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Reliable ground quality advice

Orchard Lane / East Molesey

Land Quality Assessment

November 2022 I A3711

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Reliable ground quality advice

Phase 2 land quality assessment: The Molesey Venture, East Molesey, Surrey

Prepared for: KRS Environmental Ltd
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Report reference: 4224R1rev1

Date of reporting: 12th October 2022

Report status: Final report

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Revision record:

Issue	Date	Status	Comment	Author	Recipient
1	31st December 2021	Final		AJS	KRS Environmental Ltd
Rev1	12th October 2022	Final	Including Client comments	AJS	KRS Environmental Ltd

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Glossary and Abbreviations

This glossary includes definition of key technical terms and abbreviations that may be used within the report text.

ACM	Asbestos containing material
aOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BOD	Biological oxygen demand
BTEX	Benzene, toluene, ethylbenzene, xylene
C4SL	Category 4 Screening Level
DRO	Diesel range organics
EA	Environment Agency
EPH	Extractable petroleum hydrocarbons
GRO	Gasoline range organics
GAC	Generic assessment criterion
LOD	Limit of detection
MTBE	Methyl tertiary butyl ether
NGR	National Grid Reference
PAH	Polycyclic aromatic hydrocarbons
S4UL	Suitable for Use Level
SGV	Soil Guideline Value
SOM	Soil organic matter
SVOC	Semi-volatile organic compound
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound

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1 INTRODUCTION

1.1 Background

A planning application is being prepared for the redevelopment of a 0.75 ha residential land holding located off Orchard Lane in East Molesey, London (herein referred to as the 'Site'). The Site location is shown on Figure 1.1.

The Site is currently occupied by a series of one and two-storey residential buildings which are used for sheltered housing / supported living accommodation. The buildings are largely surrounded by tarmac hard standing across the southern half of the Site, including access roads and parking areas. Several soft landscaped areas are present in the northern third of the Site including a vegetable garden in the north-east of the Site. The current configuration of on-Site buildings and areas of soft standing is shown on Figure 1.2.

The outline development plans allow for the demolition of all current Site structures (with the exception of the riverside wall associated with 'Block B', situated in the south-west of the Site; see Figure 1.3) and the erection of three new residential structures ('Block A', 'Block B' and 'Block C' as shown on Figure 1.3). The Block A structure will include a basement level comprising of parking and plant rooms.

A pre-application enquiry was submitted to Elmbridge Borough Council in August 2020 relating to the construction of '78 residential units divided across 3 blocks of accommodation'. The Council response (dated 22nd October 2020) indicated that, *'The site is located on land potentially affected by ground contamination. A land contamination assessment will be required when your application is submitted'*.

A Phase 1 contaminated land report (see Appendix A) was prepared by KRS Environmental Ltd in August 2021 in support of the planning application. The Phase 1 report concluded that the Site poses a Moderate / Low risk of contaminated land impacting on future Site users and the local environment. The Phase 1 report made the following recommendations:

> *Given the nature of the historical land use and therefore the potential for contamination to be present at the Site, it is recommended that a proportionate programme of site investigation and monitoring works be undertaken in order to establish the presence or absence of contamination and to enable a quantitative assessment of the associated environmental risks. There should also be appropriate investigation and removal of any asbestos containing material prior to any demolition.*

In response to the findings of the Phase 1 report, Ground First has been commissioned to undertake a proportionate site investigation in order to quantify potential environmental risks associated with the prevailing land quality at the Site.

1.2 Instruction

Ground First Ltd was instructed by KRS Environmental Ltd (the Client) on 10th September 2021 to undertake a Phase 2 contaminated land assessment as outlined in proposal reference 4224P1, dated 2nd September 2021.

1.3 Objectives

The objective of the commissioned work was to undertake a proportionate programme of data collation, site investigation and environmental risk assessment in order to clarify prevailing contaminated land conditions and thereby inform the planning process.

1.4 Scope of works

In order to ascertain the extent of any environmental risks posed by current ground conditions present at the Site, a programme of investigative works was designed to address the following key issues:

- The extent, thickness and composition of any Made Ground present across the study area.
- The chemical composition of any in situ Made Ground.
- The presence of any asbestos containing materials within the Made Ground / sub surface.
- The nature of the underlying natural geology and the presence of any shallow groundwater.
- The likelihood of any significant groundwater contamination.
- The likelihood of any significant soil vapours or ground gasses associated with the prevailing ground conditions.

1.5 This report

This report provides information derived from relevant data sources, factual records of all fieldwork observations, plus site measurements and analytical test results; it also presents a conceptual site model alongside the findings of appropriate risk assessments relating to relevant contaminant linkages.

1.6 Exclusions

It is noted that the findings presented in this report are in part based on information supplied by third parties. Whilst we assume that all information is representative of past and present conditions we can offer no guarantee as to its validity.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use of the proposed development. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Figure 1.1 Site location

Site location including current built structures	October 2022	Drawn: AJS
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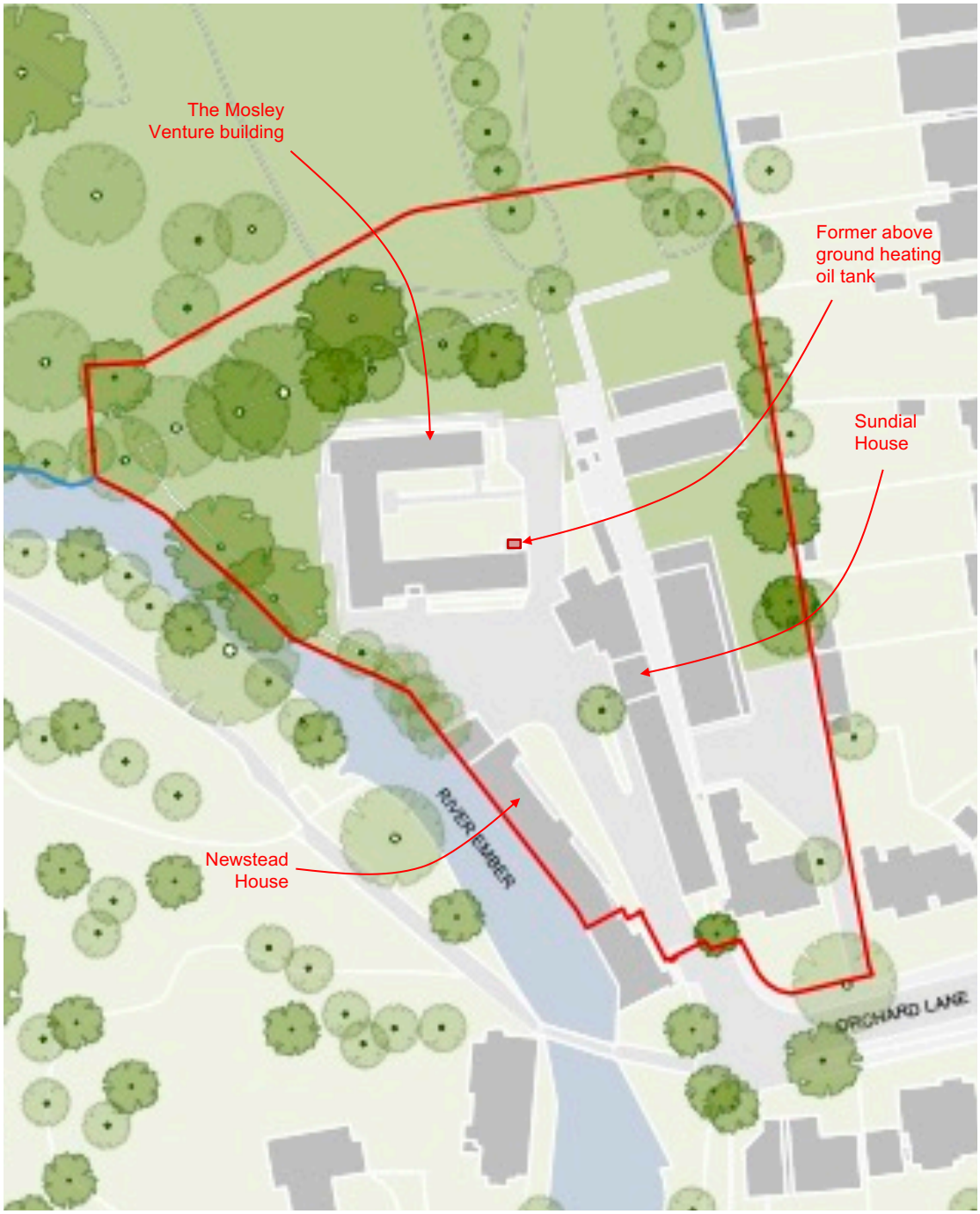
Figure 1.2 Current Site layout



Site layout (areas of soft standing within the Site boundaries are shaded green)	**October 2022**	**Drawn: AJS**
	4224R1rev1	**Rev 1**

Figure 1.3 Development plans

Ground floor plan

Basement plan

Development plans (ground floor and basement plans)	**October 2022**	**Drawn: AJS**
	4224R1rev1	**Rev 1**

2 SITE SETTING AND HISTORY

The following section provides a summary of the Site setting and land use history.

2.1 Basic site information

Information relating to the Site location is summarised in Table 2.1.

Table 2.1 Site details

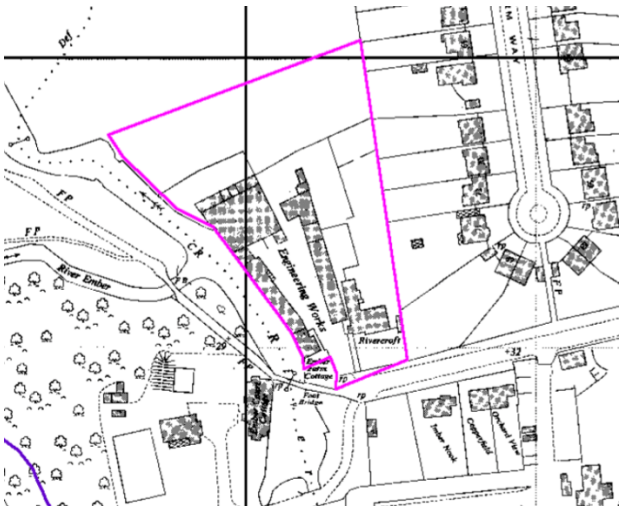
Site Address	The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN
Site area	c. 0.75 ha
NGR	514610, 167350
Topography	The Site topography is relatively flat and level. There is near vertical fall from the western Site boundary down to the adjacent river; the change in level between the Site and the river is of the order 1.5 m to 2.0 m.
General setting and Ground coverage	The Site is located within the suburb of East Molesey in south-west London. The Site is accessed from Orchard Lane, which is a no-through route extending from Ember Lane (B3379) to the east. The Site currently comprises approximately seven built structures including almshouses, apartments and garden buildings. The buildings are largely surrounded by tarmac hard standing across the southern half of the Site, including access roads and parking areas. Several soft landscaped areas are present in the northern third of the Site including a vegetable garden (former horticultural training area) in the north-east of the Site. The Site is owned by 'The Sons of the Divine Providence' who currently provide registered residential care to c. 20 people with learning disabilities. The land to the east of the Site is occupied by two-storey detached and semi-detached dwellings with both front and back gardens. Further detached residential dwellings are present to the south of the Site (beyond Orchard Lane). The River Ember forms the western Site boundary, beyond which is undeveloped land. An area of open grassland with some woodland is present to the north of the Site. Photographs of the current Site condition are included in Appendix C.

2.2 Site history

Salient aspects of the Site's historical land use are shown in Table 2.2, as derived from historical land use mapping presented in the Phase 1 report (see Appendix A).

Table 2.2 Site land use history

Date	Land use
1868 - 1893	The Site is partly developed including a collection of buildings in the southern half of the Site. The Site is bound to the west by a watercourse. There are several greenhouses located c. 50 m south of the Site. The land to the east is occupied by woodland / an orchard.
1897 - 1920	The Site has been redeveloped with multiple buildings in the southern and central Site areas which are labelled as Orchard Farm. Note: the 1897 deed plan provided for the Site shows the presence of a 'dairy farm'.
1933 - 1934	No apparent land use change on-Site although the Site is labelled as Ember Lane Farm. Several residential properties are shown to the south of the Site. Ember Court Works (concrete & engineering) is located c. 100 m south of the Site.
1938	There has been residential development adjacent to the east of the Site.

Date	Land use
1956	The Site is labelled as an Engineering Works. The on-Site buildings remain largely as per the previous farm complex. The greenhouse buildings are no longer present to the south. The metropolitan concrete works c. is mapped c. 65 m south-east. The Ember Court Works is now labelled as Trianco Works (engineering). 
1975	A former building in the central-western part of the Site has been demolished. A 'C' shaped building has been constructed in the north-west of the Site (as per the current Site configuration).
1978	The Site is labelled as The Molesey Venture (Hostel). There is a tank labelled adjacent to the 'C' shaped building in the north-west of the Site. The concrete works and Trianco Works are now labelled as Imber Court Trading Estate, comprising a series of warehouses which extend to within c. 50 m of the southern Site boundary.
2017 Aerial imagery	Aerial photography shows no apparent change on-Site. The majority of the buildings associated with Imber Court Trading Estate have been demolished.
2018 Aerial imagery	Aerial imagery shows that the former Imber Court Trading Estate is being redeveloped with residential housing.

The following additional land use information was contained in Elmbridge Borough Council's EIR correspondence (see Appendix B):

- *The site had been developed by mid to late 19th century with a number of buildings of unknown use, possibly associated with farm use or the RSPCA and part residential. Permission was granted to Trianco Ltd in 1948 for light industrial use, although historical planning records refer to the site as having been used for light industrial purposes prior to 1947. Records refer to possible use of the site for aircraft production at some point, and it was also used for the development and production of domestic and industrial boilers. Light industrial use ceased on the site in 1968.*
- *In the late 1960's / early 1970's the site underwent a change of use to provide charity residential care. The site was reconfigured with the retention of Sundial House, Ember Farm Cottage, Rivercroft and part of the former industrial-use buildings, and the erection of a new residential building in the north-west area of the site. There were a number of subsequent alterations to the site and the addition of horticultural use buildings. The site opened for this purpose circa 1975. After residential care ceased, the site continued to provide hostel/bed sit accommodation and community services.*

It is noted that the Site has been identified under the Council's Contaminated Land Inspection Strategy as a result of its former industrial use. However, it has not been determined as Contaminated Land under Part 2A of the Environmental Protection Act 1990 and furthermore, it has not been prioritised by the Council for detailed inspection at this time (see Appendix B).

In summary, historical mapping indicates that the southern half of the Site was first developed prior to 1868 for unknown purposes and has subsequently been redeveloped as a dairy farm,

an engineering works and a hostel / assisted living facility. The engineering works is understood to have been operated by Trianco Ltd between the 1940s and 1968, who also occupied part of a large industrial complex to the south of the Site. According to on-line records Trianco's operations included the fabrication of machines for producing concrete blocks and slabs as well the production of solid fuel (coal) boilers, although given the modest scale of the on-Site structures (relative to the industrial complex to the south) it is possible that the Site itself was used in part for administrative purposes. The works appeared to have occupied the former farm buildings plus an additional square structure erected along the western Site boundary; this structure was demolished in around 1970 in order to facilitate the construction of a residential building in the north-east of the Site (which included an above ground heating oil tank – this feature was decommissioned some years ago when oil-fed boilers were replaced with gas-fired heating systems).

2.3 Environmental setting

Information relating to the environmental Site setting is summarised in Table 2.3, as obtained from the existing Phase 1 report (see Appendix A) plus supporting web-based information.

Table 2.3 Environmental Site setting

Topic	Description
Geology and groundwater	 British Geological Survey (BGS) mapping shows the presence of alluvium across the northern part of the Site; these deposits are classified as a Secondary (undifferentiated) Aquifer. The southern half of the Site appears to be underlain by the Langley Silt Member (an Unproductive Strata). The bedrock geology consists of London Clay which is classified as an Unproductive Strata. The nearest BGS borehole record (TQ16NW81 - ORCHARD LANE EAST MOLESLY BH1) is positioned c. 60 m south of the Site at NGR: 514670,167230. The borehole was drilled in 1972 to a depth of 15.72m. The borehole log recorded the following geological sequence: - 3 feet of Made Ground - c. 6 feet of stiff brown sandy clayey silt - 13 feet of coarse to fine gravel with a little sand - 28+ feet stiff grey silty clay The Site does not lie within a Source Protection Zone (SPZ) and there are no licensed groundwater abstractions within 1 km of the Site. Elmbridge Borough Council's Environmental Services department does not hold any records of private water supplies within a 250 m radius of the Site (see Appendix B). The Phase 1 report (see Appendix A) identified a negligible risk of groundwater flooding at the Site. A non-coal mining search was performed for the Site by tmgroup Ltd in March 2019 (to inform development options for the Site). The mining search did 'not identify any other mining activities at this location'.

Topic	Description
Surface water and flooding	The nearest water feature is a branch of the River Ember, located directly to the west of the Site; an engineered river wall is evident along much of the western Site boundary. The main river channel is located c. 150 m to the west of the Site. The Island Barn reservoir is located c. 350 m to the west of the Site The Phase 1 report indicates that the Site lies in flood zones 1, 2 and 3. Two surface water abstraction licences are held within a 1 km radius of the Site; both relate to spray irrigation activities located c. 200 m and c. 505 m to the north-west of the Site (i.e., downstream of the Site).
Landfill / waste management	There are no recorded active, recent or historical landfills located within 500 m of the Site.
Pollution incidents	One pollution incident has been recorded by the Environment Agency within a 100 m radius of the Site; the incident occurred in 1996 c. 60 m north-west of the Site. The pollutant was unknown oils and the incident was categorised as minor. Elmbridge Borough Council's Environmental Health department does not hold 'any records of pollution incidents within the identified subject property or its immediate vicinity' (see Appendix B).
Environmental designations	There are no relevant environmental designations recorded within 500 m of the Site.

2.4 Previous ground investigations

No previous ground investigations are known to have been undertaken at the Site itself. Note: multiple previous planning applications are recorded for the Site on Elmbridge Borough Council's planning register (including various external alterations, the construction of a single story extension, the replacement of boundary fencing and the change of use of existing structures to residential accommodation) although none of these included any formal assessment of contaminated land conditions.

A site investigation was conducted in 2014 directly to the south-west of the Site, associated with Ember Farm Cottage (see Figure 3.1). The investigation was performed in support of planning application ref: 2011/5700, which related to the construction of a 'single storey front extension and side porch'.

In response to a condition of planning AP Geotechnics Ltd undertook a ground investigation at the Ember Farm Cottage site, comprising six window sampler locations drilled to depths of between 1.02 m and 2.1 m bgl. No formal reporting of the ground investigation is available on Elmbridge Borough Council's planning portal, however, borehole logs and PID soil headspace testing results are presented. The available information is summarised as follows.

- Made Ground was encountered at all six exploratory locations at thicknesses of between 0.98 m and 2.0 m.
- The Made Ground was described as topsoil and stone; clay, stone and chalk; brick, chalk and clay; black soil and clinker; black earth, stone and clinker; black clinker; and black earth and stone.
- The natural deposits comprised brown clay; brown clay with stone; light brown sandy clay; and light brown sandy gritty clay.
- All boreholes were recorded as being dry.
- All PID readings were all zero with the exception of a single reading of 0.3 ppm.

Email correspondence issued by AP Geotechnics Ltd in July 2014 indicates that soil samples were collected during the ground investigation; no associated laboratory test results were available on the Council's planning portal during December 2021. However, Council correspondence from August 2014 reference the requirement for a remediation strategy for the site (indicating that soil contamination was identified during the 2014 ground investigation).

2.5 Proposed development plans

All of the existing built structures, with the exception of the riverside wall associated with Block B (see Figure 1.3), will be demolished as part of the planned redevelopment.

The new scheme will comprise of three blocks; Block A, Block B and Block C (see Figure 1.3). Block A is a three / four-storey new build structure comprising 50 apartments with associated residents amenity space at ground floor and an underground basement containing car parking and plant rooms. Block B replaces the existing building in this location, except for the riverside wall which is re-used, to create 4 three-storey townhouses. Block C is a new build apartment block comprising 20 residential apartments.

The totality of the Site will be reduced to formation level and there will be the creation of a central road that will fork as it reaches Block A, the right hand fork will access a ramp for the basement car park of Block A (see Figure 1.3).

The creation of the basement car park will require significant groundworks including the excavation of in situ soils; it is understood that all excavation spoil will be removed off-Site.

3 SITE INVESTIGATION WORKS

3.1 Site investigation programme

A programme of intrusive site investigation was coordinated by Ground First on 8th December 2021. All intrusive works were performed by CIRC Construction Management Ltd.

The proposed scope of site investigation works was forwarded to Elmbridge Borough Council in advance. The Council was unable to provide comment on the planned investigation.

A summary of the site investigation activities undertaken is presented in Table 3.1. Trial pit locations are shown on Figure 3.1 with trial pit soil descriptions provided in Appendix D. A photographic record of the Site works is provided in Appendix C.

Table 3.1 Site investigation activities

Element of investigation	Details	Rationale
Trial pitting	Thirteen trial pit locations (TP01 to TP13) were excavated at the study site using a tracked 5-tonne excavator. The pits were distributed across the Site working within the constraints of buried services and built structures. The trial pit locations are shown on Figure 3.1. Note: full service plans were obtained in advance of the intrusive investigation. The excavation locations were also cleared using a CAT. The trial pits were excavated to depths of between 0.2 m and 1.5 m bgl. All pits were backfilled on completion. The excavated spoil was replaced in broadly the same order as it was excavated. All excavated materials were logged by an experienced site supervisor.	To characterise existing ground conditions across accessible parts of the study area, based on the following rationale: - TP01 and TP02 were targeted on the area directly alongside the former above ground heating oil tank. - TP03 to TP04 were positioned within the vegetable plot / horticultural training area in the north-east of the Site. - TP03 to TP08 were situated within areas of proposed soft standing (post development). - TP09 was situated within the footprint of a former engineering works building. - TP11 was situated along the eastern Site boundary. - TP10, TP12 and TP13 were situated within areas of proposed soft standing (post development). To assess the extent, thickness and composition of any Made Ground present across the study area. To make a visual assessment of any ground contamination. To clarify the nature of the underlying natural geology. To assess the presence of any shallow groundwater. To facilitate environmental soil sampling and chemical testing.
Hand pitting / hand augering	One hand pit (HP01) was advanced using pincer shovels and a hand auger. The hand pit was located within a raised bed / planting area situated in the south-west of the Site (as shown on Figure 3.1). The pit was excavated to a depth of 0.6 m bgl (the auger refused at this depth).	To characterise existing ground conditions within the only accessible location in the south-western part of the Site. Note: the remainder of this area was inaccessible for intrusive investigations due to building cover, an existing access road and multiple live services.
Soil sampling	13 soil samples were taken from the trial pits at depths of between 0.1 m bgl and 0.4 m bgl. 12 samples were taken from Made Ground.	To provide appropriate samples for chemical laboratory analysis (analytical suite described below) in order to inform the environmental risk assessment.

Element of investigation	Details	Rationale
Groundwater sampling	No groundwater was encountered during the site investigation; as a result no samples were collected.	/
Chemical laboratory analysis	The soil samples collected on Site were submitted to the UKAS and MCERTS accredited i2 Analytical for chemical analysis (see Section 3.2).	To allow assessment of potential land quality risks to identified receptors.

3.2 Chemical laboratory testing

Representative soil samples (13 samples in total) were obtained from 12 of the trial pits excavated at the Site. All soil samples were scheduled for analysis performed by i2 Analytical Ltd (i2 is an approved Ground First supplier). Where possible UKAS and MCERTS certified tests were used.

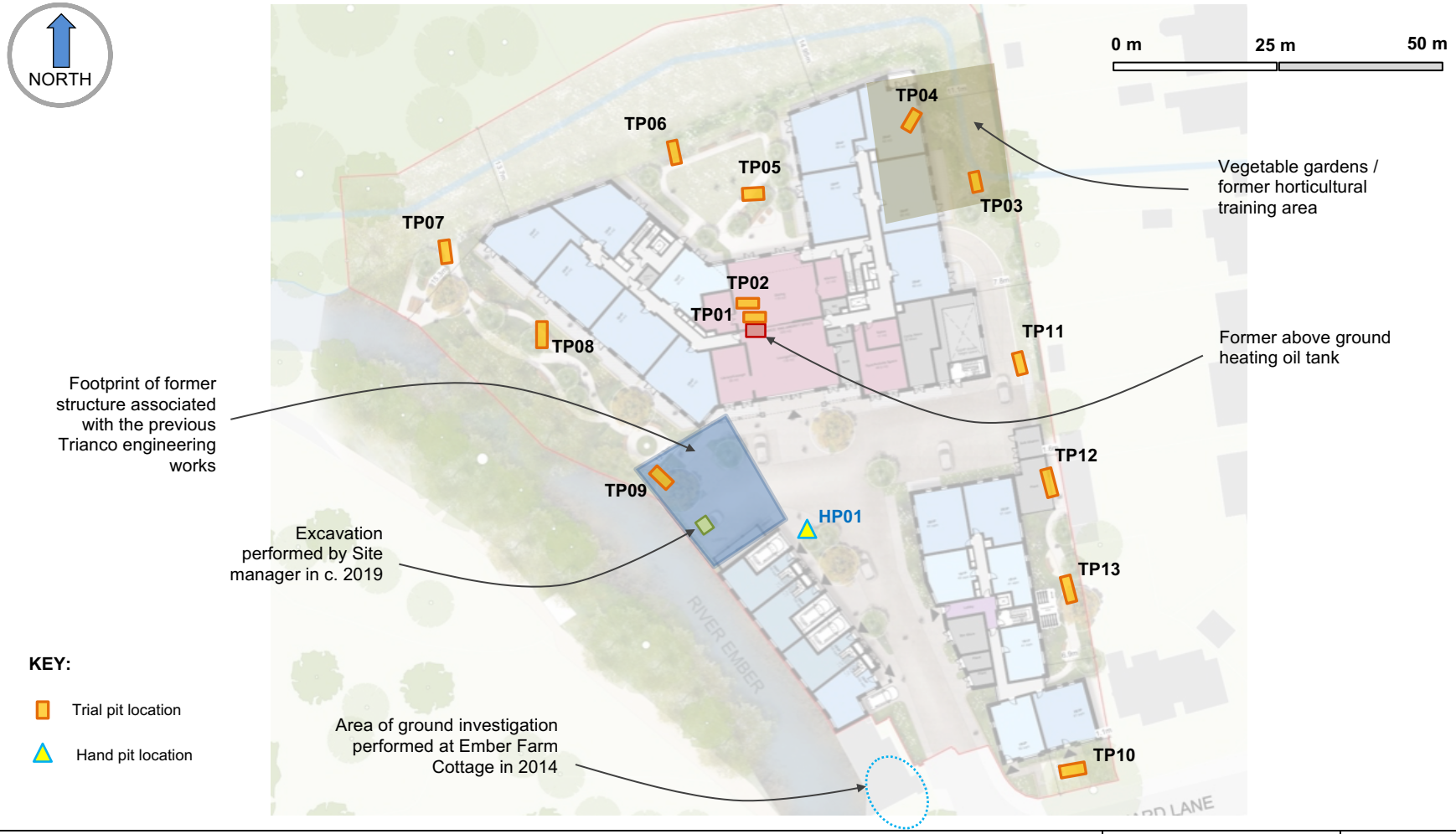
The soil samples were analysed for a range of the following soil determinands:

- Moisture content
- Fraction of organic carbon (foc)
- Soil organic matter (SOM)
- pH
- Total and water soluble sulphate
- Sulphide
- Metals and metalloids (As, Be, B, Cd, Cr (III and VI), Cu, Hg, Ni, Pb, Se, Zn and V)
- Total and free cyanide
- Thiocyanate
- Speciated TPH
- Banded TPH (C6-C10; C10-C25; C25-C40)
- Speciated PAHs
- MTBE
- BTEX
- Total phenols
- Asbestos in soil screen

Two of the soil samples (taken from Made Ground encountered at trial pits TP06 and TP08, both of which were located above the mapped alluvium deposits (a Secondary (undifferentiated) Aquifer)) were also subject to leachability testing, including the following determinands:

- pH
- Total and free cyanide
- Thiocyanate
- Sulphate and sulphide
- Metals and metalloids (As, B, Cd, Cr (III and VI), Cu, Hg, Ni, Pb, Se and Zn)
- Speciated PAHs
- Total phenols

Figure 3.1 Site investigation location plan



Site investigation locations	October 2022	Drawn: AJS
	4224R1rev1	Rev 1

4 SITE INVESTIGATION RESULTS

4.1 Encountered ground conditions

The sequence of strata encountered within each of the trial pits is described in full within Appendix D and summarised below.

