Beech Hill Stores
Eddeys Lane
Headley Down
Bordon

Remediation Strategy

Report Beneficiary:
Cimbrone Developments TWO Ltd.
43-45 Wellington Crescent
New Malden
Greater London
KT3 3NE

Project Reference: C15329

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Limitations

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1. INTRODUCTION

It is proposed to develop Beech Hill Stores located at Eddeys Lane, Headley Down, Bordon. The development proposals are understood to comprise the demolition of the existing buildings and the construction of six residential dwellings together with associated parking and landscaping. A copy of the proposed development layout is presented in Appendix A.

Ashdown Site Investigation Ltd. was commissioned to provide a remediation strategy for the site to assist with the discharge of planning conditions[1].

The following reports have previously been issued for the site:

- EnviroSmart – Phase 1 Contaminated Lane Assessment[2]
- Investigation Proposal[3]
- Quantitative Ground Contamination Risk Assessment Report[4]

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q11204, dated 24th August 2021. The instruction to proceed was received from the client.

The remediation strategy has been prepared in line with current guidance[5,6]. This report must be read in conjunction with the previous reports prepared for the site.

[1] East Hampshire District Council, Planning Application Ref: 58616, Condition 5(c).
[2] GeoSmart Information Ltd., Report Ref: 74457R1, February 2021.
[3] Ashdown Site Investigation Ltd., Project Ref: P15095, Report Ref: R14774, Issue No. 1, 9th April 2021.
[4] Ashdown Site Investigation Ltd., Project Ref: P15204, Report Ref: R14868, Issue No. 2, 17th July 2021.
[5] Environment Agency, Land Contamination Risk Management (LCRM), Stage 3 remediation and verification, Published 19th April 2021.
[6] Environment Agency Report Ref: SC030114/R1 "Verification of remediation of land contamination".

2. SITE LOCATION

The site comprises an irregular shaped plot of land located to the south of Eddeys Lane and to the east of Beech Hill, Headley Down, Bordon and is centred on the approximate Ordnance Survey national grid reference 483780 136470. A site location plan is presented as Figure 1

3. SUMMARY OF RISK ASSESSMENTS

The Phase 1 Assessment identified several on and off-site potential sources of contamination; Commercial premises, a historical laundry and coal yard on-site, a garage/filling station 80m to the north west and a historical landfill site 195m to the north west.

A ground investigation was subsequently undertaken in general accordance with an approved investigation proposal, and comprised 6 no. dynamic sampling boreholes and two hand dug trial pits.

Made ground was encountered across the site to depths of between 0.35m and 0.80m below ground level. Underlying the made ground the investigation encountered the undisturbed soils of the Hythe Formation.

Samples of the made ground were tested for the range of potential contaminants identified by the Phase 1 assessment. The testing recorded concentrations of lead and PAH compounds within the made ground that were considered to pose an unacceptable risk to future end users of the site. No unacceptable risks to controlled waters were identified.

Concentrations of petroleum hydrocarbons within the made ground were recorded above the threshold value for the use of PE water supply pipework.

Ground gas monitoring standpipes were installed within 3 of the boreholes and were monitored on three occasions. No significant concentrations of ground gases were recorded and no unacceptable risk from ground gases was considered to be present.

The quantitative conceptual model for the proposed development is presented in Appendix B.

4. REMEDIATION STRATEGY

Current best practice guidance recommends that any remedial action proposed for the site should be justified. The requirement for remedial action is considered to be justified due to the identification of complete pollutant linkages.

The remediation works have been developed to meet the technical objectives for the development, the major drivers behind which are:

- To achieve successful remediation within a particular timescale and budget;
- Familiarity with the methodology by the developer/ground worker;
- Confidence that the remediation can be carried out by good technical practices; and
- Likely success of the style of remediation.

A copy of the quantitative ground contamination risk assessment report was submitted to East Hampshire District Council and condition 5(b) was subsequently discharged. A copy of the discharge notice is included as Appendix C.

4.1 Options Appraisal

The driver for remediation at the site is the presence of shallow made ground soils containing lead and PAH compounds that are considered to pose an unacceptable level of risk to human health in the context of the development. There are no in situ or ex situ remediation techniques available to reduce the concentrations of lead or PAH compounds within the shallow soils to below that of the published screening values.

