

Remediation Strategy and Verification Plan

**Parcel O2
Arborfield Green Development
Former Arborfield Garrison
Wokingham
Berkshire**

Client

Crest Nicholson Operations Limited

J2210rem

June 2024



Project title	Arborfield Garrison Development Site Parcel O2 Arborfield Green, Wokingham, Berkshire		Project ref J2210rem
Report prepared by	Dominic Brightman BSc MSc DIC FGS CGeol ARSM		
Contact details	Wilson Bailey Partnership Limited, Northdown Farmhouse, Donhead St Mary, Wiltshire SP7 9DD www.wilson-bailey.co.uk 07740 347395 dominic.brightman@wilson-bailey.co.uk		
Issue No	Status	Date	Approved for Issue
1	Final	11 June 2024	

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1.0 INTRODUCTION

Following on from the provision of a ground investigation and contaminated land assessment, the Wilson Bailey Partnership has been commissioned by Crest Nicholson Chiltern to provide a Remediation Strategy for the proposed redevelopment of Parcel O2, which forms part of the redevelopment of the former military garrison at this site.

1.1 Proposed Development

Consideration is currently being given to the redevelopment of the site through demolition of the existing structures and construction of a residential development comprising a range of houses and apartments with areas of communal soft landscaping, private domestic gardens, access roads and areas of hard standing for car parking.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows.

- to set out the remediation objectives;
- to provide an assessment of alternative approaches and sustainability of the proposed works;
- to determine the remediation actions;
- to identify the key information that is required to be collated to demonstrate monitoring of the works; and
- to agree the scope of a Verification Report to demonstrate the completion of the remediation work.

1.3 Site Description

A full description of the site, its environmental setting and history is provided as part of the ground investigation report (reference J2210 issue 2 dated June 2024) which should be read in conjunction with this report. The site has remained disused and secured since for the completion of the ground investigation report.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by the Wilson Bailey Partnership.

2.0 Requirement for Remediation

The site is shown to have been first developed during the interwar period as part of the expanding military facilities that became Arborfield Garrison. The site itself is shown to have been occupied by Baillieu barrack, which military mapping indicates included accommodation buildings, mechanics workshops, exercise facilities coal stores, tool stores and other facilities including messes and kitchens.

The barracks was subsequently demolished and replaced with the current ATIL facilities that are a now disused training facility and include a main steel portal frame building, areas of car parking and hard standing and several screening spoil mounds. At the time of the final phase of ground investigation the demolition of these buildings was underway.

Desk study research has indicated that the site is not located within an area affected by radon and has not identified any significant potential sources of contamination within this land parcel. This part of the garrison development site is also located remote from any identified more modern areas of potential concern with regards to contamination including the former army workshops and fuel / oil stores but was formerly occupied by historical sources of ground contamination including coal stores and the potential for asbestos insulated underground service ducts, which are a common feature of historical military facilities.

The subsequent ground investigation has not identified the presence of fuel contamination, although the presence of apparently localised elevated concentrations of lead and asbestos have been identified in multiple locations within the made ground across the site. Soil gas monitoring has been carried out and has not indicated the presence of a soil gas regime of concern such that precautions with regards to the ingress of soil gasses are not required.

Further localised pockets of ground contamination may also be present on site in view of the historical development and use of the site.

Locally significant depths of made ground have been identified overlying predominantly clay soils of the London Clay, which would be expected to limit the potential for off site migration of any potentially mobile ground contaminants.

A requirement for remediation has therefore been established at this site with respect to the proposed demolition and residential redevelopment at this site.

3.0 Remediation Objectives

The following objectives has been identified as part of the contaminated land risk assessment.

3.1 Protection of Human Health (end users of the development)

Potential risks posed to human health have been considered and the results of soil contamination testing indicate that there is a requirement for ground remediation with respect to human health of future homeowners.

An objective of the remediation works will be to ensure that end users are protected from dermal contact and ingestion of any contaminated soils together with mitigating the risk of ingestion of related potentially contaminated dusts.

3.2 Protection of Human Health (site workers and future maintenance workers)

Precautions with regards to site workers and future maintenance workers are not anticipated over and above normal safe working practices such as restricted eating and drinking, regular hand washing and the provision and use of routine PPE.

The presence of numerous localised pockets of asbestos containing construction materials has been identified on site. The risks associated with these materials will require additional localised precautions to ensure that site workers are protected from the risk of ingestion of potentially contaminated dusts.

