GroundSolve Ltd
Consulting Geotechnical Engineers

VERIFICATION REPORT – PLOT 17/18, HERITAGE COURT, ACREFAIR

GSL3059R11

VERSION 1

22 AUGUST 2025

FINAL

Prepared for:

GOWER HOMES

Prepared by: A Bell

GroundSolve Ltd

DOCUMENT CONTROL

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Project Engineer:	A Bell
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This report has been prepared by GroundSolve Ltd with all reasonable care and diligence, within the best practice and guidance current at the time of issue within the proposed redline boundary and proposed Site end use as presented by the Client.

This report is confidential to the Client and GroundSolve Ltd accepts no responsibility whatsoever to third parties to whom this report is presented.

Version No.	Description of Issue / Revision	Date of Issue	Author	Reviewed By	Approved By
1	FINAL	22/08/2025	A Bell BSc (Hons) FGS	Eve Rowland MESci (Hons) FGS	Sam Fishburne BEng MSc FGS CGeol RoGEP

CONTENTS

1 INTRODUCTION 4
1.1 Proposed Development 4
1.2 Objectives 5
1.3 Previous Investigations 6
1.4 Limitations 6
2 SITE DETAILS AND DESCRIPTION 7
3 PREVIOUS INVESTIGATIONS 8
4 VERIFICATION OF TOPSOIL AND SUBSOIL 11
4.1 Introduction 11
4.2 Unexpected Contamination 11
4.3 Source of Topsoil / Subsoil 11
4.4 Site works 12
4.5 Description of Topsoil and Thickness 12
4.6 Verification of Topsoil and Subsoil – Sampling and Testing 12
5 CONCLUSIONS 14
5.1 Clean Cover Depth 14
5.2 Topsoil and Subsoil Material 14
5.3 Conclusions 14
6 REFERENCES 15
7 DEFINITIONS 16

APPENDICES

APPENDIX A - DRAWINGS
APPENDIX B – SITE PHOTOGRAPHS (PLOT 17/18)
APPENDIX C – CHEMICAL TEST RESULTS
APPENDIX D –SUMMARY OF CHEMICAL TEST

1 INTRODUCTION

GroundSolve Ltd was commissioned by Gower Homes to undertake a verification report for Plots 17 & 18, which is part of a wider development off Llangollen Road, Acrefair in North Wales referred to as Heritage Court (the "Site").

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Welsh Local Government Assoc- Development of Land Affected By Contamination Guide for Developers 2017
- Part IIA of the Environment Protection Act, 1990
- BS5930:2015: "Code of practice for site investigations"
- BS10175: 2011 +A2:2017 "Investigation of Potentially Contaminated Sites - Code of Practice"
- The Building Regulations 2010. Part C (HM Government 2013)
- Environment Agency: Land Contamination Risk Management (LCRM), Version 3, October 2020
- Environment Agency (2017) "The Environment Agency's Approach to Groundwater Protection" November 2018 Version 1.2.

1.1 Proposed Development

The proposed development comprises the construction of 22 No. three and four-bedroom residential properties with associated gardens, roads and services. This verification report relates to plot 17 and 18 only.

It is understood that the Principal Contractor for the development is Gower Homes Ltd.

Planning Application number P/2021/0793 – Condition 4 outlines:

"Each part of the site subject to the remediation under the scheme approved as part of condition 3 shall not be occupied/used until a validation report has been completed in respect of that part of the site."



Figure 1: Extract from proposed development plan (see Appendix A)

The findings and conclusions of the risk assessments have been set out and recommendations given for the proposed residential end use.

1.2 Objectives

The report provides verification of site material, compares site conditions and soil chemical parameters to the specification for verification as agreed with Wrexham County Borough Council in the Remediation Strategy outlined in GroundSolve Ltd report GSL3059R01-1 Issued, 26th February 2024.

1.3 Previous Investigations

The following reports have already been undertaken and will be summarised in Section 3:

