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Verification Report

Plots 24-28, 31, 32, 35, 36 Residential Development

Elizabeth Square, Durrington

December 2024



Project Details

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A	October 2024	FINAL	JB	MOH
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1 Introduction

1.1 Scheme Outline

- 1.1.1 The site is located at the former HM Revenues And Customs complex at Barrington Road, Worthing, BH12 4SD.
- 1.1.2 The redevelopment of the site comprises the demolition of the former HMRC buildings and construction of a residential development comprising a mixture of houses, apartments and a care home. Plans of the existing and proposed site layout are provided within Appendix A. Approximately, this comprises of 139 residential plots, 4 blocks of flats, and a care home.
- 1.1.3 The development is controlled under the Worthing Borough Council planning regime, under the planning application number AWDM/0605/22.
- 1.1.4 This Verification Report is for the verification of all remedial requirements associated with Plots 24 to 28, 31, 32, 35 and 36 only. A proposed development plan is included below, with the plots covered by this report highlighted in red, plots verified under previous reports are shown in pink.

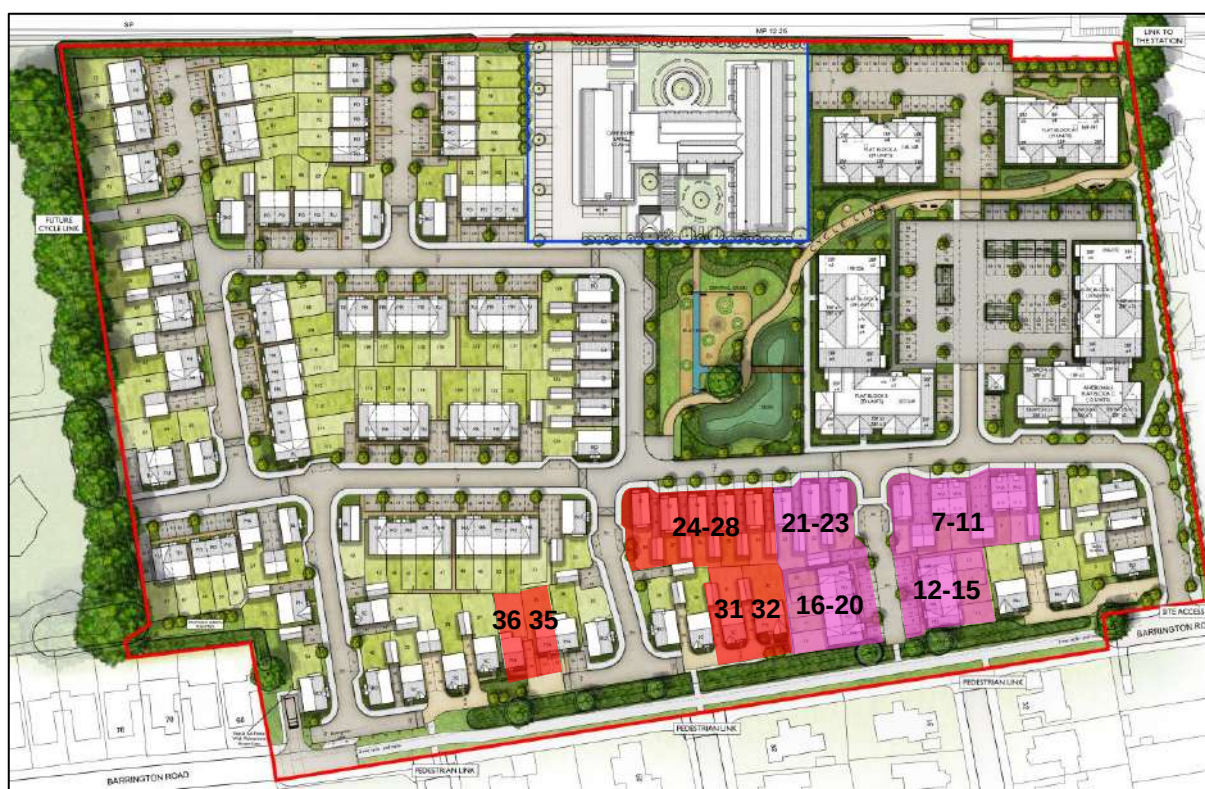


Figure 1-A: Proposed Layout and Plots In Scope

1.2 Brief

- 1.2.1 To facilitate the safe development of the project, a Remediation Strategy and Verification Plan (Report ref: STV5959-R01-Rev_C) was developed by Soiltechnics Limited, dated May 2023.
- 1.2.2 The aim of this Verification Report is to present all relevant lines of evidence obtained directly by Soiltechnics and those provided by 3rd parties, to demonstrate the required remedial actions have been completed satisfactorily, and the site is suitable and safe for use, in terms of the risks from contaminated land.

1.3 Investigation Standards

- 1.3.1 The investigation followed the principles of BS10175:2011+A2:2017 '*Investigation of potentially Contaminated Sites – Code of Practice*'. The investigation was also undertaken with reference to the Environment Agency's online publication '*Land contamination risk management (LCRM)*'.

