



REMEDIATION STRATEGY

**JACKSONS FARM
HAMMERPOND ROAD
PLUMMERS PLAIN
LOWER BEEDING
WEST SUSSEX**

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REPORT REFERENCE: R16689

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FIGURES

Figure 1 Site Location Plan

APPENDIX A

Proposed Development Plan

APPENDIX B

Quantitative Conceptual Model

1. INTRODUCTION

It is proposed to demolish the existing buildings at Jacksons Farm, Plummers Plain, West Sussex and construct three new detached houses with associated gardens. A copy of the proposed development layout is presented in Appendix A.

The development of the site forms part of a comprehensive masterplan redevelopment at Stonehouse Farm, with Jacksons Farm located in the northern-most part of the masterplan redevelopment area, for which a planning application has been made with Horsham District Council, planning application ref: DC/25/0403.

The masterplan includes:

1. Rationalisation and enhancement of existing commercial facilities (Use Classes E(g), B2 and B8 at Stonehouse Business Park, including demolition of two buildings and their replacement with new Class E(g), B2 and B8 facilities. Extension of existing building to form a new office and wardens' accommodation. Existing mobile home removed.
2. Decommissioning of the Anaerobic Digester and re-use of the existing 2no buildings for storage and office uses (Class E (g) and B8) and the diversion of a public footpath.
3. Residential redevelopment of the Jacksons Farm site including the demolition of existing barns to provide 3no. dwellings with access, parking and landscaping.

Ashdown Site Investigation Ltd. has produced a preliminary ground contamination risk assessment¹ and a ground contamination risk assessment² for the Jacksons Farm development. The ground contamination risk assessment identified complete pollutant linkages and concluded that remedial measures were necessary as part of the development.

Ashdown Site Investigation Ltd was requested to provide a remediation strategy and verification plan for the site based on the conclusions of the ground contamination risk assessment report.

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 Q15255, dated 6th May 2025. The instruction to proceed was received from the client, Lake Investments Ltd.

This report must be read in conjunction with the previous reports prepared for the site.

¹ Project Ref: P17028, Report Ref: R16576, Issue 2, dated 28th February 2025.

² Project Ref: P17132, Report Ref: R16640, Issue 1, dated 8th May 2025

2. SITE LOCATION

The site is located to the south of Hammerpond Road, Plummers Plain, West Sussex, and is centred on the approximate Ordnance Survey national grid reference 522785, 128778. A site location plan is presented as Figure 1.

3. RISK ASSESSMENT

3.1 Preliminary Risk Assessment

The preliminary risk assessment identified potential pollutant linkages associated with the current and historical use of the site for agricultural and light industrial purposes, a slurry pit and made ground and visible waste materials, including a spoil heap in the south-east of the site.

The assessment recommended that an intrusive ground investigation should be undertaken to allow a quantitative assessment to be carried out.

3.2 Quantitative Risk Assessment

A series of boreholes were drilled across the site, including within a stockpile of waste materials, with samples obtained and tested for the contaminants of concern. Ground gas monitoring standpipes were installed in three boreholes, located in close proximity to the slurry pit and monitored on three subsequent occasions at weekly intervals.

Made ground, generally comprising either clay, with varying proportions of gravel and sand, or clayey/sandy gravel, was recorded to depths of between 0.20m and 1.70m below ground level. The deepest made ground was generally recorded in close proximity to the slurry pit. Underlying the made ground, where penetrated, the investigation progressed into undisturbed slightly gravelly/gravelly clay deposits with varying sand and silt content, considered to represent the Upper Tunbridge Wells Sand indicated to underlie the site.

The results of the testing were compared to soil screening values (SSV) for the generic residential land use. Testing of the made ground identified concentrations of PAH compounds above their respective SSV, in addition to concentrations of petroleum hydrocarbons in excess of the threshold value for the use of PE water supply pipework. Localised petroleum hydrocarbon contamination was recorded within the spoil heap in the south-east of the site.

On the basis of the gas monitoring carried out, the site was categorised as Characteristic Situation 1. An assessment of the adequacy of monitoring did not believe that further monitoring at this stage was justified, provided that the material within the slurry pit (the potential source of ground gases) is removed as part of the development and the pit backfilled with suitable non-putrescible materials. It is recommended that some further monitoring is subsequently carried out to confirm that the gas concentrations have reduced.