3.3 Protection of Property buildings service lines and pipes

The risk to these potential receptors has been considered and in view of the absence of significant mobile contamination, a significant risk warranting further action has not been identified.

A requirement for the protection of drinking water pipework has not been identified, although discussions should be held with the statutory utility providers who may insist upon the use of non-plastic or protected plastic pipework as a result of the site development history.

In view of the identified presence of apparently localised pockets of fragments asbestos containing construction materials with is a requirement to protect future maintenance workers within backfilled service trenches.

3.4 Protection of Adjoining Land and Adjoining Land Users

The contaminated land risk to this potential receptor has been considered and in view of the absence of significant mobile ground contamination, a significant risk warranting further action has not been identified.

Careful consideration will need to be given to the proposed ground works to ensure that disturbance and the potential for airborne dusts to impact upon adjoining land and adjoining land users are mitigated. In particular there is a risk that any airborne dusts could potentially contain asbestos, which will need to be mitigated through carefully controlled construction management, although these works are not considered further as part of the remediation of the site covered by this report and will need to be considered as part of normal construction management risk assessments by the appointed ground works contractor.

3.5 Protection of Groundwater and Surface Water

The site is not located within a particularly sensitive setting and significantly elevated concentrations of potentially mobile contaminants have not been identified, although there remains a potential for localised contamination with fuels oils and greases to be present in locations.

Soakaways are not to form part of the proposed development as the underlying soils are not considered to be suitable for infiltration-based drainage.

A requirement for remediation to ensure the protection of groundwater and surface water is not considered necessary over and above routine best practice with regards to drainage design.

4.0 Remediation Actions

In order to satisfy the Remediation Objectives, the following Remediation Actions will be required.

4.1 Topsoil and Subsoil Capping to Gardens and Soft Landscaping Areas

Placement of a clean capping layer of topsoil and subsoil over a geotextile marker layer should ensure that end users are protected from both the chemical and physical hazards presented by the near surface soils identified as part of this ground investigation.

- The depth of capping shall be 600mm within private gardens and 450mm within areas of proposed managed soft landscaping and planting.
- The imported soils shall be placed over a marker layer where made ground remains present at the reduced formation level.
- In gardens within the southern part of the site there is a potential that the reduced formation level for gardens may be formed within natural soils, at which depth further excavation into the natural soils will not be required and a reduced capping depth can be used.
- Where gardens and soft landscaping areas are to be formed within natural soils the requirement for the geotextile marker layer may also be obviated.

Detailed records, inspections, photos and test results will need to be collected as part of these remediation actions, the details of which are presented in Section 5.1 of this report.

4.2 Protection to Site Workers

Localised pockets of asbestos containing construction materials have been encountered within the made ground at this site, which are associated with the historical above ground demolition of the former military barracks buildings that are anticipated to have incorporated these materials into their construction.

All site workers should be briefed for the potential presence of these buried pockets and where encountered, works should be halted in the immediate vicinity of the identified area, soils should be damped down and the asbestos containing fragments should be hand-picked in accordance with a suitable method statement by an appropriately trained individual or independent contractor.

4.3 Protection to Buried Services and Utilities

Subject to discussions with the utility providers it is anticipated that there will be a requirement for the use of protected plastic pipework as a result of the measured concentrations of poly-aromatic hydrocarbons and the identified potentially contaminative history of this site.

In addition it is likely to be a requirement of utility companies that service trenches are backfilled with clean backfill rather than untested excavation arisings in order to provide a further level of protection of buried utilities and future maintenance workers

Consideration could be given to carrying out further soil testing along the line of the proposed utility corridors to provide a more focused assessment of the requirement for protected services and clean backfill as the ground investigation has not identified consistently elevated concentrations of potential contaminants of concern in all locations. Prior to carry out any further testing however, discussions should be held with the utility companies to the scope of any such works.

4.4 Enabling Works and Ground Works Watching Brief

Consideration may be given to a phases of enabling works to remove obstructions and relic foundations in advance of commencement of ground works. The enabling works and subsequent ground works for the proposed residential development should be carried out in accordance with the requirements of a routine geo-environmental watching brief, whereby should any contaminated or suspicious soils be encountered they may be appropriately tested, investigated, and assessed by Wilson Bailey in consultation with the Regulatory Authorities before agreeing the scope of any remedial actions as necessary. Detailed records, inspections, photos and test results will need to be collected as part of these remediation actions, the details of which are presented in Section 5.4 of this report.