- Phase II Assessment, South Site (Former Engineering Works), Acrefair, Wrexham – carried out by WSP (Reference 9460(2), dated July 2011. which encompassed the current site of interest within a larger parcel of land.
- Coal Mining Risk Assessment Report undertaken by Earth Environmental & Geotechnical Ltd (Reference: A3341/17, August 2017)
- Phase 1 Preliminary Risk Assessment undertaken by Earth Environmental & Geotechnical Ltd (Ref. A3341/19, dated 17th December 2019)
- Phase 2 Ground Investigation undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/20/SI/V2, dated 9th September 2020)
- A Soil Contamination Delineation Letter Report undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/21, dated 24th June 2020)
- Remediation Strategy - GroundSolve Ltd report GSL3059R01-1 Issued, 26th February 2024
- Gas Membrane Verification - GSL3116LR01 - Gas Membrane Verification Plots 19, 20 and 21
- Gas Membrane Verification - GSL3116LR02 - Gas Membrane Verification Plots 1, 2, 3
- Gas Membrane Verification - GSL3116LR03 - Gas Membrane Verification Plots 4, 5 and 7
- Gas Membrane Verification - GSL3116LR04 - Gas Membrane Verification Plots 6, 9 and 17-18
- Gas Membrane Verification - GSL3116LR05 - Gas Membrane Verification Plots 16

The previous site investigation reports are discussed and summarised in **Section 3** of this report.

1.4 Limitations

This report has been prepared for the sole use of Gower Homes Ltd. No other third party may rely upon or reproduce the contents of this report without the written approval of GroundSolve Ltd. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk.

2 SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	Heritage Court, Llangollen Rd, Acrefair
Site address	Llangollen Rd, Acrefair, closest postcode LL14 3HW
National Grid Reference (NGR)	328138, 343231
Approximate Site area	The area of the site is 1.12 ha.
Site shape	The site is irregular in shape with maximum dimensions of approximately 150m north-south and 155m east-west.
Current land use on the Site	The site is currently part of the new residential development with plots under various phases of construction.
Surrounding land uses	To the northwest of the site is Llangollen Road (A539) with residential properties and vacant land beyond, to the northeast is a bowling green, to the east is a steep slope with residential properties beyond and to the south is a vacant plot of land
General topography and ground levels	No up-to-date topographical survey has been provided to GSL since groundwork changes and development on the site, however the previous topographical survey suggests site slopes from generally from north to south varying between 53mOD on the northern boundary to 48.5m OD on the southern boundary. There is a steep overgrown slope along the eastern boundary ranging from 50m OD to 61m OD.

3 PREVIOUS INVESTIGATIONS

Previous reports have already been undertaken, and the findings are summarised:

- Phase II Assessment, South Site (Former Engineering Works), Acrefair, Wrexham – carried out by WSP (Reference 9460(2), dated July 2011. which encompassed the current site of interest within a larger parcel of land.
- Coal Mining Risk Assessment Report undertaken by Earth Environmental & Geotechnical Ltd (Reference: A3341/17, August 2017)
- Phase 1 Preliminary Risk Assessment undertaken by Earth Environmental & Geotechnical Ltd (Ref. A3341/19, dated 17th December 2019)
- Phase 2 Ground Investigation undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/20/SI/V2, dated 9th September 2020)
- A Soil Contamination Delineation Letter Report undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/21, dated 24th June 2020)
- Remediation Strategy - GroundSolve Ltd report GSL3059R01-1 Issued, 26th February 2024
- Gas Membrane Verification - GSL3116R01 - Gas Membrane Verification Plots 19, 20 and 21
- Gas Membrane Verification - GSL3116LR03 - Gas Membrane Verification Plots 4, 5 and 7
- Gas Membrane Verification - GSL3116LR04 - Gas Membrane Verification Plots 6, 9 and 17-18
- Gas Membrane Verification - GSL3116LR05 - Gas Membrane Verification Plots 16

In summary, from the site history, review of historical maps and site walkover survey, there was identified a low risk of potential sources of contaminants being present at the site. Any Made Ground was anticipated to be relatively thin.

Table 3.1 Summary of main findings from the Phase 1 Report.

Summary of main findings from the Phase 1 Report	
Site History	The earliest mapping (1873) shows the presence of railway tracks and sidings running though the centre of the site connecting works to the north and south. Along the southern section of the site there is a works, potentially connected to be New British Iron Works. There are also associated buildings in the north and west. There is an embankment along the eastern boundary. Offsite, there are three reservoirs / ponds relating to the works. There are other railway sidings along eastern boundary with a series of Coke Ovens further to the east. The New British Iron Works were removed by 1899 along with the majority of associated railway lines and sidings. The previous buildings were removed within the north and southern parts of the site. By 1960s, new rectangular buildings were now present in the southern part of the site. The remaining parts of the site were used for vehicle parking. The Acrefair engineering works and Air Products Engineering facility occupied to the south of the site. The former reservoirs / ponds were infilled by 1962. The site generally has remained unchanged until recently when the previous buildings were demolished.

