Gedney, Oliver

From: Gedney, David
Sent: 11 August 2020 10:24
To: _planningadvice
Subject: FW: H22-0381-19 (Hanson-Roose)
Attachments: 0666-2 Proposed Residential Development The Hollies 30 Austendyke Road Weston Hills Spalding Lincs - Phase 2 Report - August 2020-signed.pdf

Please scan email and attachment – 6SUP (Phase 2 Report)

Regards.

David Gedney

David Gedney | Senior Planning Officer| **South Holland District Council**
dgedney@sholland.gov.uk
DDI: 01775 764468 |
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Please note that any informal officer opinion expressed by this email is without prejudice and is not binding on the Council during the consideration of any formal application.





From: G R MERCHANT [mailto:grmerchant.arch.cons@gmail.com]
Sent: 11 August 2020 09:26
To: Gedney, David
Subject: H22-0381-19 (Hanson-Roose)

Mimecast Attachment Protection has deemed this file to be safe, but always exercise caution when opening files.

This message originated from outside your organization

Dear David,

Please see attached phase 2 report with respect to the above application.

Regards
Hannah

G R Merchant Ltd
01406 490800
www.grmerchantltd.com

Goldfinch
ENVIRONMENTAL LTD

PROPOSED RESIDENTIAL DEVELOPMENT
THE HOLLIES
30 AUSTENDYKE ROAD
WESTON HILLS
SPALDING
LINCS..

PROPOSED RESIDENTIAL DEVELOPMENT THE HOLLIES 30 AUSTENDYKE ROAD WESTON HILLS SPALDING LINCS..

GEOENVIRONMENTAL GROUND INVESTIGATION REPORT

Report Ref.: 0666/2

Prepared by :

D Sargeant
D Sargeant
BSc FGS

Date:

August 2020

Goldfinch Environmental Limited
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CONTENTS

1.	INTRODUCTION	3
2.	LIMITATIONS	5
3.	LEGISLATIVE AND REGULATORY SETTING	6
4.	SITE LOCATION AND DESCRIPTION	7
5.	PRELIMINARY QUALITATIVE RISK ASSESSMENT – REPRODUCED FROM THE PHASE 1 DESK STUDY REPORT	8
6.	ENVIRONMENTAL SITE INVESTIGATION	12
7.	DISCUSSION OF CHEMICAL LABORATORY TEST RESULTS	14
8.	CONCEPTUAL MODEL & RISK ASSESSMENT	19
9.	REMEDIATION RECOMMENDATIONS	22
10.	CONCLUSIONS	23

FIGURES

- Figure 1 Site Location Plan
- Figure 2 Proposed Layout Plan
- Figure 3 Exploratory Location Plan [Over Proposed Layout]
- Figure 4 Raised Determinant Location Plan (Over Proposed Layout)

APPENDICES

- Appendix 1 Exploratory Location Records (Logs)
- Appendix 2 Chemical Laboratory Test Report

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PROPOSED RESIDENTIAL DEVELOPMENT

THE HOLLIES, 30 AUSTENDYKE ROAD

WESTON HILLS

SPALDING

LINCS..

1. INTRODUCTION.

1.1 General.

This report describes the findings of a geoenvironmental ground investigation undertaken by Goldfinch Environmental Limited, on the instruction of Mrs C Hanson-Roose (the Client), via the offices of G R Merchant Ltd to the rear of The Hollies, 30 Austendyke Road, Weston Hills, Spalding, Lincolnshire.

The investigation was required by the LPA (South Holland District Council, {SHDC}, Env. Health) as part of the planning regime and follows the preparation [by this Author] and issue of a Phase 1 [Desk Study] Report dated March 2019.

Planning reference **H06-0772-19** refers.

In accordance with the planning system the scope of work described in this report was the result of the submission of a proposal to SHDC Environmental Health which broadly described the fieldwork, chemical laboratory testing and reporting that would be carried out, and, following their approval the work was carried out as described below.

A site location plan as Figure 1, and a proposed layout plan (Figure 2), have been included towards the back of this report to assist the reader.

1.2 Additional Information.

This Phase 2 investigation report follows preparation [by this Author] and issue of a Phase 1 Desk Study report reference '*Proposed Residential Development, The Hollies, 30 Austendyke Road, Weston Hills, Spalding, Lincolnshire*' dated March 2019.

It is recommended that the referred Phase 1 Report is read in conjunction with this Phase 2 report.

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1.3 Regulatory Comment & Further Information.

It was understood by this Author that land to the west of the site had been subject to "remediation" according to the Regulator. Searches on the SHDC Planning Portal revealed that the "remediation" comprised removal [with validation] of an underground storage tank.

The Reader is referred to the Planning Portal for more specific details, however it should be noted that while the documentation associated with the removal of the tank revealed an absence of impact on the soil environment from that feature in the interest of the "precautionary" approach preferred by the Regulator the extent of the fieldwork and [as appropriate] the chemical laboratory testing was slightly amended along that boundary to reflect this.

The Reader should also note that the site within which the referred tank was located has subsequently been developed to a residential land use with private gardens.

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2. LIMITATIONS.

This report is for the sole reliance and use of the Client. Any Third Party coming into possession of this report relies on it at their risk, unless written permission is expressly sought from, and provided by, Goldfinch Environmental Limited. The author owes them no duty of care and skill. Goldfinch Environmental Ltd accepts no responsibility or liability for the consequences of this document being used for purposes other than that for which it was commissioned and the assessments provided herein should not be relied on as a legal opinion.

The findings and opinions expressed are relevant to the time of the site visit and information review and should not be relied upon to represent conditions at substantially later dates. The assessments and opinions given in this report are based upon information available at the time of the report. Where additional information comes available which may affect or identify a need to review our conclusions or assessments we request the opportunity (and reserve the right), to review the information and where warranted, modify our assessment / opinion in part or wholly, accordingly.

The purpose of this desk study report was to determine the historical use of the site and adjacent areas from searches of Public Registers and a review of available historical maps and included a site reconnaissance ('walkover') survey together with brief internet searches. The outcome of these activities is described below and this information was used to construct a conceptual model for the site from which a risk assessment was completed in the context of the proposed residential development of the site.

The risk assessment was based on the source-pathway-receptor framework, with respect to the geoenvironmental condition of the site in the context of various sensitive receptors. Goldfinch Environmental Ltd have based this desk study upon the sources given in this report, and believes them to be reliable but cannot and does not guarantee the authenticity or reliability of the data it has relied upon.

This desk study does not include any geotechnical considerations pertaining to the site as these were outside the agreed brief.

The recommendations given in this report are based on guidance and best practice in place at the time of issue of the report, the information available at the time of the investigation, the nature of the indicated proposed development and associated end user behaviour patterns. Should any of the foregoing change at any time, then this report should be reviewed in the context of proposed changes.

The absence of indicators in search data, or from on site observations does not rule out their presence in other parts of the site. This desk study report has been based on information supplied in the 'GroundSure' report and its component parts included at Appendix 1 towards the back of this report, discussions with the Client and in-house searches.

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3. LEGISLATIVE & REGULATORY SETTING.

The Environmental Protection Act of 1990 created the framework for the identification and remediation of contaminated land. The Act defines “contaminated land” as any land, which appears by the Local Authority to be “in such a condition, by reason of substances, in, on, or under the land that significant harm is being caused or there is significant possibility of such harm being caused, or, pollution of Controlled Waters is being, or is likely to be, caused”.

Land potentially affected by ‘contamination’ is a material consideration for planning purposes together with its relationship with ‘regulatory intervention’ (Part IIa), and ‘voluntary’ investigation (which includes redevelopment of sites which may be affected by contamination). The Model Procedures (CLR-11, Environment Agency 2004), provide a generic framework indicating key technical activities applicable in each of these contexts.

