Unknown Note: Confirmed As A Pollution Incident Incident Date: 10th May 1990 Incident Reference: SE900141 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	795	2	516700 171500

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
17	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Broom Road Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 7th August 1989 Incident Reference: N1890418 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A8SW (S)	807	2	517100 171400
18	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Teddington Lock Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Yes Incident Date: 17th July 1992 Incident Reference: SE920227 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A8SW (S)	809	2	517000 171400
19	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TWICKENHAM Authority: Environment Agency, Thames Region Pollutant: Unknown Sewage Note: Confirmed As A Pollution Incident Incident Date: 17th May 1991 Incident Reference: SE910115 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A12NW (W)	821	2	516200 172500
20	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Riverside, TWICKENHAM Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 7th August 1990 Incident Reference: SE900241 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A17NE (NW)	827	2	516800 173200
21	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 22nd September 1990 Incident Reference: SE900286 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	846	2	516600 171500
22	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: River Thames At, TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Unknown Sewage Note: Not Supplied Incident Date: 11th June 1997 Incident Reference: THSE1997032324 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (S)	847	2	516805 171400

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
22	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 6th October 1990 Incident Reference: SE900292 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (S)	849	2	516800 171400
22	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Not Supplied Incident Date: 2nd February 1996 Incident Reference: SE960075 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (S)	852	2	516805 171395
22	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Lensburyclub Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 26th July 1991 Incident Reference: SE910214 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (S)	853	2	516800 171395
23	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Ferry Road, TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Miscellaneous - Natural Note: No Pollution Found Incident Date: 17th November 1998 Incident Reference: THSE1998041140 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	885	2	516700 171400
24	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: RICHMOND Authority: Environment Agency, Thames Region Pollutant: Unknown Sewage Note: Not Supplied Incident Date: 26th June 1997 Incident Reference: THSE1997032339 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SW (SW)	900	2	516400 171600
25	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Marble Hill Park Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 17th November 1991 Incident Reference: SE910330 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A23SE (N)	903	2	517300 173400

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
26	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Unknown Sewage Note: Confirmed As A Pollution Incident Incident Date: 19th September 1989 Incident Reference: S1890460 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A3NW (S)	909	2	517000 171300
27	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TWICKENHAM Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Not Supplied Incident Date: 9th April 1998 Incident Reference: 38469 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A11NE (W)	910	2	516100 172395
27	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Swanisland, TWICKENHAM Authority: Environment Agency, Thames Region Pollutant: Unknown Sewage Note: Not Supplied Incident Date: 17th February 1997 Incident Reference: THSE1997031884 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A11NE (W)	910	2	516100 172400
28	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: 1 Strawberry Vale Authority: Environment Agency, Thames Region Pollutant: Unknown Sewage Note: Confirmed As A Pollution Incident Incident Date: 8th March 1989 Incident Reference: SE890072 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7NW (SW)	911	2	516200 171900
29	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: British Aerospace Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 18th August 1993 Incident Reference: SE930248 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7NW (SW)	917	2	516300 171700
29	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: British Aerospace Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 1st September 1993 Incident Reference: SE930262 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7NW (SW)	920	2	516300 171695

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
30	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Swan Island Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 12th December 1989 Incident Reference: SE890431 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A11NE (W)	920	2	516100 172500
31	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 20th August 1993 Incident Reference: SE930250 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A3NE (S)	966	2	517400 171300
31	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: TEDDINGTON Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Not Supplied Incident Date: 24th February 1996 Incident Reference: S1960079 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A3NE (S)	968	2	517405 171300
31	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: British Aerospace Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: Not Supplied Incident Reference: SE930192 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A3NE (S)	971	2	517400 171295
31	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: British Aerospace Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Yes Incident Date: Not Supplied Incident Reference: SE940332 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A3NE (S)	973	2	517405 171295
32	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: KINGSTON Authority: Environment Agency, Thames Region Pollutant: Miscellaneous - Unknown Note: Confirmed As A Pollution Incident Incident Date: 8th February 1991 Incident Reference: SE910033 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A9SW (SE)	967	2	517600 171400

Agency & Hydrological

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
33	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: STRAWBERRY HILL Authority: Environment Agency, Thames Region Pollutant: Miscellaneous - Unknown Note: Confirmed As A Pollution Incident Incident Date: 11th August 1992 Incident Reference: SE920269 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A11NE (W)	973	2	516040 172450
34	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Swan Island Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Confirmed As A Pollution Incident Incident Date: 26th May 1992 Incident Reference: SE920170 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A11NE (W)	991	2	516030 172510
	River Quality Name: Not Supplied GQA Grade: Unclassified Tidal River Reach: Not Supplied Estimated Distance (km): Not Supplied Flow Rate: Not Supplied Flow Type: Not Supplied Year: 1995	A18NW (N)	750	2	516857 173164
	River Quality Name: Thames GQA Grade: River Quality B Reach: Hogsmill - Teddington Estimated Distance (km): 2.7 Flow Rate: Flow less than 80 cumecs Flow Type: River Year: 2000	A8SW (S)	844	2	516915 171375

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
35	**River Quality Chemistry Sampling Points** Name: Thames Reach: Hogsmill To Teddington Estimated Distance: 2.70 Objective: Not Supplied Positional Accuracy: Located by supplier to within 10m Year: 1990 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1993 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1994 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1995 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1996 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1997 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1998 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 1999 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2000 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2001 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2002 GQA Grade: River Quality Chemistry GQA Grade A - Very Good Compliance: Not Supplied Year: 2003 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2004 GQA Grade: River Quality Chemistry GQA Grade A - Very Good Compliance: Not Supplied Year: 2005 GQA Grade: River Quality Chemistry GQA Grade A - Very Good Compliance: Not Supplied Year: 2006 GQA Grade: River Quality Chemistry GQA Grade A - Very Good Compliance: Not Supplied Year: 2007 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2008 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2009 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied	A8SW (S)	837	2	517020 171370
36	**Substantiated Pollution Incident Register** Authority: Environment Agency - Thames Region, South East Area Incident Date: 11th March 2002 Incident Reference: 63255 Water Impact: Category 2 - Significant Incident Air Impact: Category 4 - No Impact Land Impact: Category 4 - No Impact Positional Accuracy: Located by supplier to within 10m Pollutant: Oils - Diesel (Including Agricultural)	A7SE (SW)	714	2	516740 171570

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: D.G.Tilles & R.H.Tilles Licence Number: 28/39/34/0008 Permit Version: 102 Location: Borehole At The Exiles Ground, Twickenham Authority: Environment Agency, Thames Region Abstraction: Sports Grounds/Facilities: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: The Exiles Ground, Twickenham Authorised Start: 01 October Authorised End: 30 September Permit Start Date: 14th September 2001 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A24NE (NE)	1487	2	517840 173860
	Water Abstractions Operator: Threadneedle Property Part. Licence Number: 28/39/34/0008 Permit Version: 101 Location: Borehole At The Exiles Ground, Twickenham Authority: Environment Agency, Thames Region Abstraction: Sports Grounds/Facilities: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: The Exiles Ground, Twickenham Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 31st March 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A24NE (NE)	1487	2	517840 173860
	Water Abstractions Operator: Cable & Wireless (Meadowbank) Ltd Licence Number: 28/39/34/0008 Permit Version: 100 Location: Borehole At The Exiles Ground, Twickenham Authority: Environment Agency, Thames Region Abstraction: Sports Grounds/Facilities: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): 56 Yearly Rate (m3): 5300 Details: The Exiles Ground, Twickenham Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 15th October 1996 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A24NE (NE)	1487	2	517840 173860
	Groundwater Vulnerability Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise Map Sheet: Sheet 39 West London Scale: 1:100,000	A13NW (W)	0	2	517160 172357
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13NW (W)	0	1	517160 172357
	Superficial Aquifer Designations Aquifer Designation: Secondary Aquifer - A	A13NW (W)	0	1	517160 172357
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				

Agency & Hydrological

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Flood Defences None				
41	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 379.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A12SE (SW)	295	4	516804 172060
42	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 300.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A12SE (SW)	309	4	516768 172102
43	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 15.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A12NE (W)	339	4	516671 172391
44	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 125.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A14NE (E)	711	4	518001 172613
45	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 162.9 Watercourse Level: Not Supplied Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A14NE (E)	721	4	518023 172568
46	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 424.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Thames Catchment Name: Thames Primacy: 2	A7SE (SW)	726	4	516785 171536
47	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 239.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Thames Catchment Name: Thames Primacy: 2	A7SE (SW)	731	4	516643 171609
48	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 21.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Thames Catchment Name: Thames Primacy: 2	A7SE (SW)	745	4	516681 171568
49	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 873.4 Watercourse Level: Not Supplied Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A14NE (E)	750	4	518020 172685

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Local Authority Landfill Coverage Name: London Borough of Richmond Upon Thames - Has no landfill data to supply		0	5	517160 172357
	Local Authority Landfill Coverage Name: Royal Borough of Kingston Upon Thames - Has supplied landfill data		667	6	517531 171710
77	**Potentially Infilled Land (Non-Water)** Bearing Ref: S Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1992	A13SW (S)	92	-	517100 172121
78	**Potentially Infilled Land (Non-Water)** Bearing Ref: NW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1992	A13NW (NW)	329	-	516880 172668

Geological

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Thames Group	A13NW (W)	0	1	517160 172357
	BGS Estimated Soil Chemistry No data available				
79	**BGS Recorded Mineral Sites** Site Name: Ham Location: , Ham, Richmond, Surrey Source: British Geological Survey, National Geoscience Information Service Reference: 19674 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Quaternary Geology: Kempton Park Gravel Formation Commodity: Sand and Gravel Positional Accuracy: Located by supplier to within 10m	A12NE (NW)	457	1	516620 172600
80	**BGS Recorded Mineral Sites** Site Name: Ham Location: , Ham, Richmond, Surrey Source: British Geological Survey, National Geoscience Information Service Reference: 19676 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Quaternary Geology: Kempton Park Gravel Formation Commodity: Sand and Gravel Positional Accuracy: Located by supplier to within 10m	A7NE (SW)	480	1	516825 171790
81	**BGS Recorded Mineral Sites** Site Name: Ham Location: , Ham, Richmond, Surrey Source: British Geological Survey, National Geoscience Information Service Reference: 19675 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Quaternary Geology: Kempton Park Gravel Formation Commodity: Sand and Gravel Positional Accuracy: Located by supplier to within 10m	A12SE (SW)	577	1	516500 172050
82	**BGS Recorded Mineral Sites** Site Name: Ham Gravel Pit Location: , Ham, Richmond, Surrey Source: British Geological Survey, National Geoscience Information Service Reference: 164161 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Quaternary, Devensian Geology: Kempton Park Gravel Formation Commodity: Sand and Gravel Positional Accuracy: Located by supplier to within 10m	A12SW (W)	611	1	516417 172208
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517196, 172203 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 18.90 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 89.60 mg/kg Lead Measured Concentration: 246.20 mg/kg Nickel Measured Concentration: 25.70 mg/kg	A13SE (S)	71	1	517196 172203

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 516775, 172208 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 15.30 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 68.70 mg/kg Lead Measured Concentration: 160.00 mg/kg Nickel Measured Concentration: 27.70 mg/kg	A12SE (W)	268	1	516775 172208
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517162, 172797 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 35.90 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 59.80 mg/kg Lead Measured Concentration: 418.30 mg/kg Nickel Measured Concentration: 41.40 mg/kg	A18SW (N)	308	1	517162 172797
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517224, 171792 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 16.20 mg/kg Cadmium Measured Concentration: 0.40 mg/kg Chromium Measured Concentration: 61.20 mg/kg Lead Measured Concentration: 239.30 mg/kg Nickel Measured Concentration: 20.90 mg/kg	A8NE (S)	444	1	517224 171792
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 516653, 172693 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 16.30 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 70.90 mg/kg Lead Measured Concentration: 79.80 mg/kg Nickel Measured Concentration: 22.10 mg/kg	A17SE (NW)	488	1	516653 172693
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 516754, 171749 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 16.10 mg/kg Cadmium Measured Concentration: 0.40 mg/kg Chromium Measured Concentration: 61.40 mg/kg Lead Measured Concentration: 208.10 mg/kg Nickel Measured Concentration: 25.30 mg/kg	A7NE (SW)	553	1	516754 171749

Geological

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517870, 172143 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 17.80 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 53.80 mg/kg Lead Measured Concentration: 81.50 mg/kg Nickel Measured Concentration: 15.50 mg/kg	A14SE (E)	614	1	517870 172143
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517880, 172804 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 13.90 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 44.00 mg/kg Lead Measured Concentration: 161.70 mg/kg Nickel Measured Concentration: 17.70 mg/kg	A19SE (NE)	674	1	517880 172804
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517228, 173180 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 18.30 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 61.50 mg/kg Lead Measured Concentration: 75.40 mg/kg Nickel Measured Concentration: 20.70 mg/kg	A18NE (N)	681	1	517228 173180
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 516303, 172232 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 28.10 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 49.80 mg/kg Lead Measured Concentration: 98.50 mg/kg Nickel Measured Concentration: 27.70 mg/kg	A12SW (W)	718	1	516303 172232
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517788, 171803 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 14.30 mg/kg Cadmium Measured Concentration: 0.40 mg/kg Chromium Measured Concentration: 51.60 mg/kg Lead Measured Concentration: 85.20 mg/kg Nickel Measured Concentration: 14.20 mg/kg	A9NW (SE)	738	1	517788 171803

Geological

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 516264, 172716 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 22.90 mg/kg Cadmium Measured Concentration: 0.40 mg/kg Chromium Measured Concentration: 60.00 mg/kg Lead Measured Concentration: 89.90 mg/kg Nickel Measured Concentration: 30.20 mg/kg	A17SW (W)	826	1	516264 172716
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 517785, 173299 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 22.20 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 71.00 mg/kg Lead Measured Concentration: 203.80 mg/kg Nickel Measured Concentration: 30.40 mg/kg	A19NW (NE)	967	1	517785 173299
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 518303, 172289 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 22.20 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 61.00 mg/kg Lead Measured Concentration: 134.70 mg/kg Nickel Measured Concentration: 18.70 mg/kg	A15SW (E)	992	1	518303 172289
	BGS Urban Soil Chemistry Averages Source: British Geological Survey, National Geoscience Information Service Sample Area: London Count Id: 7209 Arsenic Minimum Concentration: 1.00 mg/kg Arsenic Average Concentration: 17.00 mg/kg Arsenic Maximum Concentration: 161.00 mg/kg Cadmium Minimum Concentration: 0.10 mg/kg Cadmium Average Concentration: 0.90 mg/kg Cadmium Maximum Concentration: 165.20 mg/kg Chromium Minimum Concentration: 13.00 mg/kg Chromium Average Concentration: 79.00 mg/kg Chromium Maximum Concentration: 2094.00 mg/kg Lead Minimum Concentration: 11.00 mg/kg Lead Average Concentration: 280.00 mg/kg Lead Maximum Concentration: 10000.00 mg/kg Nickel Minimum Concentration: 2.00 mg/kg Nickel Average Concentration: 28.00 mg/kg Nickel Maximum Concentration: 506.00 mg/kg	A13NW (W)	0	1	517160 172357

Geological

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357
	Potential for Compressible Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	41	1	516986 172263
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	78	1	517300 172260
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13NW (W)	0	1	517160 172357

Industrial Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
83	**Contemporary Trade Directory Entries** Name: K S Dry Cleaners Ltd Location: 65, Ham Street, Richmond, TW10 7HW Classification: Dry Cleaners **Status:** Active Positional Accuracy: Automatically positioned to the address	A13NE (E)	19	-	517311 172387
83	**Contemporary Trade Directory Entries** Name: Peter'S Cleaners Location: 65, Ham Street, Richmond, Surrey, TW10 7HW Classification: Dry Cleaners **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13NE (E)	20	-	517312 172387
83	**Contemporary Trade Directory Entries** Name: Mica Hardware Location: 12, Ashburnham Road, Richmond, Surrey, TW10 7NF Classification: Hardware **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13NE (E)	20	-	517302 172362
83	**Contemporary Trade Directory Entries** Name: Peels Of London Ltd Location: 63, Ham Street, Richmond, Surrey, TW10 7HW Classification: Window Tinting **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13NE (E)	26	-	517315 172382
84	**Contemporary Trade Directory Entries** Name: Www.Enviro-Blast-Clean.Com Location: 32, Mowbray Road, Richmond, Surrey, TW10 7NQ Classification: Blast Cleaning **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13SE (S)	138	-	517212 172135
85	**Contemporary Trade Directory Entries** Name: Star Optical Location: 202, Ashburnham Road, Richmond, Surrey, TW10 7NL Classification: Laboratory Equipment, Instruments & Supplies **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13SW (SW)	155	-	516888 172223
85	**Contemporary Trade Directory Entries** Name: Mercury Multimedia Ltd Location: 206, Ashburnham Road, RICHMOND, Surrey, TW10 7NL Classification: Photo & Digital Imaging Bureaus **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13SW (SW)	158	-	516882 172233
85	**Contemporary Trade Directory Entries** Name: Express Installers Location: 89, Woodville Road, Richmond, TW10 7QW Classification: Cinema Equipment **Status:** Active Positional Accuracy: Automatically positioned to the address	A13SW (W)	160	-	516873 172258
86	**Contemporary Trade Directory Entries** Name: Intech Marketing (Uk) Ltd Location: 32, Back Lane, Richmond, Surrey, TW10 7LF Classification: Office Furniture & Equipment **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13SE (SE)	194	-	517400 172186
87	**Contemporary Trade Directory Entries** Name: Sparkles Location: 89, Ashburnham Road, Richmond, Surrey, TW10 7NN Classification: Cleaning Services - Domestic **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13SW (SW)	199	-	516907 172085
87	**Contemporary Trade Directory Entries** Name: G T Harris Location: 26, Fellbrook, Richmond, Surrey, TW10 7UW Classification: Washing Machines - Servicing & Repairs **Status:** Inactive Positional Accuracy: Automatically positioned to the address	A13SW (SW)	241	-	516889 172041
88	**Contemporary Trade Directory Entries** Name: A S Motors Location: Central Garage,Croft Way,Off Dukes Av, Ham, Richmond, Surrey, TW10 7NP Classification: Mot Testing Centres **Status:** Inactive Positional Accuracy: Manually positioned to the road within the address or location	A13SW (SW)	251	-	516828 172112