Summary of main findings from the Phase 1 Report	
Geological Setting	Made ground – present on the site variable in thickness, deepest in southern part of site. Superficial deposits – Till (Diamicton), Devensian. Bedrock – Pennine Lower Coal Measures Formation comprising mudstone, coal seams, siltstone and sandstone), Carboniferous. Two coal seams outcrop through the site.
Mining	The site is located in a coal mining Development High Risk Area by the Coal Authority. There are 3no. associated coal seams and 1no. ironstone coal seam potentially underlying the site. There is a mine shaft present along the eastern boundary. The site is not in an area affected by historic brine or salt extraction. In an area where possible historical mining of bedded iron ore. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
Radon	The site is located in a Radon Affected Area as between 3 and 5% of properties are above the Action Level. Basic Radon protection measures will therefore be necessary.
Hydrogeology	Superficial deposits (Glacial Till) – Secondary Undifferentiated Aquifer. Bedrock(Pennine Lower Coal Measure) – Secondary A Aquifer. There are no Groundwater Abstraction Licence, Potable Abstractions or Surface Water Abstraction Licence points within 1000m of the site. The site is not located within 500m of a Source Protection Zone or Source Protection Zone within a confined aquifer
Hydrology	There are no surface water features identified within 250m of the site.
Waste	There are no records for current Environment Agency landfill records within 1km of the site There are 9no. records of historic Environment Agency landfill sites within 1.5km of the site. The closest record refers to a site located 17m to the northwest of the site (former infilled works reservoir. The site received inert, industrial waste between 1950 and 1960.
Contamination Sources	Made Ground from various phases of on-site development and railway land Made Ground is present on site known to comprise ash/clinker/ coal. Thickness of Made Ground varies from 0.3m to 2.0m. Asbestos containing materials (ACM) from former structures Ground gas associated with deep made ground, and infilled features from railway land Contaminants may therefore include heavy metals, polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), BTEX compounds, Volatile Organic Compounds (VOC), Polychlorinated Biphenyls (PCB), asbestos and ground gases (Carbon dioxide and methane).
Scope of Phase 2 Site Investigation	The scope of ground investigation works carried out at the site by GroundSolve comprised: • 6 No. Rotary boreholes (RH01-06) to a maximum depth of 30.0mbgl, • 4No Gas monitoring wells installed • 12 No. machine excavated Trial Pits to maximum depth of 3.15mbgl , • Sampling for chemical and geotechnical testing of soils, • Chemical testing.
Findings of the Phase 2 Ground Investigation	The sequence of strata encountered beneath the site was as follows: • Made Ground – Variable Made Ground was encountered in all the exploratory holes, comprising: o Asphalt hardstanding. o Gravels with varying sand and cobble content (containing brick, slag, glass, timber, clinker, concrete, metal, pottery fragments, carbonaceous fragments, sandstone and mudstone. • Clay was encountered in all the exploratory holes. The clay is thought to be a completely weathered mudstone that becomes less weathered with depth. This lithology was recovered as: o o Sandy gravelly clay (containing gravel of mudstone and carbonaceous fragments). o o Clayey mudstone was encountered in the rotary boreholes. • Mudstone was encountered in all of the rotary boreholes as: o Mudstone with occasional siltstone and sandstone bands. • Sandstone was also encountered in all of the rotary boreholes as: o Sandstone with mudstone bands and strong sandstone bands. • Coal was encountered in RH1 and RH3 and was found to be intact and separated by a thin layer of black shale.

Summary of main findings from the Phase 1 Report	
Phase 2 Conclusions – Geoenvironmental	**Human Health:** Elevated concentrations of contaminants of Lead, Mercury, TPH and PAH, with respect to the long-term protection of human health, have been identified across the site when compared to residential end use (with plant uptake) assessment criteria. **Controlled Waters:** No unacceptable risks. **Ground Gases (Human Health / Property):** Basic radon protective measures are indicated by the current guidance. Characteristic Situation 2 gas protection measures.
Remediation Strategy	In order to break potential pollutant linkages to future residential end users, it is recommended that garden areas across the site should have a clean soil cover of 600mm thickness (450mm thick in front gardens). Gas Protection measures to achieve CS2 and basic protection measures. • Floor Slab: ▪ Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement) – Score 0.5; or • Passive sub floor dispersal layer ▪ Good performance– Score 1.5; Media used to provide the dispersal layer are: ▪ No-fines gravel layer • Gas resistant membrane – Score 2.0: ▪ Visqueen Gas Barrier – suitable for Co2 and Radon protection ▪ verified in accordance with CIRIA C735. Gas Membrane Verification - GSL3116R01 - Gas Membrane Verification Plots 19, 20 and 21 Gas Membrane Verification - GSL3116LR03 - Gas Membrane Verification Plots 4, 5 and 7 Gas Membrane Verification - GSL3116LR04 - Gas Membrane Verification Plots 6, 9 and 17-18 The Gas Membrane Verification reports above have already been carried out and have been submitted to the council for review.