A component of **Made Ground** was observed at the majority of the exploratory trial pits.

North-western part of the Site (TP01, TP02, TP05, TP06, TP07, TP08 and TP09)

- The Made Ground included an upper soil layer comprising brown sand and gravel; mid-brown silty sand and gravel; and dark brown gravelly sand, with minimal man-made material present. This soil layer ranged in thickness between 0.05 m and 0.2 m.
- An underlying horizon typified by mid-brown to black silty sand and gravel and/or sand and gravel with some brick, slate, coal, clinker, concrete, ceramic tile, clay tile, glass and metal. This material ranged in thickness between 0.15 m (TP06) and 1.35 m (TP08).
- In addition, a distinct orange gravelly sand plus orange sand and gravel with some suspected clinker remains was observed between 0.7 m and 1.5 m bgl at TP07. An orange sand layer was also observed at TP05 between 0.6 m and 0.8 m bgl.

It is noted that the Made Ground recorded during the 2014 investigation (performed directly to the south-west of the Site – see Section 2.4) comprised clay, stone and chalk; brick, chalk and clay; black soil and clinker; black earth, stone and clinker; black clinker; and black earth and stone.

South-east of the Site (TP12 and TP13)

- The Made Ground included a thin layer of grey to black gravel (road planings / weathered tarmac) underlain by dark brown silty sand and gravel including some brick, concrete and metal remains; this material ranged in thickness between c. 0.4 m and 0.5 m.

South-east and east of the Site (TP10 and TP11)

- Only limited man-made material was observed beneath the garden areas present in the south-east (TP10) and eastern areas of the Site (TP11). The encountered soils at TP10 comprised an upper layer of mid to dark-brown silty slightly gravelly sand with roots and rootlets, overlying mid brown silty gravelly sand and gravelly silt with very occasional fine brick remains. The soil sequence observed at TP11 included 0.6 m of mid to dark-brown silty gravelly sand with roots and rootlets including very occasional glass and brick.

Where present, the full thickness of the Made Ground layer ranged between 0.35 m (TP06) and 1.5 m (TP07), with an average thickness of c. 0.8 m.

No discernible man-made material was observed within the soils encountered across the former horticultural area in the north-east of the Site (TP03 and TP04), where the ground conditions comprised c. 0.3 m of mid to dark-brown silty gravelly sand with roots and rootlets, overlying soft to firm tan silty clay. Similarly, the raised bed present alongside the Site access route in the south-west of the Site (HP01) encountered 0.6 m of mid to dark brown silty gravelly sand with some roots and rootlets.

The **natural superficial deposits** largely comprised cohesive material including firm grey to blue clay; soft to firm mid-brown silty clay; soft to firm tan brown slightly gravelly clay; and tan-brown sandy silt. A layer of grey to brown sand and gravel was encountered at TP07 directly beneath the Made Ground material. These observations are consistent with the natural deposits recorded during the 2014 investigation (performed directly to the south-west of the

Site) which comprised brown clay; brown clay with stone; light brown sandy clay; and light brown sandy gritty clay.

5.2 Groundwater

No shallow groundwater was encountered (to a maximum depth of 1.5 m bgl) during the recent site investigation. Given the presence of the River Ember directly to the west of the Site, subject to the distribution of any permeable superficial deposits, shallow groundwater may be present within c. 2.5 m of the ground surface. It is noted however that no groundwater was observed within any of the six boreholes drilled directly to the south-west of the Site in 2014 to depths of up to 2.1 m (see Section 2.4).

5.2 Visual and olfactory evidence of contamination

The following site observations were recorded in relation to potential ground contamination:

- Made Ground was identified at the majority of the site investigation locations. The Made Ground contained assorted man-made material including suspected clinker at TP02, TP05, TP06 and TP07.
- No obvious asbestos containing materials were observed at ground surface or within the Made Ground encountered at any the excavated trial pits.
- No significant staining or odours were recorded in any of the trial pits.

4.2 Chemical testing results

Full laboratory certificates of all soil test results are presented in Appendix E.1. A summary of all analytical data is also shown in Appendix E.2.

4.3 Other site observations

Salient observations made during the site investigation works included:

- The on-Site structures were of brick construction with tiled roofs (see Photographs 1 to 5, 7, 11, 12, 18, 19, 22 and 25 in Appendix C).
- The residential buildings were partly occupied at the time of the site investigation (as sheltered accommodation / assisted living).
- Numerous buried services were evident along the Site access route in the south-western part of the Site (see Photograph 3 in Appendix C).
- The route of a 36-inch water main (operated by Thames Water) was marked close to the northern edge of the Site.
- A brick and concrete engineered wall was evident along the western Site boundary; see Photographs 25 to 27 in Appendix C. At the time of the site investigation the adjacent river stage was between 1.5 m and 2.0 m below the Site ground level.
- The location of a former heating oil tank was confirmed in the central-northern part of the Site (see Figure 3.1). Although the tank is understood to have been removed many years ago, the brick tank stand remains in situ (see Photograph 8 in Appendix C). A former transmission line was evident on the western edge of the stand (see Photograph 9 in Appendix C). The tank stand was positioned on a concrete slab of c. 0.09 m thickness. Note: trial pit TP01 identified a further concrete surface directly beneath the slab (see Photograph 31 in Appendix C). No obvious staining was observed on the concrete slab underlying the former tank position.
- The southern half of the Site was largely covered by hard standing, comprising building footprints and tarmac driveways and parking areas. Raised planters were present either side of the main access route (see Photograph 3 in Appendix C) and a small grassed garden was evident in the south-east corner of the Site (see Photographs 16 and 17 in Appendix C).

- Communal grassed areas were present in and around the Molesey Venture building in the north-west of the Site (see Photographs 11 to 13 in Appendix C). A large greenhouse and a vegetable garden were present in the north-east of the Site (see Photograph 24 in Appendix C), alongside a gravelled garden with multiple raised beds / planters (see Photograph 21 in Appendix C).
- The ground elevation across the Site appeared to be broadly consistent with the neighbouring land areas to the north-east, east and south.
- A fall in surface levels of around 0.5 m was noted between the floor level of the residential structure in the north-west of the Site (The Molesey Venture structure) and the grassed area along the northern Site boundary (see Photographs 10 and 11 in Appendix C). It is feasible that this modest raising of Site levels beneath The Molesey Venture building may have been performed at the time of the building construction in response to flood risks.
- The Site maintenance manager indicated that an excavation was undertaken along the western Site boundary in c. 2019 for the purpose of installing a modest soakaway. The approximate position of the excavation is shown on Figure 3.1. The encountered ground conditions included a c. 0.9 m thickness of concrete from ground level; the encountered concrete may have related to relic foundations associated with a previous engineering works building.

5 CONTAMINATION ASSESSMENT

The following section identifies potential contaminants of concern (COC) associated with encountered ground conditions beneath the Site. The outputs of this process will be used to refine the conceptual site model which will in turn provide the technical basis for an assessment of contamination risks in Section 6.

5.1 Assessment of soil data (human health risks)

5.1.1 Contaminant screen (soil quality)

An initial soil screening exercise involved comparing observed soil quality data with a set of generic human health screening values (commonly referred to as Generic Assessment Criteria (GAC)). GACs have been compiled from various published sources based on the following hierarchy:

- Suitable for Use Levels (S4ULs) derived by a consortia of industry professionals and published by LQM and CIEH.
- Category 4 Screening Levels (C4SL) published by Defra.

The available soil quality data have been assessed against GACs representative of a typical residential land use with a sandy loam soil type and a SOM content of 6% (note: the average measured SOM, based on both observed SOM and foc results, was 5.1%). The adopted GACs are listed in Appendix F. It is noted that the GACs relating to a standard residential land use assume potential contaminant exposure via the consumption of home-grown fruit and vegetables; given the incorporation of communal garden spaces within the proposed development this exposure pathway is unlikely to be active. As such, the adopted GACs are considered to be conservative in nature.

Table 5.1 below presents a summary of soil quality determinands for which exceedances have been observed against the GACs together with corresponding locations and sample depths. GAC exceedances are highlighted in bold.

Table 5.1 Soil quality screen (residential GACs)

Analyte	No. Samples	Minimum (mg/kg)	Average (mg/kg)	Maximum (mg/kg)	GAC (mg/kg)	Number of Samples exceeding GAC	Samples exceeding GAC (depth)
Arsenic	12	12	21.2	**38**	37 (S4UL)	1 (8%)	TP11 (0.25m)
Lead	12	63	**208**	**390**	200 (C4SL – with home grown produce consumption)	7 (58%)	TP03 (0.1m) TP05 (0.15m) TP07 (0.35m) TP08 (0.3m) TP09 (0.3m) TP10 (0.2m) TP11 (0.25m)
Benzo(a)-anthracene	12	0.47	**24.8**	**260**	13 (S4UL)	1 (8%)	TP12 (0.3m)
Chrysene	12	0.61	18.3	**190**	27 (S4UL)	1 (8%)	TP12 (0.3m)
Benzo(b)-fluoranthene	12	0.66	**15.1**	**140**	3.7 (S4UL)	5 (42%)	TP02 (0.4m) TP08 (0.3m) TP10 (0.2m) TP12 (0.3m) TP13 (0.35m)

Analyte	No. Samples	Minimum (mg/kg)	Average (mg/kg)	Maximum (mg/kg)	GAC (mg/kg)	Number of Samples exceeding GAC	Samples exceeding GAC (depth)
Benzo(k)-fluoranthene	12	0.42	11.6	**120**	100 (S4UL)	1 (8%)	TP12 (0.3m)
Benzo(a)-pyrene	12	0.55	**15.5**	**150**	3.0 (S4UL)	5 (42%)	TP02 (0.4m) TP08 (0.3m) TP10 (0.2m) TP12 (0.3m) TP13 (0.35m)
Indeno(1,2,3-cd)pyrene	12	0.43	8.1	**75**	41 (S4UL)	1 (8%)	TP12 (0.3m)
Dibenz(a,h) anthracene	12	<0.05	**2.0**	**18**	0.3 (S4UL)	8 (67%)	TP02 (0.4m) TP05 (0.15m) TP06 (0.2m) TP08 (0.3m) TP10 (0.2m) TP11 (0.25m) TP12 (0.3m) TP13 (0.35m)
Naphthalene	12	<0.05	2.5	**30**	13 (S4UL)	1 (8%)	TP12 (0.3m)
Phenanthrene	12	0.33	40.5	**460**	440 (S4UL)	1 (8%)	TP12 (0.3m)

Key observations taken from the soil screening exercise (residential land use GACs), include the following:

- The majority of analytes, including total phenols, free cyanide, BTEX, MTBE and all speciated TPH fractions were measured at concentrations below the adopted screening values indicating that these substances are unlikely to pose any future health risks under the proposed residential development scenario.
- Nine PAH species did however record maximum concentrations in excess of the adopted GACs; the average concentrations of four species were also above their respective GACs, albeit these average results were skewed by the notably elevated concentrations associated with the single sample recovered from TP12. Regardless, selected PAH species could pose a potential human health risk, subject to more detailed consideration of likely contaminant exposures.
- The majority of lead concentrations were modestly in excess of the adopted GAC. The average lead concentration was slightly above the GAC, indicating a potential human health risk, subject to more detailed consideration of likely contaminant exposures.
- Only a single arsenic concentration was marginally in excess of the adopted GAC. Based on the available soil quality data, arsenic is not considered to present a significant health risk to future residential users.

Given that the proposed development does not include any private garden space (and is unlikely to include any fruit or vegetable cultivation), the available soil quality data have also been assessed against Suitable for Use Levels (S4ULs) which are representative of a Public Open Space (POS) scenario for grassed areas adjacent to residential housing (POS_{resi}) with a sandy loam soil type and a SOM content of 6%.

The key assumptions adopted in the derivation of POS_{resi} GACs include the following:

- The use of land as 'public open space in close proximity to residential housing' (POS_{resi}) includes predominantly grassed areas adjacent to high density housing; the central green area around which houses may be located, as on many housing estates from the 1930s to 1970s; as well as smaller informal grassed areas commonly incorporated in newer developments or more formal landscaped areas with a mixture of open space and covered soil with planting.
- The POS_{resi} land use is generally considered to be a predominantly grassed area of up to 500 m^2 (0.05 ha) and a considerable proportion of this (up to 50%) may be bare soil. Such areas are assumed to be in close proximity to residential housing and are regularly used by children for playing and may be used for informal sports activities such as a football 'kickabout'.
- The critical receptor is considered to be a female child (of lower body weight than a male and therefore more sensitive) and covers ages >3 years to <9 years old).
- Exposure modelling includes assessment of indoor exposure pathways as in the standard residential land-use scenario. Therefore, the relevant exposure pathways for the POS_{resi} land use are assumed to be:
  - Ingestion of soil and dust (outdoors and indoors).
  - Dermal contact with soil (outdoors); and soil-derived dust (indoors).
  - Inhalation of dust (outdoors and indoors).
  - Inhalation of vapours outdoors.
- The critical receptor is assumed to use the site on a regular basis (1 hour at a time and for 170 days per year).
- The consumption of homegrown produce is discounted since public open space is not anticipated to be used for the growing of fruit and vegetables.
- A slight reduced in the soil ingestion rate (compared to the standard residential land-use) of 75 mg/day is used for the POS_{resi} land use.

The adopted POS_{resi} GACs are presented in Table 5.2 alongside any exceedances relating to the available soil quality dataset.

Table 5.2 Soil quality screen (public open space - residential GACs)

Analyte	No. Samples	Minimum (mg/kg)	Average (mg/kg)	Maximum (mg/kg)	*GAC (mg/kg)*	Number of Samples exceeding GAC	Samples exceeding GAC (depth)
Benzo(a)-anthracene	12	0.47	24.8	**260**	*29 (S4UL)*	1 (8%)	TP12 (0.3m)
Chrysene	12	0.61	18.3	**190**	*57 (S4UL)*	1 (8%)	TP12 (0.3m)
Benzo(b)-fluoranthene	12	0.66	**15.1**	**140**	*7.2 (S4UL)*	3 (25%)	TP10 (0.2m) TP12 (0.3m) TP13 (0.35m)
Benzo(a)-pyrene	12	0.55	**15.5**	**150**	*5.7 (S4UL)*	3 (25%)	TP10 (0.2m) TP12 (0.3m) TP13 (0.35m)
Dibenz(a,h) anthracene	12	<0.05	**2.0**	**18**	*0.58 (S4UL)*	5 (42%)	TP02 (0.4m) TP08 (0.3m) TP10 (0.2m) TP12 (0.3m) TP13 (0.35m)

Key observations taken from the soil screening exercise (POS_{resi} land use GACs), include the following:

- No metal concentrations (including arsenic and lead) were found to be in excess of the public open space GACs, indicating the likely absence of any corresponding health risks under the proposed residential development scenario.
- However, the average concentrations of three PAH species were in excess of the public open space GAC; the exceedances largely related to samples derived from trial pits TP10, TP12 and TP13, all located in the south-east and east of the Site. It is noted that all average PAH concentrations were at or below the corresponding POS_{resi} GACs when the outlier concentrations from the TP12 sample are removed.
- On balance, based on the POS_{resi} land use assumptions, several PAH species may still pose a potential human health risk, subject to more detailed consideration of likely contaminant exposures.

The risks posed by the available soil quality data are discussed further in Section 6.

5.1.2 Contaminant screen (asbestos)

Nine soil samples were screened by i2 Analytical for the presence of asbestos containing materials (ACM). ACMs were identified within two of the nine samples:

- Chrysotile loose fibres were recorded within a sample taken from TP02 at a depth of 0.4 m.
- Chrysotile loose fibres were recorded within a sample taken from TP08 at a depth of 0.3 m.

CIRIA C733 (2014) provides guidance concerning the investigation, assessment and remediation of soils containing, or suspected of containing, free asbestos fibres or asbestos containing material (ACM).

C733 indicates that there are negligible health risks from the ingestion of ACMs; potentially significant health risks are constrained to the inhalation of airborne asbestos. As such, asbestos only poses a distinct health risk when it is airborne.

The number of fibres released into the air from asbestos containing soils is influenced by a range of site-specific factors (CIRIA, 2014); these factors are evaluated for the study Site in Table 5.3.

Table 5.3 Appraisal of asbestos fibre release factors (CIRIA, 2014)

Factor	Description / context	Site-specific conditions
Characteristics of the asbestos or ACM		
Concentration of asbestos in soil	The risk of exposure to ACMs is proportional to the concentration of any free fibres within the near surface soils.	Two of the nine samples recently screened for ACMs contained chrysotile loose fibres.
Depth to asbestos in relation to (final) ground level	In the absence of significant physical disturbance, exposure to airborne asbestos fibres from soil will be from friable materials or asbestos fibres present at, or very close to, the soil surface (i.e., the soil-air interface). Consequently, soil risk assessments for buried asbestos primarily need to consider the likelihood that such materials may reach the surface due to the action of burrowing animals or human activities.	Two asbestos detections were recorded from the nine soil samples which were screened. The asbestos was identified in samples taken from depths of 0.3 m bgl and 0.4 m bgl within Made Ground. The Made Ground comprised brown, grey and black sand and gravel with brick, concrete, coal, clinker, clay / ceramic tile and glass. At both of the sample locations where ACMs were identified a topsoil layer (0.15 m to 0.2 m thick) was observed above the Made Ground.

Factor	Description / context	Site-specific conditions
Volume or surface area of asbestos containing soils (ACS)	The larger the area of soil which could give rise to asbestos releases, the greater the associated exposure risks.	No visible suspected asbestos cement fragments or other ACMs were observed within any of the trial excavations during the recent site investigations. Furthermore, no asbestos remains were identified within seven of the nine soil samples subjected to laboratory screening. However, the widespread presence of Made Ground across the Site, including demolition type wastes suggests that low levels of asbestos are likely to be present elsewhere on-Site. Possible asbestos residues may therefore occur across the proposed areas of soft standing.
Type(s) of asbestos present / degree of heterogeneity	Chrysotile asbestos is less potent than amosite, which in turn is less potent than crocidolite. Chrysotile asbestos is largely considered to be both less toxic and to generate lower airborne concentrations than either amosite or crocidolite.	Two of the nine samples recently screened for ACMs contained chrysotile loose fibres. No amosite or crocidolite asbestos was identified within the screened soil samples.
Type(s) and condition of ACMs	Asbestos cement (AC) typically contains less than 10 per cent asbestos bound in a cohesive matrix; AC materials are also associated with far lower levels of fibre generation when compared with other forms of ACM (such as textiles, insultation board, etc.).	The identified asbestos related to chrysotile loose fibres. Asbestos fibres are therefore locally present within the in situ Made Ground.
Extent of bonding/friability	Chrysotile is typically less friable than other forms of asbestos.	Asbestos detections have been limited to chrysotile loose fibres. No fibre clumps, cement bound or other forms of asbestos were observed during the recent Site investigation.
Weathering, degradation or physical deterioration	Increasing amounts of fibres are likely to be released over time as ACMs deteriorate. Friable ACMs (e.g., lagging and asbestos insulating board) release fibres much more easily, and are likely to deteriorate faster, than firmly bound materials (e.g., asbestos cement), which may take a very long time to degrade, if undisturbed.	No evidence of any ACMs was visually recorded during the Site works (i.e., only localised loose fibres were identified through laboratory screening).
Fraction of free respirable fibres	Significant health risks are constrained to the inhalation of airborne asbestos fibres.	Free or loose asbestos fibres appear to be locally present within the in situ Made Ground. The quantity and distribution of asbestos fibres is somewhat uncertain, although the widespread presence of Made Ground containing demolition type wastes suggests that low levels of asbestos may be present elsewhere on-Site.
Characteristics of the soil		
Soil type including particle size distribution	Empirical experimentation has shown that the rate of release of airborne asbestos fibres is proportional to the soil particle size (i.e., lower rates of fibre release can be expected from clayey soils, as compared to more granular, sandy soils).	The majority of the Made Ground deposits encountered across the Site area were typified by granular material (which may give rise to fibre release under certain conditions), including sand and gravel and silty sand and gravel with variable amounts of man-made material.

Factor	Description / context	Site-specific conditions
Soil moisture content	The moisture content of the soil is one of the most important factors dictating the emission of airborne asbestos fibres from soil. Minor increases in moisture content significantly reduce the release of fibres. The addition of five per cent moisture to dry soil reduced airborne fibre release (in laboratory tests) by 80 to 95 per cent, and no airborne fibre were detected above 40 per cent soil moisture content. In the UK, most soils, even after long dry periods, are likely to have about five per cent moisture apart from extreme or very localised situations.	The average Moisture Content Ratio (% of as received sample) for the soil samples taken during the recent site investigations was 11.3%.
Presence of surface vegetation / (Micro) relief of soil surface	CIRIA C733 indicates that 'airborne fibres will predominantly be released only from exposed soil' and 'release will be strongly inhibited by vegetative cover'	The proposed development plans allow for both areas of hard standing (including access routes and paving) and communal soft standing areas. The future communal garden spaces are anticipated to be largely covered by lawn but may include flower beds or other areas of exposed soil.
Presence of hard landscaping or cover	Hard standing offers a pathway break to the release of any sub surface asbestos fibres.	
Weather influences		
Precipitation	Number of dry days can be used as an indicator of potential fibre release.	Rainfall data have not been collected as part of this assessment although rates of rainfall are assumed to be broadly consistent with the national average.
Temperature and ground freezing	Frozen ground conditions can inhibit the release of asbestos fibres from the near surface soils.	Frozen ground conditions are not commonly anticipated at the Site.
Wind speed and direction	Wind conditions will influence the potential for dust/fibre release from any exposed soils.	No site-specific data are available regarding wind conditions.
Land use/soil-disturbing activities		
Distance of receptor(s) from the source of asbestos	The distance separation between receptors and impacted soils will influence the exposure to any airborne asbestos.	Future residential occupants will be located on-Site and will have access to the proposed communal garden areas, potentially including areas of exposed soil.
Type(s) of activities	The level of disturbance of the surficial and sub surface soils is an important factor in controlling asbestos exposure.	Some recreational activities are likely to be performed within the proposed communal garden areas – these activities have a limited potential to disturb in situ soils and possibly give rise to airborne fibres. Gardening activities are likely to be undertaken by appointed maintenance workers / contractors.
Duration and frequency of activities	The degree of asbestos exposure is proportional to the duration and frequency of any activities which may disturb in situ ground.	
May dust mitigation measures employed	Targeted control measures can reduce the extent of dust/fibre release and associated asbestos exposure.	No specific mitigation measures are anticipated as part of the routine occupation of the Site once developed.

The risks posed by potential ACMs are discussed further in Section 6.

5.2 Assessment of soil leachability data (controlled water risks)

No shallow groundwater was encountered during the site investigation works. In the absence of any groundwater, two soil samples taken from trial pits TP06 and TP08 were subjected to leachability testing (these samples were selected in order to provide an indication of potential leachate quality above the alluvial aquifer which may result from the in situ Made Ground present in areas of proposed soft standing).

An initial controlled waters risk screening exercise has been performed in line with the Environment Agency's Remedial Targets Methodology (EA, 2006).

The screening assessment (or Level 1 Remedial Targets Methodology assessment) involves comparing the available soil eluate quality data with relevant target concentrations. This approach assumes that the 'compliance point' (i.e., the point at which target concentrations are not to be exceeded) is equivalent to the pore water within the soil matrix. As such, the Level 1 assessment does not allow for the effect of dilution within either the unsaturated or saturated zones or indeed any wider attenuation processes within the unsaturated zone. The screening results can therefore be considered to offer a conservative assessment of risks to controlled waters.

Given the presence of a Secondary (undifferentiated) Aquifer beneath the northern half of the Site, the adopted target concentrations are drinking water related, including both UK Drinking Water Standards (DWS) and also World Health Organisation (WHO) standards (including those for TPH fractions as per CL:AIRE, 2017). In the absence of DWS or WHO values, Environmental Quality Standards (EQS) have been applied. A listing of adopted target concentrations is presented in Appendix F.