Industrial Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
89	**Contemporary Trade Directory Entries** Name: Designer Carpets Location: 2, Ham Street, Richmond, Surrey, TW10 7HT Classification: Carpets & Rugs - Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	273	-	517480 172153
89	**Contemporary Trade Directory Entries** Name: M W Carpets Ltd Location: 2, Ham Street, Richmond, Surrey, TW10 7HT Classification: Carpets & Rugs - Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	273	-	517480 172153
90	**Contemporary Trade Directory Entries** Name: Lifetime Shutters & Blinds Ltd Location: 63, Perryfield Way, Richmond, Surrey, TW10 7SL Classification: Shutters - Internal **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NW (NW)	278	-	516905 172622
91	**Contemporary Trade Directory Entries** Name: B & S Car Disposal Service Location: 29, Meadlands Drive, Richmond, Surrey, TW10 7EF Classification: Car Breakers & Dismantlers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A19SW (NE)	388	-	517566 172737
92	**Contemporary Trade Directory Entries** Name: Key Cleaning Location: Flat 1, 200, Riverside Drive, Richmond, Surrey, TW10 7RP Classification: Commercial Cleaning Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8NW (S)	415	-	517006 171795
93	**Contemporary Trade Directory Entries** Name: M K B Enterprise Ltd Location: 5, Broughton Avenue, Richmond, Surrey, TW10 7TT Classification: Electronic Component Manufacturers & Distributors **Status: Active** Positional Accuracy: Automatically positioned to the address	A8NE (S)	433	-	517194 171793
94	**Contemporary Trade Directory Entries** Name: Az Clean Ltd Location: 10, Mornington Walk, Richmond, Surrey, TW10 7LY Classification: Commercial Cleaning Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8NE (SE)	445	-	517469 171932
95	**Contemporary Trade Directory Entries** Name: Surrey Auto Services Location: 156, Dukes Avenue, Richmond, TW10 7YL Classification: Garage Services **Status: Active** Positional Accuracy: Automatically positioned to the address	A8NE (S)	498	-	517289 171762
96	**Contemporary Trade Directory Entries** Name: Airs & Graces Location: 4, Beaufort Road, Richmond, Surrey, TW10 7XS Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8NE (S)	525	-	517189 171696
97	**Contemporary Trade Directory Entries** Name: M J W Print Ltd Location: 7, Lauderdale Drive, Richmond, Surrey, TW10 7BS Classification: Printers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A14NE (E)	570	-	517872 172550
98	**Contemporary Trade Directory Entries** Name: London Cleaning Service Location: 64, Beaufort Court, Beaufort Road, Richmond, Surrey, TW10 7YQ Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SW (S)	573	-	517129 171637
99	**Contemporary Trade Directory Entries** Name: Oscar Pet Foods Location: 28, Buckingham Road, Richmond, Surrey, TW10 7EQ Classification: Pet Foods & Animal Feeds **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A19SW (NE)	597	-	517788 172803

Industrial Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
120	**Contemporary Trade Directory Entries** Name: B 'N' S Salvage Location: Flat 26, Cranmer Court, Richmond Road, Kingston upon Thames, Surrey, KT2 5PY Classification: Car Breakers & Dismantlers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	987	-	517819 171512
121	**Contemporary Trade Directory Entries** Name: Smart Fleet Location: 47, Northwoald Lane, Kingston upon Thames, Surrey, KT2 5GN Classification: Car Dealers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A4NW (S)	987	-	517518 171330
122	**Contemporary Trade Directory Entries** Name: Kemetyl Location: Broom Road, Teddington, Middlesex, TW11 9NU Classification: Chemical Manufacturers **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A3NW (S)	990	-	516967 171221
123	**Fuel Station Entries** Name: A S Motors Of Ham Location: Croftway, Riverside Drive, Ham, RICHMOND, Surrey, TW10 7NP Brand: Obsolete Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Manually positioned to the address or location	A12SE (SW)	260	-	516810 172129
124	**Fuel Station Entries** Name: Ham Cross Service Station Location: 297, Richmond Road, Kingston upon Thames, Surrey, KT2 5QU Brand: Texaco Premises Type: Petrol Station **Status: Open** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	935	-	517745 171527
125	**Points of Interest - Commercial Services** Name: Tooth Removals Sarl Location: 10 Watermill Close, Richmond, TW10 7UH Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A13SW (S)	189	7	517099 172020
126	**Points of Interest - Commercial Services** Name: Crown Ltd Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
126	**Points of Interest - Commercial Services** Name: Crown Motorcycles Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
126	**Points of Interest - Commercial Services** Name: Vetech Motor Services Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
126	**Points of Interest - Commercial Services** Name: Crown Garage Kingston Ltd Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
126	**Points of Interest - Commercial Services** Name: Ham Cross Garage Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527

Industrial Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
126	**Points of Interest - Commercial Services** Name: Vetech Motor Services Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9SW (SE)	936	7	517745 171526
126	**Points of Interest - Commercial Services** Name: Crown Garages Kingston Ltd Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9SW (SE)	936	7	517745 171526
127	**Points of Interest - Commercial Services** Name: L J Motorcycle Repairs Location: Unit D1 1, Strawberry Vale, Twickenham, TW1 4RP Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A11NE (W)	980	7	516036 172478
128	**Points of Interest - Education and Health** Name: Cassel Hospital Location: 1 Ham Common, Richmond, TW10 7JF Category: Health Practitioners and Establishments Class Code: Hospitals Positional Accuracy: Positioned to address or location	A9NW (SE)	695	7	517708 171791
129	**Points of Interest - Manufacturing and Production** Name: Tank Location: TW10 Category: Industrial Features Class Code: Tanks (Generic) Positional Accuracy: Positioned to an adjacent address or location	A13SE (S)	201	7	517267 172095
130	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A9NW (SE)	768	7	517822 171795
131	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A11NE (W)	914	7	516100 172454
131	**Points of Interest - Manufacturing and Production** Name: Works Location: TW1 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A11NE (W)	918	7	516096 172454
131	**Points of Interest - Manufacturing and Production** Name: Works Location: TW1 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A11NE (W)	985	7	516030 172468
131	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A11NE (W)	989	7	516026 172469
132	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NE (NW)	935	7	516573 173189
133	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NW (NW)	963	7	516452 173145

Industrial Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
133	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NW (NW)	978	7	516428 173146
133	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NW (NW)	979	7	516443 173158
133	**Points of Interest - Manufacturing and Production** Name: Works Location: TW1 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NW (NW)	979	7	516428 173147
133	**Points of Interest - Manufacturing and Production** Name: Works Location: TW1 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NW (NW)	980	7	516443 173159
134	**Points of Interest - Public Infrastructure** Name: Metropolitan Police Service Location: 18 Ashburnham Road, Richmond, TW10 7NF Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A13NE (E)	33	7	517324 172379
134	**Points of Interest - Public Infrastructure** Name: Metropolitan Police Service Location: 18 Ashburnham Road, Richmond, TW10 7NF Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A13NE (E)	33	7	517324 172379
135	**Points of Interest - Public Infrastructure** Name: Tesco Petrol Filling Station Location: 185 Ashburnham Road, Richmond, TW10 7NR Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A12SE (SW)	235	7	516818 172182
136	**Points of Interest - Public Infrastructure** Name: Outfall Location: TW10 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A12SW (W)	725	7	516340 172066
137	**Points of Interest - Public Infrastructure** Name: Sluices Location: TW10 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A8SW (S)	752	7	516893 171474
137	**Points of Interest - Public Infrastructure** Name: Sluice Location: TW10 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A8SW (S)	767	7	516957 171447
138	**Points of Interest - Public Infrastructure** Name: Sluices Location: TW11 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A8SW (S)	797	7	517008 171411
138	**Points of Interest - Public Infrastructure** Name: Sluices Location: TW11 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A8SW (S)	819	7	517019 171389

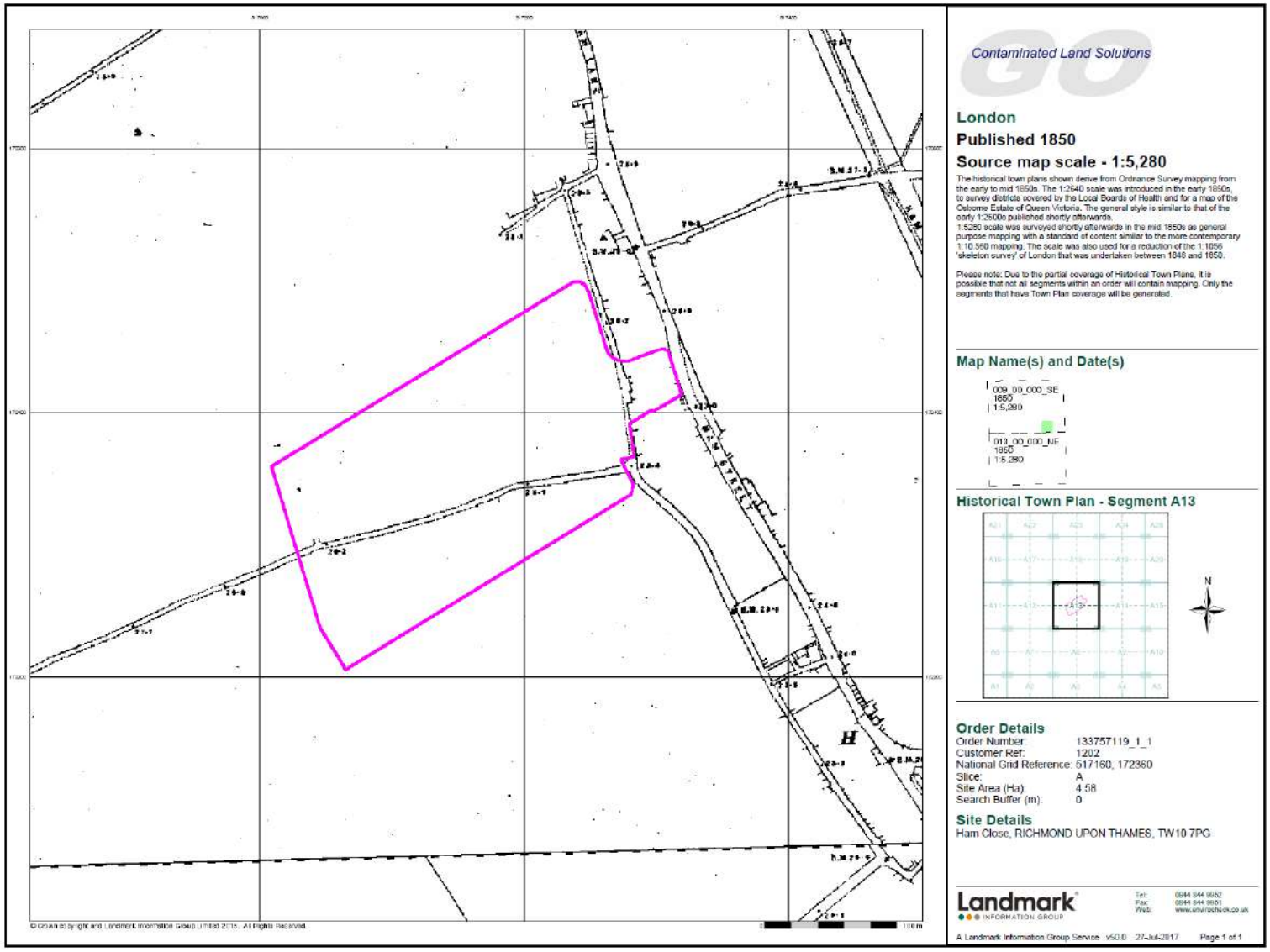
Industrial Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
138	**Points of Interest - Public Infrastructure** Name: Teddington Weir Location: TW11 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A8SW (S)	826	7	517021 171381
139	**Points of Interest - Public Infrastructure** Name: Cemetery Location: TW10 Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A9NE (SE)	867	7	517983 171831
139	**Points of Interest - Public Infrastructure** Name: Cemetery Location: Not Supplied Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A9NE (SE)	871	7	517988 171832
140	**Points of Interest - Public Infrastructure** Name: Hamcross Self Serve Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
140	**Points of Interest - Public Infrastructure** Name: Ham Cross Service Station Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
140	**Points of Interest - Public Infrastructure** Name: Ham Cross Service Station Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
140	**Points of Interest - Public Infrastructure** Name: Ham Cross Service Station Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	935	7	517745 171527
140	**Points of Interest - Public Infrastructure** Name: Texaco Location: 297 Richmond Road, Kingston upon Thames, KT2 5QU Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	936	7	517745 171526
141	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A18SW (N)	323	7	517035 172754
141	**Points of Interest - Recreational and Environmental** Name: Playground Location: Riverside Drive, TW10 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A18SW (N)	323	7	517035 172754
142	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A8SW (S)	650	7	517049 171556
142	**Points of Interest - Recreational and Environmental** Name: Playground Location: Fisherman Close, TW10 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A8SW (S)	650	7	517049 171556

Sensitive Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
145	**Local Nature Reserves** Name: Ham Lands Multiple Area: Y Area (m2): 600138.24 Source: Natural England Designation Date: 1st January 1992	A12SE (SW)	290	8	516809 172060
146	**Local Nature Reserves** Name: Ham Common, Richmond, London Multiple Area: N Area (m2): 402691.94 Source: Natural England Designation Date: 1st January 2001	A14SE (E)	671	8	517897 172074

Appendix D – Historical Maps



Contaminated Land Solutions

London

Published 1850

Source map scale - 1:5,280

The historical town plans shown derive from Ordnance Survey mapping from the early to mid 1850s. The 1:2640 scale was introduced in the early 1850s to survey districts covered by the Local Boards of Health and for a map of the Osborne Estate of Queen Victoria. The general style is similar to that of the early 1:2500s published shortly afterwards.
1:5280 scale was surveyed shortly afterwards in the mid 1850s as general purpose mapping with a standard of content similar to the more contemporary 1:10,560 mapping. The scale was also used for a reduction of the 1:1056 'skeleton survey' of London that was undertaken between 1848 and 1850.

Please note: Due to the partial coverage of Historical Town Plans, it is possible that not all segments within an order will contain mapping. Only the segments that have Town Plan coverage will be generated.

Map Name(s) and Date(s)

009_00_000_SE
1850
1:5,280

013_00_000_NE
1850
1:5,280

Historical Town Plan - Segment A13

Order Details

Order Number:	133757119_1_1
Customer Ref:	1202
National Grid Reference:	517160, 172360
Slice:	A
Site Area (Ha):	4.58
Search Buffer (m):	0

Site Details

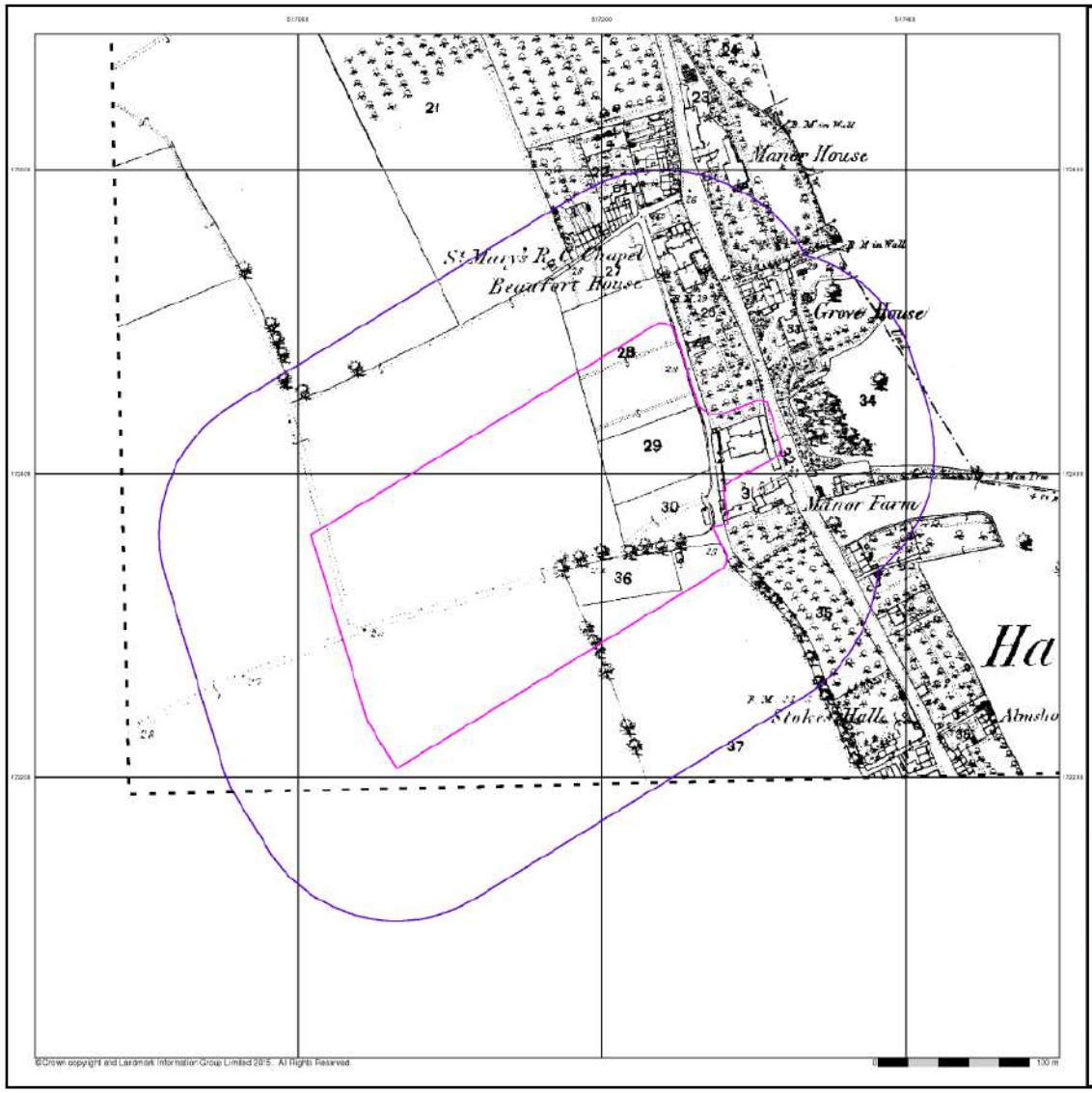
Ham Close, RICHMOND UPON THAMES, TW10 7PG