4 VERIFICATION OF TOPSOIL AND SUBSOIL

4.1 Introduction

The risk assessments have concluded that remediation measures are required to address risks to human health only, resulting from minor contamination in the existing Made Ground.

It should be noted that the site strip has been carried out and the majority of the Made Ground had been removed from site.

The remedial actions required are:

- Made Ground can be left in-situ below building floor slabs and future permanent hard standing (e.g., parking areas, roads, footpaths), excluding service runs and areas where future excavation might be anticipated (assuming all geotechnical requirements are met).
- Remediation is only required for below areas of gardens/soft landscaping to enable provision of uncontaminated cover soils in areas of garden/soft landscaping (minimum of 600 mm);
- Provision of a clean cover system in areas of gardens and soft landscaping. A 600 mm thick cover of 'clean and inert' capping is proposed (comprising 450 mm subsoil and 150 mm topsoil).

Imported topsoil and subsoil will be required to be analysed for a suitable suite of contaminants in relation to human health (in addition to topsoil being compliant with BS3882:2015).

The proposed development will be carried out in phases, with this verification report relating to Plots 3 only.

4.2 Unexpected Contamination

No unexpected contamination has been encountered within the garden areas of Plots 17 & 18.

4.3 Source of Topsoil / Subsoil

The source of the topsoil and subsoil is understood to have been delivered to site in 2021 and stored in stockpiles on site. The source of the topsoil and subsoil was from another residential development names Willow Cottage, Ruabon. The Phase 2 Geoenvironmental Report GSL2400 – issued October 2020 and has been provided previously.

4.4 Site works

GroundSolve were present at the site on the 1st August 2025 to describe and take samples of the topsoil and subsoil for chemical analysis and verify the thickness of the topsoil and subsoil. Photos are provided in Appendix B (topsoil and subsoil in garden areas).

4.5 Description of Topsoil and Thickness

In total, 2 No hand excavated pits were excavated in the rear gardens of plot 17 and plot 18.

Table 4.1 – Depth of Topsoil and Subsoil

Date	Exploratory Hole	Depth of Topsoil (m bgl)	Depth of Subsoil (m bgl)
01/08/2025	Plot 17 Front	0.30	0.60
01/08/2025	Plot 18 Front	0.30	0.60

Topsoil – Dark brown sandy gravelly silt with frequent rootlets. Gravel is fine-coarse sub-rounded.

Subsoil – Dark brown slightly gravelly sandy clay. Gravel is fine to coarse angular, sub-rounded.

Verification photographs of garden areas are presented in **Appendix B**.

The front and rear garden of Plots 17 & 18 shows a thickness of topsoil which is a minimum of 300mm depth and a depth of subsoil which is a minimum of 600mm bgl. All areas comply with the requirements detailed in remediation strategy.

4.6 Verification of Topsoil and Subsoil – Sampling and Testing

A total of 4 No. samples of topsoil / subsoil were analysed from the plots 17 and 18. From visual observation, the materials constituted topsoil comprising of "Dark brown sandy gravelly SILT".

The soil samples were sent to ChemTech. The laboratory is UKAS accredited in accordance with ISO17025 and is also MCERTS accredited for soil analysis in accordance with the Environment Agency's scheme. The laboratory analysis results are presented in Appendix C.

Table 4.2 – Acceptance Criteria for imported material (Topsoil and Subsoil)