A copy of the quantitative conceptual model is included as Appendix B.

4. REMEDIATION STRATEGY

Current best practice guidance recommends that any remedial action proposed for the site should be justified. The pollutant linkages identified by the quantitative risk assessment are considered to provide sufficient justification for remedial works.

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.

It is noted that the ground contamination risk assessment report has not yet been approved by the Local Authority. The remediation strategy proposed is provisional based upon their approval of the risk assessment. Additional measures may be required following comment from the Local Authority.

4.1 Options Appraisal

4.1.1 Made Ground

The driver for remediation at the site is the presence of made ground soils containing 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 PAH compounds within the made ground soils to below that of the published screening values.

The recommended works 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.

Either approach, or a combination of them depending on the depth of made ground present in different parts of the site, would be 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.

4.1.2 Spoil Heap

The driver for remediation of the spoil heap is elevated concentrations of petroleum hydrocarbons. Given its relatively small size, the only viable option is considered to be the removal of the spoil heap ahead of any landscaping works.

4.1.3 Slurry Pit

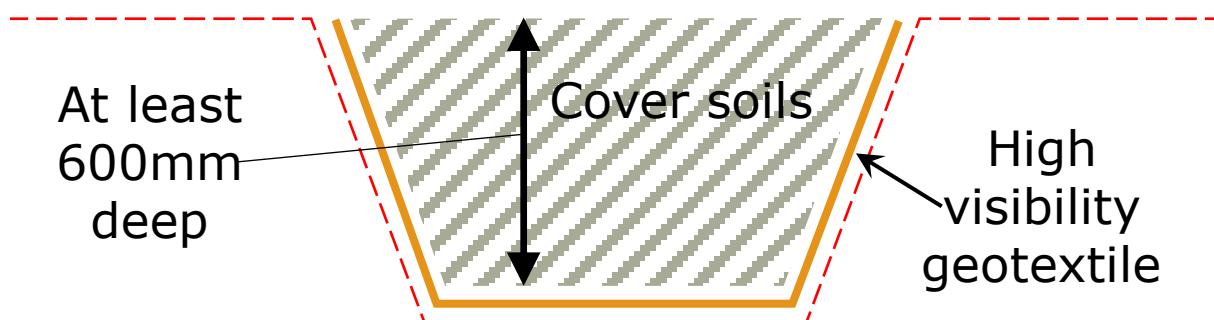
The slurry pit is to be removed as part of the development, which will remove the potential source of ground gases.

4.2 Protection of Human Health

4.2.1 Made Ground

Within proposed areas of private garden and soft landscaping (as shown on the drawing included in Appendix A), where possible the made ground soils should be excavated to expose the undisturbed soils or should be excavated to a sufficient depth 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.

A schematic cross section of the cover system construction, where it is to be employed within garden/soft landscaping areas, is shown below.



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.

Should any tree planting be proposed within areas of general soft landscaping, 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, driveways, patios and other permanent access ways comprising hard cover will also act to sever the contaminant pathways and thereby reduce the risk to end users, from the made ground soils, to an acceptable level.

It is noted that within a designated garden or soft landscaping area, only one form of remediation should be applied: either removal of made ground or provision of a cover system.

4.2.2 Spoil Heap

The soils of the spoil heap should be removed and disposed of appropriately prior to any landscaping works being undertaken at the site.

4.2.3 Slurry Pit

The pit should be excavated of all slurry material and backfilled with non-putrescible materials to remove the on-site source of ground gases.

4.3 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.

4.4 Protection of Services

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.

4.5 Protection of Construction Workers

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 the 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.

4.6 Discovery Strategy

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

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 Spoil Heap Removal

A site inspection should be undertaken to confirm the removal of the spoil heap material. This may be combined with inspection of the cover system works, as discussed below.

A photographic record of the area, showing the removal of the heap, will be maintained for inclusion in the verification report.

5.2 Slurry Pit Removal

An inspection should be carried out to view the pit following removal of all slurry materials and prior to it being backfilled.

Details of the proposed backfill materials should be provided to Ashdown Site Investigation Ltd. prior to them being brought to site. The backfill materials must be free of putrescible material (including wood or paper). It is recommended that the backfill to the pit comprises recycled crush material or virgin aggregate to ensure it does not represent a further risk of ground gas generation. As the backfill materials will be placed below the cover system in the garden areas, specific testing of the materials is not considered to be necessary.