The method chosen for remediation must be achievable by the groundworker, using techniques that they are familiar with. It is therefore considered that the remediation proposals could either comprise the complete removal of the contaminant source (the made ground soils), or the provision of a cover system to sever the contaminant pathways in areas where the end users may reasonably be expected to be exposed to the soils or soil derived dust.

Both approaches are considered to be equally straightforward and both would be an effective approach to reducing the risk to end users of the site to an acceptable level.

4.2 Asbestos

As discussed in Section 5.3.2 of the quantitative ground contamination risk assessment report, an asbestos survey was beyond the scope of the report, but the risk assessment was undertaken on the basis that, where asbestos is identified to be present within buildings or infrastructure, these materials should be appropriately removed by licensed contractors and asbestos materials disposed of in accordance with legal requirements prior to demolition to avoid contaminating soils at the site.

Prior to demolition works commencing, a suitable survey should be undertaken and all identified asbestos materials removed from site in accordance with the requirements of the Control of Asbestos Regulations 2012.

4.3 Protection of Human Health

Within all proposed areas of soft landscaping, the made ground should either be removed to expose the undisturbed soils, or to a sufficient depth as to allow the placement of a cover system of at least 600mm of verified "clean" topsoil and/or subsoil underlain by a high visibility geotextile marker.

The depth of the cover system specified represents "two spade depths" to allow for planting of trees, shrubs etc. without residents coming into contact with the contaminated soils remaining at depth.

Where narrow planting beds are proposed, such as adjacent to parking bays at the front of the houses, it is recognised that it may be difficult to provide the full 600mm of cover due to the presence of concrete haunching or other adjacent fixtures, or the presence of service runs. In such areas, the made ground should be excavated to the maximum feasible depth, the geotextile placed, and the area backfilled to ground level with "clean" cover soils.

Should any tree planting be proposed within areas of garden, then the depth of the cover system should be locally deepened to that required for the tree pit.

Elsewhere on the site the presence of building cover, car parking and permanent access ways comprising hard cover will also act to sever the contaminant pathways and thereby reduce the risk to end users to an acceptable level.

The extents of the proposed remedial works are detailed on Figure 2.

4.4 Protection of Controlled Waters

The risk assessment did not identify any unacceptable risks to controlled waters beneath the site and therefore no specific remedial works are considered necessary in this regard.

4.5 Protection of Services

Concentrations of petroleum hydrocarbons were recorded above the threshold value for the use of PE water supply pipework.

Therefore, unless confirmed otherwise in writing by the water supply company, it should be assumed that barrier pipe is required for all new water supply connections.

All service providers' requirements must be fully adhered to in order to reduce the risk to end users and services to an acceptable level. Details of any measures required by service providers and confirmation of their implementation should be included within the verification report.

4.6 Protection of Construction Workers and Future Operatives

All construction workers must undertake their own risk assessment, based upon the works to be carried out and the proposed method by which this will be achieved, in accordance with current health and safety legislation. Their assessment should take into account all available information about the site, including that present within this and previous reports prepared for the site.

Appropriate working procedures and PPE should be adopted to ensure the health and safety of the site operatives. Instruction should be given in the recognition of potentially hazardous materials. All site personnel should be appropriately briefed on the discovery strategy, presented below, and what actions they must take in the event that further evidence of contamination is identified or suspected.

Any future workers at the site must also undertake their own assessment of risk which should take into account the findings of the investigation works undertaken, the extent of the proposed remedial works and how this may impact any excavation works necessary. All reports prepared for the site should be incorporated into the health and safety file for the development.

4.7 Watching Brief on Development Works

If, during the course of the site clearance and development works, any materials not previously identified by the investigation that are suspected of being 'contaminants' are encountered, then the following procedure should apply:

- All works in that area should cease and the site manager should be informed.
- Advice should be sought from suitably qualified and experienced personnel as to whether any further site inspection, sampling, testing and/or assessment is deemed necessary.

- If required, the conclusions of any assessment and any proposed remedial works (if required) should be agreed by the local authority.
- If necessary, full details of any remedial works should be included in the verification report for the site.