As noted previously the ground works should be designed by the appointed contractor to mitigate the risk of airborne dusts which could be potentially contaminative. Consideration should therefore be given to appropriate methods of dust suppression and potentially boundary dust monitoring and analyses.

5.0 Verification Plan and Monitoring Proposals

The following records and information will need to be collected as part of the identified remediation works in order to demonstrate that the works have been carried out in accordance with the requirements set out in this report in order to ensure that the site has been rendered suitable for the consented residential redevelopment.

5.1 Topsoil and Subsoil Capping to Gardens and Soft Landscaping Areas

It is considered that there is no potential for reuse of site won topsoil at this site, due to the absence of any areas of existing areas of substantial planting.

Imported or site won topsoil and subsoil will need to be tested to confirm chemical suitability for reuse. Testing shall be carried out at a rate of not less than 1 sample per 50m³ of materials and the acceptability criteria to determine the suitability of any soils are presented below;

Determinant	Acceptability Criteria (residential with plant uptake) mg/kg	Determinant	Acceptability Criteria (residential with plant uptake) mg/kg
Asbestos	No quantifiable asbestos	Mercury (Hg)	1.0
Arsenic (As)	32	Nickel (Ni)	130
Cadmium (Cd)	10	Selenium (Se)	350
Chromium (hex)	4.3	Zinc (Zn)	3750
Chromium (Cr)	3000	Benzo(a)pyrene	5.0
Copper (Cu)	2330	Total Phenols (mono)	420
Lead (Pb)	200	Speciated Fuel Relation hydrocarbons (TPH)	Various species-specific values

Photographic records of the placement of topsoil to each plot shall be taken in order to demonstrate the placement of the marker layer and the agreed thickness of topsoil and subsoil. In particular, where gardens and areas of soft landscaping are to be formed at a reduced depth owing to the presence of natural soils at a depth of less than 600mm (or 450mm in the case of soft landscaping) additional photographs and soil samples will need to be taken to demonstrate the absence of potentially contaminated fill materials and the presence of clean natural soils.

Testing of clean natural subsoils should be carried out on the basis of one sample per plot where a reduced depth of capping is proposed within natural soils.

A plan identifying the locations of any plots where a reduced capping has been used shall be provided as part of a Verification Report together with the other supporting documentation to demonstrate that the site has been rendered suitable for the consented residential redevelopment.

As the development at this site progresses it is anticipated that a phased approach to garden validation will be taken, whereby selected plots will be inspected as and when they are ready and groups of plots may be reported separately. The verification report for each plot will however be provided prior to the occupation of each plot, even if the clearance of any contaminated land related planning conditions can only be achieved upon completion of the verification to all plots.

5.2 Protection to Site Workers

Records shall be kept of dust mitigation actions and precautions to demonstrate that the risk of asbestos containing dust has been considered and actively managed.

Records shall also be kept of the asbestos awareness briefings given to all construction operatives.

Copies of event logs shall also be maintained when hand picking is required to remove pockets of asbestos containing construction materials as and when they may be encountered. This shall also include records of the licensed disposal of any collected fragments.

5.3 Protection to Buried Services and Utilities

Copies of correspondence with utility suppliers shall be collated to evidence the decisions made with regards to the use of protected plastic pipework and clean backfill to trenches as necessary.

In the event that further testing is carried out to support these discussions, records of these works shall also be collated and presented as part of a Verification Report to demonstrate that the site has been rendered suitable for the consented residential redevelopment.

5.4 Ground Works Watching Brief

The records of all inspection visits shall be collated to provide an overall record of the watching brief. The individual records of any more substantial supplementary investigation of any potential localised pockets of ground contamination shall be collated and shall include test results, plans, photos and the records of discussions with the Regulatory Authorities to evidence the discussion of any such areas and the requirement for any further remediation.

APPENDIX

DEVELOPMENT LAYOUT SHOWING AREAS OF PROPOSED GARDEN AND PLANTING

2:3237 Ardborfield Green - Parcel 02/3237-6-1 TENDER 02/3237-6-1 TENDER DOCUMENT 02/3237-6-1 128-0001-11 Landscape Layout.dwg