A photographic record of the excavated pit must be included within the verification report, along with evidence of the suitability of the backfill material and a photographic record of the backfill material in place.

Following backfilling of the pit, it is recommended that a further three rounds of ground gas monitoring are undertaken at weekly intervals from the existing standpipes, or replacement standpipes if the original installations cannot be maintained.

Provided that the maximum concentrations of carbon dioxide and methane are similar to or lower than those previously recorded, then the removal of the source will be considered to have been effective. The results of the additional monitoring and their assessment must be included in the verification report. Should higher gas concentrations or flow rates be recorded, it may be necessary to recommend further monitoring and/or an updated gas risk assessment. In this situation, the conclusions of any further risk assessment would be subject to the approval of the Local Authority.

5.3 Made Ground

5.3.1 Stripped Formations and Placement of High Visibility Geotextile Marker

For all areas where remediation works are required (all soft landscaping and garden areas shown on the proposed development layout in Appendix A) the formation level will be inspected prior to the placement of any cover soils to confirm either the removal of all made ground soils, or that the excavations are sufficiently deep to enable placement of the required thickness of cover soils, and to document the placement of the high visibility geotextile marker.

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

If for any reason the above inspections are not undertaken for areas where remediation works are required, retrospective verification will be carried out by way of the excavation of trial pits to expose the geotextile in representative locations. In such circumstances these works may be undertaken in conjunction with the works detailed in Section 5.3.2.

5.3.2 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. In the event that all made ground soils have been removed from site, then the depth of cover soils will not be measured.

Photographic evidence of the presence of cover soils and, if necessary, the depth of soils present, will be included in the verification report.

5.3.3 Cover System 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. Obtaining such results does not negate the need to carry out sampling and testing of the soils, once brought onto the 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.

5.3.4 Soils for use in soft covered areas.

The table below summarises the soil screening values³ 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

³ Comprising 'Suitable For Use Levels' (S4ULs), 'The LQM/CIEH Suitable 4 Use Levels, 2015' 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.

Contaminant	Screening Value (mg/kg)	Contaminant	Screening Value (mg/kg)
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 (including 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.

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 method of assessment will be undertaken:

- 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.
- 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.
- 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.

5.4 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 or, if applicable, written confirmation from the local water supply company that other pipework is acceptable.

6. WASTE SOILS

The Environment Agency in their response to the planning application and the preliminary ground contamination risk assessment made a number of recommendations in relation to waste. It is recommended that the guidance provided is followed.

7. 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

Contaminant Source	Remedial Measures	Potential Pathway(s)	Assessment of Risk to Human Health
Spoil Heap	Removal of spoil heap	N/A – Source Removed	No significant pollutant linkages identified.
Slurry Pit	Removal of slurry from pit and backfilling within non-putrescible material.	N/A – Source Removed	
Made ground soils containing elevated concentrations of PAH compounds and concentrations of petroleum hydrocarbons above the threshold value for the use of PE water supply pipework.	Soft Landscape Areas: Removal of all made ground soils OR Placement of 600mm of verified “clean” cover soils over a high visibility geotextile marker.	N/A Source Removal OR Pathways severed by remedial measures	
	Services: Provision of barrier pipe or other pipework acceptable to the local water supply company	Pathways severed by remedial measures and construction works.	
	Building cover, driveways, patios and other permanent access ways comprising hard cover.	Pathways severed by construction works	