The management of land contamination broadly comprises three components that are identified as ‘Risk assessment’, ‘Options appraisal’ and ‘Implementation’. These, in turn, determine if any *un*acceptable risks exist, ascertain the most appropriate remediation strategy for the site and, finally, demonstrate that the strategy will be effective.

In accordance with this and other current guidance, where a ‘land quality’ risk assessment is required each ‘Relevant Pollutant Linkage’ (RPL, formerly referred to as “source-pathway-receptor” framework), is separately identified and a level of risk attached. This is documented in the form of a ‘Conceptual Model’.

The outcome of the assessment of established, plausible relevant pollutant linkages is used to determine qualitatively the need for further investigation, or remediation with ensuing mitigation of the determined unacceptable risk. (In accordance with the Model Procedures and Regulatory preference, detailed remedial measures should be provided in a separate phase).

The risk assessment takes account of the local environment, end user behaviour patterns, and the nature of the development in relation to proven ‘unacceptable’ risk. This is the approach advocated by current guidance (CLR-11 and BS10175 etc), and therefore has been adopted in the assessment of this site.

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4. SITE LOCATION AND DESCRIPTION.

4.1 Introduction.

A site description was provided in Section 4 of the Phase 1 Desk Study. Between issue of the Desk Study report and preparation and issue of this Phase 2 Investigation Report there were no apparent changes to the site layout. However, all the vehicles shown were no longer present and the Workshop appeared to have been vacated together with some of the skips and oil drums shown in the Desk Study, which were actually 'off-site' i.e. *outside* the application area.

The Reader is reminded at this point that the southern site boundary commences from a minimum of 2.5-3m north of the northern elevation of the Workshop as shown in Figure 2 and 3 towards the back of this report. Oil drums etc shown on Section 4 of the Desk Study were all within this 2.5-3m margin to the south of the Application area.

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5. PRELIMINARY QUALITATIVE RISK ASSESSMENT – REPRODUCED FROM THE PHASE 1 DESK STUDY REPORT.

5.1 Introduction.

There are three factors that are taken into account whilst undertaking a qualitative risk assessment. These have been described in Section 3 of this document. At the time of this report, the site had been proposed for residential development.

5.2 Conceptual Model.

Source (s) (Potential)	Pathway	Target	Risk
Soil: The site had existed as 'developed' plot of land since at least 1887 with min or changes shown on the 1968 and 1971 map editions with no further documented changes up to and including the time of the site walkover survey carried out by this Author during 21 March 2019. Database searches indicated a historic site use as a '*Garage*' [1968], but there are no records to suggest the site has accommodated tank(s) in association with the garage. There were no site-specific indicators of potential soil-borne contamination, except for a small area near the southern boundary of the site where a waste oil tank was located with a small number of subordinate oil drums nearby as discussed in Section 4 of this report. At the time of the site walkover dark staining was noted in the gravel surfaces in this part of the site suggesting possible soil impact from this feature although there were no odours noted. Visual and olfactory indicators of potential contamination immediately nearby off site were not noted.	❖ Dermal contact, ingestion and inhalation	• Present users • End users • Construction workers • General public	• Low • Low • Low • Low
	❖ Wind erosion and atmospheric dispersion	• Adjacent properties • General public • Ecological Systems • Archaeological Sites & Monuments	• Low • Low • Low • n/a
	❖ Leaching	• Adjacent properties • Shallow groundwater • Services/construction materials • Plant life • Surface water • Ecological Systems • Arch. & Monuments	• Low • Low • Low • Low • Low • Low • Low
Shallow groundwater: The site overlies 'Unproductive' aquifers, which were not considered to be pollution sources.	❖ Groundwater migration	• Adjacent properties • Deep groundwater • Services/construction materials • Plant life • Ecological Systems • Archaeological Sites & Monuments	• Low • Low • Low • n/a • Low • Low
	❖ Dermal contact, ingestion and inhalation	• Present users • End users • Construction workers • General public	• Low • Low • Low • Neg-Low

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Gas: Measurable (background) concentrations of ground gas would not (reasonably) be anticipated to be present as a result of historical site use or the underlying natural geology. Two records of potentially infilled land were given in searches however these were indicated as 'Unspecified Heap'. Additionally searches showed one record for "Waste Treatment, Transfer & Disposal Site" and planning permission had been granted for this change of use there was no evidence either at site or in other documentation that this used had been put into practice. Therefore these are no longer considered as 'plausible'.	❖ Direct inhalation ❖ Soil migration ❖ Services migration	• End users • Construction workers • Buildings • Ecological Systems • Arch. Sites & Monuments	• Low • Low • Low • Low • Neg

Negligible Risk	Defined as the site should be considered suitable for present or future use and environmental setting. Contaminants unlikely to be present, which might have unacceptable impact on key targets.
Low Risk	Defined as the site should be considered suitable for present or future use and environmental setting. Contaminants may be present but unlikely to have unacceptable impact on key targets.
Medium Risk	Defined as the site may not be suitable for present or future use and environmental setting. Contaminants are probably present and might have unacceptable impact on key targets.
High Risk	Defined as the site is probably or certainly not suitable for present or future use and environmental setting. Contaminants probably or certainly present and likely to have an unacceptable impact on key targets.
Notes:	n/a = not applicable

The risk assessment follows below:-

5.3 Targets.

Potential targets, in the context of the risk assessment (based on the relevant pollutant linkage), where a plausible pathway can be proven, are discussed as follows.

At the time of this report, the proposed scheme comprised residential development (two plots located towards the northern part of the site.).

5.3.1 Human Health (Site Users & Construction Workers)

The site had a limited documented developmental history as described above. There is limited potential for the presence of limited thicknesses of Made Ground in the form of gravelled surfaces and possible flexible surfacing and peripheral concrete.

There were no site-specific indicators of potential soil-borne contamination, except for a small area near the southern boundary of the site where a waste oil tank was located with a small number of subordinate oil drums nearby as discussed in Section 4 of this report. At the time of the site walkover dark staining was noted in the gravel surfaces in this part of the site suggesting possible soil impact from this feature although there were no odours noted. The reader will note that this location is coincident with extensive hard cover in the proposed development in the form of an access road, which will provide a permanent physical barrier between the soils in this area and the End User. Therefore this aspect of the site is no longer considered a notable or 'plausible' risk to human health.

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As part of formation of the road surface some of these soils may be removed off site once construction commences.

Based upon the foregoing and the final paragraph of this report, regarding 'unanticipated contamination:-

A *Low* risk has been identified until proven otherwise.

5.3.2 Services and Construction Materials

5.3.2.1 Concrete & Potable water supplies.

Adverse effects on services and construction materials may be anticipated where soils are impacted by localised raised/lowered pH values, PAH's, TPHs and metals contamination and where these are present in Made Ground materials. However, in this instance and based on the absence of Made Ground and the foregoing:-

A *Low* risk has been identified.

5.4 Landscaping & Planting

Based on the foregoing a '*Low*' risk is presented to this receptor.

5.5 Groundwater (Controlled Waters)

The site is underlain by '*Unproductive*' aquifers. However, there remains the potential for small quantities of perched groundwater in any superficial fills (or Made Ground), where these are present. However, searches indicated in this instance that the presence of significant thicknesses of Made Ground would not be reasonably anticipated given the documented history of the site.

A *Low* risk to deeper groundwater has been identified.

5.6 Ground Gas

Measurable concentrations of soil gases (predominantly carbon dioxide) would not be reasonably anticipated to be present as a function of any made ground present. However, where present, any granular overburden would mitigate the risk of ground gas buildup via natural ventilation of ground gas to atmosphere.