Landmark INFORMATION GROUP

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

A Landmark Information Group Service v50.0 27-Jul-2017 Page 1 of 1

9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



Contaminated Land Solutions

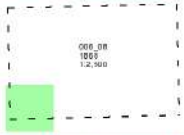
Surrey

Published 1868

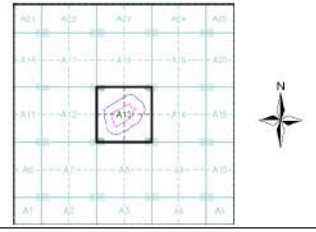
Source map scale - 1:2,500

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 and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1935, 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.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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Slice:	A
Site Area (Ha):	4.58
Search Buffer (m):	100

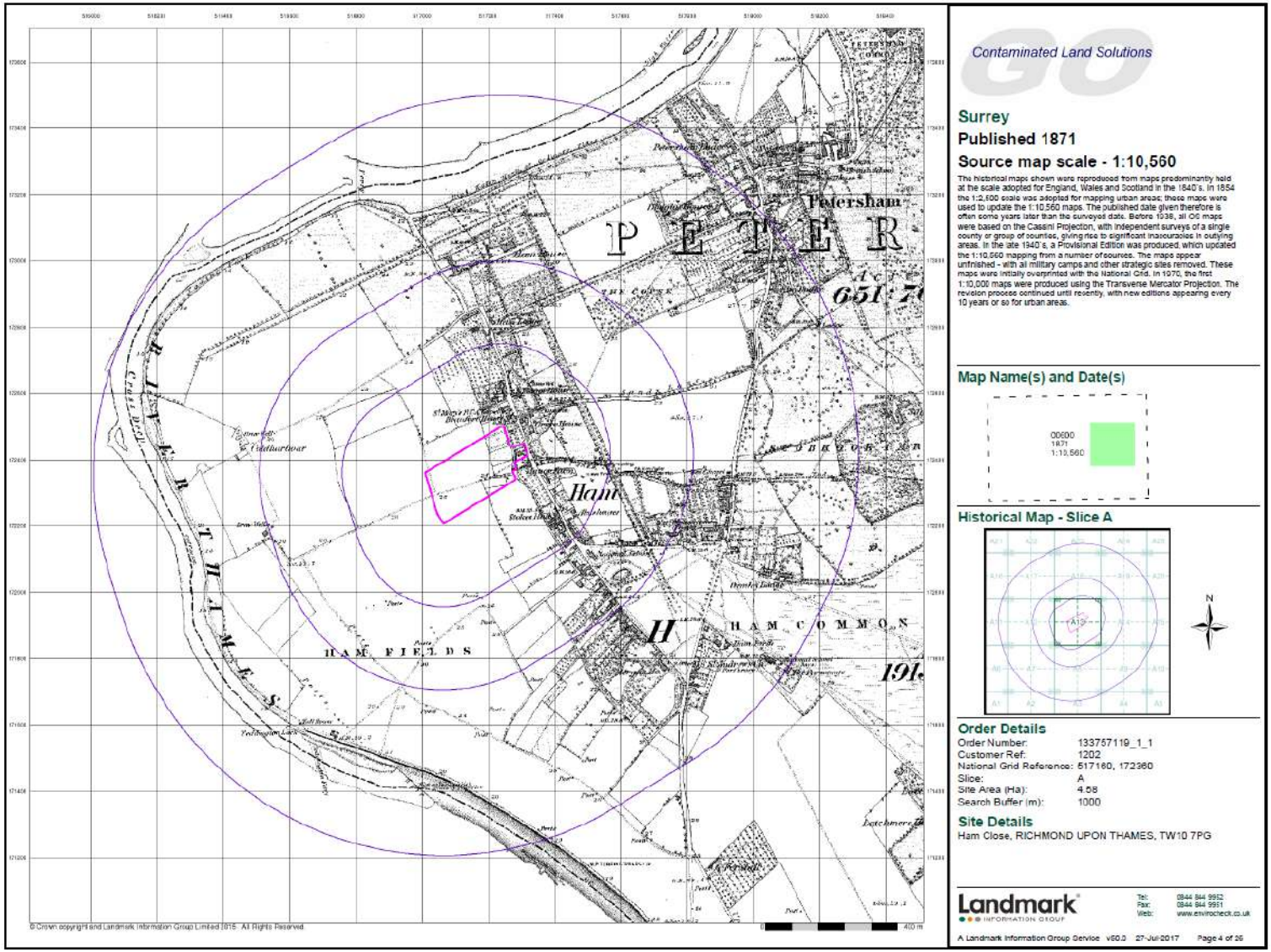
Site Details

Ham Close, RICHMOND UPON THAMES, TW10 7PG

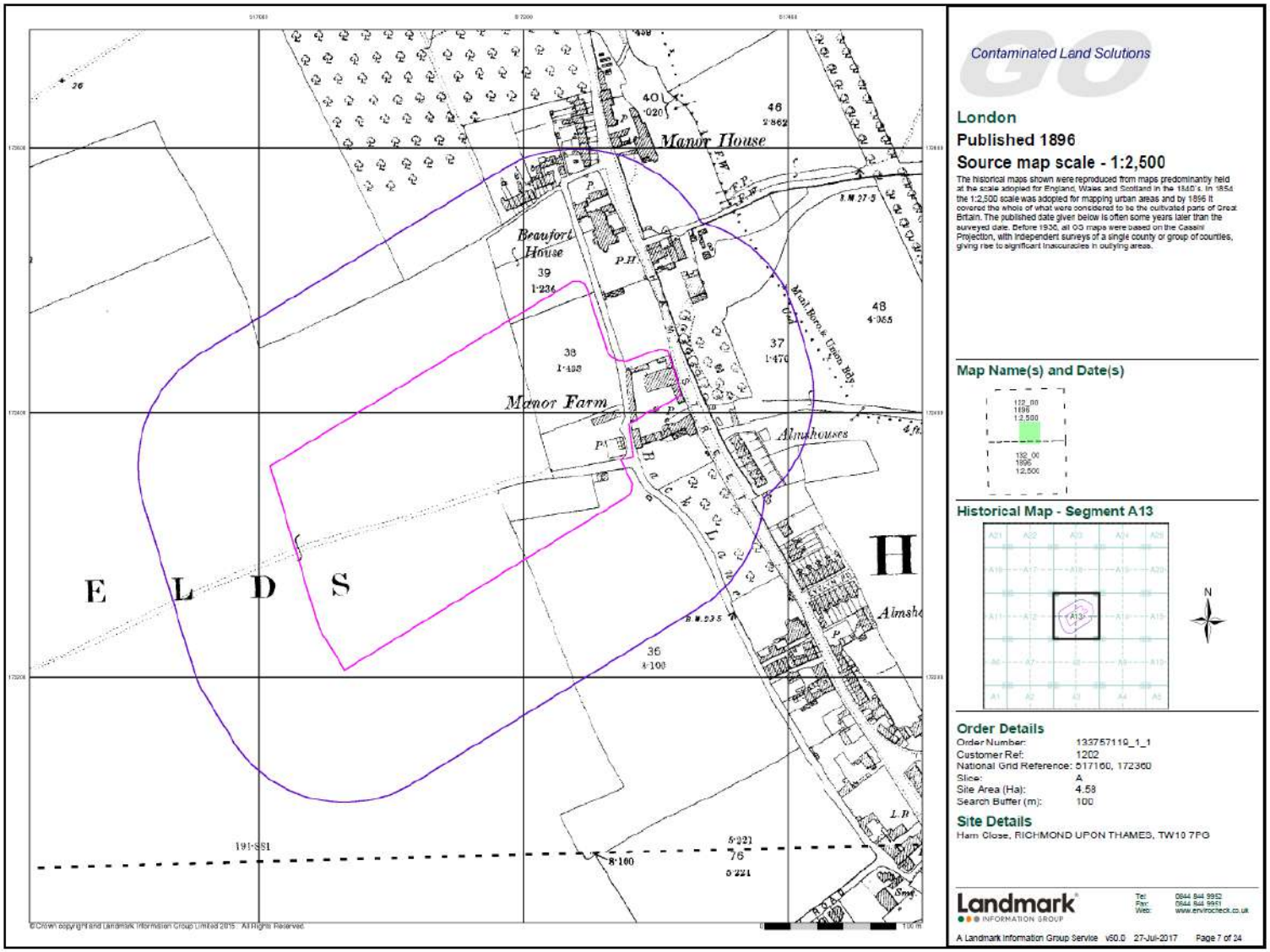
Landmark INFORMATION GROUP

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

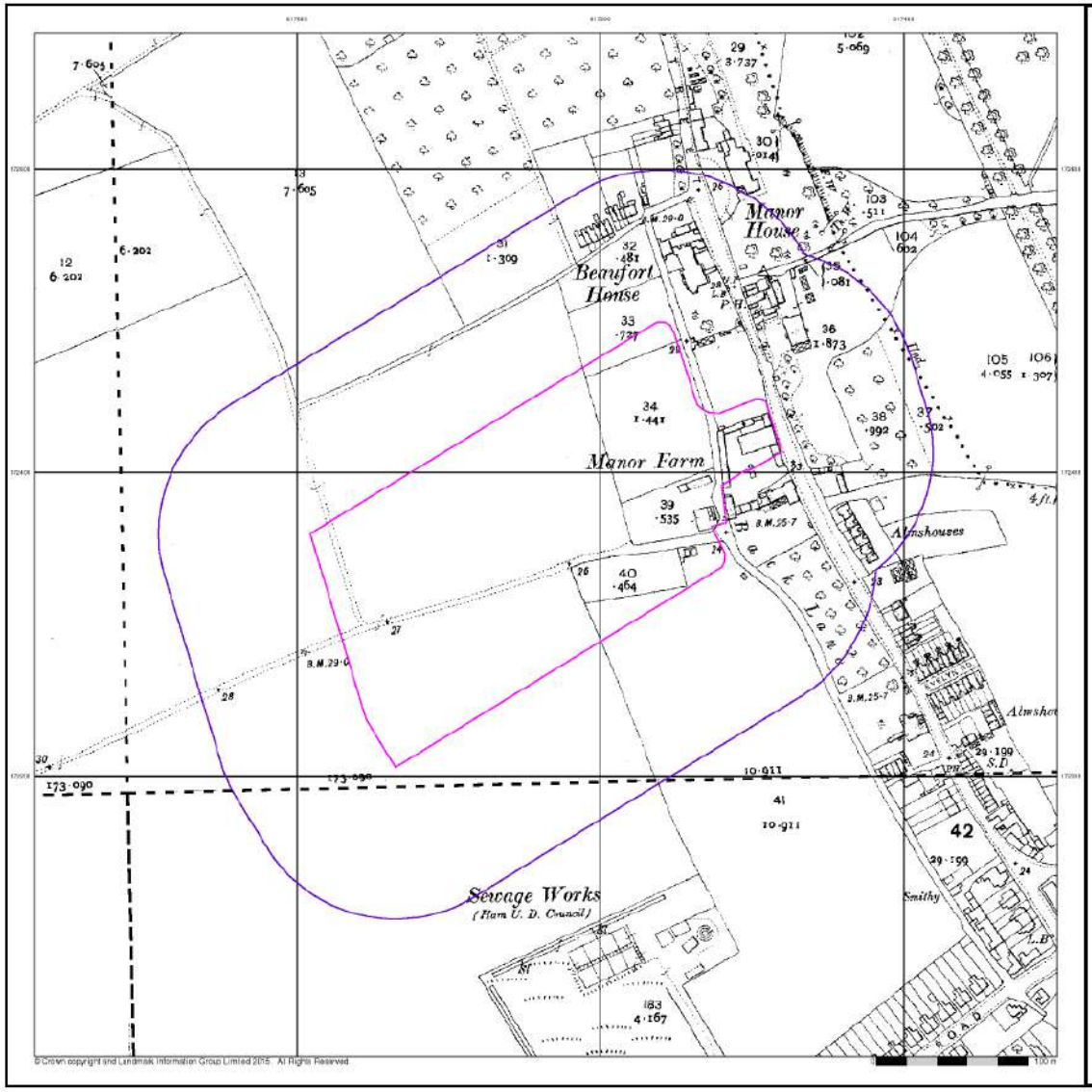
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



Contaminated Land Solutions

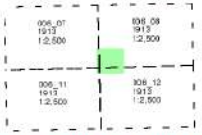
Surrey

Published 1913

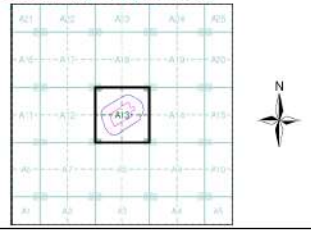
Source map scale - 1:2,500

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 and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1936, 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.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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National Grid Reference:	517160, 172360
Slice:	A
Site Area (Ha):	4.56
Search Buffer (m):	100