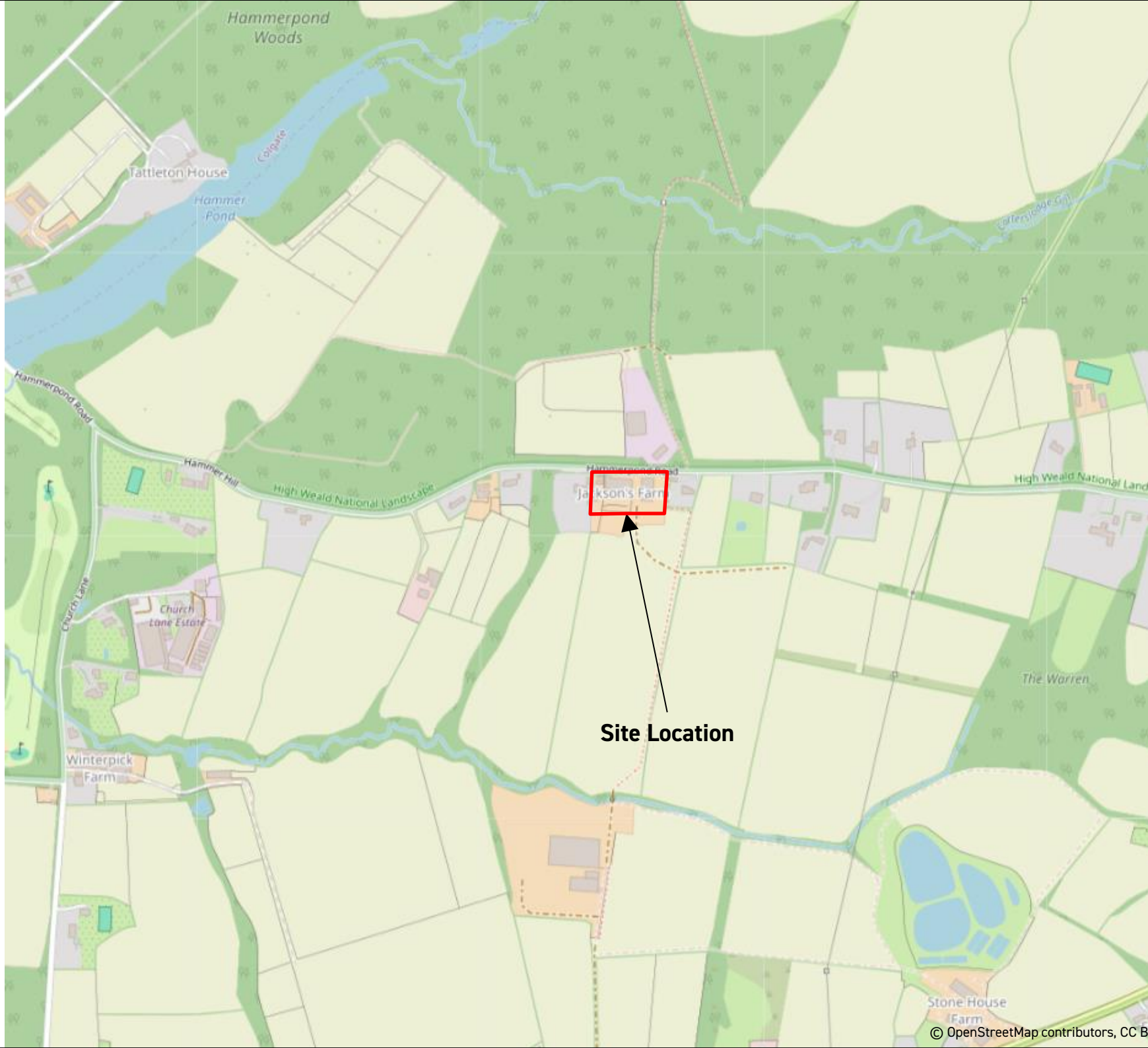
8. REGULATORY APPROVAL

It is recommended that this report (and where relevant the previous reports for the site) are submitted to the Local Authority in relation to the relevant conditions with respect to contaminated land. The report should also be submitted to any other relevant regulator.

The conclusions drawn in this report should be considered as provisional until such time as the report has been accepted and the relevant conditions have been discharged.

