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Verification Report

Plots 29, 30, 33, 34, 37-53 Residential Development

Barrington Road, Worthing

December 2024



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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 29, 30, 33, 34, 37-53 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.

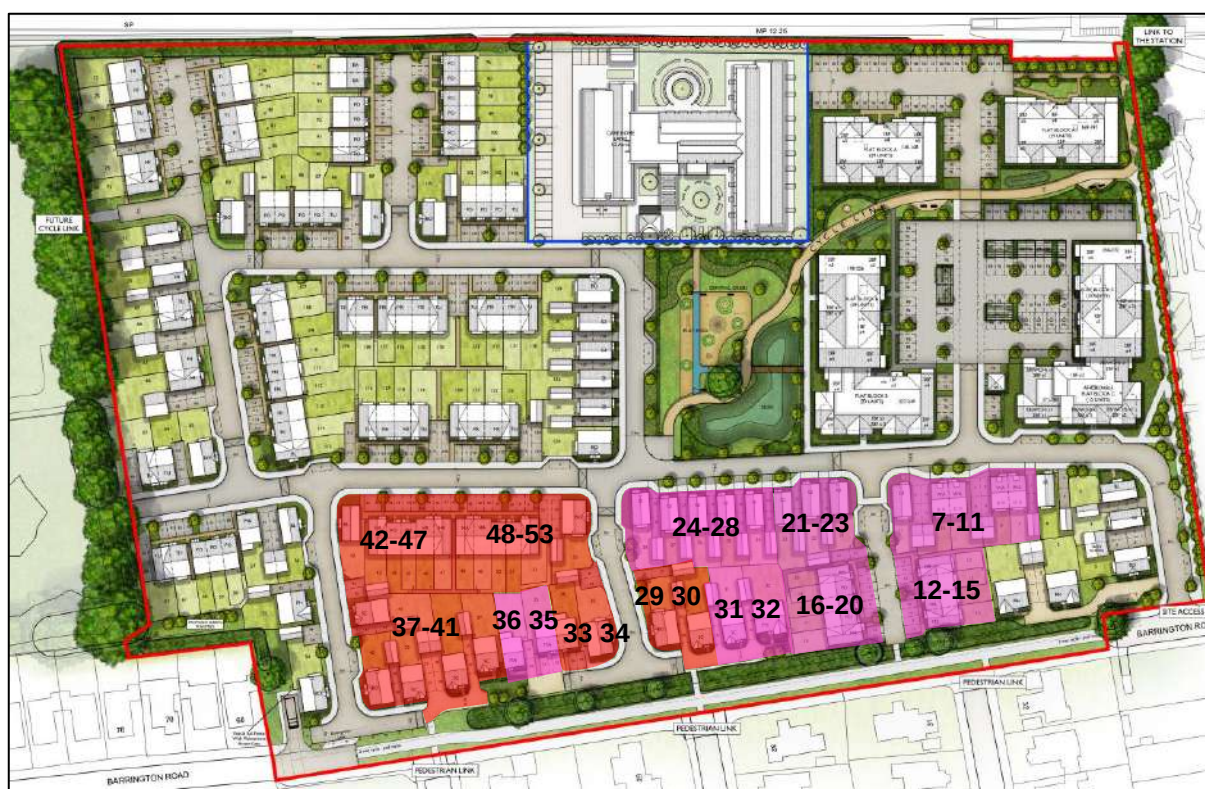


Figure 1-A: Proposed Layout and Plots In Scope

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 STV5226-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.
Soiltechnics	Verification Report (Plots 24-28, 31, 32, 35 and 36)	December 2024 STV5959-R11-Rev_B	Remedial verification report for plots 24-28, 31, 32, 35 and 36.

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 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 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.
- 4.2.4 The updated strategy for the site requires protective water pipe to be installed in drinking water infrastructure in the vicinity of the following plots.
- Plots 40, 41, 54 and 55 (in the vicinity of a former interceptor)
 - Plots 103 → 106, 126 → 134, and the care home (in the vicinity of former heating oil storage)

4.3 Verification

- 4.3.1 For this Verification Report, protective barrier pipe was required for Plots 40 and 41. All other properties are permitted to have standard PE pipe.
- 4.3.2 The contractor has provided a series of photographs showing the installation of both the standard PE pipe and protective barrier pipe, with a selection of these photographs presented within Appendix B, and a full copy can be provided upon request.
- 4.3.3 The photographs do not show any evidence of significant hydrocarbon contamination in areas of PE pipework, and protective barrier pipe can be identified by a thick brown line along blue pipework in the relevant plots. It should be noted that an oily sheen can be seen on perched water in one of the trenches exposing the protective barrier pipe, supporting the use of the pipe in this area.
- 4.3.4 The contractor has been unable to provide a delivery note.
- 4.3.5 Soiltechnics are satisfied that the remedial requirements have been met.