Salient observations taken from the comparison of soil leachability results with the adopted target concentrations are as follows:

- All metal, cyanide, sulphate and speciated PAH eluate concentrations were below the adopted target concentrations.
- Both eluate results for total phenols (11 μg/l) were modestly in excess of the corresponding EQS (7.7 μg/l).

In summary, the available soil leachability data associated with the in-situ Made Ground indicate the absence of any leachable contaminant concentrations in excess of drinking water standards; albeit the observed phenol concentrations were slightly elevated when compared to the adopted EQS.

The risks posed by the observed soil leachability results are discussed further in Section 6.

5.3 Preliminary assessment of ground gases

In general, hazardous ground gases may pose a variety of risks to human health and built structures including acute affects such as asphyxiation and explosion, as well as on-going physiological effects (CIRIA, 2007).

The most common hazardous ground gases in the context of risks to built structures and Site occupants are methane and carbon dioxide, radon and hydrocarbon vapours.

Available soil quality data and field observations suggest an absence of an appreciable vapour source within the Made Ground. This is consistent with the known land use history of the Site which includes an absence of any known former petrol storage and only localised above ground kerosene storage (which appears to have ceased many years ago). It is further noted that no significant soil vapours were detected within the Made Ground encountered directly to the south-west of the Site during an investigation undertaken during 2014 (see Section 2.4).

Public Health England mapping indicates that the Site is located within an area where less than 1% of homes are at or above the radon action level (200 Bq/m^3). As such, the proposed structures are unlikely to require any specific radon protection measures.

Methane and carbon dioxide are common gases generated through the degradation of organic material that can be contained in natural and Made Ground materials.

Key observations relating to the ground gas potential of the Made Ground encountered at the Site include the following:

- The recent site investigation has shown the presence of Made Ground across the majority of the study area. However, the thickness of Made Ground appears to be somewhat limited (i.e., the average observed thickness of Made Ground was c. 0.8 m). As such, the overall volume of Made Ground is relatively modest and as such the potential for gas generation is considered to be limited.
- The observed Made Ground appears to be dominated by inert soils with an apparent absence of any significant quantity of putrescible material (which could give rise to the production of ground gases).
- Given the Site's known development history the majority of Made Ground appears to have been in situ for many decades (and as such, any associated gases are likely to have significantly diminished over this period).

Based on the prevailing conceptual model, including the relatively modest volume of somewhat aged and predominantly inert Made Ground, a significant source of ground gas is considered unlikely to be present at the Site. It is noted that the underground car park proposed beneath Block A will require the off-Site removal of all Made Ground from across a sizeable area of the Site, further reducing the gas generation potential.

6 CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

6.1 Conceptual model

The recent site investigation was designed to update the prevailing conceptual site model by providing more detailed information relating to the physical ground model and associated plausible contaminant linkages. The updated model is outlined below.

6.1.1 Sources

Potential contaminant sources are summarised as follows:

- Made Ground containing potentially elevated lead and PAH concentrations.
- Potential for modestly elevated phenol leachate associated with the Made Ground.
- Localised asbestos containing materials (including loose fibres) present within the near surface Made Ground.

Note: based on the prevailing conceptual site model, no appreciable ground gas or soil vapour sources have been identified.

6.1.2 Pathways

The relevant potential contaminant pathways are summarised as follows:

Pathways relevant to human health

It is possible that future Site occupants could potentially be exposed to localised sub surface contaminants via one or more of the following exposure pathways:

- Dermal contact with in situ soils.
- Accidental ingestion of in situ soils.
- Inhalation/ingestion of soil dust.
- Ingress of any localised organic contamination into water supply pipework and subsequent ingestion.
- Inhalation of any localised asbestos fibres.

Pathways relevant to controlled waters

Potential contaminant migration pathways associated with local controlled waters receptors include the following:

- Dissolution of any contaminants present within the in situ Made Ground and subsequent vertical migration of dissolved phase compounds into the underlying superficial aquifers.
- Potential lateral migration of any dissolved phase contaminants within the shallow groundwater system towards the river channel directly to the west of the Site.
- Potential lateral migration of any dissolved phase contaminants within the sub surface towards the neighbouring river channel via any preferential pathways including drainage infrastructure.

6.1.3 Receptors

Based on the prevailing conceptual site model, the following environmental receptors have been identified for further consideration:

- Future construction workers.
- Future residential Site occupants.

- Neighbouring residents.
- Future maintenance / gardening contractors.
- The superficial alluvium (Secondary (undifferentiated) Aquifer) and the Langley Silt Member (an Unproductive Strata).
- The River Ember (located directly to the west of the Site).

6.2 Risk assessment

A summary of the revised potential contaminant linkages associated with the Site is presented in Table 6.1, alongside a judgement of the risks posed by each linkage.

The contaminant linkages have been assessed using the risk assessment methodology described in CIRIA C552 (2001). As such, risk is considered to be a function of both the probability (likelihood) of contamination occurring at the study site and also the potential severity (consequence) of the environmental impacts associated with any such contamination. The classification system used to define contaminant probability, consequence and risk is described in Appendix G.

Table 6.1 Risk assessment

	Sources	Pathways	Receptors	Consequence	Probability	Risk classification	Comment / *risk mitigation*
1	**Made Ground** including potentially elevated lead and PAH concentrations within the Made Ground	Dermal contact, soil ingestion and dust ingestion / inhalation	Construction workers	**Minor**	**Low likelihood**	**Very Low Risk**	Risk rating reflects the presence of some lead and PAH concentrations in excess of published GACs (albeit based on exposures during residential occupancy) but also the limited anticipated exposure durations. *Suitable PPE and working methods should be adopted to minimise soil exposure during all future development activities.*
2		Dermal contact, soil ingestion, dust ingestion / inhalation	Future residential occupants Maintenance workers (including gardening contractors)	**Medium**	**Low likelihood**	**Moderate / Low Risk**	Risk rating reflects the presence of some elevated lead and PAH concentrations within the shallow Made Ground (most notably the mid-brown to black silty sand and gravel material including various man-made remains such as brick, slate, coal, clinker, glass and metal). Average lead and PAH concentrations (when excluding localised outlier values) were however typically less than or equal to residential land use GACs, suggesting the absence of any gross contamination. The risks posed to future occupants by in situ soil quality will also be somewhat constrained by the communal nature of the proposed gardens (which will reduce routine soil exposure due to the absence of resident gardening activities). Soil exposures experienced by gardening contractors are likely to be of limited duration and frequency (i.e., of low risk). Regardless, based on the prevailing conceptual site model, some viable contaminant linkages have been identified which could pose a potential health risk to future Site occupants and maintenance staff, subject to future groundwork activities and landscaping plans. *A suitable remediation strategy will be required in order to protect the health of future residents.*
3		Ingress of localised organic contaminants to drinking water pipework and subsequent human ingestion		**Medium**	**Likely**	**Moderate Risk**	Risk rating reflects the presence of some elevated PAH concentrations which could potentially penetrate conventional water supply pipework, subject to the location and depth of future water supply pipes. As such, based on the prevailing conceptual site model, viable contaminant linkages have been identified which could pose a health risk to future Site occupants. *A suitable remediation strategy will be required in order to protect the health of future residents.*

	Sources	Pathways	Receptors	Consequence	Probability	Risk classification	Comment / *risk mitigation*
4	Potential **soluble contaminant sources** associated with the Made Ground, including total phenols	Vertical and lateral migration of any leachable contaminants towards the underlying superficial aquifers	Alluvium (Secondary (undifferentiated) Aquifer) Langley Silt Member (Unproductive Strata)	**Medium**	**Unlikely**	**Low Risk**	Risk rating reflects the likely absence of a significant dissolved phase contaminant source associated with the in-situ Made Ground (based on available soil leachability data, site investigation observations and the known land use history). It is noted that the likely removal of all in situ Made Ground from the area of the planned basement car park in the north of the Site will further reduce the potential contaminant source term. The clayey superficial deposits observed beneath the Made Ground during the recent ground investigation will likely constrain any dissolved phase contaminant migration. The presence of hard standing across much of the redeveloped Site (with associated constraints on rainfall infiltration) will further reduce the mobility of contaminant species within the residual Made Ground. On balance, the loading of any dissolved phase contaminants to the superficial aquifers following Site redevelopment is anticipated to be low. The pollution risks are further constrained by the modest resource potential of the superficial aquifers, plus the absence of any nearby SPZs or potable groundwater abstractions.
5		Vertical and lateral migration of any leachable contaminants towards the neighbouring watercourse	River Ember	**Medium**	**Unlikely**	**Low Risk**	Risk rating reflects the apparent absence of a significant dissolved phase contaminant source associated with the in-situ Made Ground (based on available soil leachability data, site investigation observations and the known land use history). It is noted that the likely removal of all in situ Made Ground from the area of the planned basement car park in the north of the Site will further reduce the potential contaminant source term. The clayey superficial deposits observed beneath the Made Ground during the recent ground investigation may constrain any dissolved phase contaminant migration towards the water course. *Continued overpage*

	Sources	Pathways	Receptors	Consequence	Probability	Risk classification	Comment / *risk mitigation*
							The presence of hard standing across much of the redeveloped Site (with associated constraints on rainfall infiltration) will further reduce the mobility of contaminant species within the residual Made Ground. On balance, the loading of any dissolved phase contaminants into the River Ember following Site redevelopment is anticipated to be low.
6	Localised **asbestos containing materials** (ACM) present within Made Ground, including chrysotile loose fibres	Potential disturbance of asbestos containing materials during the proposed construction works and subsequent inhalation of any airborne fibres	Construction workers	**Medium**	**Low likelihood**	**Moderate / Low Risk**	Risk ratings reflect the prevailing conceptual exposure model discussed in Table 5.3 including the following points: - Two of the nine samples recently screened for ACMs contained chrysotile loose fibres (at depths of 0.3 m bgl and 0.4 m bgl). Asbestos fibres are therefore locally present within the near surface Made Ground (i.e., within the upper 0.5 m). - No visible suspected asbestos cement fragments or other ACMs were identified within any of the trial excavations during the recent site investigations. - The quantity and distribution of asbestos fibres is somewhat uncertain, although the widespread presence of Made Ground containing some demolition type wastes suggests that low levels of asbestos may be present across much of the Site. - The Made Ground was typified by granular material which could give rise to fibre release under certain conditions. - Significant groundworks (including the construction of a basement car park) will be required during the construction phase of development; these works will disturb the in-situ Made Ground and could give rise to the release of asbestos fibres. - The construction works will however be of relatively limited duration (thus constraining possible asbestos exposures). - The nearest neighbouring residents are located a reasonable distance away from the Made Ground known to contain ACMs (i.e., the Made Ground located in the north-central and north-western parts of the Site).
7			Neighbouring residents	**Medium**	**Unlikely**	**Low Risk**	

	Sources	Pathways	Receptors	Consequence	Probability	Risk classification	Comment / *risk mitigation*
							Based on the prevailing conceptual site model it is considered that in situ ACMs could pose a possible health risk to future construction workers, most notably during the groundworks phase of development. However, it is considered unlikely that in situ ACMs will pose a significant health risk to neighbouring residents. *A suitable remediation strategy, including the specification of suitable working methods and PPE, will be required in order to manage the risks posed by asbestos containing soils.*
8	Localised **asbestos containing materials** (ACM) present within Made Ground, including chrysotile free fibres	Potential disturbance of asbestos containing materials during any future gardening / recreational / development activities giving rise to possible inhalation of any airborne fibres	Future residential occupants Maintenance workers (including gardening contractors)	**Medium**	**Low likelihood**	**Moderate / Low Risk**	Risk rating reflects the prevailing conceptual exposure model discussed in Table 5.3 including the following points: - Two of the nine samples recently screened for ACMs contained chrysotile loose fibres. Asbestos fibres are therefore locally present within the near surface Made Ground (i.e., within the upper 0.5 m). - A 0.15 m to 0.2 m thick layer of topsoil was however observed above the asbestos containing soils; if retained, this soil layer would reduce potential ACM exposure under the planned communal garden land use. - No visible suspected asbestos cement fragments or other ACMs were identified within any of the trial excavations during the recent site investigations. - The quantity and distribution of asbestos fibres is somewhat uncertain, although the widespread presence of Made Ground containing some demolition type wastes suggests that low levels of asbestos may be present across much of the Site. - The Made Ground was typified by granular material which could give rise to fibre release under certain conditions. - Routine recreational activities may be performed within the proposed shared garden areas – these activities have a modest potential to disturb in situ soils and possibly give rise to airborne fibres. It is noted that given the communal nature of the garden spaces future residents are unlikely to undertake routine gardening or vegetable cultivation activities.

	Sources	Pathways	Receptors	Consequence	Probability	Risk classification	Comment / ***risk mitigation***
							- Gardening contractors may potentially disturb the in-situ soils / Made Ground during routine maintenance works. Based on the prevailing conceptual site model, viable contaminant linkages have been identified which could pose a health risk to future occupants and maintenance staff. *A suitable remediation strategy will be required in order to manage the risks posed by observed soil quality across areas of proposed soft standing.*
					OVERALL **RISK RATING**	**Moderate Risk**	*All identified risks can be mitigated through the adoption of basic remedial actions*

7 RISK ASSESSMENT CONCLUSIONS AND RECOMMENDATIONS

7.1 Environmental conclusions

Historical mapping indicates that the southern half of the Site was first developed prior to 1868 for unknown purposes and has subsequently been redeveloped as a dairy farm, an engineering works and a hostel / assisted living facility. The engineering works is understood to have been operated by Trianco Ltd. between the 1940s and 1968 for the development and/or production of domestic and industrial boilers. The works occupied the former farm buildings plus an additional square structure erected along the western Site boundary; this structure was demolished in around 1970 in order to facilitate the construction of a residential building in the north-east of the Site (the Molesey Venture building).

Geological mapping shows the presence of alluvium across the northern part of the Site; these deposits are classified as a Secondary (undifferentiated) Aquifer. The southern half of the Site appears to be underlain by the Langley Silt Member (an Unproductive Strata). The bedrock geology consists of London Clay which is also classified as an Unproductive Strata.

The recent ground investigation has shown the presence of Made Ground across the majority of the Site, with the exception of the former horticultural training area in the north-east.

The Made Ground encountered in the north-west of the Site comprised an upper sand and gravel soil layer with minimal man-made material, overlying mid-brown to black silty sand and gravel with some brick, slate, coal, clinker, concrete, ceramic tile, clay tile, glass and metal; this material ranged in thickness between 0.15 m and 1.35 m.

The Made Ground encountered beneath access routes / parking areas in the eastern and south-eastern parts of the Site included a thin layer of grey to black gravel (road planings / weathered tarmac) underlain by dark brown silty sand and gravel including some brick, concrete and metal remains; this material was between c. 0.4 m and 0.5 m thick.

Only limited man-made material was observed beneath the garden areas present in the south-east and eastern areas of the Site.

Where present, the full thickness of the Made Ground deposits ranged between 0.35 m and 1.5 m, with an average thickness of c. 0.8 m.

The natural superficial deposits largely comprised cohesive material including firm grey to blue clay; soft to firm mid-brown silty clay; soft to firm tan brown slightly gravelly clay; and tan-brown sandy silt. A layer of grey to brown sand and gravel was also encountered in the north-east of the Site directly beneath the Made Ground material.

The ground investigation indicated the absence of any groundwater within 1.5 m of the ground surface; this is consistent with the findings of an earlier investigation undertaken directly to the south-west of the Site.

The Site does not lie within a Source Protection Zone and there are no licensed groundwater abstractions within 1 km of the Site. Furthermore, there are no recorded private water supplies within a 250 m radius of the Site.

A branch of the River Ember is located directly to the west of the Site. There are two surface water abstraction licences within a 1 km radius of the Site; both relate to spray irrigation activities located c. 200 m and c. 505 m to the north-west of the Site (i.e., downstream of the Site).

There are no relevant environmental designations recorded within 500 m of the Site.

There are no recorded active, recent or historical landfills located within 500 m of the Site.

Laboratory chemical testing of the in situ Made Ground has identified potentially elevated lead and selected PAH concentrations. Chrysotile loose fibres were identified within two of the Made Ground samples.

Modestly elevated phenol concentrations were identified during soil leachate testing performed on two Made Ground samples.

Given the extent, age and composition of the in situ Made Ground, the associated ground gas and soil vapour potential is considered to be low.

Public Health England mapping indicates that the application Site is in an area where less than 1% of homes are estimated to be at or above the radon Action Level. As such, no radon protective measures are likely to be necessary within the proposed structures.

7.1.1 Risks to construction workers

The health risks posed to future construction workers by the chemical quality of the in situ soils are considered to be very low, based on both the observed ground conditions and also the limited duration of any soil exposure during the proposed construction works.

The health risks posed by asbestos containing materials present within the Made Ground are considered to be moderate to low given the presence of localised loose fibres within the near surface Made Ground. Appropriate mitigation measures / working methods will therefore be required in order to reduce possible inhalation exposure risks during the construction phase of development.

7.1.2 Risks to future Site occupants and maintenance contractors

The health risks posed to future Site occupants and gardening contractors by the in situ soil quality (including lead and selected PAH concentrations) are considered to be moderate to low. These risks relate to the potential for human exposure to impacted soils within the proposed communal garden areas.

The risk posed by the possible ingress of organic contamination (including some locally elevated PAH compounds) to drinking water supply pipework is considered to be moderate (where pipework is routed through the in situ Made Ground).

The risks posed to future Site occupants and gardening contractors from asbestos containing soils are considered to be moderate to low given the presence of localised loose fibres within the Made Ground.

A suitable remediation strategy will be required in order to manage the risks posed by the presence of lead, PAHs and asbestos fibres within the in situ Made Ground.

7.1.3 Risks to neighbouring residents

The health risks posed to neighbouring land users by in situ land quality are considered to be low.

7.1.4 Risks to the water environment

The pollution risks posed to the underlying superficial aquifers and also the neighbouring River Ember are considered to be low.

7.2 Recommendations

Based on observed ground conditions and the prevailing environmental risk assessments described in this report a suitable remediation strategy will be required in order to manage the risks posed by prevailing soil quality. This strategy may adopt some or all of the following measures:

Management of risks posed by observed lead and PAHs in soil

- The potential risks posed by in situ lead and PAH concentrations may be managed through the following measures:
    - Suitable PPE and working methods should be adopted by all construction workers to minimise soil exposure during all future development activities.

- The in situ Made Ground present across areas of proposed soft standing (post development) may be excavated and removed to a suitable depth - given the scale of the observed contamination and also the absence of any private garden spaces it may be justifiable to extend the remedial excavations to a depth of c. 0.3 m below the finished ground level.
- All excavated Made Ground will require appropriate waste classification (as per EA, 2018) prior to being removed off-Site for appropriate treatment, re-use or disposal. All waste management activities must be carried out in compliance with current waste management legislation including Duty of Care for waste handling.
- A suitable anti-dig/geotextile membrane should be fitted above any residual Made Ground prior to the placement of clean soils to the required level.
- All imported material used to reinstate the remedial excavations must be 'clean' and 'inert' and free from contamination.
- As an alternative to excavating into the Made Ground it may be feasible to leave the in-situ Made Ground in place and introduce a c. 0.3 m thick clean cover layer above the current soils.
- Where future water supplies may come into contact with in-situ Made Ground, these should be constructed using barrier pipework, with clean imported backfill materials placed within associated service trenches.

Management of risks posed by asbestos containing soils

- The potential risks posed by asbestos in soil may be managed through the following measures:
  - An asbestos demolition survey should be undertaken prior to any development activities. The findings of the survey should be used to inform the methods adopted during the Site clearance phase of development.
  - All asbestos containing materials removed from the existing structures during the demolition works should be appropriately handled and disposed of off-Site under appropriate Duty of Care.
  - Suitable PPE and working methods should be adopted by all construction workers to minimise soil exposure during future development activities. In particular, the development Contractor must carefully consider the manner in which all excavation / groundworks are carried out (including the basement carpark construction), such that any dust generation / possible fibre release is minimised and associated inhalation exposures are reduced to the lowest levels reasonably practicable. The approved working methods should include careful consideration of the sequencing of future groundworks; the choice of excavation techniques; Site security and access; appropriate material management (including the avoidance of any stockpiling of excavated Made Ground); plus suitable dust/fibre control measures.
  - All future service corridors should be backfilled with clean and inert imported materials (should these require excavation into the Made Ground).
  - Excavation and replacement of in-situ Made Ground should be undertaken as described above (in relation to the management of soil lead and PAH risks). Else a suitable cover layer may be introduced above the Made Ground, subject to any constraints relating to finished ground levels.

Verification of remedial activities

- A verification report should be provided to the Planning Authority on completion of the remediation works. This report should include the following information:
    - A factual record of all remedial activities (such as any Made Ground excavations, service trench excavations, installation of barrier pipework (as required), waste removal, soil imports, etc.).
    - Photographic confirmation that the remedial activities have been adequately completed.
    - Details, where applicable, of all wastes (including contaminated Made Ground) removed off-Site, including waste volumes, waste carrier details and copies of waste transfer notes.
    - Details of any barrier pipework required by the remedial strategy.
    - Details of the origin, quantity and chemical quality of all imported soils.

In addition, the following general recommendations are made:

- Access to the Site during all proposed ground works / remedial activities should be appropriately controlled.
- A watching brief should be maintained during all future groundworks activities in order to identify any further signs of ground contamination. If any further unexpected contamination is identified, development must be halted on the impacted part of the Site and advice sought from a suitably qualified contaminated land specialist. The Local Planning Authority should also be kept informed of any notable Site observations.
- Any excess Made Ground resulting from the Site development activities (including soil excavated from the area of the proposed basement car park) will require appropriate waste classification (as per EA, 2018) prior to being removed off-Site for appropriate treatment, re-use or disposal. All waste management activities must be compliant with current waste management legislation including Duty of Care for waste handling.

8 REFERENCES

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CIRIA, 2014. Asbestos is soil and Made Ground: a guide to understanding and managing the risks. C733. ISBN: 978-0-86017-737-1.

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APPENDICES

APPENDIX A

Phase 1 contaminated land report

Phase 1 Contaminated Land Assessment

Site address
The Molesey Venture
Orchard Lane
East Molesey
Surrey
KT8 0BN

Grid Reference
514610, 167350

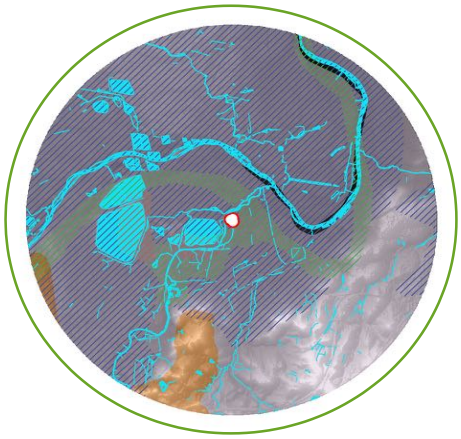
Report prepared for
Lifestyle Residences

Date issued
August 2021

Report status
Final

Site Area
0.64 ha

Report reference
75270R1



Risk – Moderate/low

Given the nature of the historical land use and therefore the potential for contamination to be present at the Site, it is recommended that a proportionate programme of site investigation and monitoring works be undertaken in order to establish the presence or absence of contamination and to enable a quantitative assessment of the associated environmental risks. There should also be appropriate investigation and removal of any asbestos containing material prior to any demolition.

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Executive Summary

The purpose of this Phase 1 Contaminated Land Assessment is to provide clear and pragmatic advice regarding the nature and potential significance of contaminated land hazards which may be present at the study site. We are providing consultancy and professional opinion based upon our collation, interpretation and assessment of information contained within an Envirocheck report, and other sources where expressly stated (i.e. site visits, photographs, and anecdotal evidence). It is acknowledged that the risk assessment findings are based on documentary sources of information alone.

Site analysis

1. **Probability/likelihood** of a contaminant hazard at the Site	High likelihood	
	Likely	
	Low likelihood	
	Unlikely	
2. Potential **severity/consequence** of any impacts	**Severe**	
	Medium	
	Mild	
	Minor	
3. **Overall land quality risks posed by the Site**	Very high	
	High	
	Moderate	
	Moderate/low	
	Low	
	Very low	

Summary of existing and proposed development

The Site is currently used for residential care and housing. Development proposals comprise the demolition of the existing accommodation with the exception of that which directly abuts the river. The new scheme will comprise of three blocks; Block A, B and C. Block A is the largest of the three, it is a 4 storey new build structure with a 72 bay underground car park. There are 52 private Apartments that are a mix of 1,2 and 3 beds with a total GIA of approximately 5000m 2 . The bounds of the Block A enable future access to the rear of the site should the remainder of the site be eligible for development in the future. Block B consists of the original buildings that abut the river. These are to be refurbished and converted to eight 1 bed Maisonettes. These are to be part of the social housing contribution of the site. Block C forms the second part of the social housing contribution. This is a new build apartment block that is on the eastern flank of the site. It is a combination of 2 and 3 storeys and a mix of 1 and 3 bed units. There are 18 units and approximately 1000m 2. The whole site will be reduced to formation level and there will be the creation of a central road that will fork as it reaches Block A, the right hand fork will continue down onto the ramp for the Basement car park of Block A.

Environmental Setting

British Geological Survey mapping indicates that the underlying superficial geology in the northern 60% of the Site consists of Alluvium which is classified as a Secondary (undifferentiated) Aquifer. The southern 40% consists of Langley Silt Member which is classified as Unproductive Strata The bedrock geology consists of London Clay Formation which is classified as Unproductive Strata.

The nearest water feature is the River Ember, located adjacent to the west of the Site boundary.

There are no environmentally sensitive land uses within 500 m of the Site.

Site History

The Site has been developed since the first available map in 1868, with several buildings in the south of the Site. The Site was redeveloped in 1897 and labelled as Orchard Farms. The Site was no longer labelled as Orchard Farms in 1938 and ion 956 was labelled as an Engineering Works. In 1975 a C shaped building was constructed in the north west of the Site and in 1978 the Site was labelled as Molesey Venture (Hostel). A tank was also labelled at this time, adjacent to the C shaped building in the north. In 1993, two further buildings were constructed in the east of the Site and there has been no apparent change since. Off-Site land uses include a reservoir c. 355 m south west, industrial land use to the south between 1933 and 2017 when the industrial area was demolished and redeveloped with residential housing in 2018.

Radon

The Site lies in an area where <1% of homes are at or above the UK radon action level (200 Bq/m3).

Coal Mining

The Site does not lie within an identified coal mining area and is therefore unlikely to be affected by related ground stability or mine gas issues.