Two records of potentially infilled land were given in searches however these were indicated as 'Unspecified Heap'. Additionally searches showed one record for "Waste Treatment, Transfer & Disposal Site" and planning permission had been granted for this

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change of use there was no evidence either at site or in other documentation that this use had been put into practice. Therefore these are no longer considered as 'plausible'.

On a precautionary basis consideration may be given to installation of a membrane in the floor construction detail which, when extended across the cavity and tied into the DPC would seal out the interior of the dwelling(s) thus reducing the potential for ground gas ingress.

On the basis of the foregoing:~

A *Low* risk has been identified.

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6. ENVIRONMENTAL SITE INVESTIGATION.

6.1. Fieldwork.

Ground conditions were determined by advancing thirteen number exploratory locations (narrrow diameter boreholes) by percussive methods to depths of approximately 1.0-2.0m.

The exploratory locations, (referenced WS1-4 and 4a-12 inclusive), are shown on a plan of the site (not to scale), in Figure 3 towards the back of this report. The accompanying Exploratory Location Records (Logs) describing the soils encountered during the fieldwork have been included in Appendix 1 towards the back of this report.

Exploratory locations had been positioned having taken account of specific potential contamination sources, access, obstructions and defined/possible service locations [together with appropriate acknowledgement of the proposed layout for the development and proposed garden and soft landscaping areas, as agreed with the Regulator.

Fifteen soil samples were taken across a variety of depths within the soil profile from the boreholes for chemical laboratory testing with a view to assessing their suitability for retention [either under hard cover or in landscaped and garden areas] at the site.

Site operations were carried out generally in accordance with BS 5930, “Code of Practice for Site Investigation”, and BS 10175:2011 as required by the Regulator.

Soil samples for inorganic analyses were placed in 1-litre plastic tubs which sealed upon closure, or where necessary, for organics analysis, in 250ml amber glass jars with PTFE-lined screw-on tops or 60ml glass vials as directed by the laboratory.

Where appropriate, samples were placed in cool-boxes, pre-cooled to $4^{o}C \pm 2^{o}C$, for delivery to the chemical test laboratory.

6.2. Laboratory Analyses.

Upon completion of the fieldwork nine soil samples were despatched, under chain of custody, to a UKAS and MCERTS accredited analytical laboratory for analysis.

The analytical schedule for the soil samples (variously) comprised a broad suite of determinants which included a metals suite, pH, SOM, and Speciated PAHs together with asbestos identification, and following visual inspection of arising soils, petroleum hydrocarbons, as agreed with the Regulator.

The Chemical Laboratory Test Report(s) containing the factual test results are included in Appendix 2 towards the back of this report.

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6.3 Groundwater Observations During Fieldwork.

Groundwater was not encountered in any of the boreholes during the fieldwork.

6.4. Proven Ground Conditions.

6.4.1. Overview.

The soil profile encountered within the thirteen boreholes was relatively consistent within, and between, the exploratory locations and generally comprised a thin horizon of [inert] Made Ground over firm to stiff multicoloured clayey silt or silty clay and rarely, 'Sand'.

6.4.2. Made Ground

This horizon was encountered in all the exploratory locations and was generally described as loose fine to coarse gravel size fragments of angular flint and comminuted brick with a slightly variable fine to coarse sand matrix. Locally [WS4a, WS5, WS6, WS7, WS8] occasional asphalt inclusions were noted and in WS9 only, fine to coarse sand to fine gravel sized fragments of ash.

In the exploratory locations this horizon was present at depths between existing ground level and a maximum depth of 0.85m in WS4a.

6.4.3. Cohesive Soils ~ Silt & Clay

This horizon was encountered in all the exploratory locations at depths between approximately 0.10m [WS9] and 0.85m [WS4a] and was generally described as firm to stiff mulitcoloured occasionally mottled black or dark red clay or silt.

The base of this horizon was beyond the target depth of the investigation.

6.5. Evidence of Potential Contamination.

Indicators, olfactory or visual, of potential contamination in the arising soils at any of the exploratory locations were noted as follows:~

Ash Fragments	Asphalt Inclusions	Flint / Comminuted Brick / Concrete	Odours
WS8, WS9	WS4a, WS5, WS6, WS7, WS8	WS2, WS4, WS4a, WS5, WS6, WS7,WS8, WS9, WS12	WS2

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7. DISCUSSION OF CHEMICAL LABORATORY TEST RESULTS.

7.1. Overview.

This section of the report provides commentary on the interpretation of the results of the chemical laboratory testing of the fifteen soil samples obtained from the site. The outcome of the review was to be carried forward into the [updated] Conceptual Model and Risk Assessment for the site which is included in Section 9 of this report.

The site has been proposed for residential development possibly with private gardens as described in Section 1 of this report and as shown in Figure 2 towards the back of this report. For the purpose of the assessment of the chemical laboratory test results [for the soil samples were compared to the LQM/CIEH 'S4UL' values for 'residential with home-grown produce' were employed as required by the Regulator with an organic matter content of **6.0**% (based upon the results of the chemical laboratory testing) taking the precautionary approach as required by the Regulator. [The reader should note that in the absence of an 'LQM/CIEH/S4UL' for lead the 'C4SL' value of 200mg kg^{-1} was employed.]

7.2. Land Contamination.

7.2.1. Inorganic Determinants.

7.2.1.1 Metals Suite

Twelve soil samples were tested for a suite of metals which included Arsenic, Lead, Copper, Nickel, Chromium, Zinc, Cadmium, Selenium and Mercury.

When compared to current guidance values for human health assessment ['residential land use with home-grown produce'] two of the soil samples exceeded the guidance value for **arsenic** [37mg kg^{-1}]. The referred soils samples were **WS5, D1 @ 0.25-0.45m** and **WS12, D1 @ 0.32-0.42m**. The measured concentrations were 49 and 48 $mgkg^{-1}$ respectively.

Four of the soil samples exceeded the guidance value for **lead** [200mg kg^{-1}]. The referred soil samples were **WS4a**, **D1 @ 0.25-0.35m, WS5**, **D1 @ 0.25-0.45m**, **WS10**, **D1 @ 0.20-0.30m** and **WS12**, **D1 @ 0.32-0.42m**. The measured concentrations were 290, 120, 740 and 270 $mgkg^{-1}$ respectively.

7.2.1.2 Asbestos

Two soil samples were scheduled for asbestos identification. The sample locations were based upon proximity to a building near the southern site boundary which appeared to have an asbestos content in its fabric and the second was from a possible garden area near the boundary of a site to the west of the application area which had seen

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commercial / industrial usage. [The Reader should note that this testing was carried out on a 'precautionary' basis as fragments of possble asbestos-containing materials were not particularly noted in soils at these locations.].

7.2.2. Organic Determinants.

Twelve soil samples were analysed for speciated polycyclic aromatic hydrocarbons (PAHs), a suite of sixteen species sometimes referred to as 'congeners'. The sixteen 'congeners of concern' are discussed individually in Sections 7.2.2.i-xvi inclusive of this report.

7.2.2.i. Napthalene.

Twelve soil samples were analysed for this determinant. One of the samples [**WS3, D1 @ 0.40-0.50m**] exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 13.0mg kg^{-1}. The measured concentration was recorded as **43**mg kg^{-1}.

7.2.2.ii. Acenapthylene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 920mg kg^{-1}.

7.2.2.iii. Acenapthene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 1100mg kg^{-1}.

7.2.2.iv. Fluorene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 860mg kg^{-1}.

7.2.2.v. Phenanthrene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 440mg kg^{-1}.

7.2.2.vi. Anthracene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 11000mg kg^{-1}.

7.2.2.vii. Fluoranthene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 890mg kg^{-1}.

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7.2.2.viii. Pyrene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 2000mg kg^{-1}.

7.2.2.ix. Benzo[a]anthracene.