Analyte	Soil Re-Use and Importation Criteria		Analyte	Soil Re-Use and Importation Criteria	
	mg/kg	Reference		mg/kg	Reference
Metals			**BTEX**		
Arsenic (total)	37	S4UL	Benzene	0.087	S4UL
Cadmium (total)	11	S4UL	Toluene	130	S4UL
Chromium (total)	520	HWT	Ethyl Benzene	47	S4UL
Chromium (hexavalent)	6	S4UL	Xylene – 0	60	S4UL
Copper (total)	200	BS3882	Xylene – M or P	56	S4UL
Lead (total)	200	C4SL			
Mercury (total inorganic)	40	S4UL	**Petroleum Hydrocarbons$**		
Nickel (total)	130	S4UL	Aliphatic > EC5 - EC6	42	S4UL
Selenium	250	S4UL	Aliphatic >EC6 - EC8	100	S4UL
Vanadium	410	S4UL	Aliphatic >EC8 - EC10	27	S4UL
Zinc (total)	2,009**	HWT	Aliphatic >EC10 - EC12	130	S4UL
			Aliphatic >EC12 - EC16	1000**	HWT
Inorganic			Aliphatic >EC16 - EC21	1000**	HWT
Sulphate	2400***	-	Aliphatic >EC21 - EC35	1000**	HWT
Phenol	120	S4UL			
			Aromatic >EC5 - EC7	70	S4UL
PAH&			Aromatic >EC7 - EC8	130	S4UL
Naphthalene	2.3	S4UL	Aromatic >EC8 - EC10	34	S4UL
Acenaphthylene	170	S4UL	Aromatic >EC10 - EC12	74	S4UL
Acenaphthene	210	S4UL	Aromatic >EC12 - EC16	140	S4UL
Fluorene	170	S4UL	Aromatic >EC16 - EC21	260	S4UL
Phenanthrene	95	S4UL	Aromatic >EC21 - EC35	1000**	HWT
Anthracene	2400	S4UL	Aromatic>EC35-44	1000**	HWT
Fluoranthene	280	S4UL	Aromatic>EC44-EC77	1000**	HWT
Pyrene	620	S4UL			
Benz(a)anthracene	7.2	S4UL	Asbestos	Not detected (<0.001%) for topsoil and subsoil	Lab LoD
Chrysene	15	S4UL			
Benzo(b)fluoranthene	2.6	S4UL			
Benzo(k)fluoranthene	77	S4UL			
Benzo(a)pyrene	2.2	S4UL			
Indeno(123cd)pyrene	27	S4UL			
Benzo(ghi)perylene	320	S4UL			
Dibenzo(ah)anthracene	0.28	S4UL			

The results of the samples collected were screened against Generic Assessment Criteria (GAC) for Human Health Risk Assessment (LQM/CIEH 2015) for a residential with gardens end-use, sandy soil with 1% SOM and pH 7.0 (presented in Table 4.1 and Appendix D).

Topsoil / Subsoil

4 No. samples were selected from the topsoil and subsoil material. All the topsoil and subsoil results pass the relevant screening criteria for residential land use with plant uptake, therefore are suitable for use within the garden areas. The results are summarised in Appendix D.

5 CONCLUSIONS

5.1 Clean Cover Depth

The remediation strategy details the requirement details the requirement for a minimum 0.60 m clean cover comprising a minimum of 200 mm topsoil across garden areas.

Visual inspection visits were performed by GroundSolve. Photographs showing the verification of depth across selected plots were found to comprise a sufficient clean cover system in accordance with the agreed remedial strategy and Welsh Local Government Association Guidance.

5.2 Topsoil and Subsoil Material

Laboratory chemical analysis results from both the recovered sub-soil and topsoil material show the samples do not exceed the agreed GACs (1% SOM).

Laboratory analysis results of recovered samples show topsoil and subsoil are generally in compliance with BS3883:2015 and BS8601:2013.

5.3 Conclusions

The report indicates that the site inspections and chemical tests results from plots 17 & 18 has met all the requirements of the remediation as outlined in the remediation strategy agreed with the Welsh Local Government Assoc Guidance.

No unexpected contamination has been encountered within plot 17 & 18.

6 REFERENCES

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7 DEFINITIONS

AOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GQRA	Generic Quantitative Risk Assessment
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
Ppm	Parts per million
Ppmv	Parts per million by volume
SAC	Special Area of Conservation
SPZ	Source Protection Zone
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest

APPENDIX A - DRAWINGS

LLANGOLLEN ROAD

BOWLING GREEN

LANCASTER TERRACE / MAES DERWYDD

SITE PLAN

BIN COLLECTION AREA
plots 4 - 8
6M WIDE PRIVATE DRIVE

BIN COLLECTION AREA
plots 12 - 20

6M WIDE PRIVATE DRIVE

2m wide footpath link

6M WIDE PRIVATE DRIVE

OPEN SPACE AND SUDS ATTENUATION AREA

ESTABLISHED SOFT LANDSCAPE AREA TO BE RETAINED TO GIVE SOFT, NATURAL BORDER WITH MAES DERWYDD

PLOTS 17-21 INCLUSIVE TO FACE OUTWARDS ONTO LLANGOLLEN ROAD

1 2 3 4 5 6 7 8 9 10 11 12 12A 14 14A 15 16 17 18 19 20 21

42 43 44 45 50 51 52 53

0M 10 20 50M

SCALE BAR 1:500

EDGE ARCHITECTS

RIBA Chartered Practice

EDGE Architects NW Ltd.
Studio 55:20
North Wales Business Park, Abergele
Conwy, LL22 8LJ