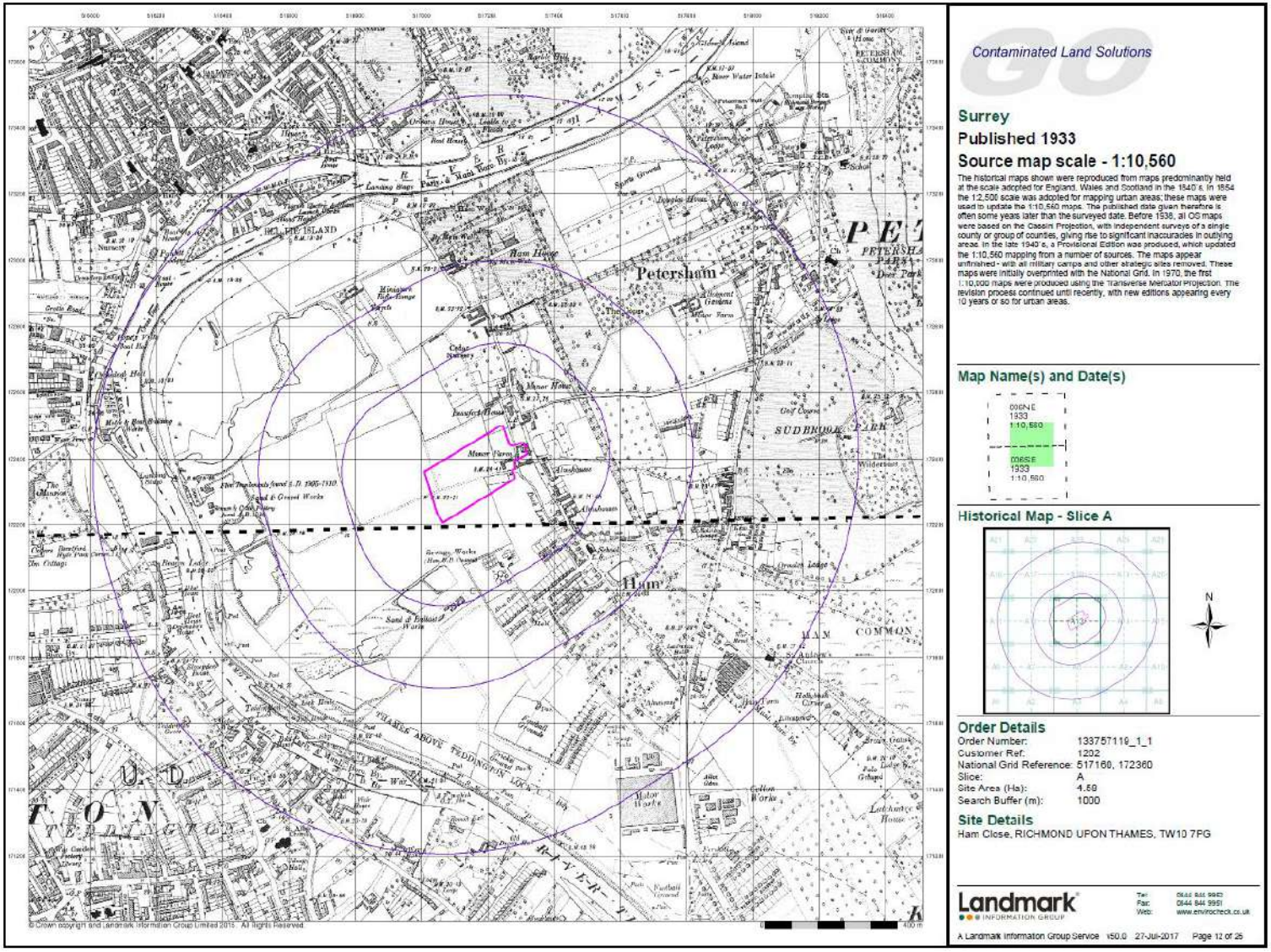
Site Details

Ham Close, RICHMOND UPON THAMES, TW10 7PG

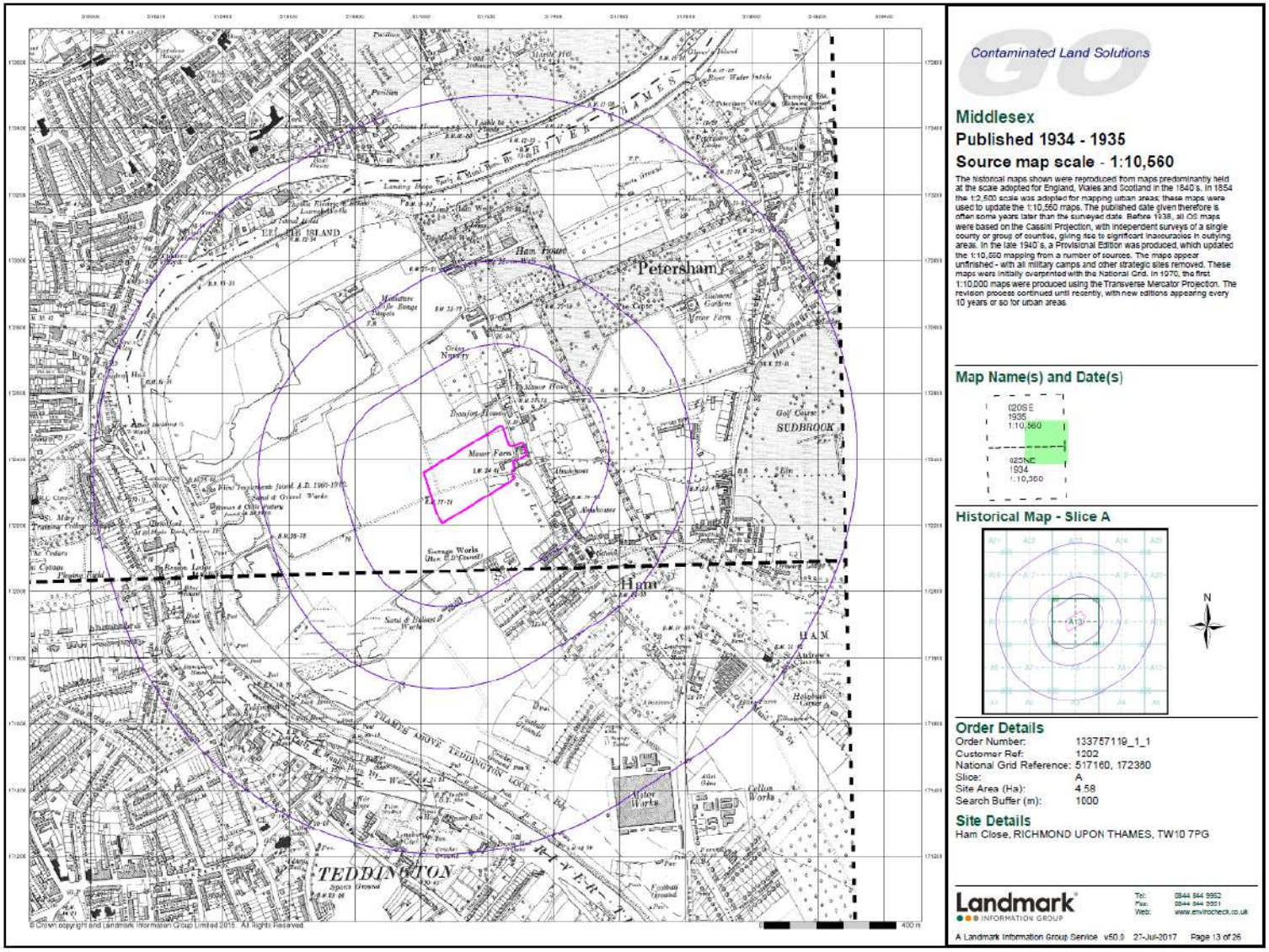
Landmark INFORMATION GROUP

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

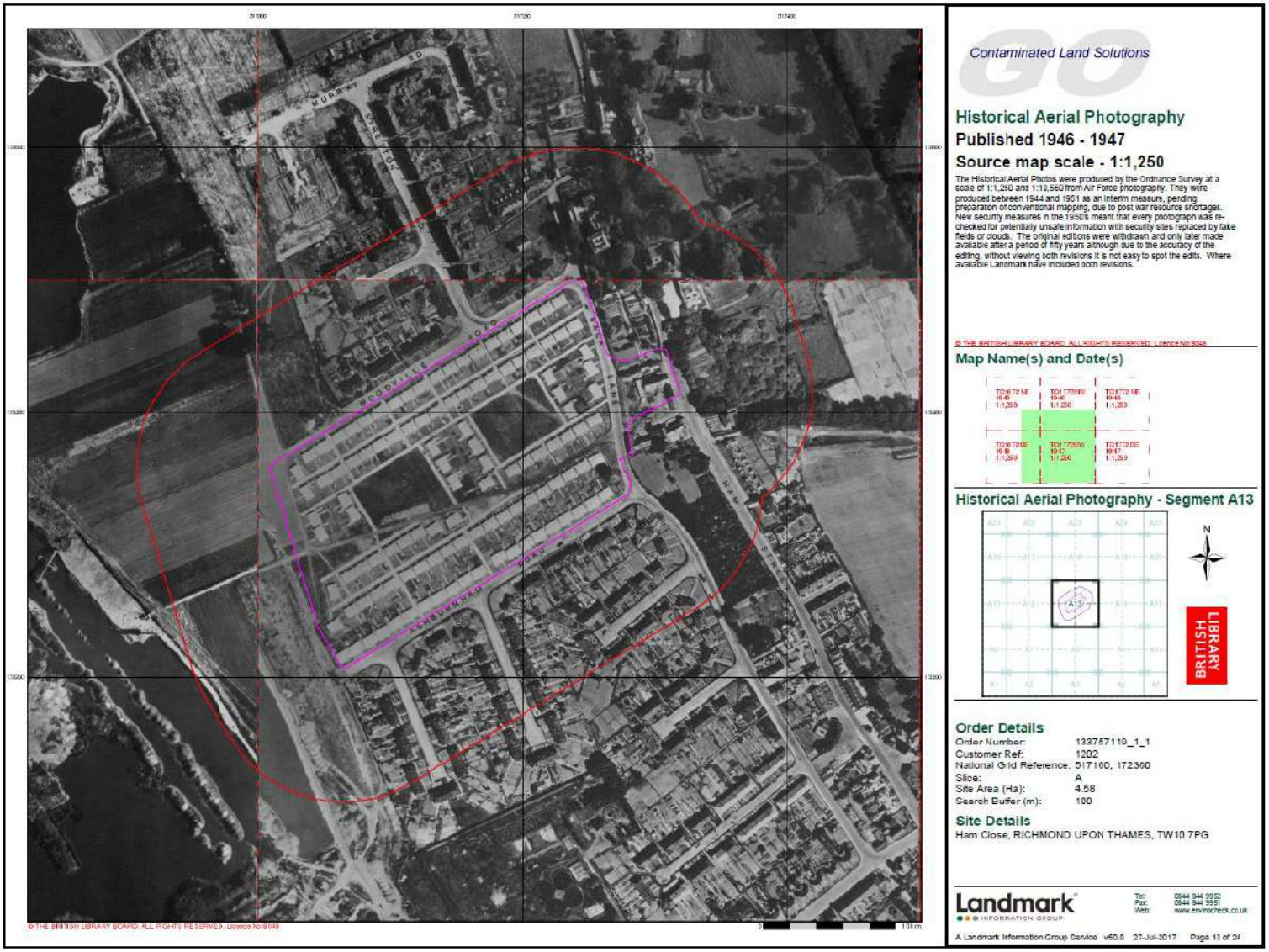
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



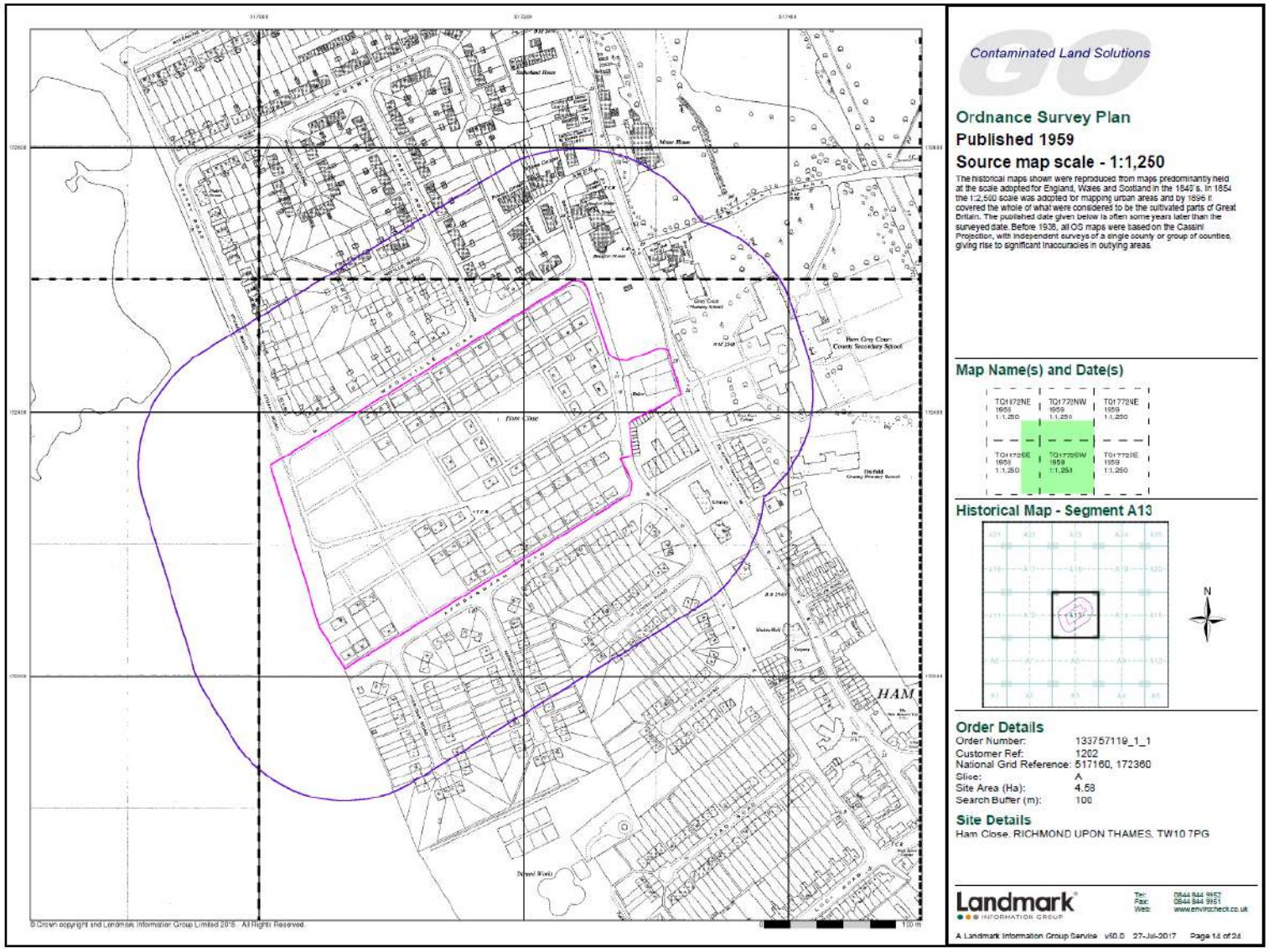
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



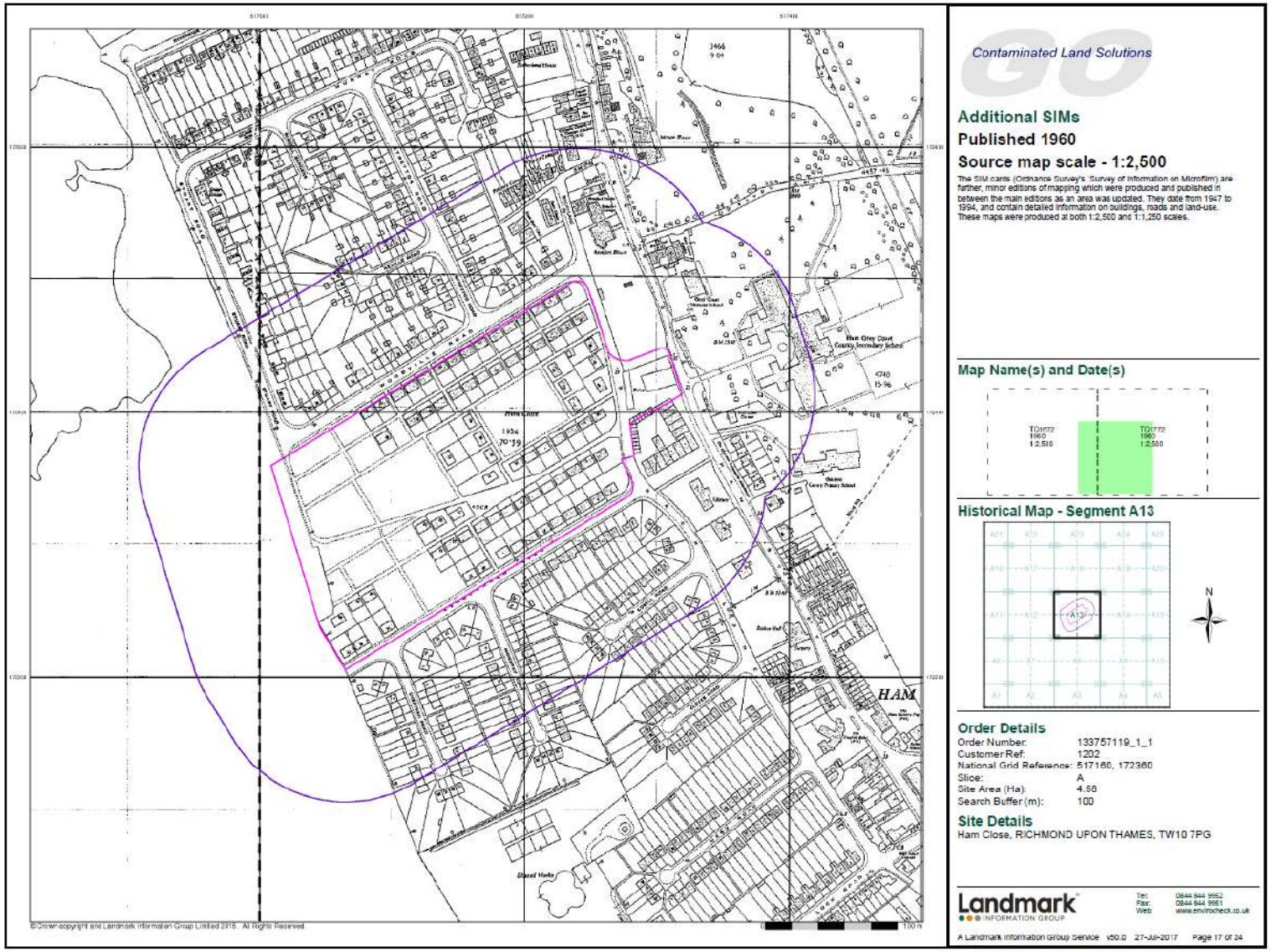
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



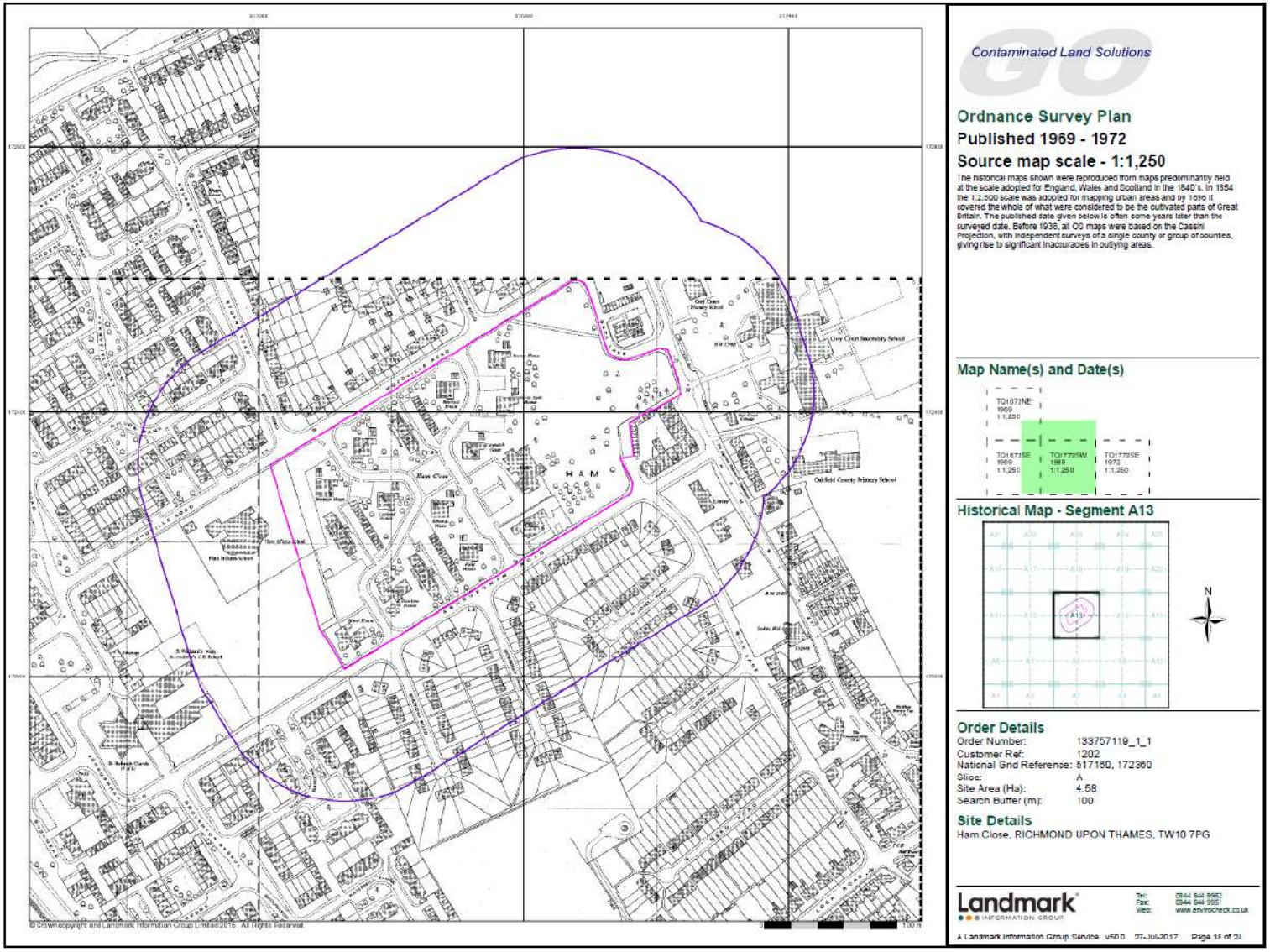
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