Summary of Conceptual Site Model (CSM)

Source of Contamination
Potential for inorganic and organic contaminants and asbestos containing material to be present within the subsurface soils associated with the industrial history of the Site and the age of the existing buildings. Potential for ground gases associated with naturally occurring peat deposits in the area.

Receptors
Human Health, Controlled Water (Groundwater within the underlying superficial Secondary (A) aquifer; and the nearest surface water feature (River Ember) adjacent to the west).

Human Health (pathway)
Dermal contact, ingestion & inhalation of soils & soil dust, consumption of home grown produce, ingress into water supply pipework and subsequent water ingestion, migration of vapours to surface; inhalation indoors, liberation of sub surface ACMs and inhalation of asbestos fibres and lateral and vertical migration into on-Site buildings; potential to cause asphyxiation or an explosion

Controlled Waters (pathway)
Dissolution into pore water/shallow groundwater and subsequent migration, dissolution into aqueous phase and preferential migration via drainage structures and lateral and vertical groundwater movement via natural or artificial flow paths.

Preliminary Risk Assessment

Overall, the preliminary risk classification of the Site in relation to the proposed redevelopment is considered to be Moderate/Low.

Recommendations / Next Steps

Phase 2 intrusive investigation
Appropriate investigation and removal of any asbestos containing material prior to demolition

Given the nature of the historical land use and therefore the potential for contamination to be present at the Site, it is recommended that a proportionate programme of site investigation and monitoring works be undertaken in order to establish the presence or absence of contamination and to enable a quantitative assessment of the associated environmental risks.

1. Introduction

1.1 Background

The study site (from herein known as 'the Site') is situated at The Molesey Venture in Orchard Lane, East Molesey. A location plan of the Site is shown in Section 1.5. A proposed development plan of the Site is shown in Section 1.6.

KRS Environmental were commissioned by Lifestyle Residences in July 2021 to undertake a Phase 1 Land Quality Assessment for the Site. The report has been requested in order to support a proposed planning application for the Site.

The proposed development is for all of the existing accommodation with the exception of that which directly abuts the river is to be demolished. The new scheme will comprise of three blocks; Block A, B and C. Block A is the largest of the three, it is a 4 storey new build structure with a 72 bay underground car park. There are 52 private Apartments that are a mix of 1,2 and 3 beds with a total GIA of approximately 5000m2 . The bounds of the Block A enable future access to the rear of the site should the remainder of the site be eligible for development in the future. Block B consists of the original buildings that abut the river. These are to be refurbished and converted to eight 1 bed Maisonettes. These are to be part of the social housing contribution of the site. Block C forms the second part of the social housing contribution. This is a new build apartment block that is on the eastern flank of the site. It is a combination of 2 and 3 storeys and a mix of 1 and 3 bed units. There are 18 units and approximately 1000m2. The whole site will be reduced to formation level and there will be the creation of a central road that will fork as it reaches Block A, the right hand fork will continue down onto the ramp for the Basement car park of Block A.

The Phase 1 Contaminated Land Assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area, including current and historical land uses, geological records and registered pollution incidents. The information which is gathered is then used to construct a 'conceptual site model', including an understanding of likely contaminant sources, pathways and receptors. Finally, a preliminary assessment of risks posed to identified receptors (i.e., people, buildings or the natural environment) from the anticipated land quality at the Site is performed. The risk assessment methodology is consistent with CIRIA C552 (2001); see Section 3.4 for details.

1.2 Purpose of this report

The purpose of this Phase 1 Contaminated Land Assessment is to provide clear and pragmatic advice regarding the nature and potential significance of contamination hazards which may be present at the Site.

1.3 Report contents

This report is divided into two sections, as described below:

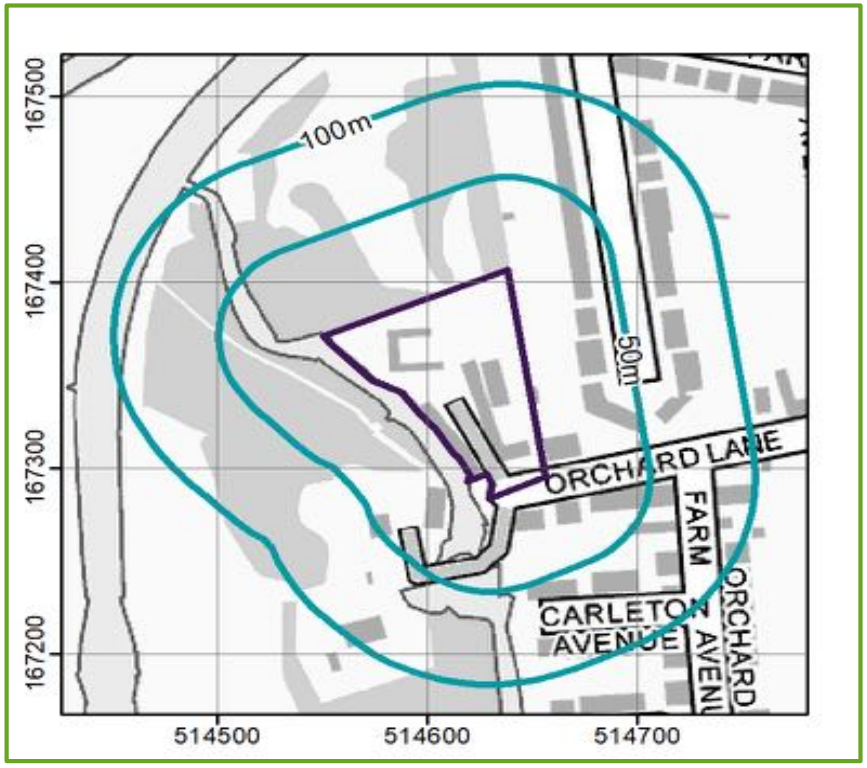
Section	Content	Purpose
Section 2: **LAND QUALITY ASSESSMENT**	A summary of the site history and environmental setting, the findings of the preliminary risk assessment and associated recommendations	To present a clear and concise overview of the land quality issues facing the Site, including recommendations of how to manage any land contamination which may be present
Section 3: **SUPPORTING INFORMATION**	A collection of site specific information on which the land quality assessment is based	To provide detailed information in support of the risk assessment; this section also represents a source of reference data for use in any subsequent site works/assessments

1.4 Report limitations

It is noted that the findings presented in this report are largely based on information supplied by third parties. Whilst we assume that all information is representative of past and present conditions we can offer no guarantee as to its validity.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

1.5 Site location plan



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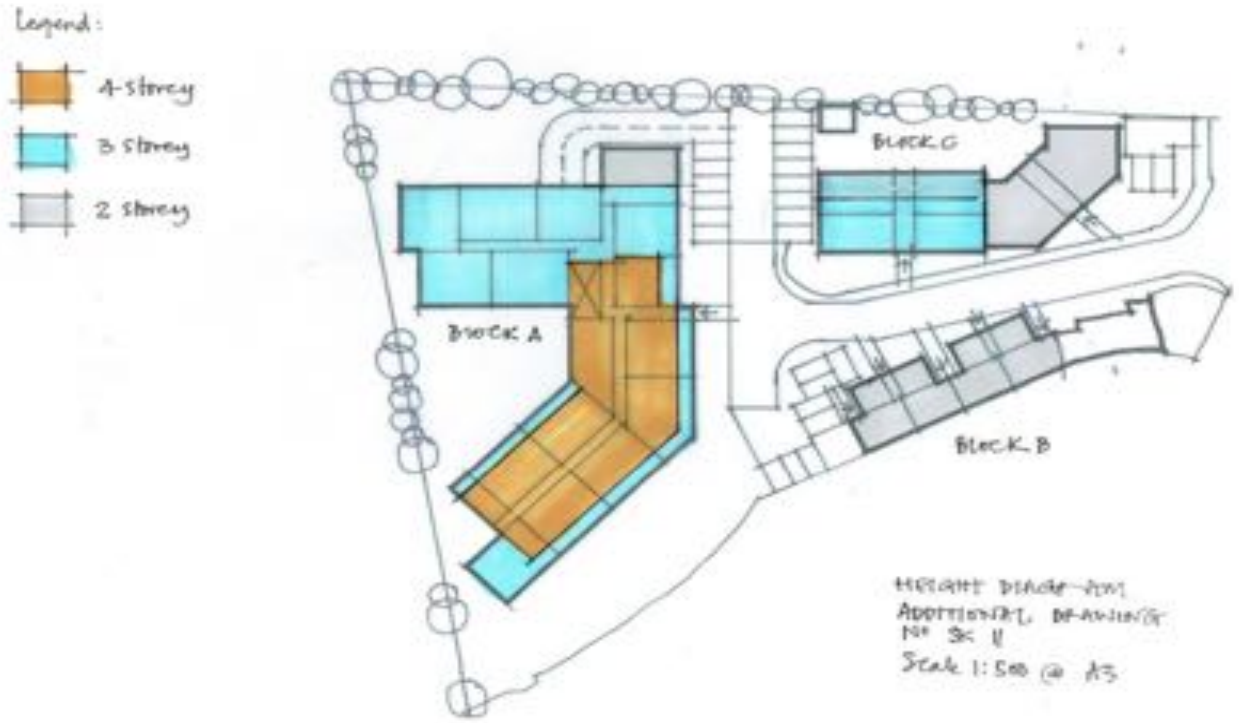
1.6 Proposed Site development sketch plan



2. Land quality assessment

2.1 Site details

Site name:	The Molesey Venture	Current land cover:	Building cover & hardstanding (50%), garden and landscaped areas (50%)
Current use:	Residential Care & Housing		
Proposed use:	Residential Care & Housing	Site area:	0.64 ha

2.2 Conceptual understanding (potential sources of contamination)

Site history
(historical land use taken within 250m radius of the Site boundary)

Date	Description of land use: On-Site	Description of land use: Off-Site
1868	The Site is developed with several buildings in the south of the Site.	The Site is bound to the west with a watercourse. There are greenhouses c.45 m south of the Site.
1871 - 1893	No apparent change	
1897	The Site has been redeveloped with multiple buildings in the south and is labelled as Orchard Farms.	A further greenhouse building has been constructed c. 50 m south.
1898	No apparent change	
1913 - 1914	No apparent change	There is a reservoir c. 355 m south west.
1919 - 1920	No apparent change	
1933 - 1934	No apparent change	There has been residential development adjacent to the south of the Site. Ember Court Works (concrete & engineering) is located c. 100 m south of the Site.
1938	The Site is no longer labelled as Orchard Farm.	There has been residential development adjacent to the east of the Site.
1945	Aerial imagery shows no apparent change	

POTENTIAL **SOURCES** OF CONTAMINATION

Source description

The land use history suggests that there is the potential for contamination to have occurred on-Site relating to the following:

Farm
- Bulk storage of fuels and/or miscellaneous chemicals.
- Miscellaneous small scale fuel and chemical spills (i.e., fuels used for heating/agricultural machinery/other vehicles, oils and lubricants, herbicides/pesticides, fertilisers, paints/thinners, creosote, etc.).
- Potential for localised/historical deposition of domestic/agricultural waste materials.
- Made Ground associated with former development/demolition activities.
- Animal effluent from the housing of livestock within the on-site buildings.
- Asbestos containing materials (ACM) may have been incorporated within the built structures in the past; the disturbance of any such materials may have resulted in asbestos being present within the sub surface surrounding the buildings.

continued overleaf

LIKELY

PROBABILITY OF CONTAMINATION

2.2 Conceptual understanding (potential sources of contamination)

Site history
(historical land use taken within 250m radius of the Site boundary)

Date	Description of land use	
	On-Site	Off-Site
1956 - 1957	The Site is labelled as an Engineering Works.	The greenhouse buildings are no longer present. The metropolitan concrete works c. is present c. 65 m south east. Ember Court Works is now labelled as Trianco Works (engineering).
1962 - 1968	No apparent change	
1975	There has been a C shaped building constructed in the north west of the Site.	A building associated with the metropolitan concrete works has been demolished.
1978	The Site is labelled as The Molesey Venture (Hostel). There is a tank labelled adjacent to the C shaped building in the north west of the Site.	The concrete works and Trianco Works are now labelled as Imber Court Trading Estate. A large warehouse building has been constructed c. 55 m south.
1991 - 1992	No apparent change	The River Ember is labelled c. 100 m west of the Site.
1993	There has been two further buildings constructed in the east of the Site.	No apparent change
1999	No apparent change	
2003 - 2015	Aerial imagery shows no apparent change	
2017	Aerial imagery shows no apparent change	Aerial imagery shows that the majority of the buildings associated with Imber Court Trading Estate have been demolished.
2018	Aerial imagery shows no apparent change	Aerial imagery shows that the former Imber Court Trading Estate is being redeveloped with residential housing.
2019 - 2020	Aerial imagery shows no apparent change	

POTENTIAL **SOURCES** OF CONTAMINATION

Source description

The land use history suggests that there is the potential for contamination to have occurred both on-Site and off-Site relating to the following:

Industrial Land Use & Tank
- Potential for bulk storage of fuels and/or miscellaneous chemicals. Note: given the land use history of the Site there is potential for underground storage tanks or pipelines containing chemical and fuel residues to be present.
- Miscellaneous fuel and chemical spills (i.e., fuels used for heating & powering machinery/vehicles, oils and lubricants, paints/thinners, degreasers, etc.).
- Potential for localised deposition of industrial wastes and by-products.
- Made Ground associated with former development/demolition activities.
- Asbestos containing materials (ACM) may have been incorporated within the built structures in the past; the disturbance of any such materials may have resulted in asbestos being present within the sub surface surrounding the buildings.

LIKELY

PROBABILITY OF CONTAMINATION

2.2 Conceptual understanding (potential sources of contamination)

<table>
<tr>
<td>Current land use</td>
<td>The Site is currently for residential care and housing.

There are no known buried storage tanks at the Site.
There is no known bulk fuel or chemical storage on Site. The client has stated that the tank seen on the historical mapping has since been removed, although the pedestal is still there.</td>
<td rowspan="2">POTENTIAL SOURCES OF CONTAMINATION</td>
<td>The Site's current use is unlikely to have given rise to significant land contamination.</td>
<td>UNLIKELY</td>
<td rowspan="2">PROBABILITY OF CONTAMINATION</td>
</tr>
<tr>
<td>Neighbouring industrial land uses
(see environmental data report in Section 3.3 for full listing)</td>
<td>There are one or more potentially contaminative land uses are located within 250 m of the Site:
<table>
<tr><th>Distance from Site</th><th>Number of active industrial land uses</th><th>Number of inactive industrial land uses</th></tr>
<tr><td>1 - 50 m</td><td>0</td><td>1</td></tr>
<tr><td>51 - 100m</td><td>0</td><td>1</td></tr>
<tr><td>101 - 250 m</td><td>0</td><td>2</td></tr>
</table>
<table>
<tr><th>Nr</th><th>Nearest distance</th><th>Land use / permitted activity / authorisation</th></tr>
<tr><td>0</td><td>NA</td><td>Fuel station entries</td></tr>
<tr><td>0</td><td>NA</td><td>Gas pipelines</td></tr>
<tr><td>0</td><td>NA</td><td>Underground electrical cables</td></tr>
<tr><td>0</td><td>NA</td><td>Control of major accident hazards sites (COMAH)</td></tr>
<tr><td>0</td><td>NA</td><td>Notification of installations handling hazardous substances (NIHHS)</td></tr>
<tr><td>0</td><td>NA</td><td>Explosives sites</td></tr>
<tr><td>0</td><td>NA</td><td>Planning hazardous substance consents</td></tr>
<tr><td>0</td><td>NA</td><td>Planning hazardous substance enforcements</td></tr>
<tr><td>0</td><td>NA</td><td>Sites determined as Contaminated Land under Part IIA of the Environmental Protection Act 1990</td></tr>
<tr><td>0</td><td>NA</td><td>Records of Licensed Discharge Consents.</td></tr>
<tr><td>0</td><td>NA</td><td>Local Authority pollution prevention and control sites</td></tr>
<tr><td>0</td><td>NA</td><td>Local Authority pollution prevention and control enforcements</td></tr>
<tr><td>0</td><td>NA</td><td>Records of Category 3 or 4 Radioactive Substance Licences</td></tr>
</table>
</td>
<td>The potentially contaminative land uses/activities identified in close vicinity of the Site may pose a contamination hazard to the Site should relevant contaminant pathways exist.

Contemporary trade directory entries include:
Landlord Property Services Cleaning Co (inactive) cleaning services - domestic c. 45 m east.
Autogas (inactive) garage services c. 100 m south east.
PCD Maltron Ltd (inactive) computer manufacturers c. 125 m east.
SBS Print Ltd (inactive) printers c. 180 m south east.</td>
<td>UNLIKELY</td>
</tr>
</table>

2.2 Conceptual understanding (potential sources of contamination)

EA recorded pollution incidents *(see environmental data report in Section 3.3 for full listing)*	One or more Environment Agency pollution incidents have been recorded within 250 m of the Site. These include: An incident occurred in 1996 c. 60 m north west of the Site. The pollutant was unknown oils and the incident was categorised as minor. An incident occurred in 1999 c. 215 m north of the Site. The pollutant was unknown and the incident was categorised as minor.	POTENTIAL **SOURCES** OF CONTAMINATION	Given the scale, timing, location and nature of the recorded incidents these past events do not appear to pose a significant contamination hazard to the Site.	**UNLIKELY**	**PROBABILITY** OF CONTAMINATION
Landfills / waste sites *(taken within 500m radius of the Site boundary, see environmental data report in Section 3.3 for full listing)*	There are no Environment Agency listed historical landfills located within 500 m of the Site. There are no registered landfills located within 500 m of the Site. There are no Local Authority listed historical landfills located within 500 m of the Site. The following other waste sites are registered within 500 m of the Site: 0 Records of registered waste transfer sites. 0 Records of registered waste treatment or disposal sites. 0 Records of licenced waste management facilities.		Given the absence of any historical or operational landfills within close proximity of the Site no associated contamination hazards have been identified. Given the absence of any waste treatment, transfer or disposal sites within close proximity of the Site no associated contamination hazards have been identified.	**NEGLIGIBLE**	
Radon *(see environmental data report in Section 3.3 for full listing)*	According to current UK radon mapping the Site lies in an area where <1% of homes are at or above the UK radon action level (200 Bq/m3).		<1% of homes are at or above the UK radon action level (200 Bq/m3).	**UNLIKELY**	

2.3 Conceptual understanding (environmental sensitivity / potential severity of impacts)

Geology and Groundwater *(see the environmental data report in Section 3.3 for full details)*	British Geological Survey mapping indicates that the underlying superficial geology in the northern 60% of the Site consists of Alluvium (ALV) which comprises clay, silt, sand and peat and is classified as a Secondary (undifferentiated) Aquifer. There is potential for there to be elevated gases relating to peat within the underlying Alluvium. The southern 40% consists of Langley Silt Member (LASI) which comprises clay and silt and is classified as Unproductive Strata. British Geological Survey mapping indicates that the bedrock geology consists of London Clay Formation (LC) which comprises of clay and silt and is classified as Unproductive Strata. According to the GeoSmart Groundwater Flood Risk (GW5) Map (GeoSmart, 2021). The risk of groundwater flooding at the Site is 'negligible'. The Site does not lie within a groundwater Source Protection Zone (SPZ). There are no groundwater abstraction licences within 1 km of the Site.	POTENTIAL **RECEPTORS**	A Secondary (Undifferentiated) Aquifer is assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. Unproductive Strata typically have low permeability and offer negligible water supply or river base flow potential. Based on the susceptibility of the Site to groundwater flooding, a groundwater flood risk assessment is not considered necessary for the Site. The depth to groundwater beneath the Site is unknown. The absence of any groundwater abstractions does not necessarily indicate a low resource potential. Small scale abstractions, such as for private water supplies, may not be listed.	**MEDIUM**	**POTENTIAL SEVERITY** OF IMPACT
Geohazards *(see the environmental data report in Section 3.3 for full details)*	The Site does not lie within a 'Coal Mining Reporting Area'. There are no brine affected areas within 75 m of the Site. Artificial ground / Made Ground is anticipated on Site. The following natural hazards are present at or within 50 m of the Site: Compressible ground deposits Shrinking or swelling clay		The Site does not lie within an identified coal mining area and is therefore unlikely to be affected by related ground stability or mine gas issues. The Site does not lie within an area of former brine working and is therefore unlikely to be affected by related ground stability issues. BGS GeoIndex Onshore mapping does not have any artificial deposits recorded at the Site. The Site has ground stability hazards that should be considered further as part of the redevelopment plans.	**MILD**	

Superficial Geology and Artificial Deposits (BGS, 2021)

Bedrock Geology (BGS, 2021)

2.3 Conceptual understanding (environmental sensitivity / potential severity of impacts)

 Surface water *(see the environmental data report in Section 3.3 for full details)*	The nearest water feature is the River Ember, located adjacent to the west of the Site boundary. 65% of the Site is located within Flood Zone 2, 5% of the Site is located within Flood Zone 3 and the remaining 30% of the Site is located within Flood Zone 1. The following surface water abstraction licences are held within 1 km of the Site: Standard Chartered Plc spray irrigation water abstraction located c. 200 m and c. 505 m north west of the Site.	**POTENTIAL** RECEPTORS	The relatively close proximity of the identified surface water feature(s) suggests that a potential linkage could occur if any contamination were present on Site. Mobile contamination may potentially enter nearby water features via any shallow groundwater or possibly via preferential flow pathways such as buried services.	**MEDIUM**	**POTENTIAL SEVERITY** OF IMPACT
 Environmental designations *(see the environmental data report in Section 3.3 for full details)*	There are no environmentally sensitive land uses within 500 m of the Site.		No relevant environmentally designated sites/receptors have been identified.	**NEGLIGIBLE**	
 Human receptors	Proposed residents/users of the Site plus neighbouring residences.		Human receptors are proposed to be present on Site.	**SEVERE**	

2.4 Regulator perspective

Consultation date	28th July 2021	Elmbridge Borough Council
Consultant	Jessica Bayliff	Environmental Health
Consultation outcome	The Council did not respond within the time frame of this report.	
Planning Record Review	A planning application from 1998 (1998/1637) shows that the tank adjacent to the C shaped building in the north west of the Site was for oil. No further information has been provided.	

2.5 Preliminary Risk Assessment

Nr	Sources	Pathways	TYPE	Receptors	Consequence	Probability	Risk classification	Comments
On-Site sources - Farm - Tank On-Site and off-Site sources - Historical industrial land use								
1	Potential for **inorganic** and low volatility organic contaminants to be present within the subsurface **soils**	Dermal contact, ingestion & inhalation of soils & soil dust	HH	Future Site occupants	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the former industrial use of the Site and surrounding area to the south, there is the potential that there are contaminants present which may impact future Site users, particularly in any garden/landscaped areas.
2		Consumption of home grown produce	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
3		Ingress into water supply pipework and subsequent water ingestion	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
4		Building materials in direct contact with aggressive ground	PROP	Future Site buildings	**MILD**	**UNLIKELY**	**VERY LOW RISK**	Aggressive ground conditions are not anticipated to be present.
5		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Alluvium (northern 60% of the Site) (a Secondary (undifferentiated) Aquifer)	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	The potential presence of contaminants could impact groundwater quality within the superficial deposits in the northern 60% of the Site.
6		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Langley Silt Member (southern 40% of the Site) (Unproductive Strata)	**MILD**	**LOW LIKELIHOOD**	**LOW RISK**	The risk classification reflects the likely low permeability of the underlying superficial deposits in the southern 40% of the Site and bedrock geology.
7		Dissolution into pore water/shallow groundwater and subsequent migration	CW	London Clay Formation (Unproductive Strata)	**MILD**	**LOW LIKELIHOOD**	**LOW RISK**	
8		Dissolution into pore water/shallow groundwater and subsequent lateral migration	CW	River Ember (adjacent to the west)	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the likely permeable nature of the superficial deposits in the northern 60% of the Site and the close proximity of the watercourse, there is potential for any potential contaminants to migrate and subsequently impact this feature.
9		Dissolution into aqueous phase and preferential migration via drainage structures	CW		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	As the watercourse is present adjacent to the Site, there is potential that an contaminants present on the Site could impact the watercourse, due to preferential migration or surface runoff.

2.5 Preliminary Risk Assessment

Nr	Sources	Pathways	TYPE	Receptors	Consequence	Probability	Risk classification	Comments
10	Potential for **volatile organic** contaminants to be present within the subsurface **soils**	Dermal contact, ingestion & inhalation of soils & soil dust	HH	Future Site occupants	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the former industrial use of the Site and surrounding area to the south, along with there being a tank on-Site (mapped from 1978 - present), there is the potential that there are contaminants present which may impact future Site users.
11		Consumption of home grown produce	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
12		Ingress into water supply pipework and subsequent water ingestion	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
13		Migration of vapours to surface; inhalation indoors	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
14		Migration of vapours to surface; inhalation outdoors	HH		**MEDIUM**	**UNLIKELY**	**LOW RISK**	
15		Building materials in direct contact with aggressive ground	PROP	Future Site buildings	**MILD**	**UNLIKELY**	**VERY LOW RISK**	Aggressive ground conditions are not anticipated to be present.
16		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Alluvium (northern 60% of the Site) (a Secondary (undifferentiated) Aquifer)	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	The potential presence of contaminants could impact groundwater quality within the superficial deposits in the northern 60% of the Site.
17		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Langley Silt Member (southern 40% of the Site) (Unproductive Strata)	**MILD**	**LOW LIKELIHOOD**	**LOW RISK**	The risk classification reflects the likely low permeability of the underlying superficial deposits in the southern 40% of the Site and bedrock geology.
18		Dissolution into pore water/shallow groundwater and subsequent migration	CW	London Clay Formation (Unproductive Strata)	**MILD**	**LOW LIKELIHOOD**	**LOW RISK**	
19		Dissolution into pore water/shallow groundwater and subsequent migration	CW	River Ember (adjacent to the west)	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the likely permeable nature of the superficial deposits in the northern 60% of the Site and the close proximity of the watercourse, there is potential for any potential contaminants to migrate and subsequently impact this feature.
20		Dissolution into aqueous phase and preferential migration via drainage structures	CW		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	As the watercourse is present adjacent to the Site, there is potential that an contaminants present on the Site could impact the watercourse, due to preferential migration or surface runoff.