CLIENT:
Gower Homes Ltd

ADDRESS:
Former Air Products site, Llangollen Road, Acrefair LL14 3HW

PROJECT:
Proposed residential development

DRAWING No: 21-DES-001-02 D

DATE: MARCH 2022

SCALE: 1:500 @ A3

APPENDIX B – SITE PHOTOGRAPHS (PLOT 17/18)



Photo 1 – Plot 18



Photo 2 – Plot 17

APPENDIX C – CHEMICAL TEST RESULTS

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: cs@etuki.eurofins.com

Final Report

Report No.: 25-26319-1

Initial Date of Issue: 20-Aug-2025

Re-Issue Details:

Client *Groundsolve Ltd*

Client Address: *Unit 1*
85 Station Road
Queensferry
Flintshire
CH5 2TB

Contact(s): *Aaron Bell*
James Thorburn

Project *3059 Acrefair*

Quotation No.: **Date Received:** 11-Aug-2025

Order No.: PO002658 **Date Instructed:** 11-Aug-2025

No. of Samples: *4*

Turnaround (Wkdays): 7 **Results Due:** 19-Aug-2025

Date Approved: 20-Aug-2025

Approved By:

[redacted]

Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 3059 Acrefair

Client: Groundsolve Ltd				**Chemtest Job No.:**		25-26319	25-26319	25-26319	25-26319
Quotation No.:				**Chemtest Sample ID.:**		2012576	2012577	2012578	2012579
				Client Reference:		*Plot 17*	*Plot 17*	*Plot 18*	*Plot 18*
				Sample Type:		*SOIL*	*SOIL*	*SOIL*	*SOIL*
				Top Depth (m):		*0.20*	*0.50*	*0.10*	*0.60*
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type		N	2192		N/A	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	15	12	16	9.0
Soil Colour		N	2030		N/A	Brown	Brown	Brown	Brown
Other Material		N	2030		N/A	Stones and Roots	Stones	Stones and Roots	Stones and Roots
Soil Texture		N	2030		N/A	Clay	Loam	Loam	Loam
pH at 20C		M	2010		4.0	6.8	8.0	6.9	7.6
Cyanide (Total)		M	2300	mg/kg	0.50	0.50	< 0.50	0.50	< 0.50
Sulphate (Total)		U	2430	%	0.010	0.11	0.052	0.078	0.12
Sulphate (Acid Soluble)		U	2430	%	0.010	0.079	< 0.010	< 0.010	0.077
Arsenic		M	2455	mg/kg	0.5	8.6	6.5	5.8	6.0
Cadmium		M	2455	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	17	15	13	11
Copper		M	2455	mg/kg	0.50	20	14	15	16
Mercury		M	2455	mg/kg	0.05	0.08	0.05	0.06	< 0.05
Nickel		M	2455	mg/kg	0.50	14	17	11	14
Lead		M	2455	mg/kg	0.50	70	44	61	44
Selenium		M	2455	mg/kg	0.25	0.33	< 0.25	< 0.25	< 0.25
Zinc		M	2455	mg/kg	0.50	82	61	62	77
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	2.3	< 2.0	< 2.0
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	13
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	360
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	8.5	< 3.0	7.5	260
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	16
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	12	< 5.0	10	630
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	12	< 10	10	650
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	2.0