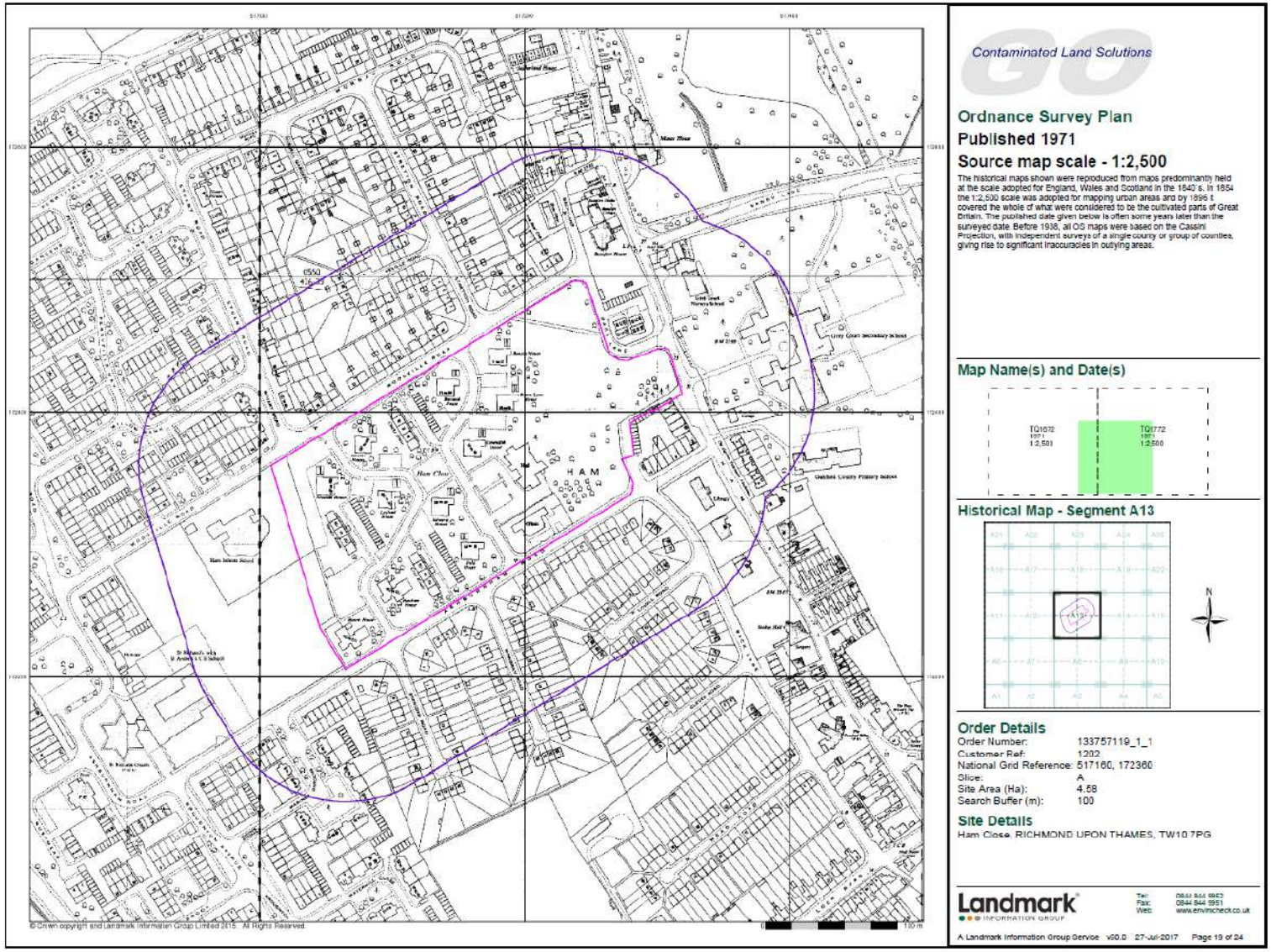
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



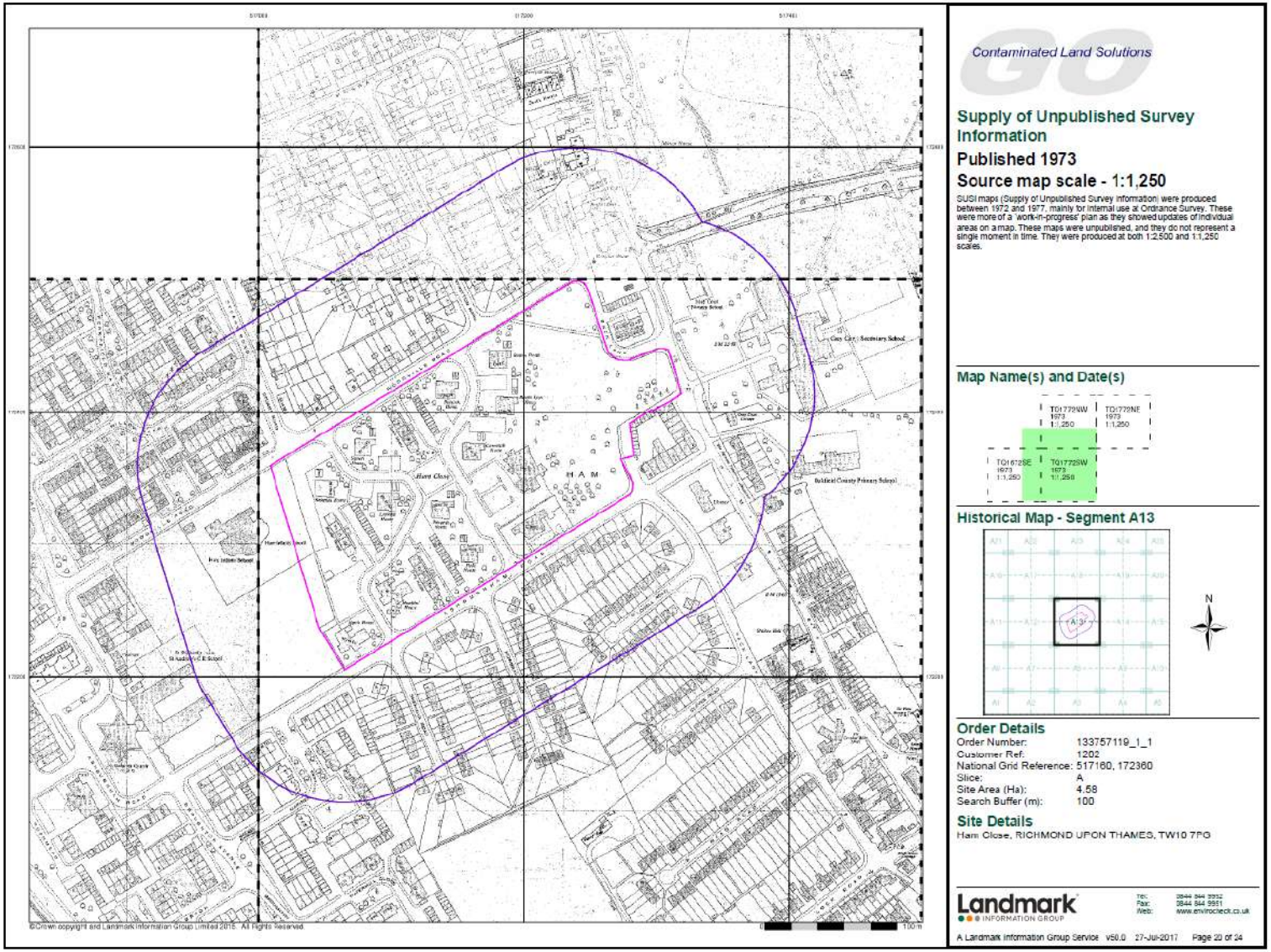
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



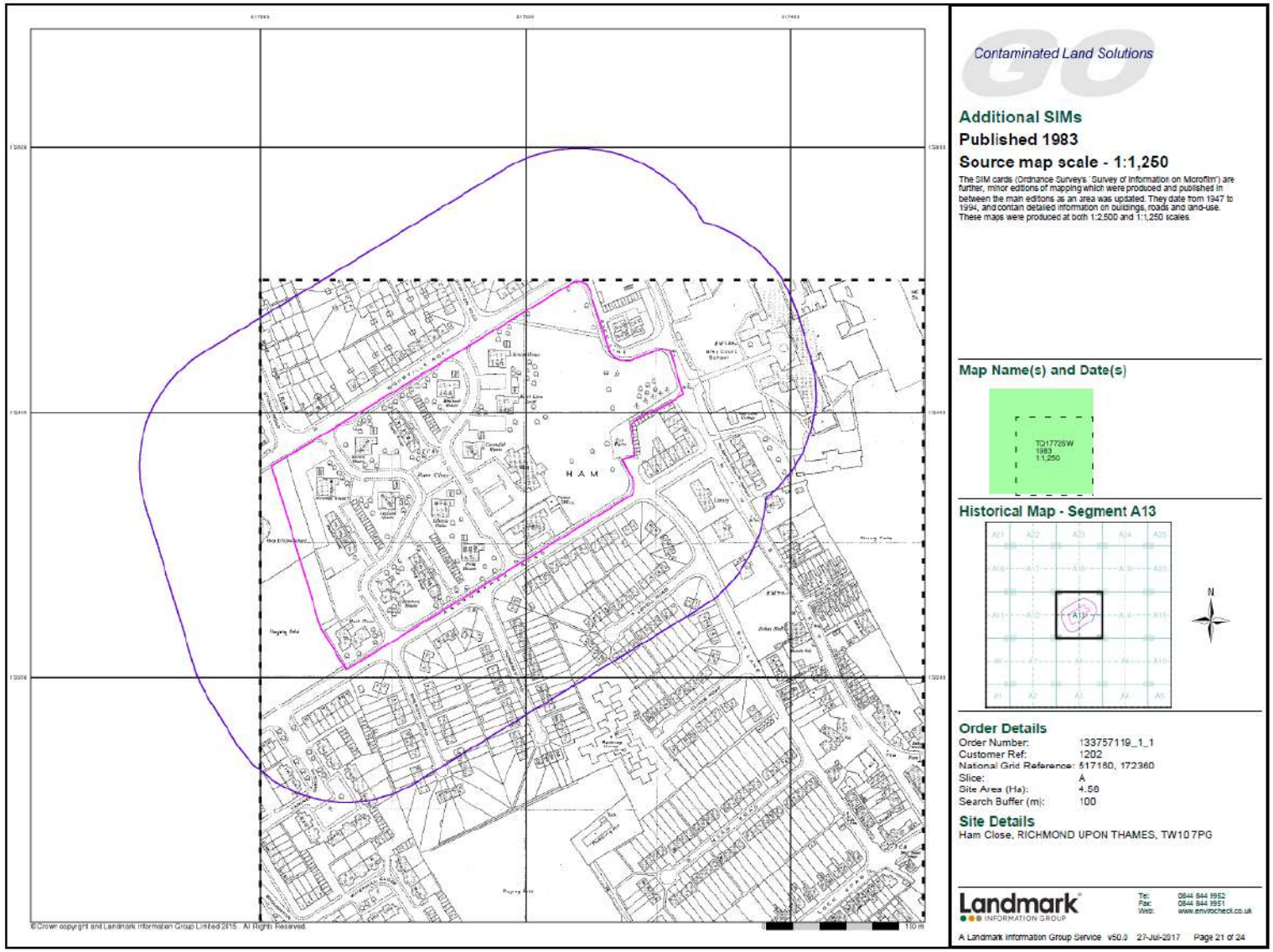
9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



Contaminated Land Solutions

Additional SIMs

Published 1983

Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

Historical Map - Segment A13

Order Details

Order Number:	133757119_1_1
Customer Ref:	1202
National Grid Reference:	517180, 172360
Slice:	A
Site Area (Ha):	4.56
Search Buffer (m):	100

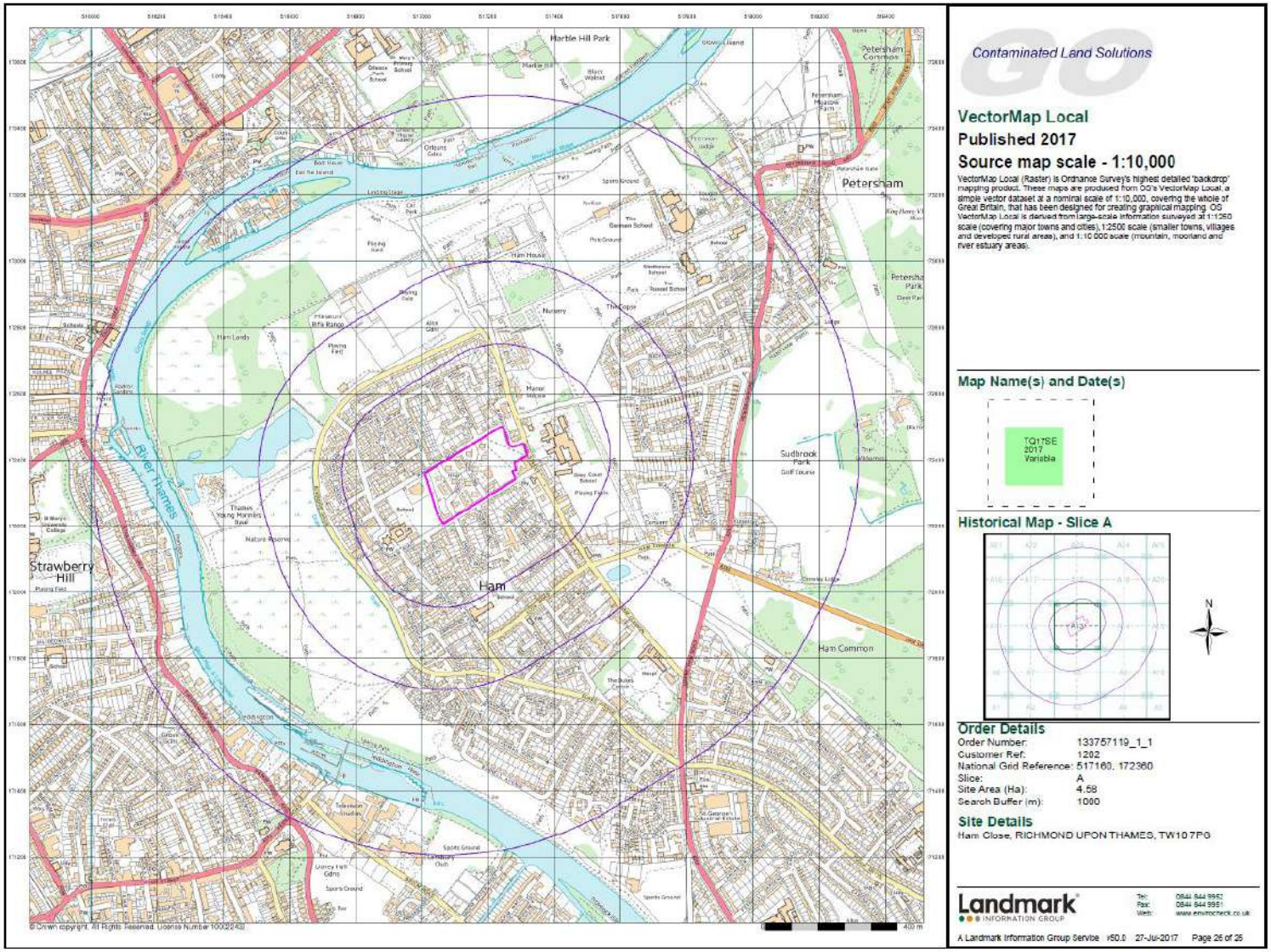
Site Details

Ham Close, RICHMOND UPON THAMES, TW10 7PG

Landmark INFORMATION GROUP

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

9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership



9324-P1E-1: Ham Close, Richmond Upon Thames
Richmond Housing Partnership

Appendix E – Owner's Questionnaire

Questionnaire, for completion by current or previous owner or manager, please enter Not Known where you are unable to provide an answer.

Ham Close, Richmond upon Thames, TW10 7PG

I have owned/managed* the above site from .2000..... to .....current.....
*(*delete as appropriate)*

Existing site & property details:

Site use:	Mainly residential Youth club/ clinic/ dentist
Number of Buildings:	14 residential blocks
Building 'A', Nature of Use: (insert lines as required)	residential
Date of Construction	1960's
Land Area (ha):	
Current Tenants:	192 units
Any asbestos containing materials?	Likely due to age of construction
Asbestos Survey available?	no
Any archaeological, geotechnical or environmental reports?	no

Current site utilities:

Commercial/Household Waste Disposal	
Sewage Discharge and Disposal	*to main drainage, yes/no, if other please specify*
Surface Water Drainage	*to main drainage/soakaway, if other please specify*
Source of heating and cooling	*Individual mains gas/electric*
Wells?	no
Septic System?	no

Historical site activities (if answered 'yes', please provide details):

Are you aware of any other past use of the site?	no
Are you aware of any other past use of adjacent areas?	Not to our knowledge
Has anything been buried on or within 250m of the site?	Not to our knowledge
Have any chemicals been stored on or within 250m of the site?	Not to our knowledge
Have any potentially contaminating processes been undertaken either on or within 250m of the site?	Not to our knowledge
Has there been any oil or fuel storage on or within 250m of the site?	Not to our knowledge
Has any fill material been deposited on or within 250m of the site?	Not to our knowledge
Have any animals been kept on site?	Maybe, as originally farmland (approx. 100 years ago)

Signed..... Date.....01 Aug 2017.....

Name...Tracey Elliott.....

Company....RHP.....