2.5 Preliminary Risk Assessment

Nr	Sources	Pathways	TYPE	Receptors	Consequence	Probability	Risk classification	Comments
21	Potential for **asbestos** containing materials within the subsurface **soils**	Liberation of sub surface ACMs and inhalation of asbestos fibres	HH	Future Site occupants	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the age of the existing building structures asbestos-containing material may be present within the building fabric and surrounding subsoils.
22	Potential for **dissolved phase** contaminants to be present within **shallow groundwater**	Lateral and vertical groundwater movement via natural or artificial flow paths	CW	Alluvium (northern 60% of the Site) (a Secondary (undifferentiated) Aquifer)	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	The potential presence of contaminants could impact groundwater quality within the superficial deposits in the northern 60% of the Site.
23		Lateral and vertical groundwater movement via natural or artificial flow paths	CW	Langley Silt Member (southern 40% of the Site) (Unproductive Strata)	**MILD**	**LOW LIKELIHOOD**	**LOW RISK**	The risk classification reflects the likely low permeability of the underlying superficial deposits in the southern 40% of the Site and bedrock geology.
24		Lateral and vertical groundwater movement via natural or artificial flow paths	CW	London Clay Formation (Unproductive Strata)	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
25		Lateral and vertical groundwater movement via natural or artificial flow paths	CW	River Ember (adjacent to the west)	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the likely permeable nature of the superficial deposits in the northern 60% of the Site and the close proximity of the watercourse, there is potential for any potential contaminants to migrate and subsequently impact this feature.
26	Potential for elevated **methane** to be present within the sub-surface **soils** associated within peat deposits	Lateral and vertical migration into on-Site buildings; potential to cause an explosion	HH	On-Site properties and their occupants	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	Based on the prevailing conceptual understanding there is a potential source of naturally occurring ground gases associated with potential peat deposits within the underlying alluvium.
27	Potential for elevated **carbon dioxide and hydrogen sulphide** to be present within the subsurface **soils** associated with peat deposits	Lateral and vertical migration into on-Site buildings; potential to cause asphyxiation	HH	Occupants of on-Site buildings	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	
28	Potential for **radon** within the subsurface	Lateral migration towards on-Site buildings; potential to cause long term health effects	HH	Occupants of on-Site buildings	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The Site lies in an area where <1% of homes are at or above the UK radon action level (200 Bq/m3).
						OVERALL RISK RATING	**MODERATE/LOW RISK**	

2.6 Next Steps

✓	**Phase 2 intrusive investigation** **Appropriate investigation and removal of any asbestos containing material prior to demolition**		Given the nature of the historical land use and therefore the potential for contamination to be present at the Site, it is recommended that a proportionate programme of site investigation and monitoring works be undertaken in order to establish the presence or absence of contamination and to enable a quantitative assessment of the associated environmental risks.

3. Supporting Information

The following supporting information is contained in this section:

Section	Content
3.1	Referenced materials used in the Phase 1 Contaminated Land reporting
3.2	Site photographs
3.3	Published environmental data records (Landmark Envirocheck report The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN. REF: 282425901_1_1) including: • Aerial photographs and site map • Environmental permits, incidents and registers • Landfill and other waste sites • Current land use information • Geology • Hydrogeology and hydrology • Flooding • Designated environmentally sensitive sites • Other environmental factors
3.4	Risk assessment methodology
3.5	Historical land use maps

3.1 References

The following references were used to inform the conceptual site model and preliminary risk assessment:

British Geological Survey, 2021a. Geology of Britain viewer (http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html)

British Geological Survey, 2021b. GeoIndex Onshore (http://mapapps2.bgs.ac.uk/geoindex/home.html)

British Standards Institute, 2011. Investigation of potentially contaminated sites – code of practice. BS10175:2011+A1:2013.

CIRIA, 2001. Contaminated land risk assessment. A guide to good practice. Publication C552. CIRIA London. ISBN 0-86017-552 9

Environment Agency, 2020. Land Contamination Risk Management (LCRM)

GeoSmart Information Limited, 2021. National Groundwater Flood Risk Map (GW5)

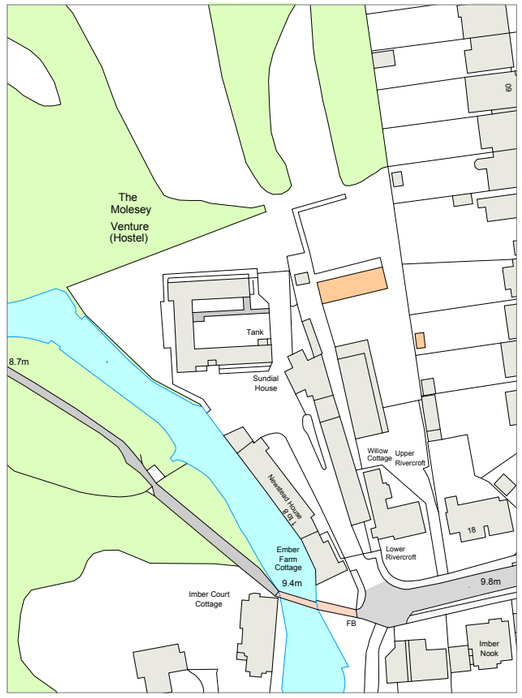
Health Protection Agency, 2000. Spring 2000 Newsletter featuring; Radon: Guidance on Protective Measures for New Dwellings (BR 211).

Landmark, 2021. Landmark Envirocheck report The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN. REF: 282425901_1_1

3.2 Site photographs

ASSESSMENT

EXISTING SITE PHOTOS & THE SURROUNDING AREA



Site map, showing the location of the application site (outlined red). Numbers relate to the views opposite.

Site View 1

Site View 2

Site View 3

Site View 4

Site View 5

Site View 6

Site View 7

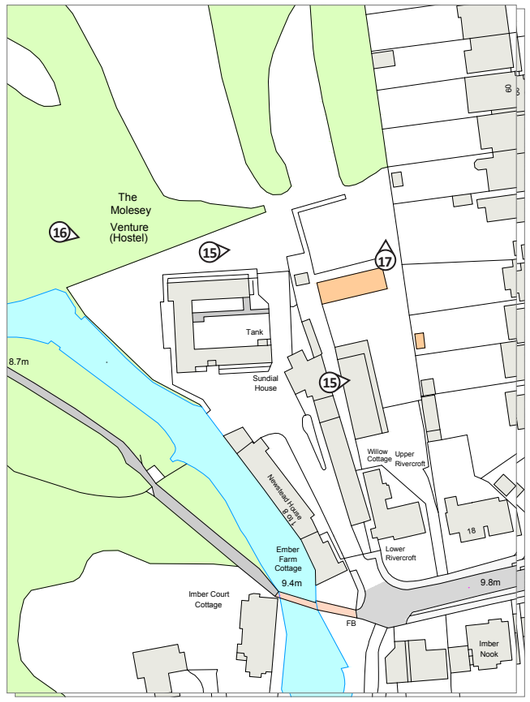
Site View 8

Site View 9

Site View 10

ASSESSMENT

EXISTING SITE PHOTOS & THE SURROUNDING AREA



Site map, showing the location of the application site (outlined red). Numbers relate to the views opposite.

Site View 11

Site View 12

Site View 13

Site View 14

Site View 15

Site View 16

Site View 17

3.3 Environmental data report

Readily available environmental information relating to the Site and its surrounding area has been provided by Landmark.

3.4 Risk assessment methodology

The method of risk evaluation adopted in this document is consistent with CIRIA C552 (2001). Hence, risk is considered to be a function of both the probability (likelihood) of contamination occurring at the study site and also the potential severity (consequence) of the environmental impacts associated with this contamination.

The classification system used to define contaminant probability, consequence and risk is described in the following tables.

Table A: Classification of probability

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

Table B: Classification of consequence

Classification	Receptor	Definition	Examples
Severe	Humans	Short-term (acute) risk to human health likely to result in "significant harm" as defined in the CTL Statutory Guidance	High concentrations of cyanide on the surface of an informal recreation area
	Controlled waters	Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource	Major spillage of contaminants from site into controlled water
	Property	Catastrophic damage to buildings/property	Explosion, causing building collapse (can also equate to an acute human health risk if buildings are occupied)
	Ecology	A short-term risk to a particular ecosystem, or organism forming part of such eco-system	Potentially long term derogation of a designated site or protected species
Medium	Humans	Chronic damage to human health ("significant harm" as defined in the CTL Statutory Guidance)	Concentrations of a contaminant from a residential site exceed the site-specific assessment criteria
	Controlled waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution)	Leaching of contaminants from a site to a principal or secondary aquifer
	Property	Significant damage to crops, buildings, structures and services	Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability)
	Ecology	A significant change in a particular ecosystem	Death of a species within a designated nature reserve

Table B: Classification of consequence (continued)

Classification	Receptor	Definition	Examples
Mild	Humans	Contamination present although unlikely to constitute a significant chronic health risk	Concentrations of a contaminant from a public access site moderately exceed the generic assessment criteria
	Controlled waters	Pollution of non-water resources	Pollution of non-classified groundwater
	Property	Damage to sensitive buildings/structures/services	Aggressive ground conditions leading to potential for long term degradation of buried concrete
	Ecology	Damage to the environment	Localised damage to aquatic habitat causing temporary relocation of certain species
Minor	Humans	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc.)	The presence of contaminants at such concentrations that protective equipment is required during site works
	Controlled waters	Potential minor release of contamination to local water features	Short term or low volume release of potentially polluting material to a secondary surface water course of low existing quality
	Property	Easily reparable effects of damage to buildings, structures and services. Harm which may result in a financial loss, or expenditure to resolve	The loss of plants in a landscaping scheme. Discolouration of concrete
	Ecology	Short term, localised damage may occur; consequences are spatially and temporally limited	Short term or localised disruption to in situ flora or fauna; no lasting effects

Table C: Risk classification (comparison of consequence and probability)

		Consequence (severity)			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High likelihood**	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Risk Key

Very High There is a high probability that severe harm could arise to a designated receptor from an identified hazard without appropriate remediation action	**High** Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action	**Moderate** It is possible that without appropriate remediation action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild	**Moderate/Low** It is possible that harm could arise to a designated receptor from an identified hazard. It is likely any harm would be mild	**Low** It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild	**Very Low** The presence of an identified hazard does not give rise to the potential to cause harm to a receptor

3.5 Historical land use maps

Historical Ordnance Survey maps relating to the site and its surrounding area have been provided by Landmark.

Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250

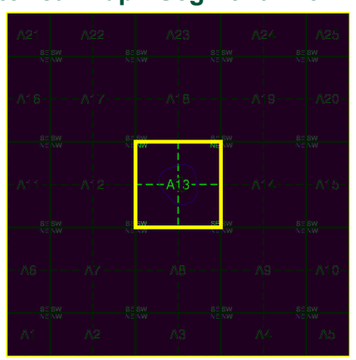
Large-Scale National Grid Data 1:2,500 and 1:1,250

GeoSmart Information
Environmental Thinking

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Surrey	1:2,500	1868 - 1885	2
Surrey	1:2,500	1868	3
Middlesex	1:2,500	1893	4
Surrey	1:2,500	1896 - 1897	5
Middlesex	1:2,500	1897	6
Surrey	1:2,500	1913 - 1914	7
Middlesex	1:2,500	1915	8
Surrey	1:2,500	1934	9
Middlesex	1:2,500	1934	10
Ordnance Survey Plan	1:1,250	1956	11
Additional SIMs	1:1,250	1956 - 1984	12
Ordnance Survey Plan	1:2,500	1957	13
Ordnance Survey Plan	1:1,250	1966 - 1978	14
Ordnance Survey Plan	1:2,500	1968	15
Additional SIMs	1:1,250	1984	16
Large-Scale National Grid Data	1:1,250	1992	17
Large-Scale National Grid Data	1:1,250	1993 - 1995	18

Historical Map - Segment A13



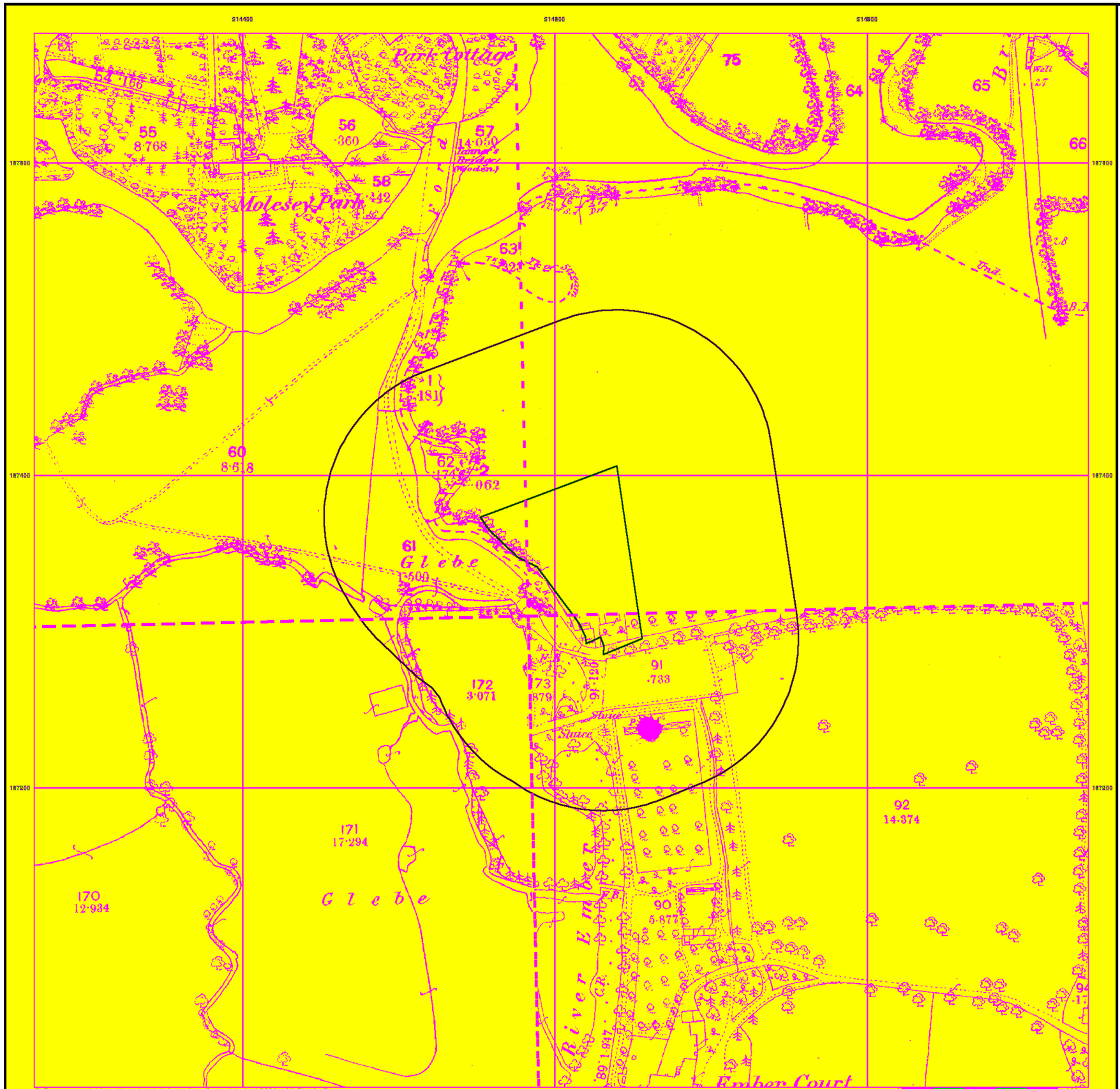
Order Details

Order Number: 282425901_1_1
Customer Ref: 75270
National Grid Reference: 514610, 167350
Slice: A
Site Area (Ha): 0.64
Search Buffer (m): 100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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



GeoSmart Information
Environmental Thinking

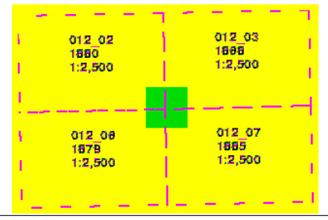
Surrey

Published 1868 - 1885

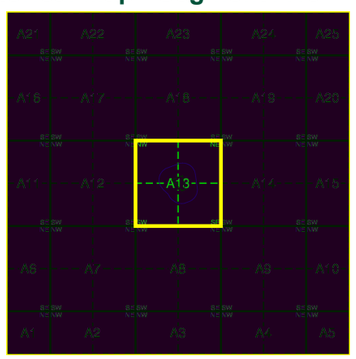
Source map scale - 1:2,500

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	282425901_1_1
Customer Ref:	75270
National Grid Reference:	514610, 167350
Slice:	A
Site Area (Ha):	0.64
Search Buffer (m):	100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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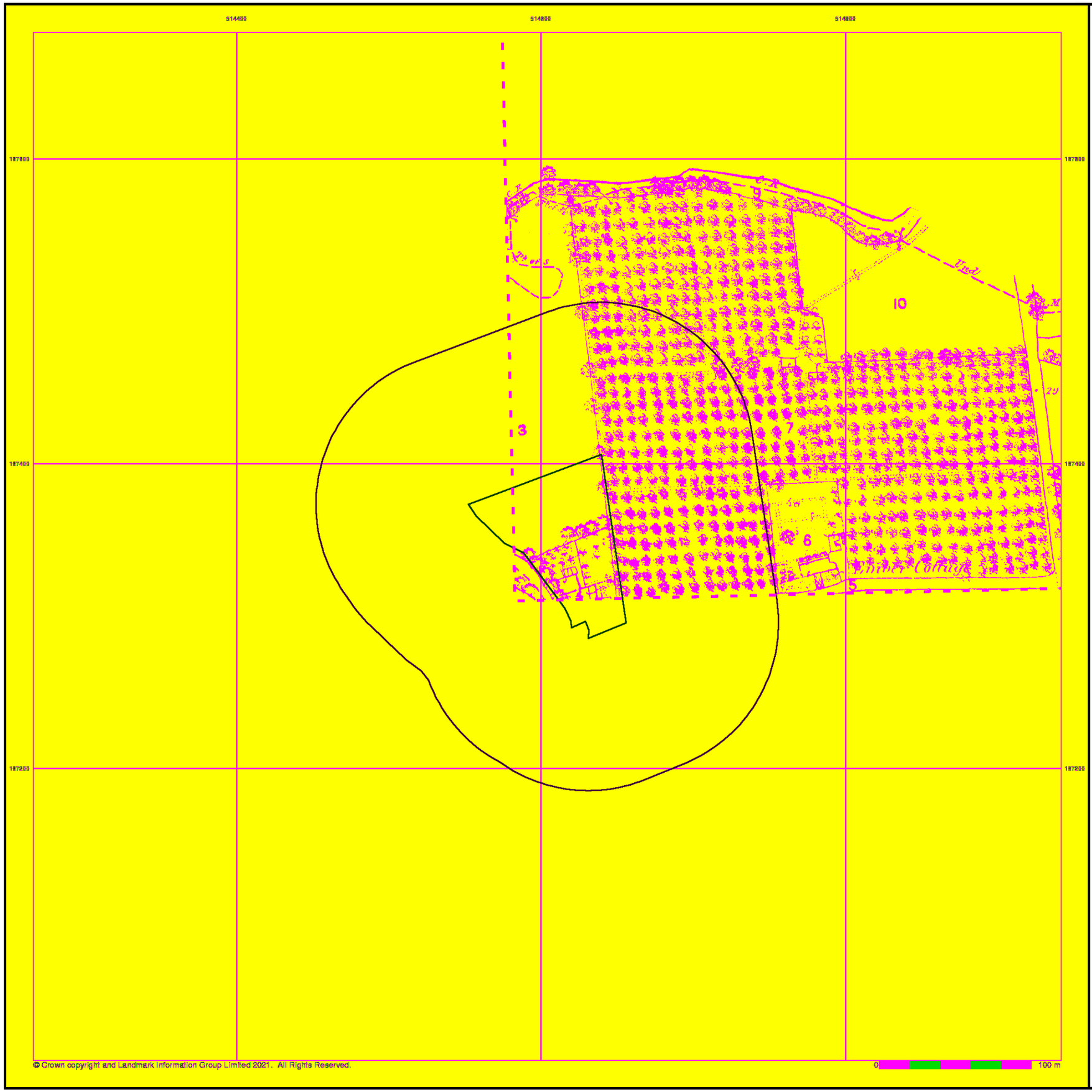
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GeoSmart Information
Environmental Thinking

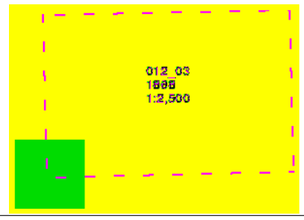
Surrey

Published 1868

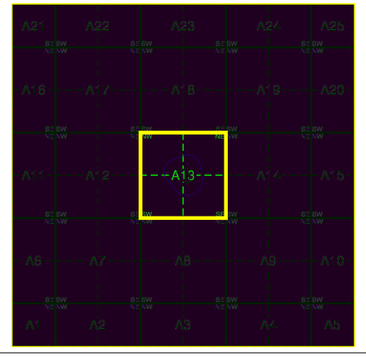
Source map scale - 1:2,500

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



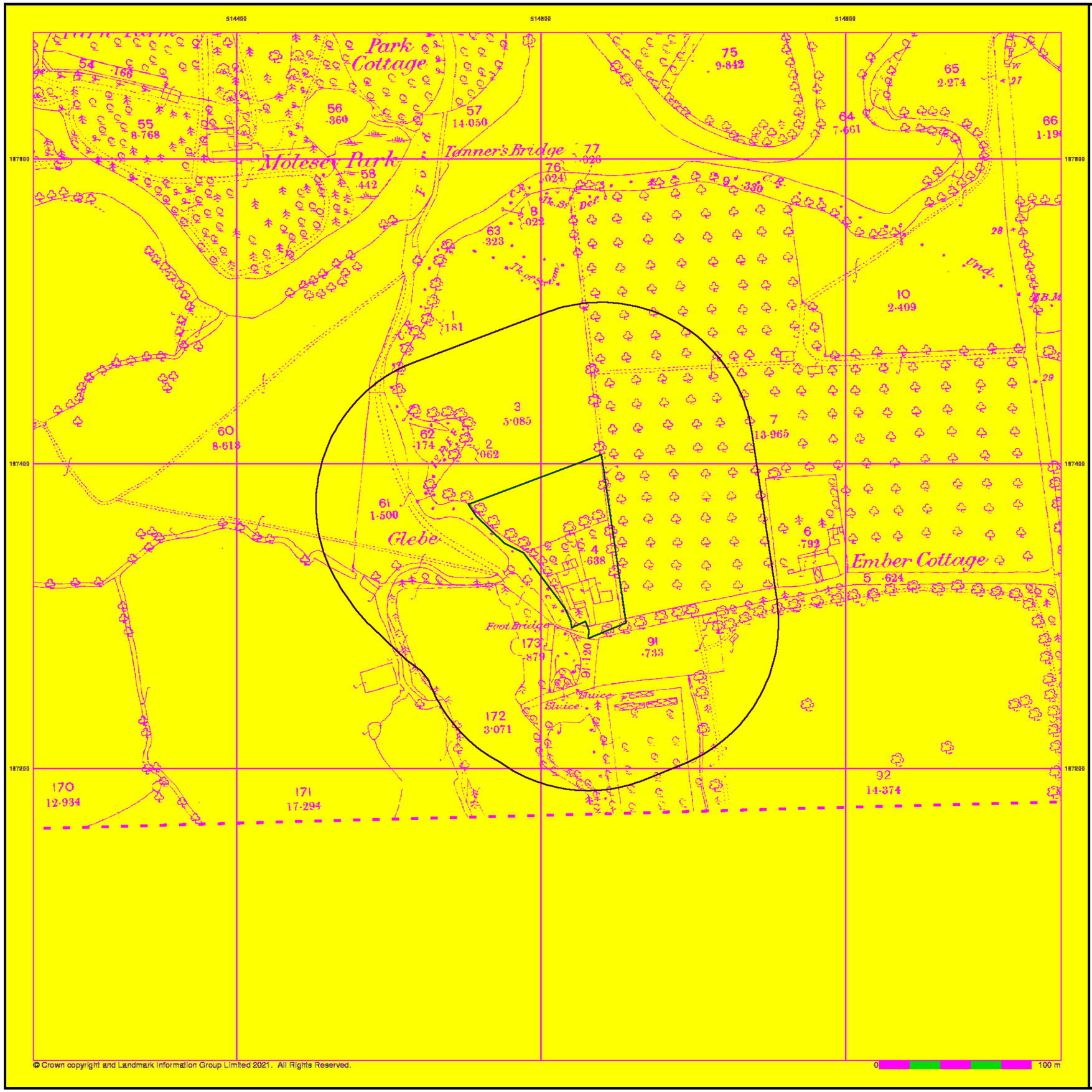
Order Details

Order Number:	282425901_1_1
Customer Ref:	75270
National Grid Reference:	514610, 167350
Slice:	A
Site Area (Ha):	0.64
Search Buffer (m):	100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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