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.

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 on 29th November 2024 to inspect the overall thickness of the cover soils and undertake additional sampling and analysis on the topsoil and subsoil materials in-situ. During the site visit the landscaping works were ongoing and the placement of topsoil had not been completed in all plots.
- 5.3.2 Therefore, a watching brief was undertaken to inspect the soils and undertake sampling of the placed subsoil, and stockpiled topsoil yet to be placed. A photographic record of the watching brief is included in Appendix E.
- 5.3.3 Previous site visits have been undertaken by Soiltechnics to inspect the overall thickness of the cover soils, and undertake sampling and analysis on the in-situ topsoil and subsoil materials for the plots included in reports ref: STV5959-R09-Rev_A and STV5959-R11-Rev_B.
- 5.3.4 Prior to the completion of this report 9 of 26 plots inspected and validated, including passing chemical testing of topsoil and subsoil. Overall, this amounts to the inspection and verification of 9 of 41 plots, which satisfies the Remediation Strategy requirement for the verification of one in every five plots. In addition to this, the subsoil and garden areas have been inspected in 5 further plots within the recent visit where landscaping works was ongoing.

- 5.3.5 Since completion of plots where topsoil had not been placed during the site visit, the contractor has provided a photographic record of the completed garden areas, provided within Appendix I.
- 5.3.6 Given the observations on site, level of work observed, and photographic evidence provided, Soiltechnics are confident that our observations made in the previously inspected and tested areas of the site can be applied to the plots under consideration within this report.

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, such as over-sized materials, sharps, or plastics.
- 5.5.2 The material underlying the topsoil comprised of a compact clay subsoil, which contain occasional brick and other similar anthropogenic materials, such as concrete. Whilst undesirable, this does not present a risk of harm to the end users.

5.6 Chemical Verification

- 5.6.1 The volume of topsoil and subsoil used across all plots verified to date (7-53) has been estimated at 400m³ subsoil and 135m³ topsoil (based on 880m² of landscaping, 150mm thickness topsoil and 450mm thickness subsoil).
- 5.6.2 During a site visit a further four subsoil and two topsoil were obtained for testing (in addition to nine topsoil and nine subsoil obtained from previous visits), therefore satisfying the minimum requirement of 3 per strata and 1 per 100m³ frequency, achieving 1 test per 50m³.
- 5.6.3 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*'.
- 5.6.4 The chemical laboratory test results are presented in Appendix F, and the GQRA screening assessment is presented in Appendix G.
- 5.6.5 The results have been screened using the C4SL and S4UL generic assessment criteria, under a residential with plant uptake scenario at 1% SOM.
- 5.6.6 Of the 6 samples analysed in the recent inspection works, two exceedances were detected for organic contamination (PAHs) within topsoil. In the context of previous chemical analysis undertaken on the topsoil, this amounts to three exceedances for the 15 samples tested. All other levels of contaminants were below the relevant screening criteria. No asbestos was detected under laboratory conditions, and there was no evidence of ACMs observed through field inspections.

5.6.7 Total PAH concentrations were below detection limits in all samples, with the exception of the subsoil from VTP50 and topsoil in VTP53. No exceedances were identified within subsoil in VTP50. Analysis of topsoil from VTP53 exhibited concentrations of Benzo[b]fluoranthene and Dibenzo(a,h)Anthracene above the GAC values (3.0 mg/kg vs 2.8 mg/kg, and 2.4 mg/kg vs 0.24 mg/kg, respectively). The third exceedance was for Dibenzo(a,h)Anthracene, identified within topsoil in VTP24 (0.55 vs 0.24 mg/kg) was also. There was no evidence of hydrocarbon contamination during the fieldwork and the underlying subsoil sample shows PAH levels to be below detectable limits. As no other exceeding results have been detected in any other samples on site, and the presence of hydrocarbon contamination is not corroborated with field observations, this is considered to pose a minimal risk to the development.

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, protective barrier pipe 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 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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