Results - Soil

Project: 3059 Acrefair

Client: Groundsolve Ltd				**Chemtest Job No.:**		25-26319	25-26319	25-26319	25-26319
Quotation No.:				**Chemtest Sample ID.:**		2012576	2012577	2012578	2012579
				Client Reference:		*Plot 17*	*Plot 17*	*Plot 18*	*Plot 18*
				Sample Type:		*SOIL*	*SOIL*	*SOIL*	*SOIL*
				Top Depth (m):		*0.20*	*0.50*	*0.10*	*0.60*
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	4.1	3.2	3.5	29
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	42	17	39	50
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	5.0	< 1.0	3.9	29
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	46	20	43	81
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	51	20	47	110
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	58	24	53	720
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	11	< 10	< 10	140
Organic Matter		M	2625	%	0.40	3.8	1.1	4.3	4.0
Total Organic Carbon		M	2625	%	0.20	2.2	0.61	2.5	2.3
TPH >C6-C10	EH_1D_Total	N	2670	mg/kg	1.0	4.8	5.5	5.6	6.4
TPH >C10-C21	EH_1D_Total	N	2670	mg/kg	1.0	38	26	27	21
TPH >C21-C40	EH_1D_Total	N	2670	mg/kg	1.0	55	30	60	30
Total TPH >C6-C40	EH_1D_Total	U	2670	mg/kg	10	98	62	93	57
Benzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.14
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2800	mg/kg	0.10	0.39	0.19	0.17	0.65
Anthracene		M	2800	mg/kg	0.10	0.11	< 0.10	< 0.10	0.15
Fluoranthene		M	2800	mg/kg	0.10	0.61	0.43	0.47	1.2
Pyrene		M	2800	mg/kg	0.10	0.55	0.39	0.44	1.1
Benzo[a]anthracene		M	2800	mg/kg	0.10	0.31	0.24	0.25	0.58
Chrysene		M	2800	mg/kg	0.10	0.32	0.26	0.30	0.59
Benzo[b]fluoranthene		M	2800	mg/kg	0.10	0.41	0.41	0.43	0.98
Benzo[k]fluoranthene		M	2800	mg/kg	0.10	< 0.10	0.11	0.15	0.38
Benzo[a]pyrene		M	2800	mg/kg	0.10	0.30	0.30	0.30	0.77
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10	0.23	0.23	0.23	0.54
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10	0.23	0.21	0.25	0.57
Coronene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's		N	2800	mg/kg	2.0	3.5	2.8	3.0	7.7

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Chemtest Sample ID	*Clients Sample Ref:*	*Clients Sample ID:*	*Clients Reference:*	*Sampled Date:*	Deviation Code(s):	Containers Received:
2012576			*Plot 17*		A,H	Amber Glass 250ml
2012576			*Plot 17*		A,H	Amber Glass 60ml
2012576			*Plot 17*		A,H	Plastic Tub 500g
2012577			*Plot 17*		A,H	Amber Glass 250ml
2012577			*Plot 17*		A,H	Amber Glass 60ml
2012577			*Plot 17*		A,H	Plastic Tub 500g
2012578			*Plot 18*		A,H	Amber Glass 250ml
2012578			*Plot 18*		A,H	Amber Glass 60ml
2012578			*Plot 18*		A,H	Plastic Tub 500g
2012579			*Plot 18*		A,H	Amber Glass 250ml
2012579			*Plot 18*		A,H	Amber Glass 60ml
2012579			*Plot 18*		A,H	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	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 <30°C.	
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.	
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.	
2455	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.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	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-MS	

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"
SOP	Standard operating procedure
LOD	Limit of detection
Text example	All items indicated in italic font represent customer-supplied information that may not be independently verified by the laboratory

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.

Any comments or interpretations are outside the scope of UKAS accreditation.

The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.

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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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.

NEW_ASB	Eurofins Chemtest Limited, 11 Depot Road, Newmarket, CB8 0AL
DURHAM	Eurofins Chemtest Limited, Unit A North Wing, Prospect Business Park, Crookhall Lane, Consett, Co Durham, DH8 7PW

Sample Deviation Codes

As a result of any of the below deviations applying, the test results may be unreliable

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 - The required amount of sample for analysis was not received

H - Appropriate cooling measures were not taken for sample transportation

Sample Retention and Disposal

All soil samples will be retained for a period of 30 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.

Report Information

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

Asbestos Tests LOD = LOQ

Limit of Detection = Limit of Quantification for asbestos results only

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

APPENDIX D –SUMMARY OF CHEMICAL TEST

Job No: 3059
Site Name: Heritage Court, Acrefair
Residential with gardens (1% SOM)

GroundSolve Ltd

Metals & Non-Metals	Plot 17 0.2	Plot 17 0.5	Plot 18 0.1	Plot 18 0.6	Adopted Guideline (mg/kg)	Source	Exceedances
Arsenic	8.6	6.5	5.8	6	37	C4SL	0
Cadmium	< 0.10	< 0.10	< 0.10	< 0.10	22	C4SL	0
Chromium	17	15	13	11	910	S4UL	0
Copper	20	14	15	16	2400	S4UL	0
Lead	0.08	0.05	0.06	< 0.05	200	C4SL	0
Mercury	14	17	11	14	40	S4UL	0
Nickel	70	44	61	44	130	S4UL	0
Total Monohydric Phenols	-	-		-	120	S4UL	0
Selenium	0.33	< 0.25	< 0.25	< 0.25	250	S4UL	0
Vanadium	-	-	-	-	410	S4UL	0
Zinc	82	61	62	77	3700	S4UL	0

Petroleum Hydrocarbons	Plot 17 0.2	Plot 17 0.5	Plot 18 0.1	Plot 18 0.6	Adopted Guideline (mg/kg)	Source	Exceedances
Benzene	< 1.0	< 1.0	< 1.0	< 1.0	0.87	C4SL	0
Toluene	< 1.0	< 1.0	< 1.0	< 1.0	130	S4UL	0
Ethylbenzene	< 1.0	< 1.0	< 1.0	< 1.0	47	S4UL	0
m,p-Xylene	< 1.0	< 1.0	< 1.0	< 1.0	56	S4UL	0
>C5-C6 Aliphatic	< 0.05	< 0.05	< 0.05	< 0.05	42	S4UL	0
>C6-C8 Aliphatic	< 0.10	< 0.10	< 0.10	< 0.10	100	S4UL	0
>C8-C10 Aliphatic	< 0.05	< 0.05	< 0.05	< 0.05	27	S4UL	0
>C10-C12 Aliphatic	< 2.0	2.3	< 2.0	< 2.0	130	S4UL	0
>C12-C16 Aliphatic	< 1.0	< 1.0	< 1.0	13	1100	S4UL	0
>C16-C35 Aliphatic	8.5	< 3.0	7.5	620	65000	S4UL	0
>C35-C40 Aliphatic	< 10	< 10	< 10	16	65000	S4UL	0
>C6-C7 Aromatic	< 0.05	< 0.05	< 0.05	< 0.05	70	S4UL	0
>C7-C8 Aromatic	< 0.05	< 0.05	< 0.05	< 0.05	130	S4UL	0
>C8-C10 Aromatic	< 0.05	< 0.05	< 0.05	< 0.05	34	S4UL	0
>C10-C12 Aromatic	< 1.0	< 1.0	< 1.0	< 1.0	74	S4UL	0
>C12-C16 Aromatic	< 1.0	< 1.0	< 1.0	2	140	S4UL	0
>C16-C21 Aromatic	4.1	3.2	3.5	29	260	S4UL	0
>C21-C35 Aromatic	42	17	39	50	1100	S4UL	0
>C35-C40 Aromatic	5	< 1.0	3.9	29	1100	S4UL	0

Polyaromatic Hydrocarbons (PAH)	Plot 17 0.2	Plot 17 0.5	Plot 18 0.1	Plot 18 0.6	Adopted Guideline (mg/kg)	Source	Exceedances
Acenaphthene	< 0.10	< 0.10	< 0.10	< 0.10	210	S4UL	0
Acenaphthylene	< 0.10	< 0.10	< 0.10	< 0.10	170	S4UL	0
Anthracene	0.11	< 0.10	< 0.10	0.15	2400	S4UL	0
Benzo(a)anthracene	0.31	0.24	0.25	0.58	7.2	S4UL	0
Benzo(a)pyrene	0.3	0.3	0.3	0.77	5	C4SL	0
Benzo(b)fluoranthene	0.41	0.41	0.43	0.98	2.6	S4UL	0
Benzo(g,h,i)perylene	0.23	0.21	0.25	0.57	320	S4UL	0
Benzo(k)fluoranthene	< 0.10	0.11	0.15	0.38	77	S4UL	0
Chrysene	0.32	0.26	0.3	0.59	15	S4UL	0
Dibenzo(a,h)anthracene	< 0.10	< 0.10	< 0.10	< 0.10	0.24	S4UL	0
Fluoranthene	0.61	0.43	0.47	1.2	280	S4UL	0
Fluorene	< 0.10	< 0.10	< 0.10	< 0.10	170	S4UL	0
Indeno(1,2,3-cd)pyrene	0.23	0.23	0.23	0.54	27	S4UL	0
Naphthalene	< 0.10	< 0.10	< 0.10	0.14	2.3	S4UL	0
Phenanthrene	0.39	0.19	0.17	0.65	95	S4UL	0
Pyrene	0.55	0.39	0.44	1.1	620	S4UL	0

Other Contaminants / Testing	Plot 17 0.2	Plot 17 0.5	Plot 18 0.1	Plot 18 0.6	Adopted Guideline (mg/kg)	Source	Exceedances
Total Organic Carbon	2.2	0.61	2.5	2.3	-	-	-
pH	6.8	8	6.9	7.6	-	-	-
Sulphide	-	-	-	-	-	-	-
Total Cyanide	0.5	< 0.50	0.5	< 0.50	-	-	-
Sulphur (free)	-	-	-	-	-	-	-
Sulphate Aqueous Extract as SO4	-	-	-	-	-	-	-