Twelve soil samples were analysed for this determinant. Two of these [**WS3, D1 @ 0.40-0.50m** and **WS5, D1 @ 0.25-0.45m**] exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 13mg kg^{-1}. The measured concentrations were recorded as **61** and **58**mg kg^{-1} respectively.

7.2.2.x. Chrysene.

Twelve soil samples were analysed for this determinant. Two of these [**WS3, D1 @ 0.40-0.50m** and **WS5, D1 @ 0.25-0.45m**] exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 27mg kg^{-1}.

The measured concentrations were recorded as **57** and **53**mg kg^{-1} respectively.

7.2.2.xi. Benzo[b]fluoranthene.

Twelve soil samples were analysed for this determinant. Four of these [**WS3, D1 @ 0.40-0.50m**, **WS4a, D1 @ 0.25-0.35m**, **WS5, D1 @ 0.25-0.45m** and **WS6, D1 @ 0.35-0.45m**] exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 3.7mg kg^{-1}.

The measured concentrations were recorded as **58**, **8.2**, **58** and **13**mg kg^{-1} respectively.

7.2.2.xii. Benzo[k]fluoranthene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 100mg kg^{-1}.

7.2.2.xiii. Benzo[a]pyrene.

Twelve soil samples were analysed for this determinant. Four of these [**WS3, D1 @ 0.40-0.50m**, **WS4a, D1 @ 0.25-0.35m**, **WS5, D1 @ 0.25-0.45m** and **WS6, D1 @ 0.35-0.45m**] exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 3.0mg kg^{-1}.

The measured concentrations were recorded as **58**, **8.2**, **58** and **13**mg kg^{-1} respectively.

7.2.2.xiv. Indeno(1,2,3-c,d)Pyrene.

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Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 41mg kg^{-1}.

7.2.2.xv. Dibenz(a,h)Anthracene.

Twelve soil samples were analysed for this determinant. Four of these [**WS3, D1 @ 0.40-0.50m**, **WS4a, D1 @ 0.25-0.35m**, **WS5, D1 @ 0.25-0.45m** and **WS6, D1 @ 0.35-0.45m**] exceeded the LQM-CIEH S4UL 'residential with home-grown produce' guidance value for this determinant of 0.3mg kg^{-1}.

The measured concentrations were recorded as **8.5**, **1.6**, **7.7** and **1.9**mg kg^{-1} respectively.

7.2.2.xvi. Benzo[g,h,i]perylene.

Twelve soil samples were analysed for this determinant. None of these exceeded the LQM-CIEH S4UL 'residential with home-grown produce' value of 340mg kg^{-1}.

7.2.3 Total Petroleum Hydrocarbons [TPHs]

The arising soils in boreholes WS2 and WS6 were noted to possibly possess weak 'hydrocarbon' odours. No staining or 'free-product' was noted. However on a precautionary basis, laboratory analysis for this potential contaminant was carreid out.

The measured concentrations did not exceed the assessment / guidance values and where 'measurable' concentrations were recorded these values were considered to be 'very low' and additionally comprised the 'heavier' least volatile fraction suggesting that the ground gas risk from their continued degradation would be considered 'low' and therefore this aspect of the site is not considered to be a '*plausible*' source of contamination.

7.3 Concluding Remarks to Section 7.

7.3.1. Soils.

7.3.1.1. Inorganic Determinants.

In summary, the results of the chemical laboratory testing showed that two of the soil samples exceeded the guidance value for **arsenic** [37mg kg^{-1}]. The referred soils samples were **WS5, D1 @ 0.25-0.45m** and **WS12, D1 @ 0.32-0.42m**. The measured concentrations were **49** and **48** $mgkg^{-1}$ respectively.

Four of the soil samples exceeded the guidance value for **lead** [200mg kg^{-1}]. The referred soil samples were **WS4a**, **WS5**, **WS10**, and **WS12** as discussed above. The measured concentrations were **290**, **120**, **740** and **270** $mgkg^{-1}$ respectively.

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Asbestos was *not* identified in the tested samples.

7.3.1.2. Organic Determinants.

The results of the chemical laboratory testing showed that four of the tested soil samples exceeded the guidance values employed for human health risk assessment for these determinants. The referred samples are **WS3, D1 @ 0.40-0.50m**, **WS4a, D1 @ 0.25-0.35m**, **WS5, D1 @ 0.25-0.45m** and **WS6, D1 @ 0.35-0.45m**] variously, for six of the sixteen PAH Congeners i.e.

- **naphthalene**
- **benzo[a]anthracene**
- **chrysene**
- **benzo[a]anthracene**
- **benzo[a]pyrene**
- **dibenz[a,h]anthracene**

Minor concentrations of 'heavy' petroleum hydrocarbons were recorded in one soil sample. The 'lighter' and potentially higher risk fractions were recorded at concentrations which were at, or below, the detection limit for the test method.

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8. UPDATED CONCEPTUAL MODEL & RISK ASSESSMENT.

8.1. Overview.

In accordance with guidance current at the time of this report, there are three principal factors that are assessed whilst undertaking a qualitative risk assessment. These are described above in Section 3 in the context of 'Relevant Pollution Linkages' (RPL). At the time of this report, the site had been proposed for redevelopment to a residential land use therefore 'residential with home-grown produce' assessment criteria were used for the assessment of the laboratory testing results as described above and the following risk assessment.

8.1.1. Conceptual Model.

Sources (Proven)	Pathway	Target	Risk
Soil: The intrusive investigation has shown six soil samples from the twelve boreholes exceeded the 'residential with home-grown produce' S4UL guidance values as follows:~ ➢ **WS3: naphthalene; benz[a]anthracene; chrysene; benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene.** ➢ **WS4a: lead; benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene.** ➢ **WS5: arsenic; lead; benz[a]anthracene; chrysene; benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene.** ➢ **WS6: benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene.** ➢ **WS10: lead.** ➢ **WS12: arsenic.** as described in Section 7 of this report .	❖ Dermal contact, ingestion and inhalation ❖ Wind erosion and atmospheric dispersion ❖ Leaching	• Present users • End users • Construction workers • General public	• Low-Med • Med-High • Med-High • Neg-Low
		• Adjacent properties • General public • Shallow groundwater • Services/construction materials • Plant life • Surface water	• Neg • Neg • Neg • Neg • Neg • Neg
Shallow groundwater: Groundwater was not encountered in any of the exploratory locations. The measured concentrations of all determinants were not considered to pose an 'unacceptable' risk to this medium.	❖ Groundwater migration	• Adjacent properties • Deep groundwater • Services/construction materials • Plant life • Surface Water	• Neg • Neg • Neg • Neg • Neg-Low
	❖ Dermal contact, ingestion and inhalation	• Present users • End users • Construction workers • General public	• Neg • Neg • Neg • Neg

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Gas: Chemical laboratory testing showed the soils had a low organic matter content and as the arising soils were assessed there was no evidence of organic material/organic odours. In WS2 the chemical laboratory testing showed that the TPH concentrations were not a 'plausible' risk to human health.	❖ Direct inhalation ❖ Soil migration ❖ Services migration	• End users • Construction workers • Buildings	• Neg • Neg • Neg

Negligible Risk	Defined as the site should be considered suitable for present or future use and environmental setting. Contaminants unlikely to be present, which might have unacceptable impact on key targets.
Low Risk	Defined as the site should be considered suitable for present or future use and environmental setting. Contaminants may be present but unlikely to have unacceptable impact on key targets.
Medium Risk	Defined as the site may not be suitable for present or future use and environmental setting. Contaminants are probably present and might have unacceptable impact on key targets.
High Risk	Defined as the site is probably or certainly not suitable for present or future use and environmental setting. Contaminants probably or certainly present and likely to have an unacceptable impact on key targets.