Suspected 'contamination' may take the following form, though it is noted that this list is not exhaustive and site operatives should ask if they are at all unsure of any findings:

- Soil or water looks oily and/or has an oily odour
- Soil or water has a solvent type of odour
- Significant quantities of man-made materials within fill such as paint cans, car parts, glass fragments
- Suspected asbestos containing materials (insulating boards, cement, loose fibres etc.)
- Significant volumes of clinker like or ashy material
- Sand bags, and/or subsurface concrete structures
- Animal carcasses or evidence of animal burial pits

5. VERIFICATION PLAN

A checklist summarising the requirements of the verification report is presented within Appendix D.

Depending on the development programme it may be necessary for interim verification reports to be produced for individual plots or groups of plots, prior to the completion of all development works.

5.1 Asbestos

A copy of the asbestos survey must be included within the verification report.

In addition, should asbestos containing materials be identified by the survey, hazardous waste consignment notes confirming the removal of asbestos materials from the existing buildings/infrastructure prior to demolition works commencing should be included within the verification report.

5.2 Inspection of Stripped Formations

For all areas where remediation works are required (reference Figure 2), the formation level will be inspected prior to placement of any cover soils to confirm that excavations are sufficiently deep to enable placement of the required thickness of cover soils or to confirm the removal of all made ground soils.

A photographic record of all stripped formations will be maintained for inclusion in the verification report.

5.3 Placement of High Visibility Geotextile Marker

Where made ground is present at the formation level, all areas where remediation works are required will be inspected to document the placement of the high visibility geotextile marker.

A photographic record of the placed high visibility geotextile marker will be maintained for inclusion in the verification report.

If for any reason inspections are not undertaken for any given area where remediation works were specified, retrospective validation may comprise excavation of trial pits by hand on a grid basis to confirm that the specified works have been undertaken. In such exceptional circumstances these works may be undertaken in conjunction with the works detailed in Section 5.4 below.

5.4 Cover System Depth

The final depth of cover material placed in all required areas should be confirmed by use of tape measurements made within excavations to the base of the cover soils. Photographic evidence of the depth of cover soils present will be included in the verification report.

In areas where all made ground soils have been removed from site, then the depth of cover soils need not be measured.

5.5 Imported Materials

Any imported material from a potentially contaminated (e.g. industrial) site should be rejected. It is recommended that chemical testing results are obtained and supplied for comment prior to accepting the soils on site.

Once imported materials have been brought to site they should be stockpiled and protected from cross contamination with any other materials already on site. They will then be inspected, sampled and tested by Ashdown Site Investigation Ltd.

5.5.1 Soils for use in soft covered areas.

The table below summarises the soil screening values[7] against which any imported soils will be assessed.

Table 1. Calculated soil screening values for imported soils

Contaminant	Screening Value (mg/kg)	Contaminant	Screening Value (mg/kg)
Arsenic	37	Fluorene	170
Cadmium	11	Phenanthrene	95
Chromium	910	Anthracene	2400
Copper	2400	Fluoranthene	280
Lead	200	Pyrene	620
Mercury	40	Benz(a)anthracene	7.2
Nickel	180	Chrysene	15
Selenium	250	Benzo(b)fluoranthene	2.6
Zinc	3700	Benzo(k)fluoranthene	77
Hexavalent Chromium	6	Benzo(a)pyrene	2.2
Water Soluble Boron	290	Indeno(123-cd)pyrene	27
Naphthalene	2.3	Dibenz(ah)anthracene	0.24
Acenaphthylene	170	Benzo(ghi)perylene	320
Acenaphthene	210	Asbestos	None detected

It is noted that the SSV are only protective of long-term risk to human health and do not necessarily represent suitable concentrations for planting or landscaping. If necessary, a horticulturalist should be consulted in this regard.

All soils must be free from any visual or olfactory evidence of suspected petroleum hydrocarbon contamination and should contain no significant quantity of putrescible material (incl. wood or paper). Along with testing for the contaminants listed above, testing should also be undertaken to confirm the absence of any significant concentrations of petroleum hydrocarbons.