Appendix F – Contacts

Local Authority	Environmental Health London Borough of Richmond upon Thames 4 Waldegrave Road, Teddington, Middlesex, TW11 8EN	www.richmond.gov.uk Simon.makoni@richmond.gov.uk
Environment Agency	National Customer Contact Centre PO Box 544 Rotherham S60 1BY	08708 506 506 enquiries@environment-agency.gov.uk
Coal Authority	Mining Reports Office 200 Lichfield Lane Berry Hill, Mansfield Notts, HG18 4RG	www.coalminingreports.co.uk
Health Protection Agency, Radiation Protection Division	Chilton Didcot Oxon, OX11 0RQ	01235 822622 radon@hpa.org.uk www.hpa.org.uk/radiation

a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of Chelmer Site Investigation Laboratories Limited (CSI) to act as a consultant.
b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, CSI has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
e) CSI acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. CSI will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, CSI shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.
f) The content of this report represents the professional opinion of experienced environmental consultants. CSI does not provide specialist legal advice and the advice of lawyers may be required.
g) In the Summary and Recommendations sections of this report, CSI has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by CSI and therefore any advice, opinions or recommendations set out in the Executive Summary, Summary and Recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.
h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data, which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.
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UNEXPLODED ORDNANCE DESK STUDY

Ham Close Redevelopment
Richmond upon Thames TW10

Prepared for: Pellings LLP

Project Number: 4769

Version: 1.0

Dated: 01/06/2017

DISTRIBUTION

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Copy 1 PELLINGS LLP

Copy 2 MACC INTERNATIONAL LTD

Authors

Project Director: K Burrows

Project Manager: J Morrison

MACC International Limited
Camilla Court
Nacton Ipswich
IP10 0EU

Telephone Number: 01473 655127

Fax Number: 01473 655098

Email: macc@macc-eod.com

Registered in England Company Registration Number 3014471

CONTENTS

REFERENCES

Publications

Sources of information used in the compilation of this study included:

German Air Raids on Britain 1914-18. Morris 1925

Unexploded Ordnance (UXO) – A guide for the Construction Industry. CIRIA C681

Dangerous Energy. Cocroft 2000

The Blitz Then and Now Volumes 1 to 3. Ramsey 1987

Advanced German Weapons WW2. Ford 2000

Dealing with Munitions in Marine Aggregates. UMA 2008

United Nations International Mine Action Standards (IMAS). UN 2010

Military Engineering Volume XII. War Office 1956

German Bomb Fuzes. USN 1945

Fields of Deception & Anti Aircraft Command. Dobinson 1988

Target Reconnaissance Photography. Luftwaffe 1939-44

Battle Stations Volume 3 DJ Smith 1980

Local Bomb Damage Maps

Internet Information

Additional information was provided through the following credible internet sites, their assistance is credited where appropriate:

Army EOD Incidents

RAF EOD Incidents & Air Situation Reports 1939-45

Luftwaffe Strategy & Tactics

Luftwaffe Bomber Specifications

WO Defence Arrangements 1939-45

News Reports Witness Accounts 1939-45

Latest News Reports

Project Information

Site and project information was provided by Pellings LLP.

TERMS AND DEFINITIONS

Anti Aircraft Ammunition (AAA)
High Explosive shells ranging from 30mm to 155mm used by air defence batteries to attack or deter enemy air attack.

Air Dropped Munition
A bomb or container dropped from an aircraft which is designed to detonate at a pre determined altitude, on impact or using a delay mechanism; after impact.

Air Dropped Sub-Munitions (Bomblet)
Small sub-munitions dispensed from a larger carrier which may be fixed to the aircraft or dropped as a single container munition which was designed to open above the target spreading its contents over a large area. Some designs are extremely dangerous and fitted with anti-handling devices.

Area Clearance
This is the term used for the systematic clearance of explosive ordnance from land, including military property, firing and bombing ranges, airfields and training areas. When the land is a former wartime battle ground, the term used is Battle Area Clearance (BAC)

Blast Zone
This term refers to the area around an explosive detonation where the explosive overpressure (Blast) can cause damage, injury or death.

Explosive Ordnance (EO)
All manufactured or improvised items designed to contain explosive, propellant, pyrotechnic and fissionable material or biological or chemical agents or pre-cursers which when coupled with an initiation or dispersal system are designed to cause damage, injury or death.

Explosive Ordnance Disposal (EOD)
A series of recognised procedures and protocols which are used by specialists in the detection, identification, evaluation, risk assessment, render safe, recovery and disposal of any item of explosive ordnance or improvised explosive device.

Fragmentation Zone
This is the term which refers to the danger area in which a piece of an item of explosive ordnance will travel on detonation. This zone is normally greater than the blast zone.

Geophysical Survey
The use of magnetometers, ground penetrating radar or other geophysical data gathering systems, which is then used for evaluation, risk assessment and to quantify further mitigation requirements.

High Explosive (HE)
High explosives react/detonate at a rate of around 9,000 metres per second, to all intents and purposes, instantaneously.

Imperial War Museum (IWM)
Wartime records source based in Lambeth Road London.

Incendiary Bomb (IB)

Incendiary bombs ranged from 1kg in size to 500kg the larger sizes were designated as Oil Bombs. Fills range from Thermite mixtures, Phosphorus, Kerosene or other pyrotechnic mixtures.

Intrusive Search

This term refers to the process of introducing a specialist magnetometer by pushing or drilling the sensor in to the ground to a pre determined depth, thus allowing construction activities such as: piling, soil testing and deep intrusive ground works to be conducted safety.

Land Service Ammunition (LSA)

LSA is a term that refers to all items containing explosives, pyrotechnic or noxious compounds which are placed, thrown or projected during land battles.

Local Records Office (LRO)

Wartime records source charged with maintaining the records for the Region, County, Borough or City.

National Archive (NA)

Wartime records source housed in Kew Gardens London.

Oil Bomb (OB)

Large airdropped bomb or modified ordnance container containing flammable material and accelerant, these weapons normally range in weight from 250 – 500kg.

Parachute Mine (PM)

Air-dropped mine designed to detonate at a pre set altitude above the ground. Essentially a large blast bomb with an explosive content of 1600 kg commonly fitted with anti-handling or anti-removal fuzes.

Unexploded Bomb (UXB)

Any air dropped bomb that has failed to function as designed.

Unexploded Ordnance (UXO)

Explosive ordnance that has been primed, fused, armed or otherwise prepared for use or used. It may have been fired, dropped, launched or projected yet remains unexploded either through malfunction or design or for any other cause.

War Office (WO)

This was the United Kingdom Government department responsible for defence of the realm, forerunner of the Ministry of Defence (MoD).

White Phosphorus (WP)

Munitions filled with WP_4 are designed for signalling, screening and incendiary purposes. They achieve their effect by dispersing WP, which burns on contact with the air.

World War One or Two (WWI or WW2)

Period of multi-national conflict, specifically: WW1; 1914-1918 or WWII; 1939-1945.

1 INTRODUCTION

1.1 Instruction & Scope

MACC International Ltd was commissioned by Pellings LLP to conduct an Unexploded Ordnance (UXO) Risk Assessment for the redevelopment at Ham Close, Richmond upon Thames TW10 (See Annex 'A'). The scope of the assessment is to determine the likelihood of an encounter with UXO within the context of the execution of ground investigations and any subsequent building works.

1.2 Methodology & Purpose

The methodology used in the study complies with the United Nations (IMAS) standards for UXO/Mine Level 1 Survey (Desk Top Study), the CIRIA C681 "Unexploded Ordnance (UXO) – A guide for the Construction Industry" and the recognised best practice advocated by the Health and Safety Executive (HSE). The quality and environmental aspects of the study comply with UKAS Accredited ISO 9001:2008 and ISO 14001:2004 standards. The purpose of the study is that of evaluation and to provide an aid in decision making by our client.

2 DETERMINING THE LIKELIHOOD OF ENCOUNTER

2.1 Aim, Research Restrictions & Indemnity

This study has drawn upon archive records which are within the public domain; however, these are acknowledged to be incomplete. Consequently, some incidents may have occurred where the records no longer exist or could not be located. The Secretary of State of the United Kingdom and MACC International Ltd does not accept responsibility for the accuracy or completeness of the information contained within the records. Some records regarding the UXO situation on some sites may not yet be within the public domain. Consequently, such information was not available for evaluation by MACC International Ltd. Research of the site history, regarding military usage, bombing raids and bomb impacts has been undertaken to establish the following:

- Frequency and location of enemy bombing raids and damage sustained to the site.
- The potential for UXO to remain on the site.
- Records of UXO removal activities and encounters.

2.2 Relevant Publications & Credible Internet Information

Published sources of information used in the compilation of this study are listed within the reference section of this study including those provided by the client. Additional information was provided through credible internet sites; their assistance is credited where appropriate and details are listed within the reference section of this study.

3 THE SITE

The site is located at approximate grid reference 516386, 172469. The majority of the site has undergone a significant level of development since the end of WWII.

4 FUTURE INTENTIONS

Future intentions for the site were not disclosed. It has however been assumed that geo-environmental investigations will be carried out prior to the commencement of any subsequent building works.

5 HISTORICAL INFORMATION

5.1 British Archives

Prior to 1942 the United Kingdom did not operate a national recording system for EO/UXO incidents or military use of land. The records compiled during 1939-1942 were conducted under local arrangements and were only as detailed and accurate as the availability of time, personnel and the ease of access to information would allow. In April 1942, the Ministry of Home Security instigated a training programme for all personnel maintaining bomb census records, these standardised national records and greatly improved the accuracy of the information. RAF Station records were generally well kept during this period, however on occasion these have been found not to record the exact positions of bomb strikes. Lack of exact bomb strike positions were most common where bombs fell on open ground well away from structures or buildings.

5.2 Manned Air Raids & Unmanned Rocket Attack Reports

Records indicate that at least three HE bombs fell within the site footprint during WWII and more fell in the immediate surrounding area. Consequently, this source of UXO contamination is considered credible.

5.3 **Airdropped Sub-Munitions' Reports**

Records indicate that enemy cluster/incendiary bombs were dropped across the site footprint. Given the low ground penetration potential for such weapons, this source of UXO contamination is considered unlikely, but cannot be ruled out entirely.

5.4 **Anti-Aircraft Ammunition (AAA) Reports**

Local fixed and mobile Anti-aircraft batteries are known to have been positioned in the area to defend against air attacks. It is a matter of record that combat engagements with enemy aircraft did take place. Consequently, this source of UXO contamination is considered to be credible.

5.5 **Abandoned Bomb Reports**

No records were found to confirm or otherwise indicate that an unexploded bomb was abandoned within the footprint of the site. Consequently, such finds are not considered to be a credible source of additional contamination.

5.6 **Migration of UXO**

It is considered possible; albeit unlikely, that a bomb was imported onto the site from other bomb sites. Additionally, where land ground levels have been increased or in-filled using Marine Dredged Aggregates there is a high potential for the aggregate to contain items of UXO. Consequently, these must be considered to have the potential to represent an additional source of UXO contamination.

5.7 **Bombing Decoys**

There were no bombing decoys in the immediate area. Consequently, these are not considered to be a credible source of additional UXO contamination.

5.8 **Military Use**

Records did not indicate that the site or adjacent land was used by the military.

5.9 **Downed / Crashed Military Aircraft**

No records were found to confirm that an armed aircraft crashed within the site footprint.

6 DETERMINING THE NATURE OF RISK

6.1 General

While HE warheads are very unlikely to detonate if left undisturbed they remain inherently dangerous and may function if subjected to suitable stimuli. The most common of these stimuli is shock, friction or heat which may cause the fuze to function or unstable explosive materials such as Picric Acid (2-4-6 Trinitrophenol (TNP)) to explode. However, in the case of incendiary bombs containing White Phosphorus (WP_4) exposure of the WP to the oxygen in the air will result in its violent ignition and combustion which may cause any HE content within the munition to detonate.

6.2 German Bombing Tactics

The tactics employed by the German Air Force during WWII show that they had a wide variety of bombs at their disposal. The most common ranged in weight from 50 kg through to 500 kg. Some models in this range of bombs were designed to be “carrier” bombs. These containers could hold potentially hundreds of smaller sub-munitions (anti personnel or incendiary bomblets). Although dropped in lesser quantities, the German arsenal also included larger bombs and parachute mines up to 1,400 kg in weight. Unmanned attacks were also mounted by the Germans using V1 Rockets and V2 Missiles, each with a warhead around 1,000 kg in weight.

6.3 Bomb Trajectory & Ground Penetration

During WWII, the Ministry of Home Security undertook a major study on bomb penetration depths using 1,328 actual bomb impact events to provide statistical analysis of penetration potential. As a result, they determined the expected behaviour of a range of bomb weights through different geological strata around the Capital. Their findings remain the only empirical gained figures to have been gathered to date for England. A summary of their findings can be found in Table 1 of this study. A number of factors will influence the behaviour of a bomb on impact with the target and its trajectory through the ground. Relevant factors include: Height and speed of release of the bomb, aerodynamic qualities of the bomb, the angle of flight and impact and the nature of impact surface and sub soil.

6.3.1 In determining the potential bomb penetration depths into the ground, using the historic geotechnical information, other factors considered were: Release height 4,545 metres (15,000 ft). Most common GP Bomb used of 500 kg in weight and an impact Angle Range of 90° (tail vertical) to 0° (tail horizontal)

6.3.2 Table 1. Extract of Ministry of Home Security Bomb Penetration Study

	Bomb Weights			
Sub Soil Type	50kg	250kg	500kg	1000kg
Soft Rock or Made Ground	2.442	5.016	6.006	7.062
Gravel	2.442	5.016	6.006	7.062
Dry Clay	3.7	7.6	9.1	10.7
Average Offset (m)	0.8-1.6	1.6-3.7	3-4.5	3.4-5.3

6.3.3 Bombs on penetration of the surface do not tend to follow a straight line trajectory, due to a number of factors, shape, angle of entry, weight and speed; they tend to arc or curve; known as a "J" curve. With the horizontal distance from the entry point to the resting point known as the offset. The typical offset is generally taken to be $^{1}/_{3}^{rd}$ of the penetration depth. However, this distance can vary greatly if the bomb strikes an obstacle just below the surface. With this mechanism of offset, it is therefore a possibility that a bomb could enter the ground outside a building and come to rest within its footprint. Having reviewed the bomb penetration information and having provided a reasonable safety factor it is considered that:

- The maximum bomb penetration depth is estimated at 10.5 metres from the 1941 ground level. The expected offset from impact point is estimated to be 3.5 metres.
- The maximum ground penetration for an AA Artillery Shell is estimated at 1.5 metres below the 1941 ground level.

7 ENVIRONMENTAL IMPACT FROM UXO

7.1 Ground Contamination & Health Risk vectors

The amount of explosive material within the most common bombs is not considered sufficient to pose a significant widespread environmental risk. Nevertheless, it should be noted that the following components are commonly used in the manufacture of a high explosive bomb and may pose a localised contamination risk to health:

- Lead (Pb)
- Zinc (Zn)
- Copper (Cu)
- Iron (Fe)
- Mercury (Hg)
- Silver Fulminate (AgCNO)
- Aluminium (Al)
- Trinitrophenol ($C_6H_3N_3O_7$)
- Trinitrotoluene ($C_7H_5N_3O_6$)
- Trimethylene ($N(CH_3)_3$)
- Trinitramine ($C_3H_6N_6O_6$)
- Ammonium (NH_4)
- Sodium Nitrate ($NaNO_3$)
- Nitro-glycerine ($C_3H_5N_3O_9$)
- White Phosphorus (WP_4). This chemical may pose a significant immediate risk of spontaneously combusting when exposed to the oxygen in the air. WP will generate large quantities of toxic white smoke when ignited.

7.2 It is recommended that specialist environmental and medical advice be sought to identify any health or other risks posed by these and other chemical compounds.

8 RISK ASSESSMENT

8.1 Risk Source

Records confirmed that the site was struck by airdropped munitions. Records are acknowledged to be incomplete and include errors; the possibility that items of UXO may have found their way onto the site and remain there to the present day is considered credible.

8.2 Risk Pathway

The risk pathway is considered to be ground intrusive investigations and earth works.

8.3 Consequence

The consequences of a UXB detonation on site during construction works are considered to be a factor of the size of the blast and the proximity of assets and individuals to the point of detonation. These will include potential to kill or seriously injure personnel destroy or damage high value site assets, nearby public and private property and infrastructure.

8.4 Risk Rating

H = A figure derived from assessing the history of the site weighing up factors such as recorded bomb damage, threat weapon type, military use and the scope of any post conflict development.

W = A figure derived from assessing the type of the process to be undertaken without putting in place any UXO mitigation measures. A low figure is assigned where the process is relatively non aggressive (minimal ground or point shock). A high figure is used where the work is considered aggressive (significant ground or point shock).

L = A figure derived by multiplying figures H and W to provide an overall likelihood of an encounter with UXO.

S = A figure derived by assessing the scope or extent of the works; a low figure is assigned where the volume of risk material is limited. A high figure is used where for example the volume of risk material is considerable such as “bulk digs” or shafting.

P = A Figure derived from assessing the result of an explosion, including primary and secondary risk pathways and receptors. A high figure is attributed for example in a gas works while a low figure is applied to a remote, rural open space.

C = A figure derived by multiplying figures S and P to provide an overall consequence of an encounter with UXO.

8.5 Table 2 Risk Level – From all potential UXO contamination sources

UXO RISK RATING (Post War Worked Ground)			
Activity	Likelihood (H x W = L)	Consequence (S x P = C)	Risk Rating (L x C = R)
Hand dug excavations	2 x 1 = 2	1 x 5 = 5	2 x 5 = 10
Limited mechanical excavations or trenching	2 x 2 = 4	2 x 5 = 10	4 x 10 = 40
Drilling, sampling, bulk excavations or piling	2 x 3 = 6	3 x 5 = 15	6 x 15 = 80
UXO RISK RATING (Post War Un-Worked Ground)			
Activity	Likelihood (H x W = L)	Consequence (S x P = C)	Risk Rating (L x C = R)
Hand dug excavations	3 x 1 = 3	1 x 5 = 5	3 x 5 = 15
Limited mechanical excavations or trenching	3 x 2 = 6	2 x 5 = 10	6 x 10 = 60
Drilling, sampling, bulk excavations or piling	3 x 3 = 9	3 x 5 = 15	9 x 15 = 135
1= Minimal 5=significant	LOW 0-100	MEDIUM 100-200	HIGH 200+

9 STUDY FINDINGS

9.1 Risk Levels

The desk study has determined the UXO risk within the site footprint. The UXO risk is considered to be lowest in post war worked ground increasing within the un-worked post war ground for some processes. When viewed from likelihood versus consequence standpoint; it is considered prudent to recommend a suitable degree of UXO mitigation to permit the work to proceed in the safest “acceptable” manner in compliance with current legislation and best practices.