The risk assessment follows below:~

8.2. Risk Assessment.

8.2.1. Targets.

Potential targets/receptors, in the context of the risk assessment, where a plausible pathway can be proven, are discussed under separate subheadings as follows:-

8.2.2. Human Health (Site Users[1] & Construction Workers).

Measured concentrations of arsenic, lead and six of the sixteen PAH congeners variously exceeded the respective guidance S4UL/C4SL values in six of the twelve soil samples for the land use '*residential with home-grown produce*'.

Figure 3 and 4 show locations WS6, WS4a, and possibly WS5 appear to be in soft landscape /garden areas. This should be confirmed by the Client or Agent prior to commencement of any further site works.

Locations WS3, WS10 and WS12 appear to be in areas of [permanent] hard cover which comprise either the access road or parking areas/footpaths. This should be confirmed by the Client or Agent prior to commencement of any further site works.

In the context of the proposed end use for the site and the localised distribution, depth, measured concentration values and contaminant type:-

A *Low-Medium* risk to this Receptor [Present Users, the site is currently unoccupied and 'not in use'] has been associated with the site.

A *Medium-High* risk to Construction Workers [Ground Workers] and End Users [Occupants of the future dwellings] is associated with the site.

[1] Current & End User
[2] UK Water Industry Research. GUIDANCE FOR THE SELECTION OF WATER SUPPLY PIPES TO BE USED IN BROWNFIELD SITES. *Report Ref. No. 10/WM/03/21*. 2010.

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8.2.3. Services and Construction Materials.

8.2.3.1. Concrete.

Concentrations of determinants are not considered to present an 'unacceptable' risk to this medium.

A *Negligible* risk has been identified.

8.2.3.2. Potable Water Supplies.

UK Water Industry Research (UKWIR), provides guidance[2] on material selection to prevent water supply lines failing prematurely. The chosen parameters are based on the potential for:

(a) taste or odour impairment of potable waters by permeation of organic contaminants through polymer-based pipework;

(b) the structural or physical deterioration of pipework materials;

(c) the contamination of the interior surfaces pipework when undertaking maintenance;

(d) health and safety of workers when undertaking repairs.

Some of these parameters follow other existing guidance, which have either been withdrawn or updated including the WRAS guidance of October 2002 (e.g., ICRCL and BRE Special Digest 1).

The UKWIR report only cites organic determinants as contaminants of concern. The investigation has shown very localised instances of marginally elevated PAHs in soils. Therefore:~

A *Negligible* risk has been identified.

8.2.4. Landscaping & Planting.

No signs of stress or unusual staining in plant life was noted.

A *Negligible* risk to plantlife has been identified.

[2] UK Water Industry Research. GUIDANCE FOR THE SELECTION OF WATER SUPPLY PIPES TO BE USED IN BROWNFIELD SITES. *Report Ref. No. 10/WM/03/21*. 2010.

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9. REMEDIATION RECOMMENDATIONS.

9.1. Land Contamination - Soils.

Based upon the results of the chemical laboratory testing the soils at the affected location are '*not suitable for retention'* in the proposed residential development where these fall within proposed garden or soft landscaped areas.

It is anticipated that 'management' (remediation) of soils in the affected locality is warranted *where these are coincident with soft landscaping and private gardens* in the proposed development in order to bring the site into a condition where the Regulator may consider it 'suitable for use' and thus consider discharging the relevant planning condition.

It is anticipated that the affected soils [i.e. those not suitable for use in the soft landscape and garden areas in the proposed development] will need to be replaced. Or, consideration may be given to sustainable reuse of these materials under permanent hard cover where topographic level changes allow.

The planning regime requires that specific remedial details will need to be submitted to the LPA in the form of a Remediaiton Method Statement [RMS] which should be approved by the LPA prior to the site works going ahead.

To comply with planning requirements the RMS should be prepared in accordance with the relevant requirements/sections of the 'YALPAG' guidance 'Technical Guidance for Developers, Landowners and Consultants' [now dated June 2020].

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10. CONCLUSIONS.

This geoenvironmental ground investigation report prepared by Goldfinch Environmental Limited was undertaken on the instruction of Mrs C Hanson-Roose (the Client), via the offices of G R Merchant Ltd to the rear of The Hollies, 30 Austendyke Road, Weston Hills, Spalding, Lincolnshire.

Thirteen narrow diameter boreholes [with one 'refusal'] were advanced across the site from which twelve soil samples were tested for a broad suite of determinants with six of these locations showing [variously] raised concentrations of lead and arsenic and several PAH Congeners.

In the light of this, and that the site is proposed for residential development an *overall Medium-High* risk to human health to the scheme occupier is associated with the site *subject to the final paragraph in this report.* However, once the soil replacement has been carried out in accordance with planning guidance requirements this risk may be downgraded accordingly.

Recommendations for the need for further work (or otherwise) and management of the findings of the Phase 2 investigation have been discussed in Section 9 of this report.

Also, at all times especially once any necessary groundworks have commenced, the final paragraph below applies regarding 'unanticipated' contamination.

The reader should note that the opinions, recommendations and conclusions in this report are subject to the agreement of the Local Authority who are the final arbiters in these matters.

Based on the foregoing and the location, depth, and single occurrence of raised determinant concentration, a *Med-High* risk to construction [ground] workers and services installations has been associated with the site until proven otherwise. Site personnel, particularly groundworkers, should follow sound health and safety welfare practices that will further mitigate this level of risk.

The Reader should note that the recommendations, opinions and comments presented in this report are based upon the proposed layout shown in Figure 2 towards the back of this report. Where changes to this are proposed it is recommended these changes are documented and submitted to the LPA for approval accordingly together with a review of this report to ensure that appropriate remedial works are being undertaken thus ensuring that the site remains 'safe for development' in the opinion of the LPA.

Should unanticipated contamination be suspected, or revealed during any groundworks, then the area should be temporarily isolated and further advice sought by a suitably independent qualified person and a management strategy for these occurrences should be submitted to the Local Authority for their approval prior to proceeding, as required by Regulatory Offices.