[7] Comprising 'Suitable For Use Levels' (S4ULs), Nathanail, C.P, et al., The LQM/CIEH S4ULs for Human Health Risk Assessment, 2015, Land Quality Press, Nottingham. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3071 and for lead, the Category 4 Screening Level (C4SL), SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.

All soils used as surface dressing or as part of the cover system must be free from propagules of aggressive weeds, fragments of glass, bricks, concrete, wire or other potentially hazardous foreign matter and bulk vegetative growth, in order to ensure negligible risk of subsequent weed problems (introduced in the soil) or traumatic injury.

In the event that any individual sample of imported material records concentrations of contaminants above the screening values listed above, the following steps may be taken:

- Depending on the findings of the analysis additional testing (which may include retests of the original sample) may be undertaken along with further analysis of the results to determine if this is representative of a widespread issue, or may be attributed to a smaller part of the site, or batch of imported soils.
- Statistical analysis of the results, along with an assessment of whether any statistical 'outliers' should be removed from the dataset and treated as 'hotspots'. If the data indicates that the majority of the soil mass as a whole may be considered to contain contaminant concentrations below the screening values then it may be deemed suitable to remain.
- Liaison with the regulators may be undertaken to agree whether or not the materials are to be considered suitable to remain.

Where testing and analysis identify a significant failure and the procedures above do not provide sufficient evidence that the imported materials are suitable to remain, then the imported soils will be removed and replaced with other suitable soils.

5.6 Services

Confirmation of any service providers' requirements and evidence to demonstrate adherence to them should be included in the verification report.

The contractor should provide photographic evidence to confirm installation of barrier pipe (if it is required by the water company) or written confirmation from the local water supply company that appropriate measures have been taken and connection made to the mains supply.

6. POST REMEDIATION RISK ASSESSMENT

The remedial works set out in this report are considered to remove or sever the identified pollutant linkages. A post remediation conceptual model is presented in the following table.

Table 2. Post Remediation Conceptual Model for End Users – Potential Pollutant Linkages and Assessment of Risk

Contaminant Source	Remedial Measures	Potential Pathway(s)	Assessment of Risk to Human Health
Made ground soils containing elevated concentrations of lead and PAH compounds, as well as petroleum hydrocarbons above the threshold value for the use of PE water supply pipework.	**Soft Landscaped Areas:** Removal of all made ground soils **OR** Placement of 600mm of verified "clean" cover soils overlying a high visibility geotextile marker.	Pathways severed by remedial measures.	No significant pollutant linkages identified.
	Building cover and permanent access ways comprising hard cover.	Pathways severed by construction works.	No significant pollutant linkages identified.
	Provision of barrier pipework or other pipework acceptable to local water supply company.	Pathways severed by construction works.	No significant pollutant linkages identified.
	All other service providers requirements fully adhered to.	Pathways severed by construction works.	No significant pollutant linkages identified.

7. REGULATORY APPROVAL

It is recommended that this report is submitted to East Hampshire District Council in relation to the discharge of Condition 5, Part c.

The conclusions drawn and recommendations made within this report should be considered as provisional until such time as the report has been approved by regulators (and/or warrantors), and any relevant conditions are discharged.

Copies of any comments received from regulators should be included within the verification report.

Ashdown Site Investigation Ltd.

FIGURES

ASHDOWN SITE INVESTIGATION LIMITED	Site Location Plan	Site Name	Figure No.	Project Reference
		Beech Hill Stores, Eddeys Lane, Headley Down, Bordon	1	P15329

ASHDOWN SITE INVESTIGATION L•I•M•I•T•E•D

Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
01273 483119
contact@ashdownsi.co.uk

Site:

Beach Hill Stores
Eddeys Lane
Headly Down
Bordon

Project Ref:

C15329

Figure No.