9.2 Determining Acceptable Level of Risk

The meaning of the term “acceptable” in the context of this study is considered to be in keeping with the Health & Safety Executive directive which identifies the acceptable level as that which is; “As Low as Reasonably Practicable” (ALARP) to achieve.

10 RECOMMENDATIONS FOR RISK MITIGATION

10.1 All Risk Level Activities

Execution of the following Risk Mitigation Measures are recommended:

- Risk Communication & Safety Planning: Stakeholders should be made aware of the UXO risk levels within the project boundary and the possible impact an encounter may have on the project and third parties. Consequently, a UXO Safety Plan should be drawn up and included within the overall project safety planning.
- Safety Training: In keeping with CDM Regulations concerning all sub-surface hazards, UXO Safety Induction Training should be provided to everyone working or visiting the site. The training should be commensurate with the individual's responsibilities and duties on site. The training should be provided by a competent individual (preferably a trained EOD Engineer) and delivered as a separate module of the Site Safety Induction Course or as a Toolbox Talk.

Additional mitigation requirements for the medium risk activities:

- Drilling, Sampling & Bulk Excavations: These should be checked for UXO by an EOD Engineer equipped with specialist magnetometers ahead of the drilling/sampling bits. Where the ground conditions will not permit this; Then a UXO safety 'watching brief' should be in place during the work.
- Piling: All positions should be tested using a specialist 'Mag Cone' and be UXO safety certified prior to the commencement of piling.

11 POST MITIGATION RISK

11.1 Overview

Prudent execution of the recommended risk mitigation strategy will reduce the risk however, it is emphasised that zero risk is not achievable given the possible variables. The study has confirmed the UXO risk level based on the nature of the work to be undertaken and has recommended suitable mitigation. An effective risk mitigation strategy will require detailed scoping to achieve its desired results in providing an acceptable level of risk. For further information concerning any part of this study please contact MACC International Ltd.

11.2 Intent & Use

This document has been produced in the United Kingdom by MACC International Limited and meets the requirements of CIRIA C681 “Unexploded Ordnance (UXO) – A guide for the Construction Industry”. It has been provided solely for the purpose of assessment and evaluation. It is not intended to be used by any person for any purpose other than that specified. Any liability arising out of use by a third party of this document for purposes not wholly connected with the above shall be the responsibility of that party, who shall indemnify MACC International Limited against all claims, costs, damages and losses arising out of such use.

MACC International Limited
Camilla Court
Nacton Ipswich
IP10 0EU

Telephone Number: 01473 655127

Fax Number: 01473 655098

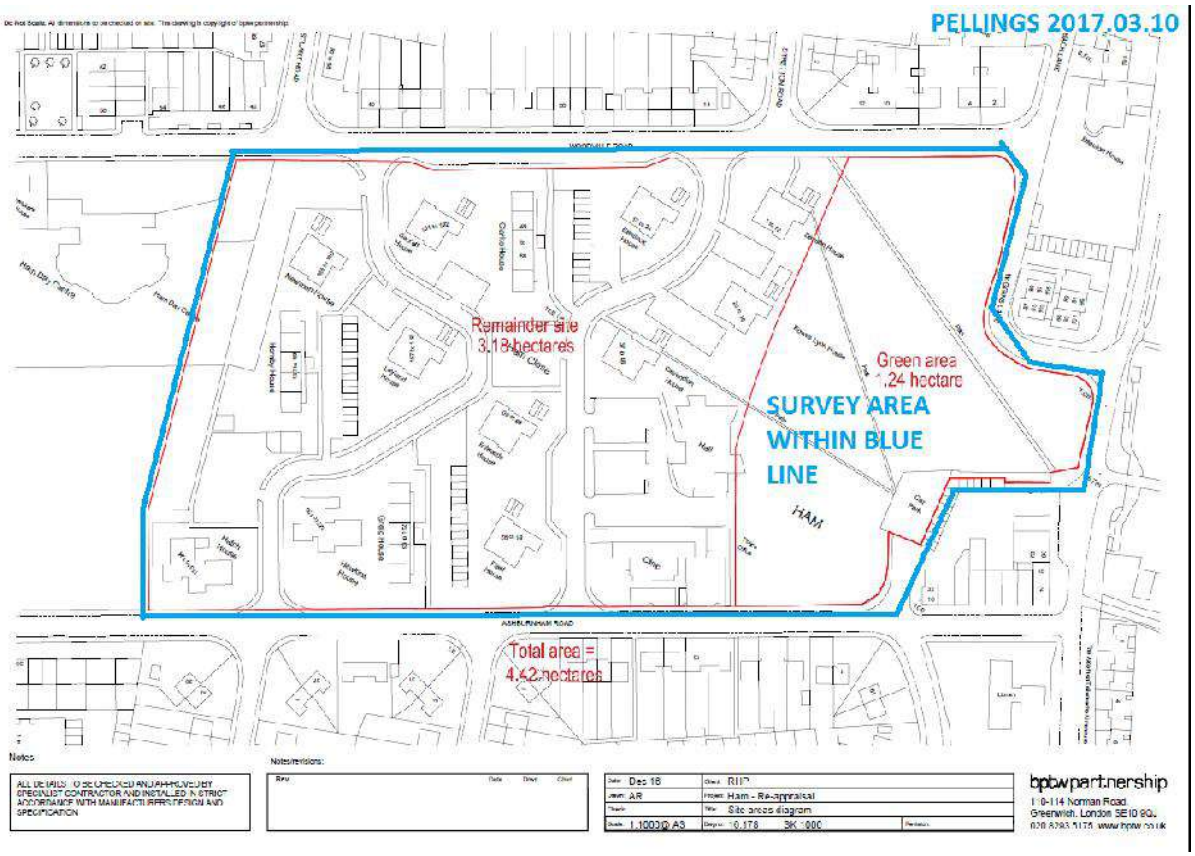
Email: macc@macc-eod.com

Registered in England Company Registration Number 301447

Annex A

SITE MAPPING

Site Footprint:



Annex B

EXPLOSIVE ORDNANCE SAFETY INFORMATION

1 UNEXPLODED ORDNANCE

Since WWII the number of incidents in the UK where EO has detonated has been minimal, though a significant number of bombs have been discovered and safely disposed of without serious consequences. More commonly on mainland Europe (France, Germany and Belgium) incidents have occurred where ground workers have been killed or injured as a result of striking buried UXO or mishandling items of UXO found during excavation and piling work.

The threat to any proposed investigation or development on the site may arise from the effects of a partial or full detonation of a bomb or item of ordnance. The major effects are typically; ground shock, blast, heat and fragmentation. For example, the detonation of a 50kg buried bomb could damage brick/concrete structures up to 16m away and unprotected personnel on the surface up to 70m away from the blast. Larger ordnance is obviously more destructive. Table B-1 shows the MOD's recommended safe distance for UXO. However, it should be noted that the danger posed by primary and secondary fragmentation may be significantly greater. Almost 60% of civilian casualties sustained in London during the blitz were the result of flying glass.

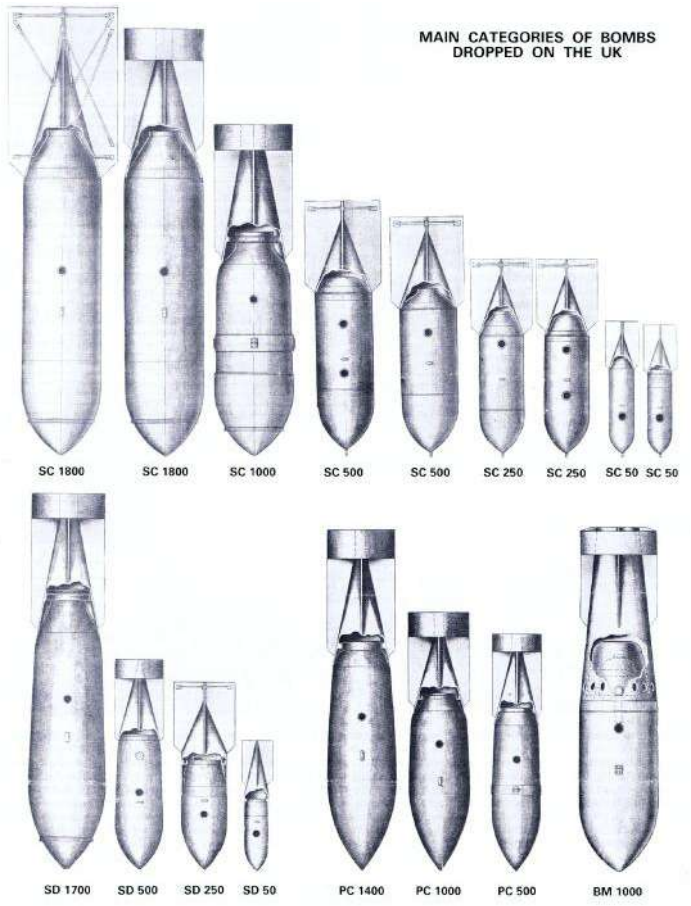
TABLE B-1 SAFETY DISTANCES FOR PERSONNEL

	Safety Distances (m)			
	Surface UXO		Buried UXO	
UXO (Kg)	Protected	Unprotected	Protected	Unprotected
2	20	200	10	20
10	50	400	20	50
50	70	900	40	70
250	185	1100	120	185
500	200	1250	140	200
1000	275	1375	185	275
3000	450	1750	300	450
5000	575	1850	400	575

Explosives rarely become inert or lose effectiveness with age. Over time some explosive materials can become more sensitive and therefore more prone to detonation. This applies equally to items that have been submersed in water or embedded in silt, clay, peat or similar materials.

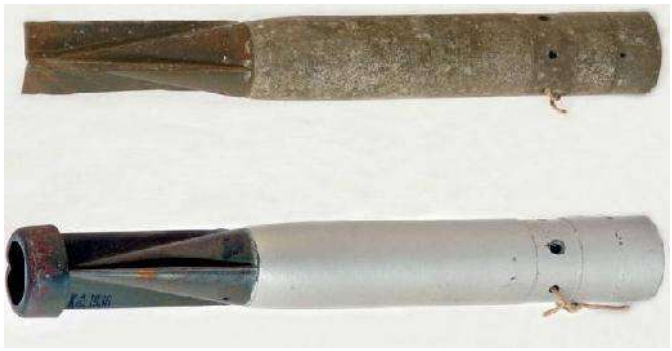
2 TYPES OF GERMAN AIRDROPPED BOMBS & MINES

2.1 HE Bombs



German 250kg Bomb found by MACC below a pre-war cellar floor in Bethnal Green London 10 August 2015

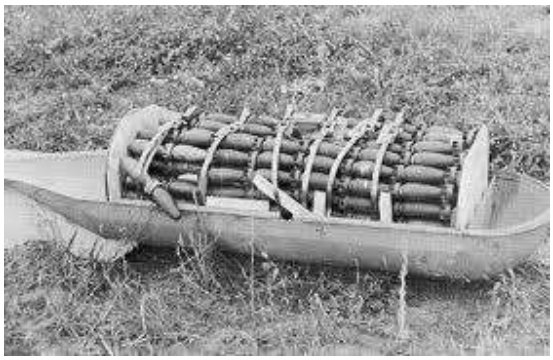
2.2 Incendiary, Anti-Personnel Bombs & Parachute Landmines



1kg incendiary Bomblet (Top as found today)

Flam c500, c250 & c50 Oil Bombs

SD1 Anti-Personnel Bomblets



SD1 Container Bomb

Parachute Mines

enzygo
geo environmental

Geo-Environmental Report

Ashburnham Rd, Richmond, TW10 7PB
for:

Hill Residential Ltd

'Experience and expertise working in union'

enzygo.com

Contact Details:

Enzygo Geoenvironmental Ltd.
The Byre
Woodend Lane
Cromhall
Gloucestershire
GL12 8AA

tel: 01454 269237
fax: 01454 269760
email: steve.rhodes@enzygo.com
www: enzygo.com

Geo-Environmental Report

Project:	Ashburnham Rd, Richmond, TW10 7PB
For:	Hill Residential Ltd
Ref:	CRM.1027.087.GE.R.003.
Status:	Revision C
Date:	December 2021
Author:	Steve Rhodes **Director**
Reviewer:	Richard Hamilton **Director of Geoenvironmental**

Executive Summary

Proposed Development

This document is a report of this survey and has been produced to support a planning submission for the site which seeks the demolition of the existing buildings on-site and phased mixed-use development comprising 452 residential homes (Class C3) up to six storeys, a Community/Leisure Facility (Class F2) of up to three storeys in height, a "MakersLab" (sui generis) of up to two storeys together with basement car parking and site wide landscaping.

Investigation

Site investigation, desk study and monitoring visits were undertaken by Enzygo Geoenvironmental Ltd.

Ground Conditions

Ground Conditions comprise Made Ground over firm clay and loose becoming dense with depth sand and gravel. Shallow groundwater was not encountered.

Contamination

Elevated PAH, Lead and Arsenic was encountered together with asbestos. Remediation and management procedures are proposed.

Foundations

Spread foundations should be suitable for domestic houses but piled foundations are likely to be required for apartments.

Pavement Design

An equilibrium CBR of 3% is recommended. Soils are not considered to be frost susceptible.

Buried Concrete

It is recommended that Class AC-1s conditions of Special Digest 1 are used.

Ground Gas and Radon

No radon risk has been identified. No significant ground gas has been measured.

TABLE OF CONTENTS

1.0 INTRODUCTION

Background

1.1 Enzygo Geoenvironmental Limited has been commissioned to prepare a Geo-Environmental Report for a site at Ashburnham Rd, Richmond, TW10 7PB.

Proposed Development

1.2 This document is a report of this survey and has been produced to support a planning submission for the site which seeks the demolition of the existing buildings on-site and phased mixed-use development comprising 452 residential homes (Class C3) up to six storeys, a Community/Leisure Facility (Class F2) of up to three storeys in height, a "MakersLab" (sui generis) of up to two storeys together with basement car parking and site wide landscaping.

Objectives

1.3 The objectives of the study are to:

- Review an existing Phase I desk study, a copy of which is included in Appendix A;
- Undertake a ground investigation;
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors; and
- Provide a factual and interpretative report relating to the desk study and site investigations. Provide a revised conceptual model and recommendations on any potential development issues and mitigation measures, where appropriate.
- Provide geotechnical recommendations in relation to foundations and infrastructure.

Risk Classification

1.4 Enzygo Geoenvironmental has utilised the available information, together with our experience to assess the likely risks to development from land quality issues. Definitions of the risk terms used are provided on the following table.

Risk	Description
Negligible	No contamination risk has been identified which is likely to affect development.
Low	No significant contaminated land risks have been encountered affecting development and a low risk that remediation will be required.
Low-Moderate	There are unlikely to be significant contaminated land issue associated with the site which will adversely affect its re-development. However, minor or localised contamination may be present requiring remediation. Remediation should be possible under a discovery strategy and with a call out service.
Moderate	Some potential contaminated land risks have been encountered or identified which may affect re- development. The risks identified are unlikely to affect the entire site or preclude development. Remediation is considered feasible as part of the development process and no further investigation is considered necessary.
Moderate-High	Some potentially significant contaminated land risks have been identified at the property that requires remediation. It is recommended that a separate remedial methodology is prepared supported by a site-specific risk assessment
High	Significant potential contaminated land risks have been identified and remediation is required supported by further intrusive ground investigation, risk assessment and remedial design.

1.5 Where adverse risks from ground instability are identified these are discussed within the report.

2.0 SITE SETTING

Site Description

Item	Description
Site Address	Ashburnham Rd, Richmond, TW10 7PB
National Grid Reference	Site centred at National Grid Reference TQ0030585 and Ordnance Survey Co-ordinates 550309, 158566.
Site Area	4.7 Ha

Current Site Description

2.1 The following site description has been compiled from the site inspection undertaken by Enzygo Geoenvironmental staff, together with current maps, aerial photographs and a topographical survey.

2.2 The site comprises existing residential buildings arranged in five storey blocks, four storey deck access flats and three storey 'T' shaped blocks. The public realm consists of large areas of surface parking and amenity grassland with scattered trees. The Youth Centre and associated car park occupies a central location on the site. Ham Village Green sits at the eastern edge of the site. The site is bound by Woodville Road to the north, Wiggins Lane and Ham Street to the east, Ham Clinic and Ashburnham Road to the south and St Richard's C of E Primary School playing fields and the children's garden pre-school to the west.

2.3 Internal roadways, parking areas and lock-up garages were present between the apartment blocks.

2.4 Within the southern area of the site an amenity hall, clinic and estate office are present with associated parking.

2.5 The eastern area of the site is open land vegetated with grass and including footpaths.

2.6 An electricity sub station is present on the western boundary. This appears to be of modern construction with no evidence of leakage. The sub-station is not considered a significant risk.

Surrounding Area

2.7 The surrounding land uses are summarised as follows:

Direction	Land Use

South	Ashburnham Road with residential development beyond.
East	Wiggins Lan with residential development beyond.
West	School and open space.
North	Woodville Road with residential development beyond.

2.8 No significant sources of potential contamination were noted on or adjacent to the site.

3.0 SITE HISTORY

3.1 A review of historical Ordnance Survey maps and information pertinent to the site obtained from the existing desk study report is summarised below:

3.2 The site is shown as open land prior to construction of a farm in the eastern part of the site by 1868.

3.3 The site was redeveloped for residential use by 1947. A ruin is shown in the eastern part of the site by 1959 which is likely to be from bomb damage.