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FIGURES

Approximate Site Location

N

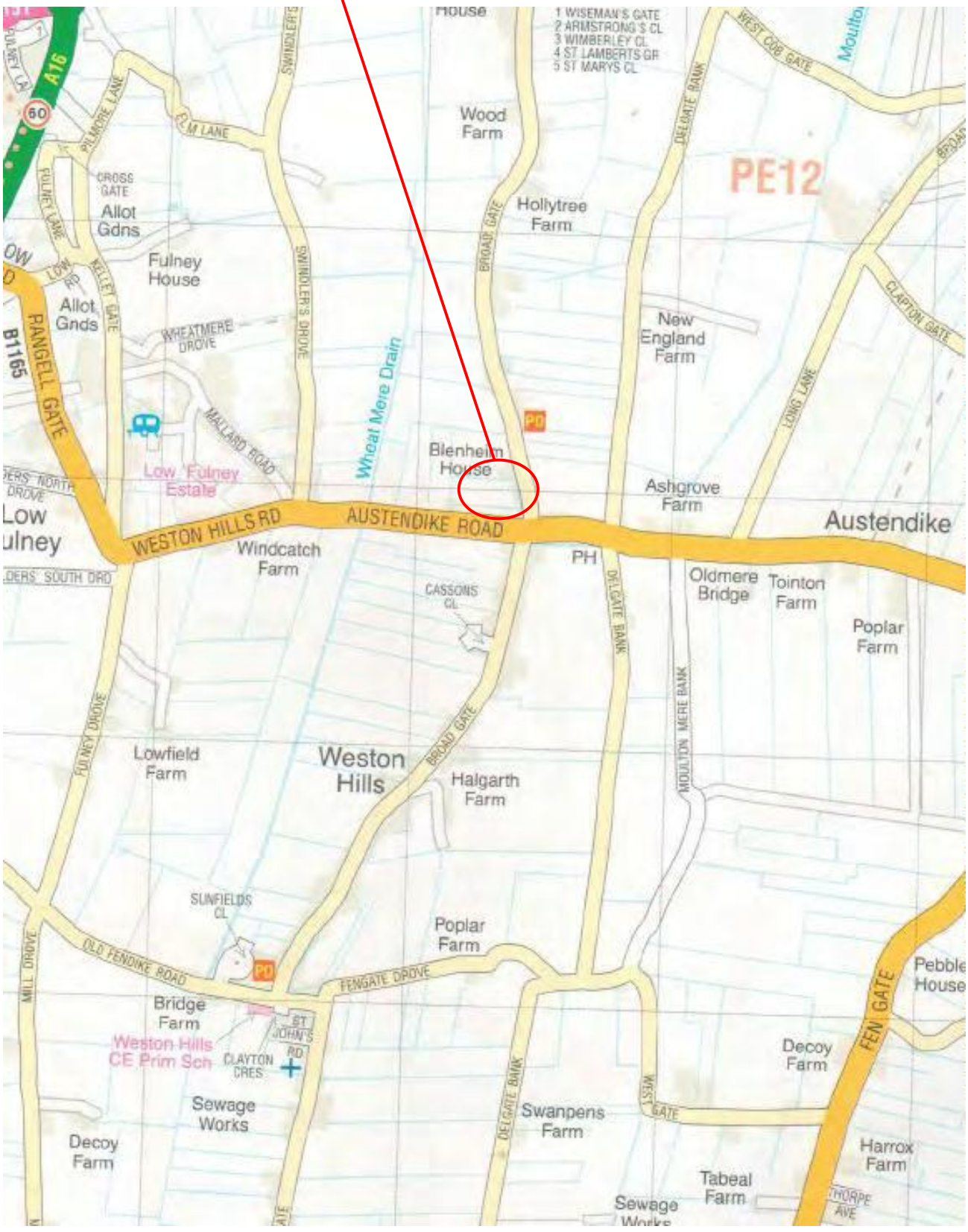


Figure 1	Site Location Plan	**Goldfinch** Environmental Ltd
Ref: 0666/2		



Figure 2	Proposed Layout Plan	**Goldfinch** Environmental Limited
Ref: 0666/2		

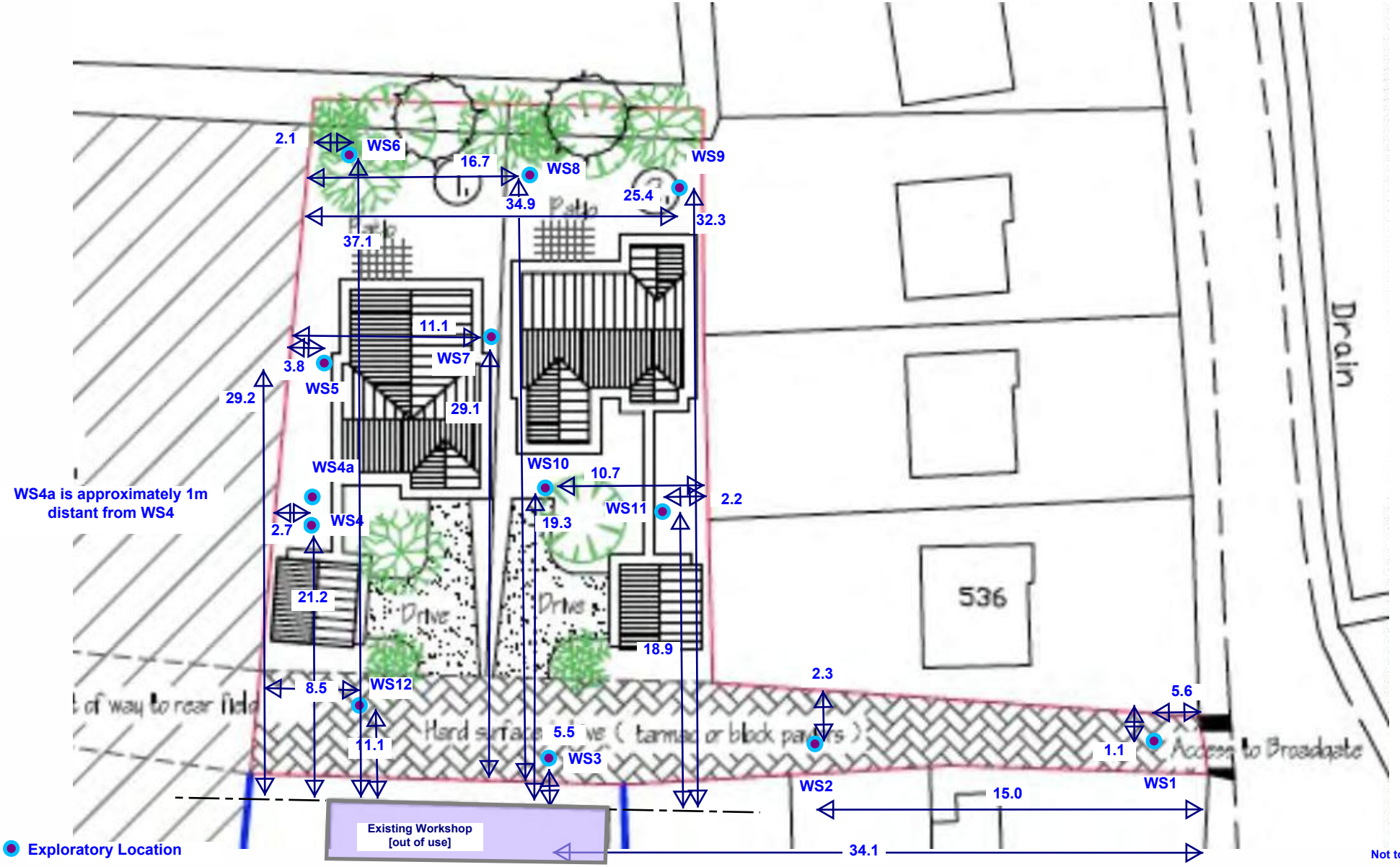


Figure 3	Exploratory Location Plan [Over Proposed Layout]	**Goldfinch** Environmental Limited
Ref: 0666/2		



Figure 4	Plan To Show raised Determinant Concentrations Over Proposed Layout Plan	**Goldfinch** Environmental Limited
Ref: 0666/2		

APPENDIX 1

Exploratory Location Records [Logs]

Goldfinch ENVIRONMENTAL LTD

EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS1 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground [Inert] comprising loose gravel of angular flint with dark brown sand matrix and sparse weed cover.	-	-
0.01	Loose dark brown angular flint gravel and fine to coarse sand.	D1=0.35-0.45	-
0.55	Firm to stiff dark brown silty clay [Occasionally dark red mottled from approximately 1.60m.].	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 2m.

Goldfinch ENVIRONMENTAL LTD

EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS2 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground [Inert] comprising loose gravel of angular flint with dark brown sand matrix and sparse weed cover.	J1=0.3-0.35	Possible weak [transient] hydrocarbon odours 0.30-0.35m]
0.35	Firm to stiff dark brown silty clay. [Rare fine gravel size angular fragments of comminuted brick]	D1=0.38-0.48	-
0.60	Firm to stiff dark grey and dark brown silty clay.	-	-
1.50	Firm to stiff dark orange brown silty clay.	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination [other than referred weak hydrocarbon odour @ 0.30-0.35m].
3. Location terminated at 2.0m.