FIGURES

Figure 1 Site Location Plan



Head Office

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Site

Jacksons Farm
Hammerpond Road
Plummers Plain
Lower Beeding
West Sussex

Project Ref

C17195

Figure No

1

Drawing Title

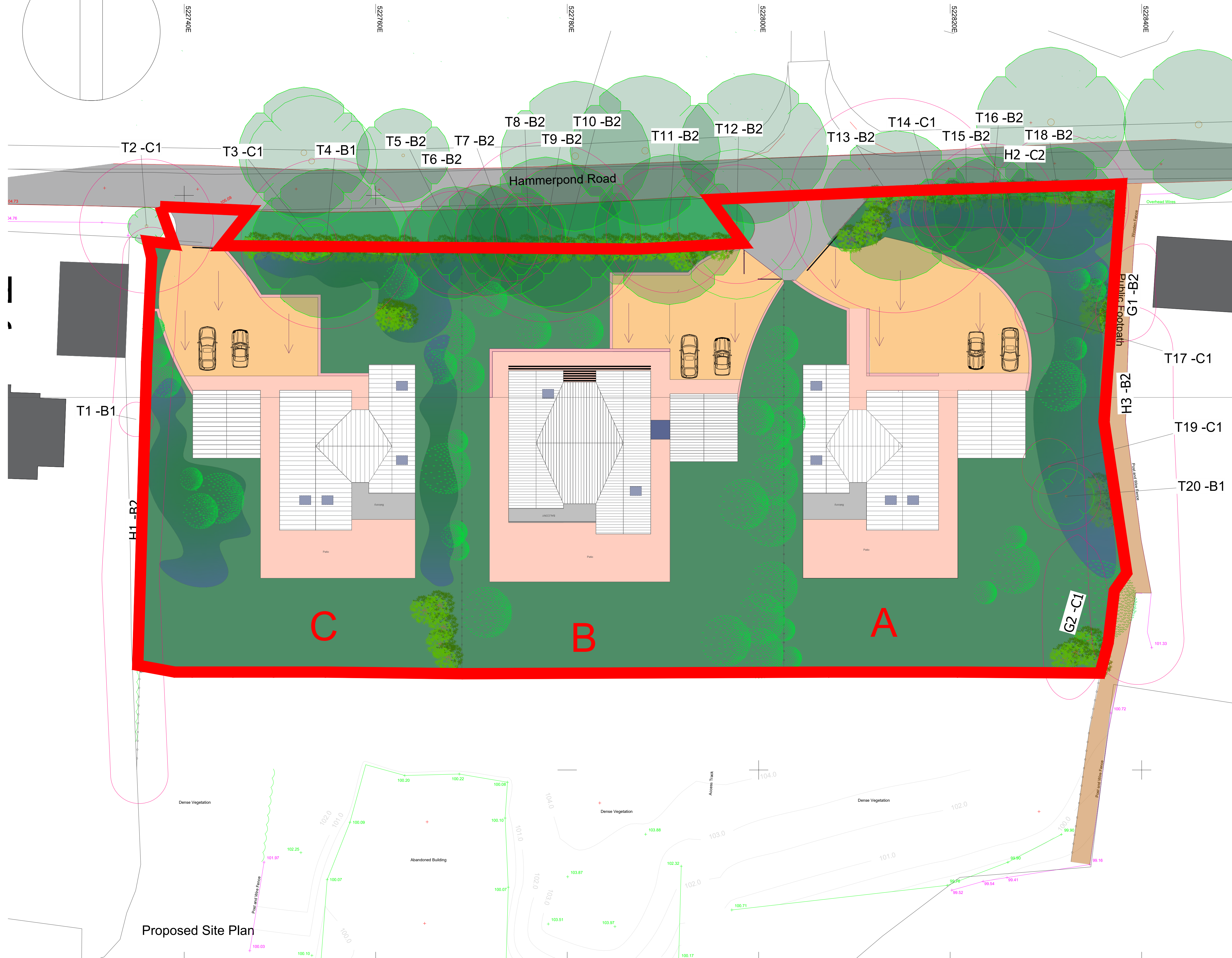
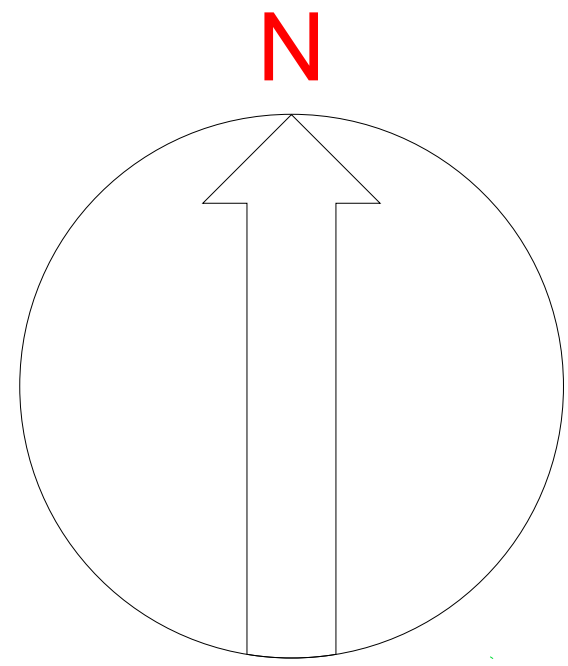
Site Location Plan