APPLICATION BOUNDARY

SANG BOUNDARY

EXISTING TREES

PROPOSED TREES

SPECIMEN SHRUBS

HEDGE PLANTING

MIX NATIVE HEDGE PLANTING

MIXED NATIVE SCRUB

STRUCTURAL PLANTING

ORNAMENTAL PLANTING

GROUND COVER PLANTING

AMENITY GRASS SHORT - PUBLIC REALM

AMENITY GRASS LONG - PUBLIC REALM

AMENITY GRASS - PRIVATE FRONT LAWN

PRIVATE REAR GARDENS

ROADS

PATHS

RAISED TABLES

NON-PERMEABLE BLOCK PAVING - DRIVEWAYS AND PARKING COURTS

NON-PERMEABLE BLOCK PAVING - SHARED SURFACES

PRIVATE PATHS AND PATIO

BOUND GRAVEL PATH

INFORMAL GRASS PATHS

GRAVEL STRIP

REAR GARDEN WALL

REAR GARDEN FENCE 1.8M

ACOUSTIC FENCE

LIGHT COLUMNS

PATH REDUCED TO 1.8M WIDTH TO ALLOW OFFSET FROM SWALE

PATH TO BE ALIGNED TO AVOID SLITHER OF VERGE

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Notes

Related Drawings: QIA Drawing based on
- Shape Engineering, drawing 2651-SCE-00-00-DR-C-0004-P03 S104 Agreement Plan, received 01/02/2024
- Shape Engineering, drawing x-adoptable drainage, received 01/02/2024
- Loveday Lighting, drawing LL1646-001, Ardborfield Garrison, Wokingham - 538 Lighting - Design Layout, received 04/03/2024

Issue: Drawn by David Jarvis Associates Limited (CROWN COPYRIGHT. ALL RIGHTS RESERVED. 2024 LICENCE NUMBER 0100031673). This drawing is for Planning purposes only - Do not use this drawing for Construction. The information contained in the drawing should be used as a guide to the final forms and finishes of the landscape scheme. Any revisions to be approved by the Client and Local Authority.

Scaling: Do not scale this drawing. Use given dimensions only.

Setting out: refer to Engineers for information regarding setting out. In the event of discrepancy refer to Engineers in the first instance.

Survey: Original survey provided by the Client.

Services: Where possible these are identified on the drawings but, for the avoidance of doubt all service/utility locations should be considered indicative until identified on site. To ensure those services / utilities shown are current refer to the original survey provider or utilities designer or Client for confirmation and further information regarding easements. In the event of new services being installed refer to the appointed Engineer. It is recommended that hazard warning tape 'danger electric cable/danger services' to be installed over all service routes (to remain on site) to current BS guidelines (BS7671).

Lighting: Refer to lighting engineers drawings.

Planting: Plant species are selected and located in line with consideration of the site conditions, NHBC guidelines and discussions with the Local Authority and design team. All plants and planting procedure to conform to the David Jarvis Associates Limited Landscape Specification that will accompany the Construction issue drawings. No species or plant location is to be varied without prior consent of the Landscape Architect.

Biosecurity: All plant stock to be sourced from a supplier certified to be pest and disease free and in accordance with Plant Passport / Animal and Plant Health Agency (APHA) and current DEFRA requirements. Supplier information / certification to be retained for a period of not less than 12 years and must be made available upon request.

Foundations: Developers / Contractors to ensure that all foundations (buildings and external walling) are designed and constructed so as to take into account, at the time of maturity, any existing or proposed trees, hedgerows or other vegetation on the application site or existing vegetation on land adjoining the site at the time of construction and any trees felled or hedgerows removed on or adjacent to the site during the previous 15 years. For this purpose the developer / contractors will submit all relevant details to the authority dealing with the Building Regulations Certificate.

Design Levels: Refer to Engineers where design levels are not shown.

CDM: Drawings to be read in conjunction with Designers risk assessment. Potential risks above that of those associated with the general construction typical to the drawing are identified below.

Drawing Revision				
Rev.	Date	Description	Drawn	Checked
T3	06/03/2024	Pedestrian links surface amended to match planning layout.	AB/IE	ED
T3	01/03/2024	Updated following clients comments	AB/IE	ED
T2	19/02/2024	Revised draft layout	AB	ED
T1	15/01/2024	First draft issue.	AB	ED

Status

DRAFT

DAVID JARVIS ASSOCIATES

DAVID JARVIS ASSOCIATES LIMITED
1 Tennyson Street Swindon Wiltshire SN1 5DT
t: 01793 612173
e: mail@davidjarvis.biz
w: www.davidjarvis.biz

Client

CREST NICHOLSON CHILTERN

Project

ARBORFIELD 02

Drawing Title

LANDSCAPE LAYOUT

Scale		Sheet Size		Date Plotted	
1:500		A1		06/03/2024	
Client Ref.	Drawing Ref.	Drawing No.	Version		
-	3237-6-1	DR-0001	T4		