GeoSmart Information
Environmental Thinking

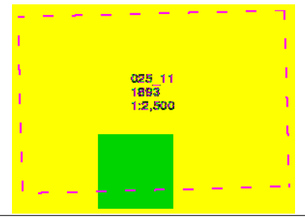
Middlesex

Published 1893

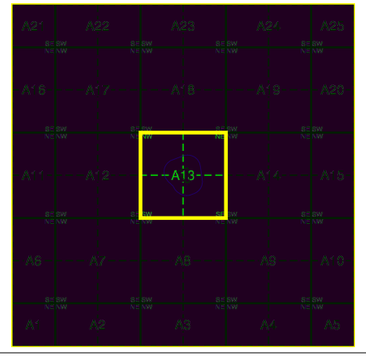
Source map scale - 1:2,500

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



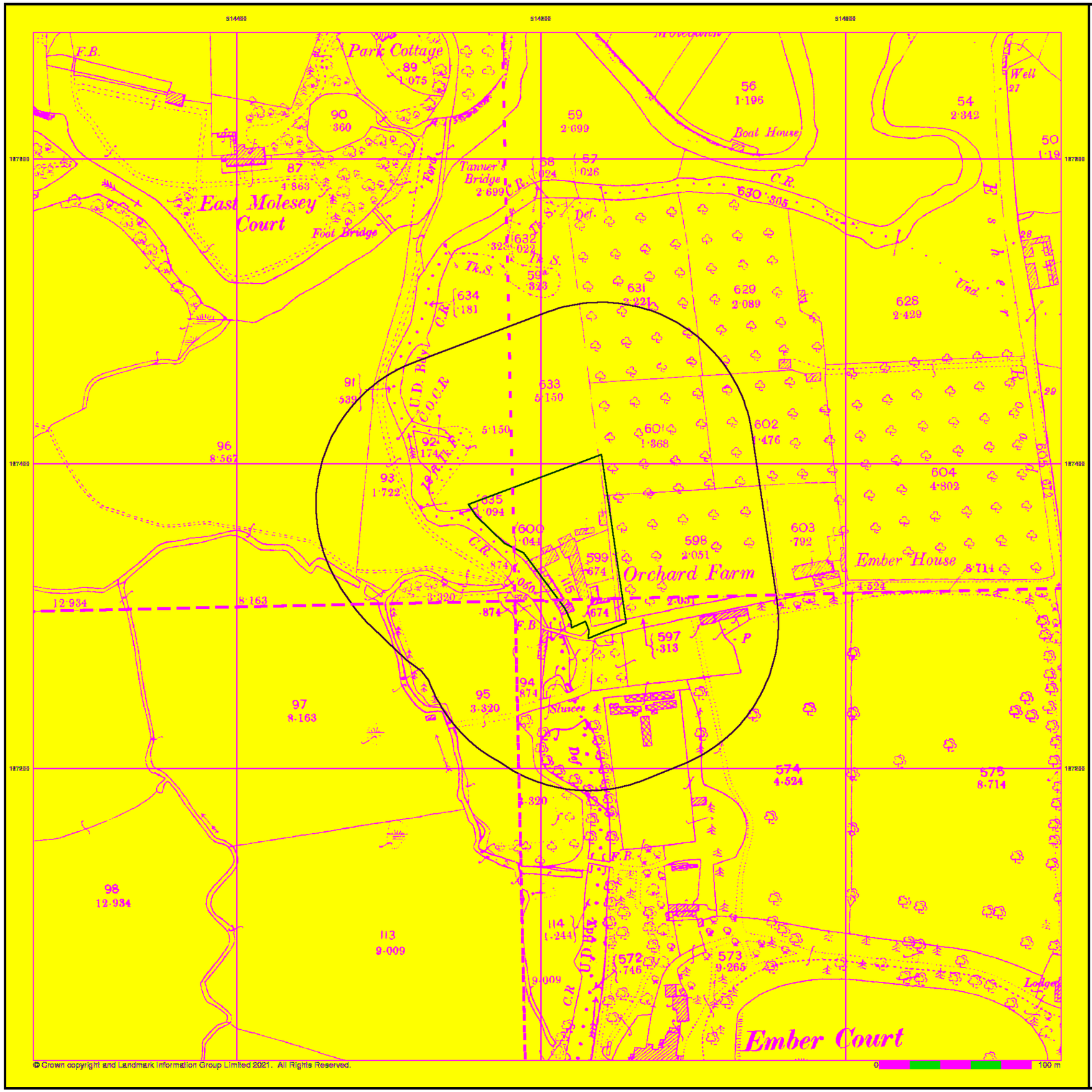
Order Details

Order Number:	282425901_1_1
Customer Ref:	75270
National Grid Reference:	514610, 167350
Slice:	A
Site Area (Ha):	0.64
Search Buffer (m):	100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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



GeoSmart Information
Environmental Thinking

Surrey

Published 1896 - 1897

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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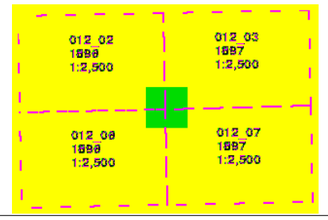
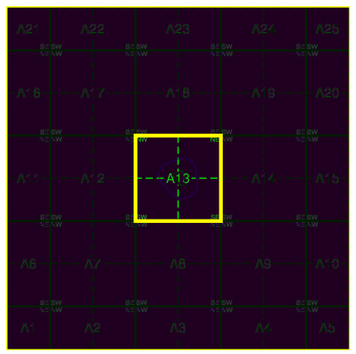


Historical Map - Segment A13



Order Details

Order Number:	282425901_1_1
Customer Ref:	75270
National Grid Reference:	514610, 167350
Slice:	A
Site Area (Ha):	0.64
Search Buffer (m):	100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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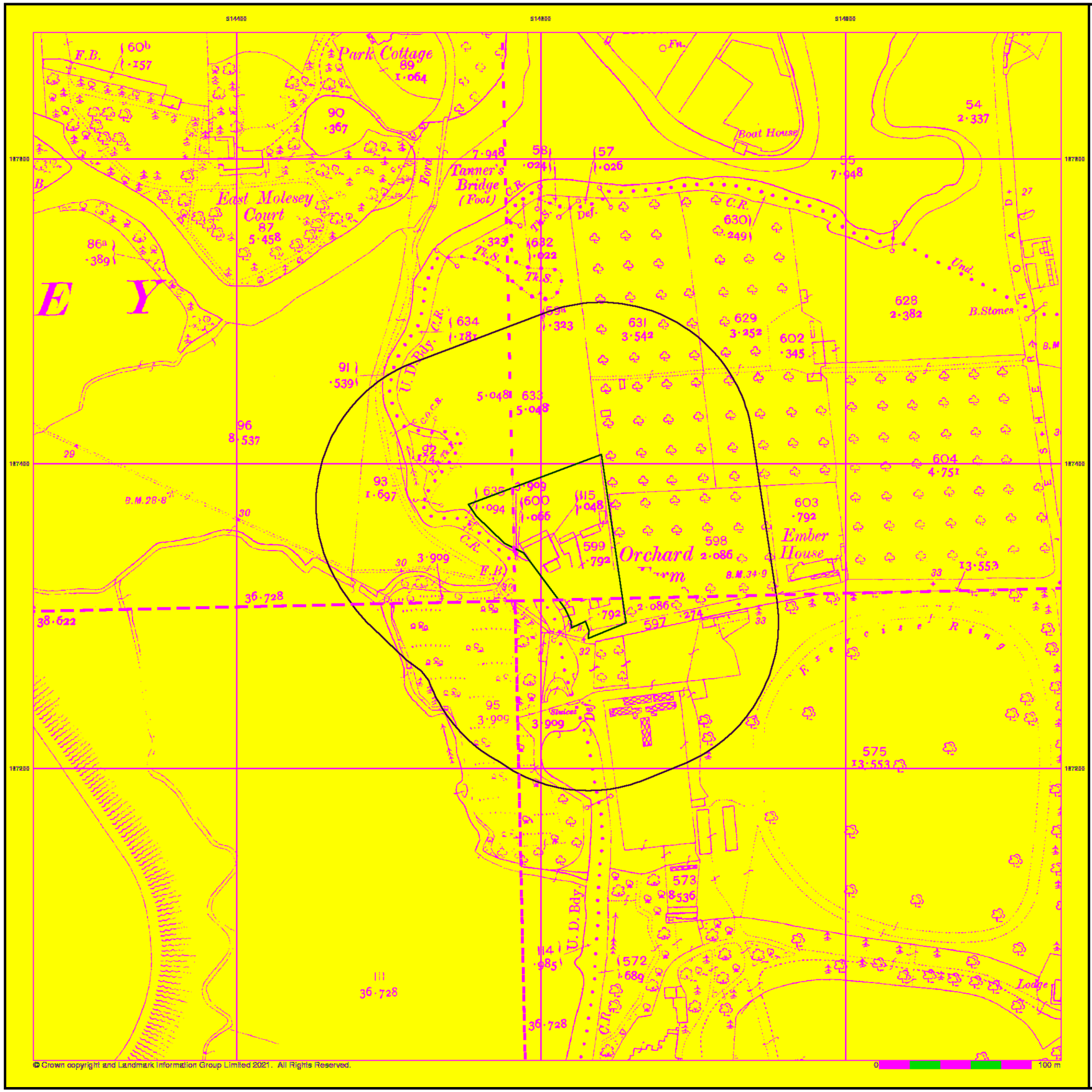


GeoSmart Information
Environmental Thinking

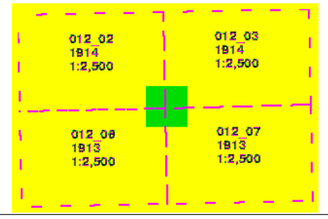
Surrey

Published 1913 - 1914

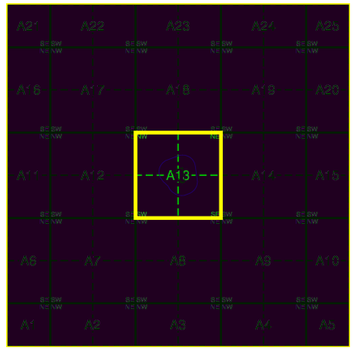
Source map scale - 1:2,500

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	282425901_1_1
Customer Ref:	75270
National Grid Reference:	514610, 167350
Slice:	A
Site Area (Ha):	0.64
Search Buffer (m):	100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

GeoSmart Information
Environmental Thinking

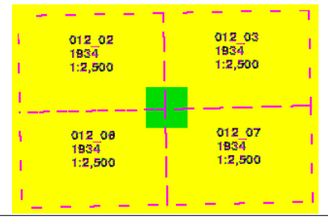
Surrey

Published 1934

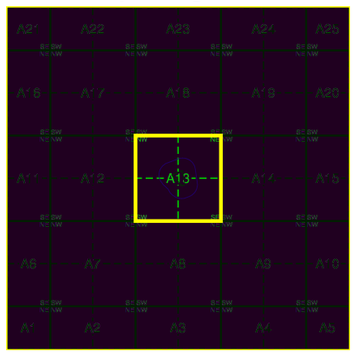
Source map scale - 1:2,500

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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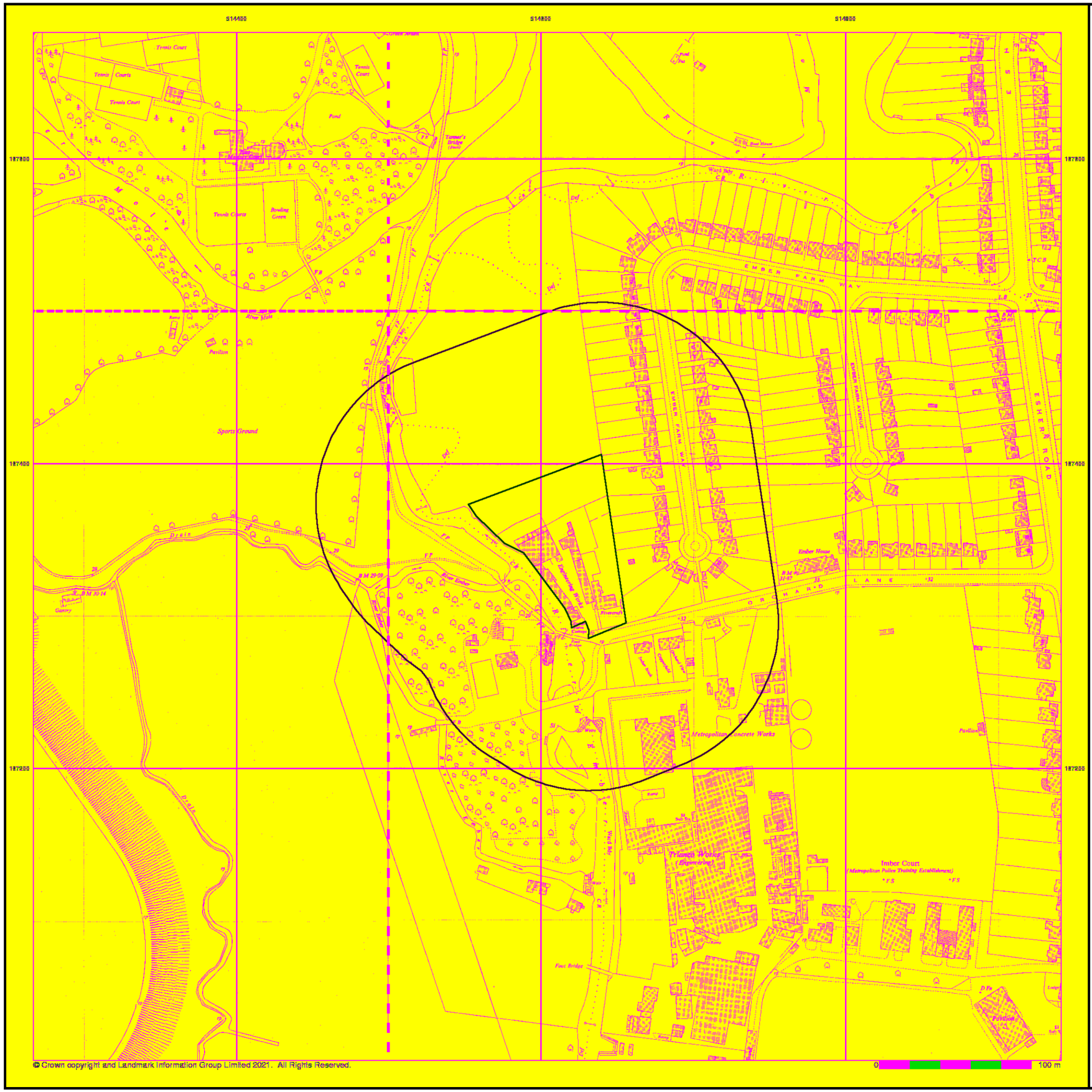
Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN



GeoSmart Information
Environmental Thinking

Ordnance Survey Plan

Published 1956

Source map scale - 1:1,250

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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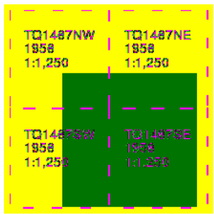
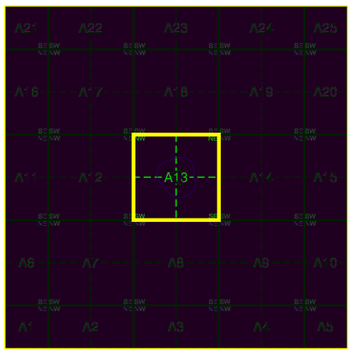


Historical Map - Segment A13



Order Details

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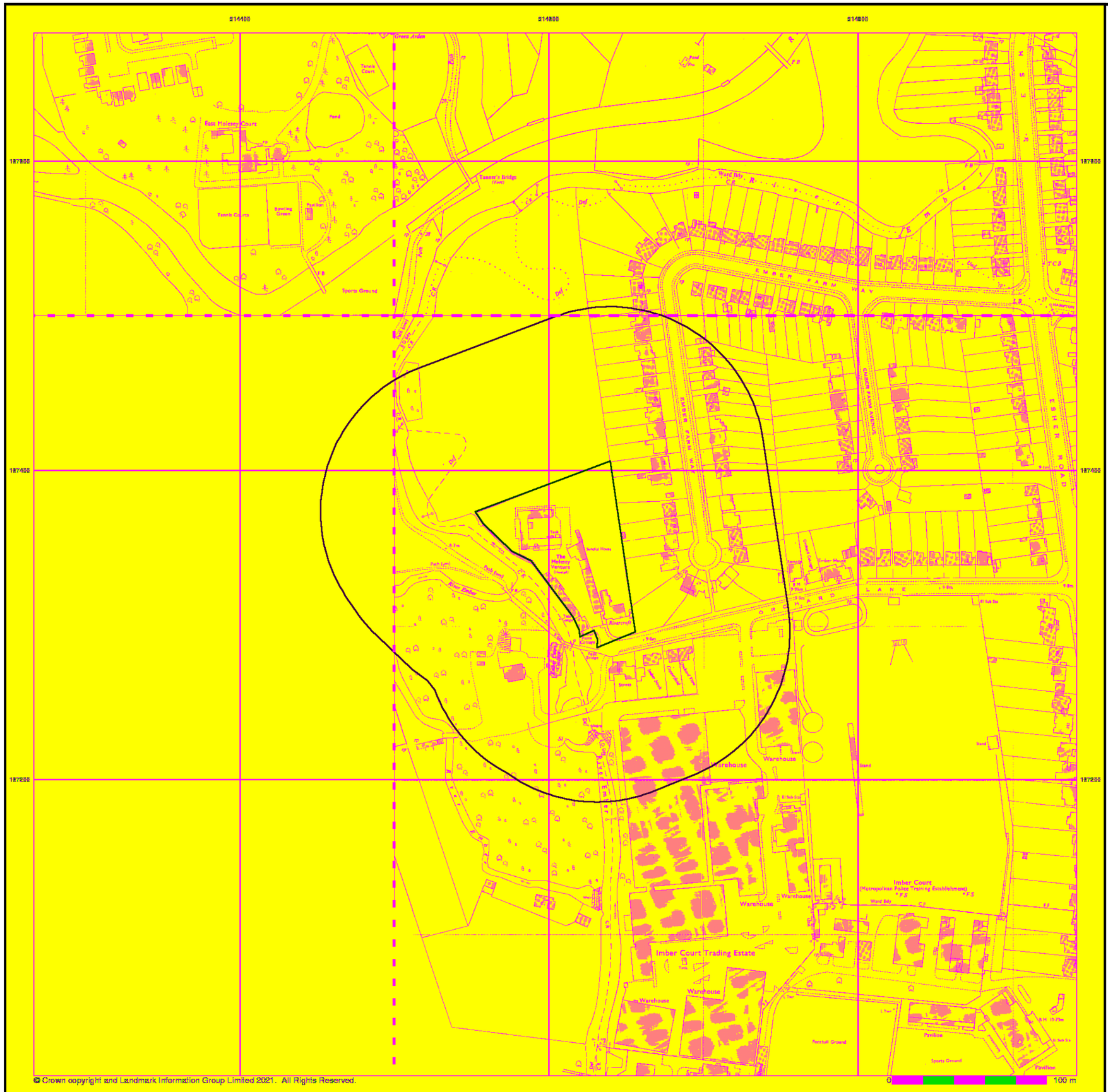
Slice:	A
Site Area (Ha):	0.64
Search Buffer (m):	100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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



GeoSmart Information
Environmental Thinking

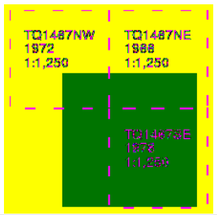
Ordnance Survey Plan

Published 1966 - 1978

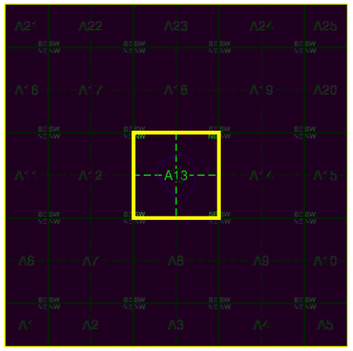
Source map scale - 1:1,250

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	282425901_1_1
Customer Ref:	75270
National Grid Reference:	514610, 167350
Slice:	A
Site Area (Ha):	0.64
Search Buffer (m):	100

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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

GeoSmart Information
Environmental Thinking

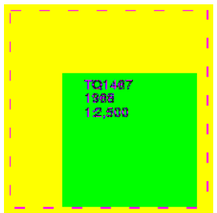
Ordnance Survey Plan

Published 1968

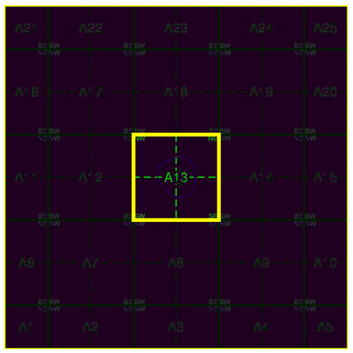
Source map scale - 1:2,500

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 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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Site Area (Ha):	0.64
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GeoSmart Information
Environmental Thinking

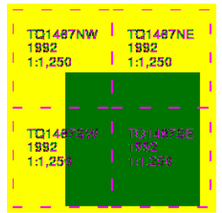
Large-Scale National Grid Data

Published 1992

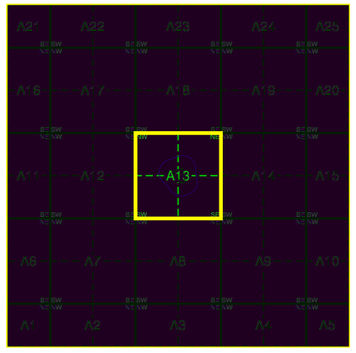
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Electricity Transmission Line
Pole
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Standard Gauge Single Track
Road Under
Road Over
Level Crossing
Foot Bridge
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

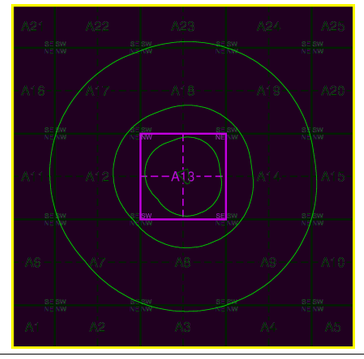
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

GeoSmart Information
Environmental Thinking

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Middlesex	1:10,560	1869	2
Surrey	1:10,560	1871	3
Surrey	1:10,560	1897 - 1898	4
Middlesex	1:10,560	1898	5
Surrey	1:10,560	1919 - 1920	6
Middlesex	1:10,560	1920	7
Surrey	1:10,560	1933	8
Middlesex	1:10,560	1938	9
Surrey	1:10,560	1938	10
Surrey	1:10,560	1938	11
Ordnance Survey Plan	1:10,000	1940	12
Ordnance Survey Plan	1:10,000	1962	13
Ordnance Survey Plan	1:10,000	1965 - 1968	14
Ordnance Survey Plan	1:10,000	1975 - 1976	15
Ordnance Survey Plan	1:10,000	1987	16
Ordnance Survey Plan	1:10,000	1991	17
10K Raster Mapping	1:10,000	1999	18
Street View	Variable		19

Historical Map - Slice A



Order Details

Order Number: 282425901_1_1
Customer Ref: 75270
National Grid Reference: 514610, 167350
Slice: A
Site Area (Ha): 0.64
Search Buffer (m): 1000

Site Details

The Molesey Venture, Orchard Lane, East Molesey, Surrey, KT8 0BN

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

APPENDIX B

Information supplied by Elmbridge Borough Council (EIR response)

Elmbridge Borough Council
... bridging the communities ...

Civic Centre
High Street, Esher
Surrey KT10 9SD
01372 474474
contactus@elmbridge.gov.uk
elmbridge.gov.uk

Mr A Singleton
Ground First Ltd
26 Victoria Street
Castlefields
Shrewsbury
Shropshire, SY1 2HS

Email: andy@groundfirst.com

contact: Helen Ballard
direct line: 01372 474755
e-mail: envhealth@elmbridge.gov.uk
my ref: WK/202104943/ 2021-22 EIR No.4

13 October 2021

Dear Mr Singleton

Environmental Information Regulations 2004 request: The Molesey Venture, Orchard Lane, East Molesey, Surrey KT8 0BN

This report is provided in response to your Environmental Information Regulations 2004 (EIR) request on the subject property. Specifically, it provides a brief history of the site based on available information held within Elmbridge Borough council (EBC) Environmental Health department records, the status of the site with respect to Part 2A and response to your specific enquiry questions.

Please note that the information supplied is as a result of a search of EBC Environmental Health department records and is not guaranteed to be comprehensive. The information supplied is believed to be correct but the Council provides no guarantee as to its accuracy and does not accept any liability for any error or omission in the information or accept any liability for any loss resultant from the supply of this information.

Whilst information has been supplied, the Council does not provide interpretation and, should this be required, you should employ the services of a suitably qualified Environmental Consultant.

Care should be taken in the interpretation of this report since whilst a potentially contaminative use may be identified, this does not mean that the site was impacted by contamination, or that if it was that the contamination is still present on the site, or that if it is still present that it presents an unacceptable risk to human health or the wider environment.

Site Setting

Historical Context

1971 Aerial Photograph

The site had been developed by mid to late 19th century with a number of buildings of unknown use, possibly associated with farm use or the RSPCA and part residential. Permission was granted to Trianco Ltd in 1948 for light industrial use, although historical planning records refer to the site as having been used for light industrial purposes prior to 1947. Records refer to possible use of the site for aircraft production at some point, and it was also used for the development and production of domestic and industrial boilers. Light industrial use ceased on the site in 1968.

In the late 1960's/early 1970's the site underwent a change of use to provide charity residential care. The site was reconfigured with the retention of Sundial House, Ember Farm Cottage, Rivercroft and part of the former industrial-use buildings, and the erection of a new residential building in the north west area of the site. There were a number of subsequent alterations to the site and the addition of horticultural use buildings. The site opened for this purpose circa 1975. After residential care ceased, the site continued to provide hostel/bed sit accommodation and community services.

Elmbridge Borough Councils Environmental Health Records

The Environmental Health department does not hold any records of pollution incidents within the identified subject property or its immediate vicinity relevant to this enquiry. The Surrey County Council Trading Standards or the Environment Agency may be able to provide additional information with regards to this.

Previous Site Investigation

The Environmental Health department does not hold any records for intrusive site investigations conducted on the subject property within the red line boundary provided. A site investigation was conducted immediately south west of the subject site in 2014 associated with Ember Farm Cottage.

Interpretation under the Contaminated Land regime

The Contaminated Land (England) Regulations (as amended) place duties upon local authorities to inspect their district and determine if land therein is contaminated. Furthermore, the local authority should seek to give priority to particular areas of land that it considers most likely to pose the greatest risk to human health or the environment.

The subject property has been identified under the Councils Contaminated Land Inspection Strategy as a result of its former industrial use. However, it has not been determined as Contaminated Land under Part 2A and it has not been prioritised for detailed inspection at this time.

Elmbridge Borough Council has exercised all reasonable care in considering the currently available information to provide an assessment of the level of risk posed with respect to Part 2A. However, limited information is currently available and ground conditions specific to the subject property are currently unknown. Should new information become available, supporting the reasonable possibility that a significant contaminant linkage is likely to exist, or changes to the legislation be introduced, then the Council may need to re-evaluate its prioritisation and may decide that the site requires further inspection.

Specific Questions (not covered above)

- *Based on a recent Phase 1 contaminated land report the study site is understood to have been first developed prior to 1868 and has subsequently been redeveloped as a farm, an engineering works and a hostel. A bulk oil storage tank was evident in the north-west of the site during the 1970s. We would be interested to obtain any additional Council-held information relating to the Site's previous land uses, any known pollution incidents at the site, plus any specific concerns regarding the prevailing land quality.*

  Please see above

- *Is the Council aware of any previous ground investigations relating to the study site?*

  Please see above

- *Does the Council have details of any private water supplies within a 250 m radius of the study site?*

  EBC Environmental Services department does not hold any records of private water supplies within a 250 m radius of the study site.