3.4 The current residential development is shown by 1983 and with open space in the east.

3.5 There is the potential for Made Ground associated with historic buildings, demolished prior to the current development. No other significant potential sources identified on or near to the site.

3.6 No significant off-site contamination sources are identified.

3.7 A low Unexploded Ordnance Risk was identified in relation to ground investigation works.

4.0 ENVIRONMENTAL SETTING

Ground Conditions

4.1 The British Geological Survey (BGS) indicates that the site is underlain by the following geological sequence:

Geological Unit	Type	Description	Aquifer Classification
Drift	Kempton Park Gravels	Sand and Gravel	Secondary A
Solid	London Clay	Clay	Unproductive

4.2 There are no records of Made Ground below the site. Made Ground is shown 41m south west. Given the distance from the site this is not considered a significant risk.

4.3 There are no records of landslips on the site.

4.4 BGS borehole records on site show 0.6m of Made ground over gravel and with London Clay encountered at depths of 6m.

Groundwater

4.5 The Desk Study Report shows that the site is not within a Source Protection Zone.

4.6 BGS records show that the site is at potential risk of groundwater flooding.

Coal Mining

4.7 No historical or current coal mining extraction has been identified within 1000m of the site.

Non Coal Mining

4.8 No other mining activity has been identified within 1000m of the site.

Cavities

4.9 No natural cavities or solution features are identified on site.

Hydrology

4.10 There are no water courses on the site.

4.11 Environment Agency records show that the site is not within an Environment Agency Flood Zone.

Radon Risk Potential

4.12 The Groundsure GeoInsight Report indicates that the site is not within a Radon Affected Area. No radon protective measures are necessary in the construction of new dwellings.

Natural Hazards Finding

4.13 BGS information presented within the Groundsure Geoinsight report identifies the following:

Hazard	Risk Designation (Groundsure)
Coal Mining.	None Identified.
Collapsible Ground.	Very Low.
Compressible Ground.	Very Low.
Ground Dissolution.	Very Low.
Landslide.	Very Low.
Running Sand.	Very Low.
Swelling / Shrinking Clay.	Very Low.

4.14 No significant geotechnical risks are identified.

Sensitive Land Uses

4.15 There are no sites of special interest on or surrounding the site.

4.16 English Heritage has not identified any listed buildings or scheduled ancient monuments on or close to the site. No sensitive geology has been identified at the site.

Environmental Sensitivity

4.17 Overall the site is currently considered to be of low/moderate sensitivity due to the following:

- The underlying stratum is classified as a Secondary A Aquifer;
- Not within a source protection zone;
- No surface water courses on or adjacent to the site; and
- No sensitive ecology is noted adjacent to or on the site.

4.18 The proposed end use of the site is residential and as such future sensitivity will be high for end users.

Industrial Land Uses

4.19 No significant current industrial activities are identified on or adjacent to the site.

Landfill Sites and Waste Treatment Sites

4.20 There are no active or historic landfills within 250m of the site.

Planning Records

4.21 A review of London Borough of Richmond's planning history shows no relevant information for the site.

5.0 PREVIOUS REPORTS

5.1 No previous ground investigation reports were provided.

6.0 PRELIMINARY CONCEPTUAL MODEL

6.1 Based on the desk study information the following Preliminary Conceptual Model has been prepared:

Source	Location	Exposure Pathway	Potential Receptor	Probability of Exposure	Details
Human Health					
Asbestos, Hydrocarbon and metals.	Unforeseen Contamination.	Ingestion dermal and inhalation.	Construction Workers.	Dismissed.	Normal site management practices and PPE will address risk.
			Site users.	Negligible.	No source identified.
Asbestos, Hydrocarbon and metals.	Made Ground.	Ingestion dermal and inhalation.	Construction Workers.	Dismissed.	Normal PPE will address risk.
			Site users.	Very Low.	If present can easily be addressed through development.
Hydrocarbon and metals.	Potential migration from off-site source.	Ingestion dermal and inhalation.	Construction Workers.	Dismissed.	No significant off site sources identified.
			Site users.		
Ground Gas.	Historic Landfill.	Inhalation & Explosive.	Construction Workers.	Dismissed.	No source identified.
			Site users.		
	Potential Made Ground.	Inhalation & Explosive.	Construction Workers.	Dismissed.	No significant source identified.
			Site users.		
Groundwater					
Hydrocarbon and metals.	Potential spillage on site.	Vertical Migration.	Groundwater.	Dismissed.	No source identified.
Surface Water					
Hydrocarbon and metals.	Potential spillage on site.	Horizontal Migration.	River Network.	Dismissed.	No source or credible receptor.
Environmental Receptors					
On site contaminants		Ingestion dermal and inhalation.	Ecology.	Dismissed.	No sensitive ecology designation.
		Direct.	Archaeology.	Dismissed.	None present.
		Direct.	Geology.	Dismissed.	No sensitive receptor present.
		Phytotoxic.	Woodland.	Dismissed.	None present.
		Phytotoxic.	Crops.	Dismissed.	No source identified.
		Ingestion dermal and inhalation.	Livestock.	Dismissed.	No source identified.
Building Services					
On site contaminants		Direct.	Historic Buildings.	Dismissed.	None present.
		Direct.	Proposed Buildings.	Dismissed.	No source identified.
		Permeate into pipework.	Water Pipes.	Dismissed.	No significant source identified.

6.2 There is a very low risk from Made Ground, including former buildings which will be investigated. Should contamination be present this can easily be addressed through development. No other significant risks are identified.

7.0 SITE INVESTIGATION

General

7.1 A ground investigation was undertaken based on the findings of the desk study. The locations of the exploratory holes are shown on Drawing CRM.1027.087.GE.D.001.

Site Works

7.2 The site investigation works comprised window sampler holes (WS1 to WS18) advanced between 27th and 29th April 2021 and six deep boreholes (BH1 to BH6) advanced between 16th and 19th August 2021.

7.3 A subsequent visit was undertaken during October 2021 with six window sampler holes (WS101 to WS106) being advanced on 25th October 2021 in areas of car park where access was not previously permitted. Six soakaway tests (SA1 to SA6) were undertaken on 26th and 27th October 2021.

7.4 Exploratory hole locations were determined to provide general coverage of the site within areas where access was permitted by the land owner. The investigation works are summarised in the table below:

Rational	Exploratory Holes	Notes
Site Coverage.	WS1 to WS18.	Across site.
Car park areas	WS101 to WS106	Car parks
Soakaways	SA1 to SA6	To assess viability of soil infiltration.
Monitoring.	WS5 WS6 WS7 WS9 WS14 WS16 & WS18.	Installations.
Deep foundations.	BH1 to BH6.	Deep boreholes.

7.5 Strength of soils were assessed using Standard Penetration Tests (SPT). The results of which are included on the borehole logs presented in Appendix B.

7.6 Representative soil samples were collected for chemical and geotechnical testing. Soil samples destined for chemical analysis were collected in appropriate containers provided by the analytical laboratory. Samples were stored in cool boxes prior to dispatch to the laboratory for analysis. All samples were collected using appropriate sampling equipment that was cleaned at each sampling location.

7.7 Generally samples were collected from Made Ground, which may contain potential inclusions of contaminating materials and materials displaying evidence of potential contamination.

7.8 In the absence of any evidence of contamination samples were collected near surface as this material is more likely to be contaminated by surface spillages and also will potentially be in contact with future residents.

Monitoring

7.9 Return visits to monitor groundwater levels were undertaken and during these visits ground gas was also measured.

Laboratory Testing

7.10 Samples for geotechnical testing were sent to the laboratories of I2, which is UKAS accredited, for the following analysis:

- California Bearing Ratio(CBR) tests undertaken on re-compacted samples
- Atterberg Limits Determinations;
- Moisture Content; and
- Soluble sulphate and pH.

7.11 Samples for chemical analysis were sent to the laboratories of The I2 Ltd who are UKAS and MCERTS accredited. Samples were tested for the CLEA metal suite, pH, sulphate, cyanide, phenols, speciated Polycyclic Aromatic Hydrocarbons (PAH), organic carbon, banded Total Petroleum Hydrocarbon (TPH), asbestos quantification, and two stage WAC tests.

8.0 GROUND AND GROUNDWATER CONDITIONS

Summary of Ground and Groundwater Conditions

8.1 The investigations undertaken by Enzygo Geoenvironmental Ltd identify the following strata:

Strata	Summary Description	Thickness (m)
Made Ground	Brown and grey clayey fine sand and flint gravel with fragments of brick concrete and ash.	0.4 to 1.2
Kempton Park Gravels	Firm and stiff brown clay and gravelly clay.	0 to 0.9
	Loose becoming medium dense and dense with depth brown sand and flint gravel.	3.8 to 5.3
London Clay	Stiff grey brown silty clay with occasional claystone gravel.	>20
Groundwater	Seepages	2.2m to 4.3 bgl.

8.2 Details of the ground and groundwater conditions encountered are given on the exploratory hole records included in Appendix B and are summarised in the sections below:

Made Ground

8.3 Made Ground was encountered across the site comprising brown and grey clayey fine sand and flint gravel with fragments of brick concrete and ash.

8.4 This material is consistent with typical Made Ground comprising natural soils with anthropogenic inclusions associated with demolition and removal of historic buildings

Kempton Park Gravels

8.5 The Kempton Park Gravels were encountered at depths of between 0.4m and 1.2m below ground level (bgl). The upper horizon of the Kempton Park Gravels generally comprised firm and stiff brown clay and gravelly clay.

8.6 The clay layer was underlain by loose becoming medium dense and dense with depth brown sand and flint gravel. The granular Kempton Park Gravels were encountered at depths of between 0.4m and 1.5m bgl.

London Clay

8.7 The London Clay was only encountered in deep boreholes and comprised stiff grey brown silty clay with occasional claystone gravel.

Visual and Olfactory Evidence of Contamination

8.8 Potential asbestos fragments were encountered in Window Sampler boreholes WS6 and WS8. No other visual or olfactory evidence of contamination was encountered during the site works. Samples of potential asbestos were collected for laboratory testing and this is discussed in Section 9.

Soil Strength

8.9 Undrained shear strength of cohesive Kempton Park Gravels were calculated using the correlations of Stroud and Butler. These show the undrained shear strength values to vary from 45kN/m^2 to 100kN/m^2 at 1m bgl. Granular soils ere noted to be loose medium dense and dense with depth. SPT values increasing 7 at 1m bgl to over 50 at 4m bgl being recorded.

8.10 London Clay was noted to have undrained shear strength values increasing from 60kN/m^2 at 6m to 170kN/m^2 at 25m bgl.

Groundwater

8.11 Groundwater was encountered as a seepages at depths of between 2.2m to 4.3 bgl from within the Kempton Park Gravels. The depth to groundwater measured during the monitoring visit is summarised on the table below:

Exploratory Hole	Depth m(bgl)					
	12.5.21	19.5.21	2.6.21	16.6.21	30.6.21	14.7.21
WS5	Dry	Dry	Dry	Dry	Dry	Dry
WS6	Dry	Dry	Dry	Dry	Dry	Dry
WS7	Dry	Dry	Dry	Dry	Dry	Dry
WS9	Dry	Dry	Dry	Dry	Dry	Dry
WS14	Dry	Dry	Dry	Dry	Dry	Dry
WS16	Dry	Dry	Dry	Dry	Dry	Dry
WS18	Dry	Dry	Dry	Dry	Dry	Dry

Ground Gas

8.12 Ground gas was monitored during the return visit to monitor groundwater levels and the results are summarised on the table below:

Exploratory Hole	Atmos pressure (Mb)	Flow (l/hr)	CH4		CO2		O2
			Concentration (%)	GSV (l/hr)	Concentration (%)	GSV (l/hr)	Concentration (%)
12.5.21							
WS5	997	<0.1	<0.1	<0.0001	1.8	<0.0018	19.5
WS6	997	<0.1	<0.1	<0.0001	1.8	<0.0018	19.4
WS7	997	<0.1	<0.1	<0.0001	1.5	<0.0015	19.1
WS9	997	<0.1	<0.1	<0.0001	1.2	<0.0012	19.3

WS14	997	<0.1	<0.1	<0.0001	1.6	<0.0016	18.9
WS16	997	<0.1	<0.1	<0.0001	0.8	<0.0008	18.8
19.5.21							
WS5	1017	<0.1	<0.1	<0.0001	1.9	<0.0019	18.1
WS6	1017	<0.1	<0.1	<0.0001	1.1	<0.0011	18.8
WS7	1017	<0.1	<0.1	<0.0001	2.0	<0.0020	18.0
WS9	1017	<0.1	<0.1	<0.0001	1.3	<0.0013	19.6
WS14	1017	<0.1	<0.1	<0.0001	1.7	<0.0017	18.2
WS16	1017	<0.1	<0.1	<0.0001	1.4	<0.0014	18.9
WS18	1017	<0.1	<0.1	<0.0001	1.1	<0.0011	19.6
2.6.21							
WS5	1014	<0.1	<0.1	<0.0001	2.1	<0.0021	18.2
WS6	1014	<0.1	<0.1	<0.0001	1.2	<0.0012	18.6
WS7	1014	<0.1	<0.1	<0.0001	1.7	<0.0017	18.5
WS9	1014	<0.1	<0.1	<0.0001	1.2	<0.0012	19.1
WS14	1014	<0.1	<0.1	<0.0001	1.6	<0.0016	18.8
WS16	1014	<0.1	<0.1	<0.0001	1.5	<0.0015	18.7
WS18	1014	<0.1	<0.1	<0.0001	1.0	<0.0010	19.7
16.6.21							
WS5	1009	<0.1	<0.1	<0.0001	2.1	<0.0023	18.3
WS6	1009	<0.1	<0.1	<0.0001	1.4	<0.0014	18.7
WS7	1009	<0.1	<0.1	<0.0001	1.5	<0.0015	18.8
WS9	1009	<0.1	<0.1	<0.0001	1.3	<0.0013	19.2
WS14	1009	<0.1	<0.1	<0.0001	1.6	<0.0016	18.9
WS16	1009	<0.1	<0.1	<0.0001	1.7	<0.0017	18.5
WS18	1009	<0.1	<0.1	<0.0001	0.7	<0.0007	19.9
30.6.21							
WS5	1015	<0.1	<0.1	<0.0001	1.8	<0.0018	18.2
WS6	1015	<0.1	<0.1	<0.0001	1.3	<0.0013	18.9
WS7	1015	<0.1	<0.1	<0.0001	1.6	<0.0016	18.7
WS9	1015	<0.1	<0.1	<0.0001	1.4	<0.0014	18.9
WS14	1015	<0.1	<0.1	<0.0001	1.5	<0.0015	19.0
WS16	1015	<0.1	<0.1	<0.0001	1.6	<0.0016	18.8
WS18	1015	<0.1	<0.1	<0.0001	1.0	<0.0010	19.2
14.7.21							
WS5	1017	<0.1	<0.1	<0.0001	1.9	<0.0019	18.3
WS6	1017	<0.1	<0.1	<0.0001	1.5	<0.0015	18.9
WS7	1017	<0.1	<0.1	<0.0001	1.6	<0.0016	18.7
WS9	1017	<0.1	<0.1	<0.0001	1.2	<0.0012	18.7
WS14	1017	<0.1	<0.1	<0.0001	1.7	<0.0017	18.8
WS16	1017	<0.1	<0.1	<0.0001	0.9	<0.0009	19.3
WS18	1017	<0.1	<0.1	<0.0001	0.8	<0.008	19.5

8.13 No significant ground gas has been measured.

Soakaways

8.14 Results of the soakaway testing is provided on the table below:

Soakaway	Depth (m bgl)	Test No	Soil Infiltration Rate	
SA 1	2.0	Test 1	Insufficient soakage	
SA 2	2.0	Test 1	$9.1E^{-6}$ m/s	
SA 3	2.0	Test 1	Insufficient soakage	
SA4	2.1	Test 1	$5.6E^{-6}$ m/s	
SA5	2.0	Test 1	Insufficient soakage	
SA6	2.0	Test 1	$7.7E^{-4}$m/s	Extrapolated

9.0 CONTAMINATION ASSESSMENT

General

9.1 A Tier I risk assessment has been undertaken using available and current screening values for human health and where appropriate controlled waters. The risk assessment is undertaken based on the findings of the preliminary conceptual model presented in Section 6. Based on the contamination testing and Tier I assessment a revised Conceptual Model has been prepared, which is presented later in this section.

9.2 Where significant risks are identified remedial measures are recommended.

Human Health

9.3 Assessment of the risks to human health has been undertaken by comparing the soil quality data with reference values obtained from the Contaminated Land Exposure Assessment (CLEA), Soil Guideline Values (SGV) and General Acceptance Criteria (GAC) published by LQM and derived in consultation with the Chartered Institute of Environmental Health. The LQM/CIEH S4ULs values are used and summary tables of the reference values are included in Appendix C.

9.4 Where an exceedance is identified the risk is assessed by considering the sensitivity of the proposed development and the potential pathway. The proposed development comprises conventional residential houses with domestic gardens.

9.5 The GAC values for residential use with plant uptake are used as the development includes domestic properties.

9.6 The soil quality shows exceedances of the GAC values for the following contaminants.

Exploratory Hole	Determinant	Concentration (mg/kg)	
		GAC	Soil
WS2 0.2m	Asbestos	Absent	0.006%
	Arsenic	37	40
WS6 0.4m	Asbestos	Absent	<0.001%
WS8 0.4m	Asbestos	Absent	3.127%
	Benzo(b)fluoranthene	2.6	3.4
	Benzo(a)pyrene	2.2	2.6
	Dibenzo(a,h)anthracene	0.24	0.53
	Lead	200	320
WS1 0.4m	Benzo(b)fluoranthene	2.6	8.1
	Benzo(a)pyrene	2.2	7.0
	Dibenzo(a,h)anthracene	0.24	1.1
	Lead	200	310
WS10 0.4m	Lead	200	250