Goldfinch ENVIRONMENTAL LTD

EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS3 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground [Inert] comprising loose gravel of angular flint with dark greyish-brown sand matrix.	-	-
0.17	Firm to stiff dark greyish brown slightly clayey silt.	D1=0.40-0.50 D2=0.20-0.30	-
0.50	Firm to stiff dark grey brown slightly clayey silt.	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 2.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS4 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground [Inert] comprising loose 'multicoloured' gravel of angular flint with dark greyish-brown sand matrix.	-	-
0.12	Concrete fragments. ['Refusal']	-	Horizon not fully penetrated & Borehole terminated on 'obstruction'.

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at approx. 0.12m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS4a **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground comprising compacted multicoloured fine to coarse gravel sized fragments of angular comminuted brick and flint with occasional asphalt inclusions and possible comminuted lean mix concrete.	-	-
0.85	Firm to stiff dark grey mottled black silty clay.	D1=0.25-0.35	-
1.70	Firm to stiff dark reddish brown silty clay.	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 2.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS5 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground comprising compacted multicoloured fine to coarse gravel sized fragments of angular comminuted brick and flint with occasional asphalt inclusions and possible comminuted lean mix concrete.	-	-
0.18	Loose gravel sized fragments of angular comminuted flint and ash with occasional asphalt.	-	-
0.22	Firm to stiff friable dark brown silty clay.	D1=0.25-0.45	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination [with possible exception of occasional asphalt inclusions].
3. Location terminated at 2.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS6 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground comprising compacted multicoloured fine to coarse gravel sized fragments of angular comminuted brick and flint with occasional asphalt inclusions and possible comminuted lean mix concrete.	D1=0.35-0.45 J1=0.45-0.55	-
0.55	Firm to stiff [friable] dark brown occasionally mottled black silty clay.	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 1.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS7 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground comprising compacted multicoloured fine to coarse gravel sized fragments of angular comminuted brick and flint with occasional asphalt inclusions and possible comminuted lean mix concrete.	-	-
0.28	Firm to stiff [friable] dark brown occasionally mottled black silty clay [becoming dark orange brown from approximatetly 0.65m.]	D1=0.28-0.38	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 1.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS8 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground comprising compacted multicoloured fine to coarse gravel sized fragments of angular comminuted brick and flint with occasional asphalt inclusions and possible comminuted lean mix concrete.	-	-
0.20	Firm to stiff [friable] dark grey occasionally mottled black silty clay. [Small pocket of ash at approximately 0.20-0.25m.].	-	-
0.45	Firm to stiff dark brown occasionally mottled orange brown silty clay.	D1=0.45-0.50	-
0.85	Firm to stiff [friable] dark orange brown and dark brown occasionally mottled black clayey silt.	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination [other than occasional asphalt and ash inclusions.].
3. Location terminated at 1.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS9 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground comprising compacted fine to coarse gravel sized fragments of angular comminuted brick and flint with occasional 'ash' inclusions.	-	-
0.10	Firm to stiff dark brown silty clay.	-	-
0.21	Firm to stiff dark brown [becoming occasionally mottled black] silty clay.	D1=0.30-0.40	-
0.45	Firm to stiff orange brown and dark brown silty clay.	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination [except for the 'ash' inclusions.].
3. Location terminated at 1.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS10 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground [inert] comprising compacted fine to coarse gravel sized fragments of angular comminuted flint with fine to coarse sand matrix.	-	-
0.12	Firm to stiff friable dark greyish brown silty clay.	-	-
0.18	Firm to stiff dark grey occasionally mottled brown silty clay with rare fine to coarse gravel sized fragments of subrounded chalk.	D1=0.20-0.30	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 1.0m.

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EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS11 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground [inert] comprising compacted fine to coarse gravel sized fragments of angular comminuted flint and occasional yellow brick with fine to coarse sand matrix.	-	-
0.35	Firm to stiff friable dark yellowish brown silty clay.	D1=0.50-60	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 1.0m.

Goldfinch ENVIRONMENTAL LTD

EXPLORATORY LOCATION LOG

Site: Weston Hills

Location Ref: WS12 **Date**: 27 July 2020

Depth	Description	Sampling depth (m)	Remarks
0.00	Made Ground [inert] comprising fine to coarse gravel sized fragments of angular comminuted flint and red brick with fine to coarse sand matrix.	-	-
0.22	Firm to stiff dark greyish brown slightly gravelly silty clay. Gravel is fine to coarse angular comminuted concrete and red brick.	-	-
0.32	Firm to stiff dark grey/black silty clay.	D1=0.32-0.42	Possible [weak] 'alluvial' odour
0.85	Firm to stiff grey slightly sandy clayey silt.	-	Horizon not fully penetrated

Notes:
1. Groundwater not encountered.
2. No apparent indicators of contamination.
3. Location terminated at 1.0m.

APPENDIX 2

Chemical Laboratory Test Report

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

Final Report

Report No.:	20-19915-1
Initial Date of Issue:	06-Aug-2020
Client	Goldfinch Environmental Ltd
Client Address:	19 Palmer Street Walsham-le-Willows Bury St. Edmunds Suffolk IP31 3BZ
Contact(s):	Group Email Address
Project	0666/2 Weston Hills
Quotation No.:	
Order No.:	
No. of Samples:	15
Turnaround (Wkdays):	5
Date Approved:	06-Aug-2020
Approved By:	
Details:	Glynn Harvey, Technical Manager

Date Received:	28-Jul-2020
Date Instructed:	30-Jul-2020
Results Due:	05-Aug-2020

Results - Soil

Project: 0666/2 Weston Hills

Client: Goldfinch Environmental Ltd				**Chemtest Job No.:**	20-19915	20-19915	20-19915	20-19915	20-19915	20-19915	20-19915	20-19915	20-19915
Quotation No.:				**Chemtest Sample ID.:**	1040905	1040906	1040907	1040908	1040909	1040910	1040911	1040912	1040913
				Client Sample ID.:	D1	D1	J1	D1	D2	D1	D1	D1	J1
				Sample Location:	WS1	WS2	WS2	WS3	WS3	WS4a	WS5	WS6	WS6
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.35	0.38	0.30	0.40	0.20	0.25	0.25	0.35	0.45
				Bottom Depth (m):	0.45	0.48	0.35	0.50	0.30	0.35	0.45	0.45	0.55
				Date Sampled:	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020
				Asbestos Lab:					DURHAM		DURHAM		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A					-		-		
Asbestos Identification	U	2192	%	0.001					No Asbestos Detected		No Asbestos Detected		
ACM Detection Stage	U	2192		N/A					-		-		
Moisture	N	2030	%	0.020	18	22	24	9.6		6.9	7.1	11	20
Stones and Removed Materials	N	2030	%	0.020	< 0.020	< 0.020		< 0.020		< 0.020	< 0.020	< 0.020	
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown		Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones		Stones	Stones	Stones and brick	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Clay	Sand		Sand	Sand	Sand	Clay
pH	M	2010		4.0	8.4	8.2		10.0		10.5	9.1	9.2	
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	2.2	3.2		1.4		1.4	2.1	1.5	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.025	0.040		0.26		1.1	0.34	0.14	
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50		< 0.50		< 0.50	< 0.50	< 0.50	
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50		< 0.50		< 0.50	< 0.50	< 0.50	
Thiocyanate	M	2300	mg/kg	5.0	< 5.0	< 5.0		< 5.0		< 5.0	< 5.0	< 5.0	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	7.5	4.7		240		150	330	190	
Sulphate (Total)	M	2430	%	0.010	0.10	0.11		0.54		0.69	0.48	0.41	
Arsenic	M	2450	mg/kg	1.0	21	19		21		26	49	23	
Cadmium	M	2450	mg/kg	0.10	0.20	0.33		0.24		0.32	0.36	0.28	
Chromium	M	2450	mg/kg	1.0	15	21		26		20	41	23	
Copper	M	2450	mg/kg	0.50	31	44		24		26	31	56	
Mercury	M	2450	mg/kg	0.10	0.31	0.58		< 0.10		0.17	0.13	0.15	
Nickel	M	2450	mg/kg	0.50	21	20		26		23	36	22	
Lead	M	2450	mg/kg	0.50	170	130		130		290	120	190	
Selenium	M	2450	mg/kg	0.20	0.33	0.30		< 0.20		< 0.20	< 0.20	< 0.20	
Zinc	M	2450	mg/kg	0.50	87	190		95		140	140	140	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50		< 0.50		< 0.50	< 0.50	< 0.50	
Organic Matter	M	2625	%	0.40	9.3	6.4		5.0		2.1	4.8	2.2	
Total Organic Carbon	M	2625	%	0.20		3.7		2.9					6.4
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			< 1.0						< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			< 1.0						< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0						< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0						< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0						< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0			< 1.0						< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0			77						< 1.0