2

Drawing Title

Remedial Works Plan

Scale

NTS

APPENDIX A

Proposed Development Layout

A2

refer to all relevant detail drawings before undertaking any work

read this drawing in conjunction with Consultant's relevant drawings

verify all dimensions on site before undertaking any work or preparing any shop drawings

refer any discrepancies to the architect immediately

refer to the architect before undertaking work or giving instructions if in doubt

notes

0 1 2 3 4 5 10

1:200 scale bar

revisions

CLIVE DAVIS 137 HARROWDENE GARDENS
TEDDINGTON TW11 0DN 07766 912382
info@clivedavisarchitect.co.uk

project
Beech Hill Stores redevelopment

drawing
Proposed site plan

drawing number
GU35 8HU TP02
scale
1.200 at A2

date
JUL 2021

revision

APPENDIX B

Quantitative Conceptual Model

Beech Hill Stores, Eddeys Lane, Headley Down, Bordon				Quantitative Conceptual Model		P15204	
Source	**Receptor**	**Contaminants**	**Pathway**	**Complete Linkage Present?**	**Probability**	**Consequence**	**Risk**
Made ground soils containing elevated concentrations of lead and PAH compounds, as well as petroleum hydrocarbons above the threshold value for the use of PE water supply pipework.	End Users	Lead and PAH Compounds	Dermal contact with soil and dust (indoor & outdoor)	Yes	P3: Moderate	C3: Moderate	Moderate
			Ingestion of soil and indoor dust	Yes	P3: Moderate	C3: Moderate	Moderate
			Consumption of home-grown produce and attached soil	Yes	P3: Moderate	C3: Moderate	Moderate
			Inhalation of soil dust (indoor and outdoor)	Yes	P2: Low	C3: Moderate	Low/Moderate
			Inhalation of soil vapours	Identified contaminants do not pose a risk via this pathway			N/A
			Inhalation of soil gases/ Risk of explosion	Identified contaminants do not pose a risk via this pathway			N/A
	End Users (via Water Supply Pipework)	Petroleum Hydrocarbons	Contamination of incoming services	Yes	P2: Low	C3: Moderate	Low/Moderate
	Groundwater		Migration to groundwater	Identified contaminants do not pose a risk via this pathway at the concentrations recorded.			N/A

APPENDIX C

Decision Notice

East Hampshire DISTRICT COUNCIL

Penns Place, Petersfield, Hampshire GU31 4EX
Telephone 01730 266551 • DX100403 Petersfield
info@easthants.gov.uk • www.easthants.gov.uk
@EastHantsDC
/EastHampshireDistrictCouncil

Mr C Davis
Clive Davis Architects
137 Hazledene Gardens
Teddington
TW11 0DN

Case Officer: Jon Holmes
Direct Dial: 01730 234243
Our Ref: 58616
Your Ref:
Date: 16 August 2021
email: jon.holmes@easthants.gov.uk

Dear Mr Davis

Town and Country Planning (Development Management Procedure) (England) Order 2015
Discharge of Conditions Application

Location: Beech Hill Stores, Eddeys Lane, Headley Down, Bordon, GU35 8HU
Planning No: 58616

This letter confirms that the following condition has been **PART DISCHARGED.**

5 Contamination Site Investigation and Risk Assessment
The Ashdown Site Investigations report: Quantitative Ground ConditionContamination and Risk Assessment, Document reference R 14868 dated 7th July 2021,read in conjunction with Document Reference R 14774- letter: dated 9th April 2021(Desk top Study) is agreed and satisfies the requirements of parts A and B of the condition.
To enable full discharge of the condition (part C), a detailed remediation strategy is required followed by verification of remediation once agreed.

This decision does not in any way affect Conditions which may have been imposed previously, which continue to apply.

Yours sincerely

Simon Jenkins
Director of Regeneration and Place

APPENDIX D

Checklist for Verification Report(s)

Item	Tick (✓)
Regulatory Feedback on Remediation Strategy	
Asbestos Survey	
Hazardous Waste Consignment Notes for Asbestos Removal (Where Identified)	
Documentation (Including Photographs) of Stripped Formation	
Documentation (Including Photographs) of Placed High Visibility Geotextile Marker (If Required)	
Documentation (Including Photographs) Confirming Depth of Cover Soils (If Required)	
Supplier Certification for Imported Soils (If Provided)	
Laboratory Test Data for Imported Materials	
Documentation from Contractor (Including Photographs) of Barrier Pipe Installation or Written Confirmation from Local Water Supply Company of Suitability of Water Supply Pipework (if required)	