Scale

Not To Scale

APPENDIX A

Proposed Development Plan



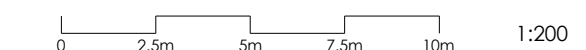
**LLOYD
HARDEN**

Design • Planning • Architecture

- Proposed Grass
- Proposed Wild Flowers and Grass
- Existing Grass Verge
- Proposed Permeable Paviments - SUDS Refer To Drainage drawing
- Patio and Paths
- Existing Footpath to remain
- Retaining Walls
- Balconies
- Proposed Trees
- Existing Trees To Remain
- Proposed Bushes
- Proposed Estate Fencing
- Proposed Sliding Gate
- Proposed Inward Opening Gate

REV BY DATE DETAILS

SCALE @ A1 -1:200



CLIENT

Lee Goossens
Hammerpond Lane, Horsham, RH13 6PE

PROJECT

Jackson's Farm - Demolition of Barns - 3 new Build Houses

DRAWN BY

LKH

CHECKED BY

LKH

PLANNING

DRAWING TITLE

Proposed Site Plan

DATE

05.01.24

DRAWING NUMBER

259101-110

REVISION

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APPENDIX B

Quantitative Conceptual Model

Site: Jacksons Farm, Hammerpond Road, Plummers Plain, Lower Beeding, West Sussex

Project Ref: P17132

Source	Receptor	Contaminants	Pathway	Complete Linkage Present?	Probability	Consequence	Risk
Made ground soils containing elevated concentrations of PAH compounds and concentrations of petroleum hydrocarbons above the threshold value for the use of PE water supply pipework.	End Users	PAH Compounds	Dermal contact with soil and dust (indoor & outdoor)	Yes	P2: Low	C3: Moderate	Low/Moderate
			Ingestion of soil and indoor dust	Yes	P2: Low	C3: Moderate	Low/Moderate
			Consumption of home-grown produce and attached soil	Yes	P2: Low	C3: Moderate	Low/Moderate
			Inhalation of soil dust (indoor and outdoor)	Yes	P2: Low	C3: Moderate	Low/Moderate
			Inhalation of soil vapours	Identified contaminant does not pose a risk via this pathway			N/A
			Inhalation of soil gases/ Risk of explosion	Identified contaminant does 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	No contaminants present at concentrations posing risk to groundwater			N/A
Localised petroleum hydrocarbon contamination within spoil heap in the south east of the site.	End Users	Petroleum Hydrocarbons	Dermal contact with soil and dust (indoor & outdoor)	Yes	P2: Low	C2: Minor	Low
			Ingestion of soil and indoor dust	Yes	P2: Low	C2: Minor	Low
			Consumption of home-grown produce and attached soil	Yes	P2: Low	C2: Minor	Low
			Inhalation of soil dust (indoor and outdoor)	Yes	P2: Low	C2: Minor	Low
			Inhalation of soil vapours	Yes	P1: Very Low	C2: Minor	Very Low
			Inhalation of soil gases/ Risk of explosion	Identified contaminant does 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	No contaminants present at concentrations posing risk to groundwater			N/A

Site: Jacksons Farm, Hammerpond Road, Plummers Plain, Lower Beeding, West Sussex				Project Ref: P17132			
Source	Receptor	Contaminants	Pathway	Complete Linkage Present?	Probability	Consequence	Risk
• Ground gases from the slurry pit	End Users	Ground Gases	Dermal contact with soil and dust (indoor & outdoor)	Identified contaminant does not pose a risk via this pathway			N/A
			Ingestion of soil and indoor dust	Identified contaminant does not pose a risk via this pathway			N/A
			Consumption of home-grown produce and attached soil	Identified contaminant does not pose a risk via this pathway			N/A
			Inhalation of soil dust (indoor and outdoor)	Identified contaminant does not pose a risk via this pathway			N/A
			Inhalation of soil vapours	Identified contaminant does not pose a risk via this pathway			N/A
			Inhalation of soil gases/ Risk of explosion	Yes	P1: Very Low	C2: Minor	Very Low
	End Users (via Water Supply Pipework)		Contamination of incoming services	N/A			N/A
	Groundwater		Migration to groundwater	N/A			N/A