Sincerely,

Helen Ballard

Helen Ballard
Contaminated Land Officer
For Environmental Health & Licensing Manager

APPENDIX C

Site investigation photographs

Photograph 1

Description: Main Site entrance / access road
Date: 08/12/2021
Location: View from Orchard Lane; looking to the north

Photograph 2

Description: Lower Rivercroft property and Sundial House
Date: 08/12/2021
Location: Southern end of the Site; looking to the north-east

Photograph 3

Description: Site access route
Date: 08/12/2021
Location: South-western part of the Site; looking to the north

Photograph 4

Description: The Molesey Venture residential accommodation
Date: 08/12/2021
Location: North-western part of the Site; looking to the north-west

Photograph 5

Description: Car parking area in front of The Molesey Venture accommodation
Date: 08/12/2021
Location: Central-western part of the Site; looking to the north-west

Photograph 6

Description: Northern end of Site access road
Date: 08/12/2021
Location: North-central part of the Site; looking to the north

Photograph 7

Description: Courtyard area – The Molesey Venture accommodation
Date: 08/12/2021
Location: North-western part of the Site; looking to the west

Photograph 8

Description: Location of former above ground heating oil storage tank
Date: 08/12/2021
Location: South-eastern corner of The Molesey Venture courtyard area

Photograph 9

Description: Fuel transmission line – former heating oil storage area
Date: 08/12/2021
Location: South-eastern corner of The Molesey Venture courtyard area

Photograph 10

Description: Grassed amenity space
Date: 08/12/2021
Location: Land to the rear of The Molesey Venture accommodation; view to west

Photograph 11

Description: Rear (northern) elevation of The Molesey Venture accommodation
Date: 08/12/2021
Location: View from northern Site boundary; looking to the south

Photograph 12

Description: Western elevation of The Molesey Venture accommodation
Date: 08/12/2021
Location: View from north-western corner of Site; looking to the south-east

Photograph 13 **Description:** North-western corner of the Site
Date: 08/12/2021
Location: View from south-western corner of The Molesey Venture: looking to north

Photograph 14 **Description:** Grassed area directly to north of application Site
Date: 08/12/2021
Location: View from northern Site boundary; looking to the north

Photograph 15

Description: Secondary Site entrance (off Orchard Lan)
Date: 08/12/2021
Location: View from south-eastern corner of the Site; looking to the north

Photograph 16

Description: Lower Rivercroft property (residential use)
Date: 08/12/2021
Location: Southern end of the Site; looking to the north

Photograph 17

Description: Front garden to the Lower Rivercroft property
Date: 08/12/2021
Location: Southern end of the Site; looking to the south-east

Photograph 18

Description: Access route and parking area in the south-east of the Site
Date: 08/12/2021
Location: South-eastern part of the Site; looking to the north

Photograph 19

Description: Parking area in the south-east of the Site
Date: 08/12/2021
Location: South-eastern part of the Site; looking to the west

Photograph 20

Description: Landscaped area
Date: 08/12/2021
Location: Central-eastern part of the Site; looking to the north

Photograph 21

Description: Former garden area and greenhouse
Date: 08/12/2021
Location: Eastern part of the Site; looking to the north-west

Photograph 22

Description: Alleyway to rear of Sundial House
Date: 08/12/2021
Location: Central-eastern part of the Site; looking to the south

Photograph 23

Description: Garden sheds and greenhouse
Date: 08/12/2021
Location: North-eastern part of the Site; looking to the north

Photograph 24

Description: Former vegetable plot
Date: 08/12/2021
Location: North-eastern part of the Site; looking to the north-east

Photograph 25

Description: Rear of Newstead House and adjacent watercourse
Date: 08/12/2021
Location: South-western Site boundary; looking to the north

Photograph 26

Description: Central-western Site boundary and adjacent watercourse
Date: 08/12/2021
Location: View from third party land to the west of the stream; looking to the east

Photograph 27

Description: North-western Site boundary and adjacent watercourse
Date: 08/12/2021
Location: View from third party land to the west of the stream; looking to the east

Photograph 28

Description: Drainage channel flowing into the neighbouring watercourse
Date: 08/12/2021
Location: Area to the west of the Site; looking to the east

Photograph 29

Description: Mechanical excavator used for the ground investigations
Date: 08/12/2021
Location: Example excavation in the north-west of the Site

Photograph 30

Description: Trial pit TP01
Date: 08/12/2021
Location: Excavation alongside former fuel tank (adjacent to The Molesey Venture)

Photograph 31

Description: Concrete slab alongside TP01 (base of former fuel tank stand)
Date: 08/12/2021
Location: Excavation alongside former fuel tank (adjacent to The Molesey Venture)

Photograph 32

Description: Trial pit TP02
Date: 08/12/2021
Location: Excavation alongside former fuel tank (adjacent to The Molesey Venture)

Photograph 33

Description: Made Ground recovered from trial pit TP02
Date: 08/12/2021
Location: Excavation alongside former fuel tank

Photograph 34

Description: Clay deposits recovered from trial pit TP02
Date: 08/12/2021
Location: Excavation alongside former fuel tank

Photograph 35 **Description:** Trial pit TP03
Date: 08/12/2021
Location: Former vegetable plot – north-eastern part of the Site

Photograph 36 **Description:** Trial pit TP03
Date: 08/12/2021
Location: Former vegetable plot – north-eastern part of the Site

Photograph 37 **Description:** Trial pit TP03
Date: 08/12/2021
Location: Former vegetable plot – north-eastern part of the Site

Photograph 38 **Description:** Trial pit TP04
Date: 08/12/2021
Location: Former vegetable plot – north-eastern part of the Site

Photograph 39 **Description:** Top soil layer recovered from trial pit TP04
Date: 08/12/2021
Location: Former vegetable plot – north-eastern part of the Site

Photograph 40 **Description:** Silty clay layer recovered from trial pit TP04
Date: 08/12/2021
Location: Former vegetable plot – north-eastern part of the Site

Photograph 41 **Description:** Trial pit TP05
Date: 08/12/2021
Location: Grassed area to north of The Molesey Venture building

Photograph 42 **Description:** Made Ground recovered from trial pit TP05
Date: 08/12/2021
Location: Grassed area to north of The Molesey Venture building

Photograph 43 **Description:** Silty clay recovered from trial pit TP05
Date: 08/12/2021
Location: Grassed area to north of The Molesey Venture building

Photograph 44 **Description:** Trial pit TP06
Date: 08/12/2021
Location: Grassed area to north of The Molesey Venture building

Photograph 45

Description: Trial pit TP06
Date: 08/12/2021
Location: Grassed area to north of The Molesey Venture building

Photograph 46

Description: Upper Made Ground recovered from trial pit TP06
Date: 08/12/2021
Location: Grassed area to north of The Molesey Venture building

Photograph 47 **Description:** Lower Made Ground recovered from trial pit TP06
Date: 08/12/2021
Location: Grassed area to north of The Molesey Venture building

Photograph 48 **Description:** Trial pit TP07
Date: 08/12/2021
Location: Grassed area to west of The Molesey Venture building

Photograph 49 **Description:** Upper Made Ground recovered from trial pit TP07
Date: 08/12/2021
Location: Grassed area to west of The Molesey Venture building

Photograph 50 **Description:** Made Ground recovered from TP07 between 0.1 m and 0.7 m
Date: 08/12/2021
Location: Grassed area to west of The Molesey Venture building

Photograph 51 **Description:** Made Ground recovered from TP07 between 0.7 m and 1.5 m
Date: 08/12/2021
Location: Grassed area to west of The Molesey Venture building

Photograph 52 **Description:** Trial pit TP08
Date: 08/12/2021
Location: Grassed area to west of The Molesey Venture building

Photograph 53 **Description:** Made Ground recovered from TP07 between 0.05 m and 1.4 m
Date: 08/12/2021
Location: Grassed area to west of The Molesey Venture building

Photograph 54 **Description:** Gravelly clay recovered from trial pit TP08
Date: 08/12/2021
Location: Grassed area to west of The Molesey Venture building

Photograph 55 **Description:** Trial pit TP09
Date: 08/12/2021
Location: Western Site boundary to the south of The Molesey Venture building

Photograph 56 **Description:** Brick structure encountered at the base of trial pit TP09
Date: 08/12/2021
Location: Western Site boundary to the south of The Molesey Venture building

Photograph 57 **Description:** Made Ground recovered from trial pit TP09
Date: 08/12/2021
Location: Western Site boundary to the south of The Molesey Venture building

Photograph 58 **Description:** Trial pit TP10
Date: 08/12/2021
Location: Front garden of Lower Rivercroft property

Photograph 59 **Description:** Topsoil / upper Made Ground recovered from trial pit TP10
Date: 08/12/2021
Location: Front garden of Lower Rivercroft property

Photograph 60 **Description:** Sub soil / lower Made Ground recovered from trial pit TP10
Date: 08/12/2021
Location: Front garden of Lower Rivercroft property

Photograph 61

Description: Trial pit TP11
Date: 08/12/2021
Location: Landscaped area along the eastern Site boundary

Photograph 62

Description: Topsoil / upper Made Ground recovered from trial pit TP11
Date: 08/12/2021
Location: Landscaped area along the eastern Site boundary

Photograph 63

Description: Topsoil / upper Made Ground recovered from trial pit TP11
Date: 08/12/2021
Location: Landscaped area along the eastern Site boundary

Photograph 64

Description: Gravelly clay recovered from trial pit TP11
Date: 08/12/2021
Location: Landscaped area along the eastern Site boundary

Photograph 65 **Description:** Trial pit TP12
Date: 08/12/2021
Location: Former parking area in the east of the Site

Photograph 66 **Description:** Trial pit TP12
Date: 08/12/2021
Location: Former parking area in the east of the Site

Photograph 67

Description: Made Ground recovered from trial pit TP12
Date: 08/12/2021
Location: Former parking area in the east of the Site

Photograph 68

Description: Silty clay recovered from trial pit TP12
Date: 08/12/2021
Location: Former parking area in the east of the Site

Photograph 69

Description: Trial pit TP13
Date: 08/12/2021
Location: Former parking area in the south-east of the Site

Photograph 70

Description: Made Ground recovered from trial pit TP13
Date: 08/12/2021
Location: Former parking area in the south-east of the Site

Photograph 71

Description: Sandy silt recovered from trial pit TP13
Date: 08/12/2021
Location: Former parking area in the south-east of the Site

Photograph 72

Description: Location of hand pit / hand auger HP01
Date: 08/12/2021
Location: Raised planter in the south-western part of the Site

Photograph 73

Description: Hand pit / hand auger HP01
Date: 08/12/2021
Location: Raised planter in the south-western part of the Site

APPENDIX D

Trial pit soil descriptions

Depth: m bgl	Soil description	Comments
TP01		
0.0 - 0.12	Brown sand and gravel. Sand is fine to medium; gravel is fine to coarse and sub rounded to sub angular (sub base). **MADE GROUND**	Trial pit targeted on the land directly alongside a former above ground heating oil tank. Trial pit refused on concrete surfacing at 0.2 m bgl. No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.1 m.
0.12 - 0.2	Dark to mid-brown silty sand and gravel. Sand is fine; gravel is fine to coarse and sub rounded to sub angular including occasional brick and slate. **MADE GROUND**	
TP02		
0.0 - 0.15	Mid-brown silty slightly gravelly fine sand. Gravel is fine to coarse and sub rounded to sub angular. **MADE GROUND**	Trial pit targeted positioned directly to the north of TP01 No groundwater encountered. The base of the Made Ground was moist. No discernible staining or odours recorded. Soil sample taken at 0.4 m.
0.15 - 0.9	Brown, grey and black slightly silty sand and gravel. Sand is fine; gravel is fine to coarse and sub rounded to angular including some brick with abundant coal and clinker. **MADE GROUND**	
0.9 - 1.2+	Firm grey to blue clay.	
TP03		
0.0 - 0.3	Mid to dark-brown silty gravelly sand with roots and rootlets. Sand is fine; gravel is fine to coarse and sub rounded to sub angular.	Trial pit targeted on former vegetable plot. Geotextile membrane present beneath the upper soil layer. No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.1 m.
0.3 - 0.9+	Soft to firm tan silty clay.	
TP04		
0.0 - 0.35	Mid to dark-brown silty gravelly sand with roots and rootlets. Sand is fine; gravel is fine to coarse and sub rounded to sub angular.	Trial pit targeted on former vegetable plot. No groundwater encountered. No discernible staining or odours recorded. No soil sample taken (apparent natural soils).
0.35 - 0.7+	Soft to firm tan silty clay.	
TP05		
0.0 - 0.2	Brown sand and gravel with roots and rootlets. Sand is fine to medium; gravel is fine to coarse and sub rounded to sub angular. **MADE GROUND**	Trial pit targeted positioned on slightly raised land area surrounding existing residential building in north-west of the Site. No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.15 m.
0.2 - 0.6	Brown to black silty sand and gravel. Sand is fine; gravel is fine to coarse and sub rounded to angular including some brick, coal, clinker and ceramic tile, plus occasional metal and half bricks. Concrete boulder at 0.4 m bgl. **MADE GROUND**	
0.6 - 0.8	Orange fine sand. **MADE GROUND**	
0.8 - 0.9+	Soft light to mid brown silty clay.	

Depth: m bgl	Soil description	Comments
TP06		
0.0 - 0.2	Mid-brown silty sand and gravel with roots and rootlets. Sand is fine; gravel is fine to coarse and sub rounded to sub angular. **MADE GROUND**	No groundwater encountered. No discernible staining or odours recorded. Soil samples taken at 0.2 m and 0.3 m.
0.2 - 0.35	Dark brown to black sand and gravel. Sand is fine; gravel is fine to coarse and sub rounded to angular including some brick, coal, clinker and tile. **MADE GROUND**	
0.35 - 0.65+	Firm grey to blue clay.	
TP07		
0.0 - 0.1	Dark brown gravelly sand with roots and rootlets. Sand is fine to medium; gravel is fine to coarse and sub rounded to sub angular. **MADE GROUND**	No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.35 m.
0.1 - 0.7	Brown to orange sand and gravel. Sand is fine; gravel is fine to coarse and rounded to sub angular including occasional brick, clay drainage pipework, glass, slate and metal. Occasional sub rounded cobbles. **MADE GROUND**	
0.7 - 1.5	Orange gravelly sand and orange sand and gravel. Sand is fine; gravel is fine to medium including suspected clinker. **MADE GROUND**	
1.5+	Grey to brown sand and gravel. Sand is fine to medium; gravel is fine to coarse and rounded to sub angular.	
TP08		
0.0 - 0.05	Mid-brown silty gravelly fine sand. Gravel is fine to coarse and sub rounded to sub angular. **MADE GROUND**	No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.3 m.
0.05 - 1.4	Mid-brown sand and gravel. Sand is fine; gravel is fine to coarse and sub rounded to sub angular including some brick, concrete, clay tile, coal, ceramic tile and glass plus some half bricks. **MADE GROUND**	
1.4 - 1.45+	Soft to firm mid-brown silty clay.	
TP09		
0.0 - 0.8+	Mid to dark brown gravelly sand with some roots and rootlets. Sand is fine to medium; gravel is fine to coarse and sub rounded to sub angular including some brick, ceramic tile, concrete and slate remains. **MADE GROUND**	Tree stump removed prior to trial pitting. Trial pit refused on engineering brick (potentially associated with the neighbouring river / retaining wall). No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.35 m.

Depth: m bgl	Soil description	Comments
TP10		
0.0 - 0.2	Mid to dark-brown silty slightly gravelly sand with roots and rootlets. Sand is fine; gravel is fine to coarse and sub rounded to sub angular. **MADE GROUND**	Minimal man made material encountered. No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.2 m.
0.2 - 0.8+	Mid brown silty gravelly sand and gravelly silt. Sand is fine; gravel is fine to coarse and sub rounded to sub angular. Very occasional fine brick remains. **MADE GROUND**	
TP11		
0.0 - 0.6	Mid to dark-brown silty gravelly sand with roots and rootlets. Sand is fine; gravel is fine to coarse and sub rounded to sub angular including very occasional glass and brick. **MADE GROUND**	Minimal man made material encountered. No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.25 m.
0.6 - 0.75+	Soft to firm tan brown slightly gravelly clay.	
TP12		
0.0 - 0.02	Grey to black fine to medium sub angular gravel (road planings / weathered tarmac). **MADE GROUND**	No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.3 m.
0.02 - 0.07	Weathered tarmac layer. **MADE GROUND**	
0.07 - 0.6	Dark brown silty sand and gravel. Sand is fine; gravel is fine to coarse and sub rounded to angular including some brick, concrete and metal remains. **MADE GROUND**	
0.6 - 0.9+	Soft mid-brown silty clay to clayey silt.	
TP13		
0.0 - 0.05	Grey to black fine to medium sub angular gravel (road planings / weathered tarmac). **MADE GROUND**	No groundwater encountered. No discernible staining or odours recorded. Soil sample taken at 0.35 m.
0.05 - 0.4	Dark brown silty sand and gravel. Sand is fine; gravel is fine to coarse and sub rounded to angular including occasional brick and concrete. **MADE GROUND**	
0.4 – 1.0+	Tan-brown sandy silt.	

Depth: m bgl	Soil description	Comments
HP01		
0.0 - 0.6+	Mid to dark brown silty gravelly sand with some roots and rootlets. Sand is fine to medium; gravel is fine to coarse and sub rounded to sub angular.	No groundwater encountered. No discernible staining or odours recorded. No soil samples taken.

APPENDIX E

Laboratory results

Appendix E.1: Laboratory test certificates

Andy Singleton
Ground first
26 Victoria Street
Castlefields
Shrewsbury
Shropshire
SY1 2HS

e: andy@groundfirst.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 21-28131

Project / Site name:	Molesey	**Samples received on:**	10/12/2021
Your job number:	4224	**Samples instructed on/ Analysis started on:**	10/12/2021
Your order number:		**Analysis completed by:**	21/12/2021
Report Issue Number:	1	**Report issued on:**	21/12/2021
Samples Analysed:	2 leachate samples - 8 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-28131
Project / Site name: Molesey

Lab Sample Number				2110989	2110990	2110991	2110992	2110993
Sample Reference				TP01	TP02	TP03	TP05	TP06
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.40	0.10	0.15	0.20
Date Sampled				08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	27	< 0.1	40	38
Moisture Content	%	0.01	NONE	13	13	15	13	13
Total mass of sample received	kg	0.001	NONE	0.80	0.80	0.90	0.80	0.40

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile - Loose Fibres	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	-	Detected	-	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A		DSA		DSA	

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	8.4	7.3	7.4	6.6
Total Cyanide	mg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Free Cyanide	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Thiocyanate as SCN	mg/kg	5	NONE	-	-	5.5	-	13
Total Sulphate as SO4	mg/kg	50	MCERTS	-	-	660	-	210
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.016	-	0.0067
Sulphide	mg/kg	1	MCERTS	-	-	9.1	-	< 1.0
Organic Matter (automated)	%	0.1	MCERTS	-	-	8.0	-	3.8
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	-	0.028	-	0.024	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	0.39	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	0.33	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	5.1	0.47	1.2	0.88
Anthracene	mg/kg	0.05	MCERTS	-	1.1	< 0.05	0.25	0.23
Fluoranthene	mg/kg	0.05	MCERTS	-	9.7	1.5	2.9	3.0
Pyrene	mg/kg	0.05	MCERTS	-	8.6	1.3	2.6	3.0
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	5.7	0.90	1.9	2.0
Chrysene	mg/kg	0.05	MCERTS	-	3.8	0.72	1.4	1.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	5.3	0.94	1.9	1.8
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	2.9	0.56	1.1	1.6
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	4.9	0.83	1.7	2.0
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	3.0	0.56	1.0	1.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.86	< 0.05	0.35	0.30
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	3.6	0.68	1.1	1.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	55.2	8.47	17.4	18.8

Analytical Report Number: 21-28131
Project / Site name: Molesey

Lab Sample Number				2110989	2110990	2110991	2110992	2110993
Sample Reference				TP01	TP02	TP03	TP05	TP06
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.40	0.10	0.15	0.20
Date Sampled				08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	23	17	21	20
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	1.5	-	1.3	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	0.5	1.3	0.7	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	0.9	1.2	1.3	1.0
Chromium (hexavalent)	mg/kg	4	MCERTS	-	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	-	30	-	26	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	30	23	26	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	95	71	83	32
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	190	210	220	110
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	0.4	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	39	23	31	29
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	50	-	49	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	200	240	250	140
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Petroleum Hydrocarbons								
Petroleum Range Organics (C6 - C10) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	-	-	-	-
TPH-CWG - Aliphatic > EC35 - EC44 $_{EH\_CU\_1D\_AL}$	mg/kg	8.4	NONE	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	< 10	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC44) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	24	-	-	-	-
TPH-CWG - Aromatic > EC35 - EC44 $_{EH\_CU\_1D\_AR}$	mg/kg	8.4	NONE	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	32	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC44) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	-	-	-	-	-
TPH (C10 - C25) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	-	58	-	14	-
TPH (C25 - C40) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	-	75	-	12	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-28131
Project / Site name: Molesey

Lab Sample Number				2110994	2110995	2110996
Sample Reference				TP06	TP07	TP08
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.35	0.30
Date Sampled				08/12/2021	08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	53	27	24
Moisture Content	%	0.01	NONE	12	11	12
Total mass of sample received	kg	0.001	NONE	1.3	0.80	0.80
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	Chrysotile - Loose Fibres
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Detected
Asbestos Analyst ID	N/A	N/A	N/A	DSA	DSA	DSA
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	7.1	7.8	8.2
Total Cyanide	mg/kg	1	MCERTS	-	-	-
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Thiocyanate as SCN	mg/kg	5	NONE	-	-	-
Total Sulphate as SO4	mg/kg	50	MCERTS	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0088	-	0.016
Sulphide	mg/kg	1	MCERTS	-	-	-
Organic Matter (automated)	%	0.1	MCERTS	-	-	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.020	0.026	0.016
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.51
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.33	0.44	2.6
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.64
Fluoranthene	mg/kg	0.05	MCERTS	1.1	0.87	8.1
Pyrene	mg/kg	0.05	MCERTS	1.0	0.77	7.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.75	0.47	4.3
Chrysene	mg/kg	0.05	MCERTS	0.65	0.61	4.2
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.94	0.66	4.9
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.44	0.42	2.5
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.76	0.55	4.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.51	0.43	2.6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.74
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.44	0.48	2.9
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	6.94	5.70	45.5

Analytical Report Number: 21-28131
Project / Site name: Molesey

Lab Sample Number				2110994	2110995	2110996
Sample Reference				TP06	TP07	TP08
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.35	0.30
Date Sampled				08/12/2021	08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	21	19
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.0	1.4	1.3
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	0.3	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.0	2.4	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	34	30	27
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	34	32	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	36	170	59
Lead (aqua regia extractable)	mg/kg	1	MCERTS	86	390	210
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.8	0.6
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	31	36	29
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	41	53	50
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	470	200
Monoaromatics & Oxygenates						
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons						
Petroleum Range Organics (C6 - C10) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	-	< 0.1	-
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	-	< 8.0
TPH-CWG - Aliphatic > EC35 - EC44 $_{EH\_CU\_1D\_AL}$	mg/kg	8.4	NONE	< 8.4	-	< 8.4
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	< 10	-	< 10
TPH-CWG - Aliphatic (EC5 - EC44) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	< 10	-	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0	-	2.1
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	-	23
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	-	41
TPH-CWG - Aromatic > EC35 - EC44 $_{EH\_CU\_1D\_AR}$	mg/kg	8.4	NONE	< 8.4	-	< 8.4
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	< 10	-	66
TPH-CWG - Aromatic (EC5 - EC44) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	< 10	-	66
TPH (C10 - C25) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	-	< 10	-
TPH (C25 - C40) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	-	< 10	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-28131
Project / Site name: Molesey

Lab Sample Number				2110997	2110998
Sample Reference				TP06	TP08
Sample Number				None Supplied	None Supplied
Depth (m)				0.30	0.30
Date Sampled				08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
General Inorganics					
pH (automated)	pH Units	N/A	ISO 17025	6.7	7.6
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10
Thiocyanate as SCN	µg/l	200	ISO 17025	390	360
Sulphate as SO_4	µg/l	100	ISO 17025	1160	1630
Sulphide	µg/l	5	NONE	< 5.0	< 5.0
Total Phenols					
Total Phenols (monohydric)	µg/l	10	ISO 17025	11	11
Speciated PAHs					
Naphthalene	µg/l	0.01	ISO 17025	1.3	1.4
Acenaphthylene	µg/l	0.01	ISO 17025	0.21	0.25
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01
Total PAH					
Total EPA-16 PAHs	µg/l	0.2	NONE	1.5	1.6
Heavy Metals / Metalloids					
Arsenic (dissolved)	µg/l	1	ISO 17025	3.3	6.9
Boron (dissolved)	µg/l	10	ISO 17025	22	22
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	0.10
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.1	0.9
Copper (dissolved)	µg/l	0.7	ISO 17025	15	10
Lead (dissolved)	µg/l	1	ISO 17025	3.1	6.4
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	6.4	2.7
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	23	14

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-28131
Project / Site name: Molesey

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2110989	TP01	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
2110990	TP02	None Supplied	0.4	Brown loam and clay with stones and vegetation.
2110991	TP03	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
2110992	TP05	None Supplied	0.15	Brown loam and clay with stones and vegetation.
2110993	TP06	None Supplied	0.2	Brown loam and clay with stones and vegetation.
2110994	TP06	None Supplied	0.3	Brown loam and clay with gravel and stones.
2110995	TP07	None Supplied	0.35	Brown loam and clay with stones and vegetation.
2110996	TP08	None Supplied	0.3	Brown clay and loam with stones and vegetation.