Results - Soil

Project: 0666/2 Weston Hills

Client: Goldfinch Environmental Ltd					**Chemtest Job No.:**	20-19915	20-19915	20-19915	20-19915	20-19915	20-19915	20-19915	20-19915
Quotation No.:					**Chemtest Sample ID.:**	1040905	1040906	1040907	1040908	1040909	1040910	1040911	1040912	1040913
					Client Sample ID.:	D1	D1	J1	D1	D2	D1	D1	D1	J1
					Sample Location:	WS1	WS2	WS2	WS3	WS3	WS4a	WS5	WS6	WS6
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.35	0.38	0.30	0.40	0.20	0.25	0.25	0.35	0.45
					Bottom Depth (m):	0.45	0.48	0.35	0.50	0.30	0.35	0.45	0.45	0.55
					Date Sampled:	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020
					Asbestos Lab:					DURHAM		DURHAM		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0						< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0			77						< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0			< 1.0						< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0			< 1.0						< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0						< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0						< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0						< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0			24						< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0			260						< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0						< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0			290						< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0			360						< 10
Naphthalene	M	2700	mg/kg	0.10	0.21	0.23		43		4.3	0.81	0.64	
Acenaphthylene	M	2700	mg/kg	0.10	0.13	0.12		4.1		0.51	1.7	0.75	
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10		41		4.4	16	3.6	
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10		50		5.1	22	4.7	
Phenanthrene	M	2700	mg/kg	0.10	0.76	0.89		290		25	210	27	
Anthracene	M	2700	mg/kg	0.10	0.30	0.26		72		8.0	51	8.1	
Fluoranthene	M	2700	mg/kg	0.10	2.3	2.2		220		23	200	25	
Pyrene	M	2700	mg/kg	0.10	2.3	1.9		200		22	200	25	
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.1	0.91		61		9.7	58	10	
Chrysene	M	2700	mg/kg	0.10	1.4	1.1		57		9.8	53	11	
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.1	1.2		58		8.2	58	13	
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.56	0.40		24		3.9	24	5.4	
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.3	1.2		51		8.9	47	11	
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	0.97	0.75		28		6.6	26	8.1	
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.27	0.18		8.5		1.6	7.7	1.9	
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	1.8	1.1		23		4.9	21	6.6	
Total Of 16 PAH's	M	2700	mg/kg	2.0	15	12		1200		150	1000	160	
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30		< 0.30		< 0.30	1.9	< 0.30	

Results - Soil

Project: 0666/2 Weston Hills

Client: Goldfinch Environmental Ltd		**Chemtest Job No.:**			20-19915	20-19915	20-19915	20-19915	20-19915	20-19915
Quotation No.:		**Chemtest Sample ID.:**			1040914	1040915	1040916	1040917	1040918	1040919
		Client Sample ID.:			D1	D1	D1	D1	D1	D1
		Sample Location:			WS7	WS8	WS9	WS10	WS11	WS12
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.28	0.45	0.30	0.20	0.50	0.32
		Bottom Depth (m):			0.38	0.50	0.40	0.30	0.60	0.42
		Date Sampled:			27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020
		Asbestos Lab:								
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A						
Asbestos Identification	U	2192	%	0.001						
ACM Detection Stage	U	2192		N/A						
Moisture	N	2030	%	0.020	19	20	16	18	14	21
Stones and Removed Materials	N	2030	%	0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Sand	Sand	Sand	Sand
pH	M	2010		4.0	8.4	8.3	8.3	8.0	8.0	8.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	3.6	3.3	3.1	2.5	2.5	7.0
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.14	0.042	0.083	0.056	0.17	0.22
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thiocyanate	M	2300	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	62	26	3.7	4.0	2.7	43
Sulphate (Total)	M	2430	%	0.010	0.14	0.084	0.081	0.13	0.092	0.59
Arsenic	M	2450	mg/kg	1.0	14	10	8.7	18	11	48
Cadmium	M	2450	mg/kg	0.10	0.24	0.11	< 0.10	0.68	< 0.10	0.37
Chromium	M	2450	mg/kg	1.0	14	14	14	14	14	22
Copper	M	2450	mg/kg	0.50	29	46	23	72	17	80
Mercury	M	2450	mg/kg	0.10	0.19	0.26	0.21	0.20	0.43	0.29
Nickel	M	2450	mg/kg	0.50	18	18	17	18	15	46
Lead	M	2450	mg/kg	0.50	130	33	21	740	30	270
Selenium	M	2450	mg/kg	0.20	0.34	0.34	0.27	0.29	0.25	0.89
Zinc	M	2450	mg/kg	0.50	140	87	63	230	56	260
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	9.0	3.3	2.2	5.7	1.9	21
Total Organic Carbon	M	2625	%	0.20	5.2		1.3		1.1	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0						
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0						
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0						
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0						
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0						
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0						
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0						

Results - Soil

Project: 0666/2 Weston Hills

Client: Goldfinch Environmental Ltd			**Chemtest Job No.:**		20-19915	20-19915	20-19915	20-19915	20-19915	20-19915
Quotation No.:			**Chemtest Sample ID.:**		1040914	1040915	1040916	1040917	1040918	1040919
			Client Sample ID.:		D1	D1	D1	D1	D1	D1
			Sample Location:		WS7	WS8	WS9	WS10	WS11	WS12
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.28	0.45	0.30	0.20	0.50	0.32
			Bottom Depth (m):		0.38	0.50	0.40	0.30	0.60	0.42
			Date Sampled:		27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020
			Asbestos Lab:							
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0						
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0						
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0						
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0						
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0						
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0						
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0						
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0						
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0						
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0						
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0						
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0						
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.26	< 0.10	0.69
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.18	< 0.10	0.21
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.15	< 0.10	0.16
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.24	< 0.10	0.19
Phenanthrene	M	2700	mg/kg	0.10	0.91	< 0.10	< 0.10	2.1	< 0.10	1.2
Anthracene	M	2700	mg/kg	0.10	0.36	< 0.10	< 0.10	0.81	< 0.10	0.37
Fluoranthene	M	2700	mg/kg	0.10	0.97	0.31	< 0.10	3.9	< 0.10	3.0
Pyrene	M	2700	mg/kg	0.10	1.1	0.36	< 0.10	3.7	< 0.10	3.0
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.7	< 0.10	1.4
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.8	< 0.10	1.7
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.9	< 0.10	1.6
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.82	< 0.10	0.78
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.6	< 0.10	1.6
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.95	< 0.10	1.0
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.23	< 0.10	0.31
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.3	< 0.10	1.5
Total Of 16 PAH's	M	2700	mg/kg	2.0	3.3	< 2.0	< 2.0	22	< 2.0	19
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

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

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