1.4 Limitations

- 1.4.1 Soiltechnics disclaims any responsibility to our Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence in accordance with the terms of our contract, taking account of the resources, investigations and testing devoted to it by agreement with our Client. This report is confidential to our Client and Soiltechnics accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

2 Site Conditions and Remedial Strategy

2.1 Sources of information

2.1.1 Reference has been made to the following sources of information. Full copies of all documents can be provided upon request.

Author	Document Title	Date & Document Reference	Report Context
Ashdown Ground Investigation Limited	Combined Geotechnical and Ground Contamination Risk Assessment	December 2018 R18-13236	Preliminary geoenvironmental risk assessment, an assessment of ground conditions and a geotechnical appraisal
Soiltechnics	Ground Investigation Report	April 2021 STS5226-G01-Rev_A	Supplementary works to address outstanding geotechnical and contamination concerns at the site.
Soiltechnics	Piling Risk Assessment	February 2023 STV5959-R02-Rev-A	A piling risk assessment in order to satisfy planning condition 29 of the planning application.
Soiltechnics	Supplementary Ground Investigation Report	May 2023 STV5959-R03-Rev_A	The previous ground investigation works identified some data gaps which required further investigation once access into previously unexplored areas of the site was facilitated.
Soiltechnics	Remediation Strategy	May 2023 STV5959-R01-Rev_C	A remedial and verification strategy for the site to address identified contaminant linkages.
Soiltechnics	Subsoil Verification Testing	August 2023 L-STV5959M-001	Stockpile sampling and characterisation work on imported subsoils. Included as Appendix D.
Soiltechnics	Verification Report (Plots 7-23)	August 2024 STV5959-R09-Rev_A	Remedial verification report for plots 7-23.

Table 2-A: Summary of Previous Reports

2.2 Relevant Contaminant Linkages

2.2.1 Both the Ashdown and Soiltechnics reports noted sporadic elevated levels of PAHs and metals within the Made Ground deposits following soil testing. In addition, asbestos fibres were identified in Made Ground local to the former maintenance compound although given the variability of the Made Ground, its presence elsewhere could not be discounted.

2.2.2 The risk assessment concluded that while sporadic, due to the sensitivity of a residential development, contaminant levels could pose an unacceptable level of risk to proposed end users, and therefore the site required remediation.

2.2.3 Relevant contamination linkages identified relate solely to human health receptors and can be summarised as follows:

- i) Inhalation of asbestos fibres present within Made Ground soils.
- ii) Contact, inhalation and ingestion of soils and dusts arising from Made Ground soils.
- iii) Accumulation and inhalation of radon.

2.2.4 Given the previous uses of the site, it was also acknowledged that there was a potential for unexpected and previously unknown contamination to be present, such as localised gross hydrocarbon contamination. If present, this had potential to impact both human health and sensitive water receptors.

2.3 Outline of Remedial Strategy

2.3.1 To mitigate the risks posed by the identified relevant contaminant linkages, the Remediation Strategy detailed four key remedial actions which required evidencing through verification works, specifically:

- i) Prepare a discovery strategy and provide a watching brief in the event of encountering unexpected or previously unencountered contamination.
- ii) Installation of barrier pipe for underground drinking water infrastructure to prevent permeation of organic contaminants into drinking water.
- iii) Install a cover system in proposed soft landscaped areas to prevent end user exposure to identified contamination.
- iv) Install basic Radon Protection measures to prevent ingress into buildings.

2.3.2 The following report sections address each remedial action in turn.

3 Unexpected Contamination

3.1 Remedial Requirement

- 3.1.1 As with the development of any site, there was the potential to encounter unexpected contamination, in particular within the areas of former oil storage and drainage interceptors.
- 3.1.2 A contamination discovery protocol was established, and a copy provided to the developer to communicate and distribute through their workforce.

3.2 Verification Works

- 3.2.1 Soiltechnics have been in regular contact with the developer throughout the enabling works and build programme, and have not been informed of any contamination discovery event. The contractors on site were aware of their reporting obligations.
- 3.2.2 In addition, the plots under scope of this Verification Report are not in any areas suspected of containing oil or fuel infrastructure.
- 3.2.3 No unexpected contamination is believed to have been encountered, and this remedial action is considered to have been satisfactorily addressed.

4 Drinking Water Barrier Pipe

4.1 Remedial Requirement & Verification Plan

- 4.1.1 To address risk from residual hydrocarbon contamination permeating into below ground drinking water infrastructure, barrier pipe was required to be installed for all new below-ground water supply pipes.
- 4.1.2 The verification of the installation was to be evidenced by the provision of delivery tickets showing protective barrier pipe has been delivered to site, and by providing photographs showing the subsequent installation.

4.2 Deviation

- 4.2.1 The contractor deviated from the agreed remedial strategy without consultation with Soiltechnics.
- 4.2.2 A Water Main Design drawing, dated June 2023, see Appendix B, shows that standard PE pipe is planned to be installed in all areas of the site, with the exception of two hotspot areas. One in the area of a known drainage interceptor tank, the other in the area of known former heating oil storage near the centre of the site.
- 4.2.3 Neither of these hotspot areas are in the plots covered by this Verification Report. It can therefore be assumed that standard PE pipe has been installed for the water supply infrastructure.
- 4.2.4 Whilst this is a significant deviation from the Remediation Strategy, the change can be retrospectively justified as chemical testing results from all three phases of intrusive work show low levels of organic contaminants outside of the highlighted hotspot areas. However, agreement should have been sought from both the consultant and the regulator.
- 4.2.5 The contractor has also provided a series of photographs showing the installation of the standard PE water mains, taken from each day of the installation works. A selection of these photographs are presented within Appendix B, and a full copy can be provided upon request.
- 4.2.6 The photographs confirm the use of standard PE pipe.
- 4.2.7 The photographs also do not show any evidence of significant hydrocarbon contamination.

4.3 Verification

- 4.3.1 Protective barrier pipe has not been installed within the drinking water infrastructure supplying the properties. However, on a review of the CSM and previous laboratory data, the site-wide recommendation was given out of an abundance of caution, and a zoned approach to barrier pipe requirement is a reasonable alteration.
- 4.3.2 Furthermore, as the photographs and video footage viewed of the service trench excavations do not show significant organic contamination to be present, the risk is considered low.
- 4.3.3 Overall, the use of standard PE pipe is considered suitable for the supply of drinking water.

5 Clean Cover Verification

5.1 Remedial and Verification Requirements

- 5.1.1 In areas of hard landscaping, no remedial works are considered necessary.
- 5.1.2 In all private gardens and planted areas of public open space, the cover requirement should be a minimum of 600mm thick. This reduces to 300mm in grassed public open space lawn areas.
- 5.1.3 All materials utilised in the cover system should be chemically suitable and laboratory testing was required to confirm suitability of the material, at a minimum testing frequency of 1 sample per 100m³ per soil type, subject to a minimum of 3 samples.
- 5.1.4 On site inspections were required to confirm the minimum thickness and adequate installation of the cover system. Based upon the overall development proposals, inspection pits were required at a frequency of one in every five plots. However, as this is a partial discharge of a smaller number of plots (7 No.), a higher pit frequency would be recommended.

5.2 Material Source

- 5.2.1 The topsoil was sourced through Eurogreen Environmental Ltd, and a pre-delivery compliance testing certificate was provided to give assurance of suitability. This is included within Appendix C.
- 5.2.2 Delivery certificates were not made available to confirm the overall volume of topsoil material imported.
- 5.2.3 Subsoil was imported from two sites, called Billingshurst and Newick. A site visit was undertaken to inspect the stockpiled materials and sample them to determine suitability prior to use. This is reported within Appendix D, and the assessment confirmed that material was suitable for use. Delivery notes of the subsoil imports have been provided, and a full copy can be provided upon request.

5.3 Clean Cover Inspection

- 5.3.1 A site visit was undertaken by Soiltechnics on the 9th October 2024, following the placement of clean cover system in Plots 24 to 28, 31 and 32 to inspect the overall thickness of the cover soils and undertake additional sampling and analysis on the topsoil and subsoil materials in-situ, with a second visit on the 29th November to inspect Plots 35 and 36.
- 5.3.2 The pit inspection records are provided within Appendix E, and confirm the cover system to be of sufficient thickness and suitable composition.
- 5.3.3 Works were ongoing at the time of the visit, and topsoil was yet to be laid within plot 31, 32, 35 and 36; however, the reduced level dig was evident and the topsoil stockpile was inspected and confirmed to be of the same source as used for the other plots.
- 5.3.4 The verification plan requires inspection pits to be completed in one of every five plots. This report includes four inspection pits complete across 9 plots, and is therefore considered sufficient. Given the observations on site, level of work observed, and evidence provided, Soiltechnics are confident that our observations made in the completed areas of the site can be applied to the other plots under consideration within this report.

5.3.5 Since completion, the contractor has provided a photographic record of the completed garden areas, provided within Appendix I.

5.3.6 An exploratory hole plan is provided below.



Figure 5-A: Pit Verification Plan

5.4 Contamination Observations

5.4.1 No visual or olfactory evidence of contamination was noted within the clean cover soils, and no suspected ACMs were identified.

5.5 Physical Verification

5.5.1 No undesirable or injurious artefacts were observed within the topsoil or subsoil, such as over-sized materials, sharps, or plastics.

5.6 Chemical Verification

5.6.1 The volume of topsoil and subsoil used across all plots has been estimated at 170m³ each (~575m² at 300mm thickness). Three samples of topsoil and three samples of subsoil were obtained over the four pits, satisfying the minimum requirement of 3 per strata and 1 per 100m³.

5.6.2 Samples obtained from site were sent to an independent accredited laboratory for chemical analysis, and the samples were handled in accordance with BS ISO 18400-105:2017 'Soil quality — Sampling Part 105: Packaging, transport, storage and preservation of samples'.

5.6.3 The chemical laboratory test results are presented in Appendix F, and the GQRA screening assessment is presented in Appendix G.

5.6.4 The results have been screened using the C4SL and S4UL generic assessment criteria, under a residential with plant uptake scenario at 1% SOM.

- 5.6.5 Of the six samples analysed, two exceedances were detected for dibenz(a,h)anthracene, which is an organic PAH compound. All other levels of contaminants, including the other PAHs were below the relevant screening criteria. No asbestos was detected under laboratory conditions, and there was no evidence of ACMs observed through field inspections.
- 5.6.6 Total PAH concentrations were below detection limits in all samples, with the exception of the topsoil in VTP24 and the subsoil in VTP31, which exhibited concentrations of dibenz(a,h)anthracene above the GAC values (0.55 and 1.3 mg/kg vs 0.24 mg/kg). There was no evidence of hydrocarbon contamination during the fieldwork and all TPH compounds are below the limit of detection (LOD).
- 5.6.7 Overall, the presence of hydrocarbon contamination is not corroborated with field observations and TPH testing, concentrations of all other PAH compounds are within acceptable levels, and the concentrations of the exceedances are within a single order of magnitude of the screening value. Overall, the exceedances are considered to pose a minimal risk to the development, and the material is safe for use.

5.7 Conclusion

- 5.7.1 Overall, the soils are considered to be suitable for use, in terms of the risks from land contamination, and placed at a sufficient thickness to protect against contamination in the underlying Made Ground at depth.

6 Gas Protection Measures

6.1 Remedial Requirement

- 6.1.1 To address risk from radon ingress, basic radon gas protection measures were required to be installed in all properties.

6.2 Verification

- 6.2.1 Membrane Testing Solutions were commissioned as the independent verifier for the scheme. They have inspected the plots under the scope of this report, and a copy of their certification of approval is provided within Appendix H.

7 Final Remarks, Monitoring & Maintenance

7.1 Remedial Works Conclusion

- 7.1.1 Remedial works carried out on the scheme comprised the installation of a clean cover system and basic radon protection measures. Verification works were undertaken through a combination of site inspections, a review of contractor supplied records, and the sampling and analysis of materials. There is sufficient lines of evidence to demonstrate the satisfactory completion of these elements.
- 7.1.2 Protective barrier pipe was required to be installed; however the developer deviated from the agreed approach without consultation with Soiltechnics. On review, the adoption of standard PE water mains is a safe and suitable approach for these plots.
- 7.1.3 Overall, the development is considered safe and suitable for use in relation to the risk of harm from land contamination.

7.2 Post Construction Monitoring

- 7.2.1 No post construction monitoring is required.

7.3 Long Term Maintenance

- 7.3.1 Post completion and following occupation of the buildings, landscaping and maintenance works may disturb or damage the clean cover system. Based upon the levels of contamination encountered and the site setting, it is considered unlikely that the cover system would be damaged in a way sufficient to compromise the protection of human health. As such, there is no formal monitoring or maintenance necessary for upkeep of the cover system.
- 7.3.2 All buildings on site have a radon gas membrane and passive ventilation. Both aspects will be adequately protected by the building slab throughout the lifespan of the property and therefore do not require regular upkeep. However, the membrane would be put at risk of damage during any significant structural; renovation works. No works must be permitted which could compromise the integrity of the installation without full consideration. Therefore, the owner of the buildings must be made aware of the location and purpose of the radon protection measures within the buildings' construction.

Appendix A Drawings

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Appendix B Drinking Water Barrier Pipe Verification



- Notes
1. This drawing has been prepared in accordance with the scope of SNR ENG Ltd's appointment by its Client and is subject to the terms and conditions of said appointment. Unless agreed in writing by SNR ENG Ltd no other party may use or rely upon the contents of this drawing.
 2. No liability is accepted by SNR ENG Ltd for any use of this drawing other than for the purpose for which it was originally prepared.
 3. This drawing should be read in conjunction with all other relevant drawings and specifications.
 4. Do not scale from this drawing; only written dimensions should be used. If in doubt contact SNR ENG Ltd. If received electronically it is the responsibility of the recipient to print this drawing to the correct scale.
 5. All dimensions are in metres unless noted otherwise.
 6. The contractor shall prior to construction check and verify that the details shown on this drawing are fully compatible with any constructed dimensions or levels. Any discrepancies should be immediately reported in writing to SNR ENG Ltd.
 7. This drawing may include data provided by third parties. No liability is accepted by SNR ENG Ltd as to the accuracy of this data.
 8. This drawing shall not be reproduced without the written permission of SNR ENG Ltd.

Disclaimer
This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any works (including but not limited to excavations) in the vicinity of SOUTHERN WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems.

CONSULT ALL UTILITY PLANS
BEFORE ANY EXCAVATION

AS-LAID Disclaimer
As-laid data capture should be recorded in accordance with Section 3.7.5 of the Code of Practice for the Self-Laying of Water Mains and Services (England and Wales). The Water Company's asset data is recorded on a geographic information (digital mapping) or CAD system. Therefore, it is important that accurate location information is supplied to the Water Company.

AS-LAID Drawing
If an As-laid drawing is required by the Water Company in AutoCAD format, please contact info@snr-eng.co.uk for further information.

KEY:

EXISTING:

WATER MAIN

FIRE HYDRANT (FH)

PROPOSED:

WATER MAIN

SERVICE CONNECTION

TEMPORARY WASHOUT (TW)

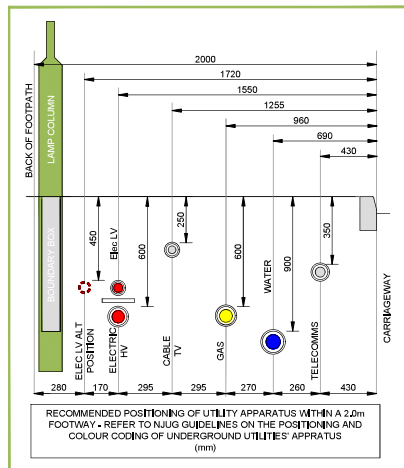
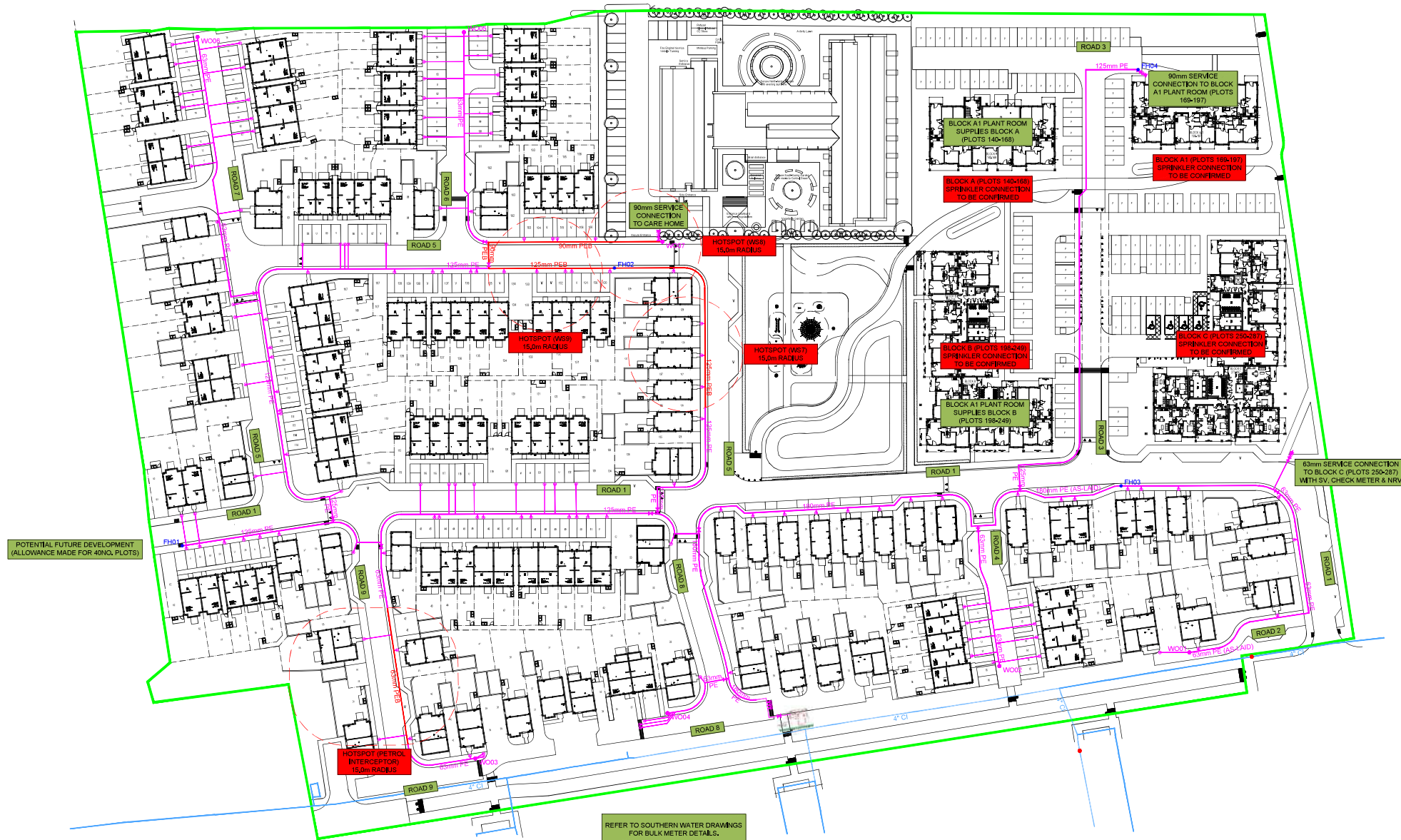
SLUCE VALVE
(ANTI-CLOCKWISE CLOSING
UNLESS STATED OTHERWISE)

WASHOUT (WO)

CHECK VALVE

NOTE:

- SERVICE CONNECTIONS <30m TO BE 25mm.
- SERVICE CONNECTIONS >30m TO BE 32mm.
- SERVICE CONNECTIONS TO PEB MAINS SHALL ALSO BE IN BARRIER PIPE.
- SERVICE CONNECTION TO CARE HOME & APARTMENT BLOCKS TO BE FITTED WITH EXTERNAL CHECK METER ARRANGEMENT (CONSISTING OF A SV, METER & CHECK VALVE).



H	BLOCK C CONNECTION AMENDED & DRAWING STATUS UPDATED FOLLOWING NAV APPROVAL	23.05.24	RAK	RAK
O	UPDATED TO SUIT CLIENT & NAV COMMENTS	28.03.24	RAK	RAK
F	UPDATED TO SUIT CLIENT & NAV COMMENTS	30.01.24	RAK	RAK
E	UPDATED TO SUIT NAV COMMENTS	17.01.24	RAK	RAK
D	UPDATED TO SUIT NEW POC & AS-LAID INFO	15.01.24	RAK	RAK
C	UPDATED TO SUIT NAV COMMENTS	15.03.23	RAK	RAK
B	UPDATED TO SUIT 1NO. POC	26.08.23	RAK	RAK
A	UPDATED TO SUIT 2NO. POCs	11.07.23	RAK	RAK

REV DESCRIPTION DATE BY AUTH

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Civil Engineering Design | Utilities Design Consultancy

Bellway

PROJECT
**BARRINGTON ROAD,
DURRINGTON ON SEA BN12 4SE**

TITLE
WATER MAIN DESIGN

DRAWN
RAK

APPROVED
RAK

SCALE
1:500 @ A0

DATE
JUN '23

PROJECT NO.
2305020

DRAWING NO.
100

REV
H

APPROVED

TABLE 1: SCHEDULE										
STREET NAME	USRN	HAUC CLASS	PIPE SIZE (mm)	MATERIAL	PRESSURE RATING	LENGTH (m)	FITTINGS			
							SV	WO	UPT	TEE
ROAD 1	-	-	180	PE	SDR17	185.5	0	0	0	4
ROAD 1	-	-	125	PE	SDR17	132.5	1	1	0	2
ROAD 1	-	-	63	PE	SDR11	36.2	1	0	0	0
ROAD 2	-	-	63	PE	SDR11	34.5	1	1	0	0
ROAD 3	-	-	125	PE	SDR17	138.2	1	1	0	0
ROAD 4	-	-	63	PE	SDR11	37.7	1	1	0	0
ROAD 5	-	-	125	PE	SDR17	172.9	2	0	0	2
ROAD 5	-	-	125	PEB	SDR17	91.2	0	1	0	0
ROAD 5	-	-	90	PEB	SDR17	52.5	1	1	0	1
ROAD 6	-	-	63	PE	SDR11	58.6	1	1	0	0
ROAD 7	-	-	63	PE	SDR11	76.5	1	1	0	0
ROAD 8	-	-	180	PE	SDR17	62.8	1	0	0	1
ROAD 8	-	-	63	PE	SDR11	21.0	1	2	0	1
ROAD 9	-	-	63	PE	SDR11	38.1	1	1	0	0
ROAD 9	-	-	63	PEB	SDR11	36.4	0	0	0	0
TOTALS:						1,174.8	13	11	0	11

TABLE 2: HYDRANT SCHEDULE FIRE SERVICE REFERENCE			
REF	ADOPT (Y/N)	MARKER (Y/N)	COMMENTS
WO01			THROUGHBORE
WO02			
WO03			
WO04	N	N	
WO05			
WO06			HYDRANTS TO BE ADOPTED BY WEST SUSSEX FIRE & RESCUE SERVICE REFERENCE C04985 (THROUGHBORE)
WO07			
FH01	Y	N	
FH02			
FH03			
FH04			

Appendix C 3rd Party Topsoil Compliance Testing



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr Jonathan Cowley
Eurogreen Environmental Ltd
North Barn Farm
Titnore Lane
Worthing
West Sussex, BN12 6NZ

14th June 2024
Our Ref: TOHA/24/1399/SS
Your Ref: as below

Dear Sirs

Topsoil Analysis Report: 10mm Topsoil – Batch No. 9

We have completed the analysis of the soil sample recently submitted, referenced *Batch No. 9*, and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine its compliance with the requirements of the British Standard for Topsoil (*BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil*).

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the topsoil source. The report and results should therefore not be used by third parties as a means of verification or validation testing or waste designation purposes, especially after the topsoil has left the Eurogreen Environmental Ltd site.

SAMPLE EXAMINATION

The sample was described as a very dark brown (Munsell Colour 10YR 2/2), slightly moist, friable, moderately calcareous LOAMY SAND with a weakly developed, fine to medium granular structure*. The sample was virtually stone-free, and contained a moderate proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

*This appraisal of soil structure was made from examination of a disturbed sample. Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.

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www.toha.co.uk

Registered in England No. OC324049 Registered Office: The Innovation Centre, Howbery Park, Wallingford, Oxfordshire OX10 8BA

ANALYTICAL SCHEDULE

The sample was submitted to a UKAS and MCERTS accredited laboratory for a range of physical and chemical tests to confirm the composition and fertility of the soil, and the concentration of selected potential contaminants. The following parameters were determined:

- particle size analysis (sand, silt, clay);
- stone content (2-20mm, 20-50mm, >50mm);
- pH and electrical conductivity values;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (As, B, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn);
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX).

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

RESULTS OF ANALYSIS

Particle Size Analysis and Stone Content

The sample fell into the *loamy sand* texture class, which is usually considered suitable for general landscape applications provided the soil's physical condition is satisfactory.

The sample was virtually stone-free, and as such, stones should not restrict the use of the soil for general landscape purposes.

pH and Electrical Conductivity Values

The sample was strongly alkaline in reaction (pH 8.3). This pH value would be considered suitable for general landscape purposes provided species with a wide pH tolerance or those known to prefer alkaline soils are selected for planting, turfing and seeding.

The electrical conductivity (salinity) value (water extract) was moderate, which indicates that soluble salts should not be present at levels that would be harmful to plants.

The electrical conductivity value by CaSO_4 extract was equal to the maximum specified value (3300 $\mu\text{S}/\text{cm}$) given in BS3882:2015 – Table 1.

Organic Matter and Fertility Status

The sample was well supplied with organic matter and all major plant nutrients.

The C:N ratio of the sample was acceptable for general landscape purposes.

Potential Contaminants

With reference to BS3882:2015 - Table 1: Notes 3 and 4, there is a requirement to confirm levels of potential contaminants in relation to the topsoil's proposed end use. This includes human health, environmental protection and metals considered toxic to plants. In the absence of site-specific assessment criteria, the concentrations that affect human health have been compared with the *residential with homegrown produce* land use in the Suitable For Use Levels (S4ULs) presented in *The LQM/CIEH S4ULs for Human Health Risk Assessment* (2015) and the DEFRA SP1010: *Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination – Policy Companion Document* (2014).

Of the potential contaminants determined, none was found at levels that exceeded their guideline values.

Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded the maximum permissible levels specified in *BS3882:2015 – Table 1*.

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes. The analysis has also been undertaken to determine the sample's compliance with the requirements of the British Standard for Topsoil (*BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil*).

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, moderately calcareous, virtually stone-free *loamy sand* with an adequate structure. The sample contained sufficient reserves of organic matter and all major plant nutrients. Of the potential contaminants determined, none exceeded their respective guideline values.

To conclude, based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes (trees, shrubs and amenity grass), provided the physical condition of the soil is satisfactory and species with a wide pH tolerance or those known to prefer alkaline soils are selected.

The topsoil was also fully compliant with the requirements of the British Standard for Topsoil (*BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil*).

Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid structural damage during all phases of soil handling (e.g. stockpiling, resspreading, cultivating, planting, seeding or turfing). As a consequence, soil handling operations should be carried out when soil is reasonably dry and non-plastic (friable) in consistency.

It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the soil is friable in consistency. If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

Further details on soil handling are provided in Annex A of *BS3882:2015*.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Yours faithfully



Ebony Gheorghe
BSc MSc
Soil Scientist



Tim White
BSc MSc M(SoilSci) CSci
Senior Associate

For & on behalf of Tim O'Hare Associates LLP

[illegible]

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+1.8
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+0.3
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+1.0

-0.05
0.06
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-0.05
0.58
-0.03
1.00
-0.67
-0.43
0.48
-0.81
-0.19
0.40
0.27
-0.09
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-0.920
-0.850
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- \$ 0.007
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- \$ 0.006
- \$ 0.003

Ebony Okeagha
MSW, ACSW
Social Scientist

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Appendix D Imported Subsoil Verification Record



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Clive Hilton
Bellway Homes Limited, South London

Date: 2nd August 2023
Your Ref: Barrington Road,
Worthing
Our Ref: L-STV59595M-001

RE: Subsoil Verification Testing at Barrington Road, Goring-by-Sea, Worthing, BN12 4EA

Introduction

Further to our email correspondence of 28th June 2023, we are pleased to enclose our subsoil verification assessment.

We confirm our brief was to undertake sampling of subsoil stockpiles originating from the Bellway site at Billingshurst and a HGH site at Newick, both of which have been imported for use within the residential development at Barrington Road, Goring-by-Sea. The scope of the assessment is to determine the suitability of the soils for reuse on site, in terms of the risks to human health.

Site location and description

The residential development site is located on land south of the Durrington-on-Sea train station and North of Barrington Road, Goring-by-Sea, which provides access to the site.

The development is for the construction of approximately 139 residential plots, 4 blocks of flats and a care home with associated access, open space, parking, landscaping, infrastructure and other associated works. The development is controlled under the Worthing Borough Council planning regime, under the planning application number AWDM/0605/22.

Summary of findings

Aspect	Comments
Material tested	Billingshurst Material, Newick Material
Current placement	3x Billingshurst stockpiles (total of 2,600m ³), 1x Newick stockpile (total of 550m ³)
Approximate volume	~3,150m ³
Testing frequency	10x Billingshurst, 3x Newick. Equivalent to 1 sample per 250m ³ .
Physical suitability	No injurious, or over-sized artefacts identified.
Chemical suitability	Contaminants are within acceptable levels.
Overall comments	Chemically and physical suitable for use. No further testing required.
Recommendations	Organic matter content appears low, consider applying an organic based soil improver, or testing to BS:3882 standards to ensure suitability as a growing medium

Material origin

The subsoil materials are understood to be imported from two separate developments, a Bellway site at Billingshurst and a HGH site at Newick. On review of desk study and investigation reports provided, it was concluded that there is no evidence to indicate the site has been subject to activities which could produce a significant source of chemical contamination, and the materials are considered to be clean and naturally occurring.

Chemical testing has been carried out for reassurance purposes and to ensure no unexpected contamination is present or cross-contamination has occurred.

Fieldwork

The fieldwork was undertaken on 4th July 2023 and comprised the collection of soil samples from the recently formed stockpiles.

The dimensions of the stockpile have not been surveyed and the volume estimates provided below are based on visual observations at the time of the site visit.

Stockpile Origin	Stockpile Reference	Approximate Volume	Approximate Dimensions	Samples Obtained
Billingshurst	SL01	50m ³	4m x 6m x 2.5m	2
	SL02	800m ³	8m x 25m x 5m	4
	SL03	1,600m ³	10m x 40m x 5m	4
Newick	SL04 / SL05	500m ³	7m x 25m x 3.5m	3

The Billingshurst subsoil typically comprised of brown, slightly gravelly clay. With gravels of fine, subrounded flint. The material included infrequent inclusions of brick and concrete.

The Newick subsoil comprised of firm brown slightly sandy slightly gravelly clay. With gravels of fine to coarse, subrounded to subangular flint, brick and concrete.

Sampling was evenly distributed across the extent of the stockpiles. Generally sampling was undertaken following the principles of ISO 18400-104:2018 *Soil quality – Sampling - Part 104: Strategies*. Laboratory testing was undertaken on all samples collected for a general suite of organic and inorganic contaminants, as well as asbestos. Laboratory test results are presented within Appendix B. The stockpile location plan is shown below.



Fig 1 A Stockpile Location

The following photographs presented below shows one of the Billingshurst stockpiles and a stockpile of Newick soil.



Figure 1: Billingshurst soil stockpile SL01

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Figure 2: Billingshurst soil stockpile SL02



Figure 3: Billingshurst soil stockpile SL03

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Figure 4: Billingshurst soil stockpile SL04/05

Assessment for reuse

The soils were screened against published, widely accepted generic criteria for a residential end-use (with plant uptake).

No exceedances were detected within Billingshurst soil samples.

Exceedances from the Newick soil materials showed exceedances of Dibenz(a,h)anthracene, with a maximum concentration of 0.31 mg/kg, against the guideline value of 0.24mg/kg. As the exceedance is marginal, and all other PAH compounds fall below the guideline values, it is not considered to represent a significant risk to future residents, and can be discounted. Details of laboratory testing screening is presented within Appendix C.

Observations from the fieldworks, and screening of the laboratory analysis indicate that the imported soil materials are not impacted by contamination and are considered chemically suitable for re-use on site.

No injurious, undesirable, or over-sized materials were identified within the soil stockpile and is therefore considered broadly physically suitable for use.

Conclusions

Based on evidence obtained during our investigations, we are of the opinion that the subsoil deposits at the site are not affected by chemical contamination and can be reused within a residential development.

Should any of the soils be suspected to contain contamination or non-inert materials (by virtue of visual or olfactory evidence) upon excavation, then such soils should be stockpiled separately, and additional testing carried out as considered necessary.

Yours sincerely,

Prepared by

Richard Farrell BSc.

Geoenvironmental Consultant, Soiltechnics Limited

Supervised/reviewed by

Mark Hamill BSc, MSc, CEnv, MIEEnvSc.

Technical Director, Soiltechnics Limited

Encs.

Appendices	Principal coverage
A	Definitions of geo-environmental terms used in this report
B	Chemical laboratory test results
C	GQRA chemical screening assessments

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