Analytical Report Number : 21-28131
Project / Site name: Molesey

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS

Analytical Report Number : 21-28131
Project / Site name: Molesey

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in leachate (automated)	Determination of pH in leachate by electrometric measurement.	In house method.	L099B	W	ISO 17025
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Sulphide in leachate	Determination of sulphide in leachate by ion selective electrode.	In-house method	L010-PL	W	NONE
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Thiocyanate in leachate	Determination of thiocyanate in water by discreet analyser (colorimetry).	In house method based on SMWW 4500-CN-M.	L082-PL	W	ISO 17025
Thiocyanate in soil	Determination of thiocyanate in soil by extraction in water followed by acidification followed by addition of ferric nitrate followed by discrete analyser (spectrophotometer).	In-house method	L082-PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH Oils (Soils)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
DRO (Soil)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

Analytical Report Number : 21-28131
Project / Site name: Molesey

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method	L009	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 21-28244

Project / Site name:	Molesey	**Samples received on:**	10/12/2021
Your job number:	4224	**Samples instructed on/ Analysis started on:**	10/12/2021
Your order number:	4224	**Analysis completed by:**	21/12/2021
Report Issue Number:	1	**Report issued on:**	21/12/2021
Samples Analysed:	5 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-28244
Project / Site name: Molesey
Your Order No: 4224

Lab Sample Number				2111835	2111836	2111837	2111838	2111839
Sample Reference				TP09	TP10	TP11	TP12	TP13
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.20	0.25	0.30	0.35
Date Sampled				08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	50	31
Moisture Content	%	0.01	NONE	11	11	10	6.3	6.3
Total mass of sample received	kg	0.001	NONE	0.80	0.90	0.80	0.80	0.80
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SFS		SFS	SFS	SFS

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	6.6	7.3	8.5	8.1
Total Cyanide	mg/kg	1	MCERTS	-	< 1.0	-	-	-
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thiocyanate as SCN	mg/kg	5	NONE	-	< 5.0	-	-	-
Total Sulphate as SO4	mg/kg	50	MCERTS	-	350	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.013	0.0063	-	0.014
Sulphide	mg/kg	1	MCERTS	-	< 1.0	-	-	-
Organic Matter (automated)	%	0.1	MCERTS	-	4.0	-	-	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.045	-	0.021	0.040	0.046

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	30	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	1.5	< 0.05	16	3.3
Acenaphthene	mg/kg	0.05	MCERTS	0.37	< 0.05	< 0.05	59	0.52
Fluorene	mg/kg	0.05	MCERTS	0.32	0.27	< 0.05	67	0.85
Phenanthrene	mg/kg	0.05	MCERTS	2.8	3.2	2.3	460	6.2
Anthracene	mg/kg	0.05	MCERTS	0.75	1.5	0.66	120	3.1
Fluoranthene	mg/kg	0.05	MCERTS	4.2	10	5.6	410	17
Pyrene	mg/kg	0.05	MCERTS	4.1	9.5	4.7	320	17
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.1	6.6	2.3	260	11
Chrysene	mg/kg	0.05	MCERTS	1.6	5.3	2.2	190	7.8
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.7	7.6	2.9	140	12
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.70	4.4	1.3	120	3.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.9	7.2	2.5	150	9.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.1	4.4	1.3	75	5.6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	1.3	0.44	18	1.9
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.2	4.7	1.5	79	7.0

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	23.7	67.4	27.7	2510	106

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	23	16	38	28	12
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	-	0.93	0.84	0.61
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	0.7	0.2	0.3	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.6	1.6	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	25	-	19	26	14
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	20	21	27	16
Copper (aqua regia extractable)	mg/kg	1	MCERTS	120	130	65	31	33
Lead (aqua regia extractable)	mg/kg	1	MCERTS	260	240	380	140	63

Analytical Report Number: 21-28244
Project / Site name: Molesey
Your Order No: 4224

Lab Sample Number				2111835	2111836	2111837	2111838	2111839
Sample Reference				TP09	TP10	TP11	TP12	TP13
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.20	0.25	0.30	0.35
Date Sampled				08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.5	0.5	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	26	20	21	20	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	43	-	42	51	61
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	440	320	270	120	77

Analytical Report Number: 21-28244
Project / Site name: Molesey
Your Order No: 4224

Lab Sample Number				2111835	2111836	2111837	2111838	2111839
Sample Reference				TP09	TP10	TP11	TP12	TP13
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.20	0.25	0.30	0.35
Date Sampled				08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
Petroleum Range Organics (C6 - C10) HS_1D_TOTAL	mg/kg	0.1	MCERTS	< 0.1	-	-	< 0.1	-
TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	MCERTS	-	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	MCERTS	-	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	MCERTS	-	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	-	-	< 2.0	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	-	-	< 8.0	-	11
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	-	-	< 8.0	-	200
TPH-CWG - Aliphatic > EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	-	-	< 8.4	-	430
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	MCERTS	-	-	< 10	-	210
TPH-CWG - Aliphatic (EC5 - EC44) EH_CU+HS_1D_AL	mg/kg	10	NONE	-	-	< 10	-	650
TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	MCERTS	-	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	MCERTS	-	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	MCERTS	-	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	-	-	< 1.0	-	2.9
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	-	-	< 2.0	-	13
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	-	-	< 10	-	73
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	-	-	22	-	680
TPH-CWG - Aromatic > EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	-	-	< 8.4	-	1100
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	MCERTS	-	-	30	-	770
TPH-CWG - Aromatic (EC5 - EC44) EH_CU+HS_1D_AR	mg/kg	10	NONE	-	-	30	-	1900
TPH (C10 - C25) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	14	-	-	1800	-
TPH (C25 - C40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	21	-	-	1600	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-28244
Project / Site name: Molesey

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2111835	TP09	None Supplied	0.3	Brown loam and clay with gravel and vegetation.
2111836	TP10	None Supplied	0.2	Brown loam and clay with gravel and vegetation.
2111837	TP11	None Supplied	0.25	Brown loam and clay with gravel and vegetation.
2111838	TP12	None Supplied	0.3	Brown loam and clay with gravel and stones.
2111839	TP13	None Supplied	0.35	Brown loam and sand with gravel and stones.

Analytical Report Number : 21-28244
Project / Site name: Molesey

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Thiocyanate in soil	Determination of thiocyanate in soil by extraction in water followed by acidification followed by addition of ferric nitrate followed by discrete analyser (spectrophotometer).	In-house method	L082-PL	D	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

Analytical Report Number : 21-28244
Project / Site name: Molesey

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH Oils (Soils)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
DRO (Soil)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method	L009	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Appendix E.2: Summary of laboratory test results

Analytical Report Number: 21-28131
Project / Site name: Molesey

Lab Sample Number				2110989	2110990	2110991	2110992	2110993	2110994	2110995	2110996	2111835	2111836	2111837	2111838	2111839
Sample Reference				TP01	TP02	TP03	TP05	TP06	TP06	TP07	TP08	TP09	TP10	TP11	TP12	TP13
Depth (m)				0.1	0.4	0.1	0.15	0.2	0.3	0.35	0.3	0.3	0.2	0.25	0.3	0.35
Date Sampled				08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**													
Stone Content	%	0.1	NONE	< 0.1	27	< 0.1	40	38	53	27	24	< 0.1	< 0.1	< 0.1	50	31
Moisture Content	%	0.01	NONE	13	13	15	13	13	12	11	12	11	11	10	6.3	6.3
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.9	0.8	0.4	1.3	0.8	0.8	0.8	0.9	0.8	0.8	0.8

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile - Loose Fibres	-	-	-	-	-	Chrysotile - Loose Fibres	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	-	Detected	-	Not-detected	-	Not-detected	Not-detected	Detected	Not-detected	-	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A		DSA		DSA		DSA	DSA	DSA	SFS		SFS	SFS	SFS

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	8.4	7.3	7.4	6.6	7.1	7.8	8.2	8.1	6.6	7.3	8.5	8.1
Total Cyanide	mg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0	-	-	-	-	< 1.0	-	-	-
Free Cyanide	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thiocyanate as SCN	mg/kg	5	NONE	-	-	5.5	-	13	-	-	-	-	< 5.0	-	-	-
Total Sulphate as SO4	mg/kg	50	MCERTS	-	-	660	-	210	-	-	-	-	350	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.016	-	0.0067	0.0088	-	0.016	-	0.013	0.0063	-	0.014
Sulphide	mg/kg	1	MCERTS	-	-	9.1	-	< 1.0	-	-	-	-	< 1.0	-	-	-
Organic Matter (automated)	%	0.1	MCERTS	-	-	8	-	3.8	-	-	-	-	4	-	-	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	-	0.028	-	0.024	-	0.02	0.026	0.016	0.045	-	0.021	0.04	0.046

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	30	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.51	< 0.05	1.5	< 0.05	16	3.3
Acenaphthene	mg/kg	0.05	MCERTS	-	0.39	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.37	< 0.05	< 0.05	59	0.52
Fluorene	mg/kg	0.05	MCERTS	-	0.33	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.32	0.27	< 0.05	67	0.85
Phenanthrene	mg/kg	0.05	MCERTS	-	5.1	0.47	1.2	0.88	0.33	0.44	2.6	2.8	3.2	2.3	460	6.2
Anthracene	mg/kg	0.05	MCERTS	-	1.1	< 0.05	0.25	0.23	< 0.05	< 0.05	0.64	0.75	1.5	0.66	120	3.1
Fluoranthene	mg/kg	0.05	MCERTS	-	9.7	1.5	2.9	3	1.1	0.87	8.1	4.2	10	5.6	410	17
Pyrene	mg/kg	0.05	MCERTS	-	8.6	1.3	2.6	3	1	0.77	7.4	4.1	9.5	4.7	320	17
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	5.7	0.9	1.9	2	0.75	0.47	4.3	2.1	6.6	2.3	260	11
Chrysene	mg/kg	0.05	MCERTS	-	3.8	0.72	1.4	1.6	0.65	0.61	4.2	1.6	5.3	2.2	190	7.8
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	5.3	0.94	1.9	1.8	0.94	0.66	4.9	2.7	7.6	2.9	140	12
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	2.9	0.56	1.1	1.6	0.44	0.42	2.5	0.7	4.4	1.3	120	3.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	4.9	0.83	1.7	2	0.76	0.55	4.3	1.9	7.2	2.5	150	9.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	3	0.56	1	1.3	0.51	0.43	2.6	1.1	4.4	1.3	75	5.6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.86	< 0.05	0.35	0.3	< 0.05	< 0.05	0.74	< 0.05	1.3	0.44	18	1.9
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	3.6	0.68	1.1	1.2	0.44	0.48	2.9	1.2	4.7	1.5	79	7

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	55.2	8.47	17.4	18.8	6.94	5.7	45.5	23.7	67.4	27.7	2510	106

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	23	17	21	20	16	21	19	23	16	38	28	12
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	1.5	-	1.3	-	1	1.4	1.3	1.1	-	0.93	0.84	0.61
Boron (water soluble)	mg/kg	0.2	MCERTS	-	0.5	1.3	0.7	0.3	0.5	0.3	0.2	1.2	0.7	0.2	0.3	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	0.9	1.2	1.3	1	1	2.4	< 0.2	1.6	1.6	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	-	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	-	30	-	26	-	34	30	27	25	-	19	26	14
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	30	23	26	27	34	32	27	25	20	21	27	16
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	95	71	83	32	36	170	59	120	130	65	31	33
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	190	210	220	110	86	390	210	260	240	380	140	63
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	0.4	< 0.3	< 0.3	< 0.3	< 0.3	0.8	0.6	< 0.3	0.5	0.5	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	39	23	31	29	31	36	29	26	20	21	20	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	50	-	49	-	41	53	50	43	-	42	51	61
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	200	240	250	140	130	470	200	440	320	270	120	77

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10) HS_1D_TOTAL	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-	-	< 0.1	-	< 0.1	-	-	< 0.1	-

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-	< 0.001	-	< 0.001	-	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-	< 0.001	-	< 0.001	-	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-	< 0.001	-	< 0.001	-	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	-	-	-	-	< 1.0	-	< 1.0	-	-	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	-	-	-	-	< 2.0	-	< 2.0	-	-	< 2.0	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	-	-	-	-	< 8.0	-	< 8.0	-	-	< 8.0	-	11
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	-	-	-	-	< 8.0	-	< 8.0	-	-	< 8.0	-	200
TPH-CWG - Aliphatic > EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	-	-	-	-	-	< 8.4	-	< 8.4	-	-	< 8.4	-	430
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	MCERTS	< 10	-	-	-	-	< 10	-	< 10	-	-	< 10	-	210
TPH-CWG - Aliphatic (EC5 - EC44) EH_CU+HS_1D_AL	mg/kg	10	NONE	-	-	-	-	-	< 10	-	< 10	-	-	< 10	-	650

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-	< 0.001	-	< 0.001	-	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-	< 0.001	-	< 0.001	-	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-	< 0.001	-	< 0.001	-	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	-	-	-	-	< 1.0	-	< 1.0	-	-	< 1.0	-	2.9
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	-	-	-	-	< 2.0	-	2.1	-	-	< 2.0	-	13
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	-	-	-	-	< 10	-	23	-	-	< 10	-	73
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	24	-	-	-	-	< 10	-	41	-	-	22	-	680
TPH-CWG - Aromatic > EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	-	-	-	-	-	< 8.4	-	< 8.4	-	-	< 8.4	-	1100
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	MCERTS	32	-	-	-	-	< 10	-	66	-	-	30	-	770
TPH-CWG - Aromatic (EC5 - EC44) EH_CU+HS_1D_AR	mg/kg	10	NONE	-	-	-	-	-	< 10	-	66	-	-	30	-	1900

TPH (C10 - C25) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	-	58	-	14	-	-	< 10	-	14	-	-	1800	-
TPH (C25 - C40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	-	75	-	12	-	-	< 10	-	21	-	-	1600	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-28131
Project / Site name: Molesey

Lab Sample Number				2110997	2110998
Sample Reference				TP06	TP08
Depth (m)				0.30	0.30
Date Sampled				08/12/2021	08/12/2021
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
General Inorganics					
pH (automated)	pH Units	N/A	ISO 17025	6.7	7.6
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10
Thiocyanate as SCN	µg/l	200	ISO 17025	390	360
Sulphate as SO_4	µg/l	100	ISO 17025	1160	1630
Sulphide	µg/l	5	NONE	< 5.0	< 5.0
Total Phenols					
Total Phenols (monohydric)	µg/l	10	ISO 17025	11	11
Speciated PAHs					
Naphthalene	µg/l	0.01	ISO 17025	1.3	1.4
Acenaphthylene	µg/l	0.01	ISO 17025	0.21	0.25
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01
Total PAH					
Total EPA-16 PAHs	µg/l	0.2	NONE	1.5	1.6
Heavy Metals / Metalloids					
Arsenic (dissolved)	µg/l	1	ISO 17025	3.3	6.9
Boron (dissolved)	µg/l	10	ISO 17025	22	22
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	0.10
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.1	0.9
Copper (dissolved)	µg/l	0.7	ISO 17025	15	10
Lead (dissolved)	µg/l	1	ISO 17025	3.1	6.4
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	6.4	2.7
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	23	14

U/S = Unsuitable Sample I/S = Insufficient Sample

APPENDIX F

Soil and water screening values

Screening values adopted for the human health risk assessment

Parameter	Units	Screening value/GAC	Comment
Metals			
Arsenic	mg/kg	37	LQM (2015)
Beryllium	mg/kg	1.7	LQM (2015)
Boron	mg/kg	290	LQM (2015)
Cadmium	mg/kg	11	LQM (2015)
Chromium VI	mg/kg	6	LQM (2015)
Chromium III	mg/kg	910	LQM (2015)
Copper	mg/kg	2400	LQM (2015)
Lead	mg/kg	200	Category 4 Screening Level incorporating vegetable consumption (DEFRA, 2014)
Mercury	mg/kg	11	LQM (2015) - Methylmercury
Nickel	mg/kg	130	LQM (2015)
Selenium	mg/kg	250	LQM (2015)
Vanadium	mg/kg	410	LQM (2015)
Zinc	mg/kg	3700	LQM (2015)
Miscellaneous			
Phenols	mg/kg	380	LQM (2015)
Cyanide (free)	mg/kg	16.8	RIVM derived value[1] for free cyanide
PAHs			
Acenaphthene	mg/kg	1100	LQM (2015)
Acenaphthylene	mg/kg	920	LQM (2015)
Anthracene	mg/kg	11000	LQM (2015)
Benzo[a]anthracene	mg/kg	13	LQM (2015)
Benzo[a]pyrene	mg/kg	3	LQM (2015)
	mg/kg	5	Category 4 Screening Level incorporating vegetable consumption (DEFRA, 2014)
Benzo[b]fluoranthene	mg/kg	3.7	LQM (2015)
Benzo[g,h,i]perylene	mg/kg	350	LQM (2015)
Benzo[k]fluoranthene	mg/kg	100	LQM (2015)
Chrysene	mg/kg	27	LQM (2015)
Dibenzo[a,h]anthracene	mg/kg	0.3	LQM (2015)
Fluoranthene	mg/kg	890	LQM (2015)
Fluorene	mg/kg	860	LQM (2015)
Indeno[1,2,3-cd]pyrene	mg/kg	41	LQM (2015)
Naphthalene	mg/kg	13	LQM (2015)
Phenanthrene	mg/kg	440	LQM (2015)
Pyrene	mg/kg	2000	LQM (2015)
BTEX and speciated TPH			
Benzene	mg/kg	0.37	LQM (2015)
Toluene	mg/kg	660	LQM (2015)
Ethylbenzene	mg/kg	260	LQM (2015)
m Xylene	mg/kg	320	LQM (2015)
p Xylene	mg/kg	310	LQM (2015)
o Xylene	mg/kg	330	LQM (2015)
Aliphatics C5-C6	mg/kg	160	LQM (2015)
Aliphatics >C6-C8	mg/kg	530	LQM (2015)
Aliphatics >C8-C10	mg/kg	150	LQM (2015)
Aliphatics >C10-C12	mg/kg	760 (283)^{vap}	LQM (2015). GAC exceeds theoretical soil saturation limit

Parameter	Units	Screening value/GAC	Comment
Aliphatics >C12-C16	mg/kg	4300 (142)^{sol}	LQM (2015). GAC exceeds theoretical soil saturation limit
Aliphatics >C16-C21	mg/kg	110,000	LQM (2015). Based on GAC for C16-C35 fraction
Aliphatics >C21-C35	mg/kg	110,000	LQM (2015). Based on GAC for C16-C35 fraction
Aromatics C6-C7	mg/kg	300	LQM (2015). Based on GAC for C5-C7 fraction
Aromatics >C7-C8	mg/kg	660	LQM (2015)
Aromatics >EC8-EC10	mg/kg	190	LQM (2015)
Aromatics >EC10-EC12	mg/kg	380	LQM (2015)
Aromatics >EC12-EC16	mg/kg	660	LQM (2015)
Aromatics >EC16-EC21	mg/kg	930	LQM (2015)
Aromatics >EC21-EC35	mg/kg	1700	LQM (2015)
Aromatics >EC35-EC44	mg/kg	1700	LQM (2015)

DEFRA, 2014. SP1010: Development of Category 4 Screening Levels for assessment of land affected by contamination. Policy companion document.

LQM, 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment.

RIVM, 2001. Technical evaluation of the Intervention Values for Soil/sediment and Groundwater Human and ecotoxicological risk assessment and derivation of risk limits for soil, aquatic sediment and groundwater. RIVM report 711701 023.

Target concentrations adopted for the controlled waters risk screen

Parameter	Unit	Drinking Water Standards		Environmental Quality Standards		Comment
Metals						
Antimony	µg/l	5	DWS	-	-	
Arsenic	µg/l	10	DWS	50	AA	
Barium	µg/l	700	WHO	-	-	
Beryllium	µg/l	-	-	-	-	
Boron	µg/l	1000	DWS	2000	-	Protection of freshwater aquatic life
Cadmium	µg/l	5	DWS	0.25 (1.5)	AA (MAC)	Assuming hardness in excess of 200 mg CaCO3/l
Chromium (total)	µg/l	50	DWS	-	-	
Chromium VI	µg/l	-	-	3.4	AA	
Chromium III	µg/l	-	-	4.7 (32)	AA (95%ile)	
Copper	µg/l	2000	DWS	1	AA	EQS reflects bioavailable component
Lead	µg/l	10	DWS	1.2 (14)	AA (MAC)	
Mercury	µg/l	1	DWS	0.07	MAC	
Molybdenum	µg/l	-	-	-	-	
Nickel	µg/l	20	DWS	4 (34)	AA (MAC	
Selenium	µg/l	10	DWS	-	-	
Vanadium	µg/l	-	-	60	AA	Former EQS for List II substances. Assuming hardness in excess of 200 mg CaCO3/l
Zinc	µg/l	3000	SW	12.3	AA	
Others						
Ammoniacal Nitrogen as NH_4	mg/l	0.5	DWS	-	-	
Ammonia (ammonium (NH_3 as N))	mg/l	-	-	0.021	AA	
Chloride	mg/l	250	DWS	250	AA	
Nitrate as NO_3	mg/l	50	DWS	-	-	
Nitrite as NO_2	mg/l	0.5	DWS	-	-	
Phenol	µg/l	0.5	BW	7.7 (46)	AA (95%ile)	
Sulphate	mg/l	250	DWS	400	AA	
Sulphite	mg/l	-	-	-	-	
Total Cyanide	mg/l	0.05	DWS	0.001 (0.005)	AA (MAC)	
Petroleum hydrocarbons compounds						
Oils/hydrocarbons	µg/l	10	DWS	-	-	Former DWS
Methyl tertiary butyl ether (MTBE)	µg/l	-	-	-	-	No published standards

Parameter	Unit	Drinking Water Standards		Environmental Quality Standards		Comment
Benzene	µg/l	1	DWS	10 (50)	AA (MAC)	
Ethylbenzene	µg/l	300	WHO	20 (200)	AA (MAC)	Former EQS for List II substances
Toluene	µg/l	700	WHO	74 (380)	AA (95)	
o-Xylene	µg/l	500	WHO	30	AA	
p/m-Xylene	µg/l	500	WHO	30	AA	
Aliphatics EC5-EC6	µg/l	15000	WHO	-	-	
Aliphatics EC6-EC8	µg/l	15000	WHO	-	-	
Aliphatics EC8-EC10	µg/l	300	WHO	-	-	
Aliphatics EC10-EC12	µg/l	300	WHO	-	-	
Aliphatics EC12-EC16	µg/l	300	WHO	-	-	
Aromatics EC5-EC6	µg/l	10	WHO	-	-	
Aromatics EC6-EC8	µg/l	700	WHO	-	-	
Aromatics EC8-EC10	µg/l	300	WHO	-	-	
Aromatics EC10-EC12	µg/l	90	WHO	-	-	
Aromatics EC12-EC16	µg/l	90	WHO	-	-	
SVOCs						
Anthracene	µg/l	-	-	0.1 (0.1)	AA (MAC)	
Benzo(a)pyrene	µg/l	0.01	DWS	0.00017 (0.27)	AA (MAC)	
Benzo(b)fluoranthene	µg/l	0.1	DWS	0.00017 (0.017)	AA (MAC	
Benzo(k)fluoranthene	µg/l			0.00017 (0.017)	AA (MAC	
Benzo(ghi)perylene	µg/l			0.00017 (0.0082)	AA (MAC)	
Indeno(123cd)pyrene	µg/l			0.00017	AA	
Fluoranthene	µg/l	-	-	0.0063 (0.12)	AA (MAC)	
Naphthalene	µg/l	-	-	2.0 (130)	AA (MAC)	

Sources

The Water Supply (Water Quality) Regulations 2016: Statutory Instruments 2016 No. 614. *In addition, drinking water is required to be wholesome and therefore any substances that taint water supply (odour or taste) will effectively be set a drinking water standard equivalent to the taste/odour objection threshold.*

Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

The Environment Agency's Chemical Standards Database (http://evidence.environment-agency.gov.uk/chemicalstandards/)

Notes

DWS	Drinking Water Standard
WHO	World Health Organisation Drinking Water Guidelines
SW	Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996
BW	Bathing Water (Classification) Regulations 1991
AA	Annual average
MAC	Maximum allowable concentration
-	No water standard specified

APPENDIX G

Risk classification methodology

Risk classification methodology

The method of risk evaluation adopted in this document is consistent with CIRIA C552 (2001). Hence, risk is considered to be a function of both the probability (likelihood) of contamination occurring at the study site and also the potential severity (consequence) of the environmental impacts associated with this contamination.

The classification system used to define contaminant probability, consequence and risk is described in the following tables.

Table A: Classification of probability

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

Table B: Classification of consequence

Classification	Receptor	Definition	Examples
Severe *(acute risks)*	Humans	Short-term (acute) risk to human health likely to result in "significant harm" as defined in the CTL Statutory Guidance	High concentrations of cyanide on the surface of an informal recreation area
	Controlled waters	Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource	Major spillage of contaminants from site into controlled water
	Property	Catastrophic damage to buildings/property	Explosion resulting from methane accumulation, causing building collapse (can also equate to an acute human health risk if buildings are occupied)
	Ecology	A short-term risk to a particular ecosystem, or organism forming part of such eco-system	Potentially significant derogation of a designated site or protected species
Medium *(long-term)*	Humans	Chronic damage to human health ("significant harm" as defined in the Contaminated Land Statutory Guidance)	Concentrations of a contaminant from site exceed the GAC or SSAC
	Controlled waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution)	Leaching of contaminants from a site to a Principal or Secondary Aquifer

Classification	Receptor	Definition	Examples
	Property	Significant damage to sensitive crops, buildings, structures and services	Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability)
	Ecology	A significant change in a particular ecosystem, or organism forming part of such ecosystem	Death of a species within a designated nature reserve
Mild *(long-term; less sensitive receptors)*	Humans	Contamination present although unlikely to constitute a significant chronic health risk to sensitive receptors	Concentrations of chemical species that exceed the GAC or SSAC for a low sensitive land-use e.g. public open space
	Controlled waters	Pollution of non-sensitive water resources	Pollution of non-classified groundwater
	Property	Damage to sensitive. buildings/structures/services	Aggressive ground conditions leading to potential for long term degradation of buried concrete
	Ecology	Damage to the environment	Localised damage to aquatic habitat causing temporary relocation of certain species
Minor *(long-term; less significant receptors)*	Humans	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.)	The presence of contaminants at such concentrations that protective equipment is required during site works.
	Controlled waters	Potential minor release of contamination to local water features	Short term or low volume release of potentially polluting material to a secondary surface water course of low existing quality
	Property	Easily reparable effects of damage to buildings, structures and services. Harm which may result in a financial loss, or expenditure to resolve.	The loss of plants in a landscaping scheme. Discolouration of concrete
	Ecology	Short term, localised damage may occur; consequences are spatially and temporally limited	Short term or localised disruption to in situ flora or fauna; no lasting effects

Table C: Risk classification (comparison of consequence and probability)

Probability (likelihood)		Consequence (severity)			
		Severe	***Medium***	***Mild***	***Minor***
	High likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk