



Phase II Geo-Environmental Assessment

9 Spalding Common

Spalding
Lincolnshire
PE11 3AS

Prepared for:

Mr & Mrs Paul Martin

9 Spalding Common
Spalding
Lincolnshire
PE11 3AS

EPS Project Reference: UK17.2582b

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9 SPALDING COMMON, SPALDING

NON TECHNICAL CLIENT SUMMARY

This report presents the findings of a Phase II Intrusive Ground Investigation undertaken to establish if there are any environmental risks associated with the site and its development. Pertinent findings and conclusions may be summarised as follows:

- The site comprises a small parcel of land, measuring approximately 400m² and is anticipated to have been recently used as a private garden and possibly a home grown vegetable plot. The area has a low environmental sensitivity, due to the presence of underlying clayey soils. Risks from contamination were identified by a previous desk study, primarily due to the presence and nature of made ground (backfill) materials and the possible presence of a historically infilled areas of land.
- Ground investigation work included forming a number of hand augered boreholes and the retrieval of samples from across the site. The shallow soils encountered comprised made ground underlain by clayey Tidal Flat Deposits.
- Levels of the metal lead were encountered in shallow soils which do not meet modern environmental quality requirements for use within the proposed garden areas. Therefore, for redevelopment a recommendation has been presented based on a clean soil capping of **290mm** in thickness to control this risk. It should be appreciated that the purpose of the cover system is to comply with modern planning requirements and it is not considered that the levels of lead recorded pose a plausible risk to current users of the site.
- A Ground gas monitoring programme has reported concentrations of ground gases to be generally low and gas screening values fall into characteristic situation 1 (very low risk), for which no special ground gas protection measures are required.
- A copy of this report should be forwarded to South Holland District Council for inclusion into their land quality records and to support the future planning application.

By their very nature, the above bullet points represent a simplified summary of our work and should not be relied upon to form the basis for key decisions for the proposed development. A full picture is provided in the following report, or alternatively give us a call and we'll talk you through it.



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The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' in house quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.

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1 INTRODUCTION

In April 2017, Environmental Protection Strategies Ltd (EPS) was commissioned by Mr & Mrs Paul Martin to complete a Phase II Geo-Environmental Ground Investigation at 9 Spalding Common, Spalding, Lincolnshire, PE11 3AS ('the site'); see Figure 1. Selected site photographs are included as Appendix A and a proposed development is included as Appendix B.

This report presents a summary of previous phases of environmental assessment together with the findings, conclusions, and recommendations of this phase of investigation. A Phase I desk study has previously been undertaken by EPS for the site, a brief summary of which is provided below.

The work was commissioned in order to address planning requirements for a proposed detached residential dwelling under planning application reference: H16-1178-16.

1.1 Objectives

The objectives of this investigation were as follows:

- a) To establish the presence of potential contaminant linkages established by the previous desk study by means of investigating shallow soils.
- b) To determine the potential risks posed by the site and make recommendations for any further work that may be required and to ensure suitability for use and safe development in accordance with the *Model Procedures for the Management of Land Contamination - Contaminated Land Report 11* and the *National Planning Policy Framework*.

1.2 Scope of Work

To perform an exploratory assessment of the site in accordance with the principles and requirements of DEFRA Circular 01/2006, BS10175 – '*Investigation of Potentially Contaminated Sites*' and BS5930:2015 '*Code of practice for ground investigation*'.

Site Work:

- Site walkover, inspection and obtaining photographic records.
- Health and safety briefing / site supervision.
- Drilling of four boreholes to a maximum depth of 2.0 metres below ground level (mbgl) using a hand auger.
- Continual logging of ground conditions including inspection of samples for visual and olfactory contamination, and laboratory analysis of selected soil samples.
- Installation of three gas monitoring wells and completion of a programme of ground gas monitoring over a period of two weeks.

Reporting:

- Data collection and interpretation.
- Reporting.

The findings of these investigations and their conclusions are presented in the following sections.

1.3 Limitations and Constraints

The purpose of this report is to present the findings of an environmental investigation conducted at the location specified. When examining the data collected from the investigations made during the assessment, EPS makes the following statements:

No investigation method is capable of completely identifying all ground conditions that might be present in the soil or groundwater under a site. Where outlined in our report, we have examined the ground beneath a site by constructing a number of boreholes to recover soil samples. The locations of these excavations and sampling points are considered to be representative of the condition of the whole site subsurface however, ground conditions are naturally variable and it may be possible that the ground conditions encountered may differ to those encountered during the investigation.

No visible evidence of Japanese Knotweed was identified during the site walkover. However this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its presence at certain times of the year. For this reason, EPS cannot confirm that Japanese Knotweed rhizomes do not exist and it is recommended that if it is suspected that this species, or other similarly invasive plants are present at the site, a specialist contractor should be commissioned to make a detailed assessment.

Whilst it is recognised that information contained within this report may assist relevant and suitably qualified professionals, this report does not provide a geotechnical appraisal of ground conditions with respect to suitability of foundations or future structures, nor does it intend to identify a need for any associated geotechnical ground improvement works.

The investigation was carried out to assess the significance of the underlying ground conditions as identified in this report. Unless EPS has otherwise indicated, no assessment of potential impacts of any other previous uses has been made.

2 SUMMARY OF PREVIOUS REPORTS

This investigation supplements a Phase I Desk Study for the site undertaken by EPS Ltd in April 2017. For background information, it is recommended that the reader review the following report:

- *Phase I Geo-Environmental Assessment, 9 Spalding Common, Spalding, PE11 3AS* (Ref: UK17.2582b)

A summary of the information contained within the report, relating to the geo-environmental setting of the site, is presented in the following sections.

2.1 Geo-Environmental Setting

Detail	Description
Location	The site is located on Spalding Common, approximately 2.7km south west of Spalding town centre.
Grid Reference	523370, 320580
Topographic Elevation	Approximately 3m Above Ordnance Datum (AOD).
Topographic Gradient	The site and surrounding area are generally flat with no discernible topographic gradient.
Description of Site	<p>A walkover survey was undertaken on 10th February 2017 whereby the site was noted to comprise an area of private garden associated with the adjacent residential property, known as 9 Spalding Common.</p> <p>The site itself comprises a small parcel of land, measuring approximately 400m² and is anticipated to have been recently used as a private garden and possibly a home grown vegetable plot. No structures were noted during the walkover and the soils present had been recently turned, with no evidence of made ground such as building debris identified. Furthermore, other than a mature hedgerow present within the garden of the neighbouring property, no evidence of significant vegetation was noted during the site visit.</p>
Surrounding Land Use	The site is bound to the north, south and east by residential dwellings, with a railway line present around 20m west, beyond Spalding Common. The wider surrounding area comprises predominantly agricultural land, with occasional farm holdings noted nearby.

Detail	Description
Geology	Geological maps of the area indicate the ground conditions to comprise Superficial Tidal Flat Deposits (clay and silt), overlying Oxford Clay Formation (mudstone).
Hydrogeology	<p>Groundwater vulnerability maps for the area show that the underlying solid and drift geology are classified as Unproductive Strata. The site does not lie within a Source Protection Zone (SPZ) for groundwater abstraction with no protected areas highlighted locally.</p> <p>No groundwater abstractions are highlighted within 1km.</p>
Hydrology	<p>The nearest surface watercourse is Soke Dyke located approximately 90m south east and runs parallel and adjacent to a section of the River Welland, which is situated 195m south east. A significant network of drainage channels / ditches is also highlighted nearby, primarily associated with agricultural land. The Envirocheck report lists four discharge consents within 500m, the nearest and active record relating to sewage discharge of final/ treated effluent to watercourse at a point roughly 380m north. One surface water abstraction is highlighted locally, situated approximately 480m south and is used for spray irrigation for agricultural land.</p> <p>Review of the Environment Agency (EA) flood zone map for the area indicates that the site lies within flood zone 3, which is the area defined as having a high risk of flooding within Table 1 of technical guidance to the National Planning Policy Framework (NPPF). It should be noted that the EA maps do not take into account the presence of flood defences (which are likely to be present in this area) or flooding from other potential sources of floodwater, such as from poor drainage, or groundwater. On this basis, a flood risk assessment is likely to be required in order to fulfil the planning requirements for the site.</p>
Landfill & Waste	<p>The EA public database does not list any active or historic landfills within 1km.</p> <p>Envirocheck lists one record of potentially infilled land (non-water) on site for unknown filled ground.</p>
Licensed Industrial Activity	No sites are licensed by the EA for industrial use within 1km.
Site History	Mapping for the late 1800s shows the site to be undeveloped with a tree present on site, several dashed features are illustrated on site representing possible pit outlines. Furthermore, residential dwellings are present adjacent to the west and south western boundaries of the site. The surrounding area appears to be for agricultural use, with a railway line present around 20m west beyond Spalding Common. There appears to be several ponds of varying size approximately 25m south of the site, running south, one is marked with reeds and there is a “draining pump” labelled.

Detail	Description
Site History (Continued)	<p>The potential pits are infilled by 1904 outlined on site are no longer present/have been filled, however a pond/marshland feature appears to be present adjacent to the site, which runs along the south eastern corner. In the surrounding area one of the large ponds to the south is now detailed with reeds. By 1932 the surrounding area shows residential development in the south along Spalding Common and Cradge Bank, with the ponds all shown to contain reeds and are significantly reduced in size.</p> <p>By 1968 the ponds are no longer detailed and developments to the south including residential and two structures labelled “works” approximately 150m south east and 200m south west. Mapping from 1980 shows significant residential development along Spalding Common, Cradge Bank and Aintree Drive to the north of the site. There is no significant change of note to the site throughout the remainder of the historical period, although a property (9 Spalding Common) has been built to the south by 1988, with a further, smaller property to the north by 1995.</p>

2.2 Desk Study Conclusions and Recommendations

A Conceptual Site Model was developed which identified potential risks to future site users associated with the areas of potentially infilled land both on site and adjacent to the site as well as migration onsite of landfill gases. On this basis, recommendations were made for completion of further investigation. The objective of this work was to determine the quality and nature of the soils underlying the site and to establish if any of the identified contaminant linkages have the potential to become active as a result of the proposed redevelopment.

3 SUMMARY OF INTRUSIVE INVESTIGATIONS

The Intrusive Investigation was undertaken at the site on the 7th April 2017 in accordance with EPS standard operating procedures, copies of which will be made available on request. A summary of all site activities is presented in the following sections.

3.1 Hand Auger Borehole Locations

Hand auger borehole locations were selected through consideration of the identified plausible contaminant linkages and potential areas of concern, the proposed development plan, the findings of local utilities searches and site specific health & safety considerations.

Four hand auger boreholes (HA1-HA4) were formed to a maximum depth of 2m bgl.

The objective in terms of hand auger locations was to provide an appropriate lateral and vertical coverage of the shallow soils across the site as well as to pick up gases entering the site from any direction. The previously identified AST's were also specifically targeted to quantify the risk posed. Further rationale for the sampling locations is provided in the table below.

Reference	Rationale
HA1-HA4	To investigate the nature and quality of shallow soils in the area of the proposed development.
HA1, HA2 and HA3	To allow for installation of gas monitoring wells to investigate the presence of ground gas at the site.

All boreholes were undertaken in accordance with standard EPS methodologies. A detailed site layout plan showing the location of the Hand Auger boreholes completed during the investigation is presented as Figure 4. Site Specific Borehole logs are included as Appendix C.

3.2 Soil Sampling

The boreholes were logged for ground conditions encountered and inspected for any physical evidence of contamination, such as soil staining, odour and the presence of separate phase liquids and putrefiable material, as well as fragments of asbestos containing materials on a precautionary basis.

Where potentially volatile organic compounds are suspected, EPS carries a Photoionisation Detector (PID), which can be used to measure the relative concentrations of vapour associated with soil samples collected from different depths and locations at the site. Headspace testing by PID was undertaken during the investigation and the results are included on the borehole logs.

Shallow soil samples were obtained and submitted for laboratory analysis to assess the nature and quality of underlying soils. Soil samples were also taken from the aforementioned mounds of material and submitted for testing.

3.3 Laboratory Analysis

All samples obtained for analysis of contaminants of concern were submitted to Exova Jones Environmental of Flintshire, who hold appropriate UKAS / MCERT accreditation for the required testing. Samples were transported in laboratory supplied containers and delivered to the laboratory by approved courier.

Copies of chain of custody documentation for each laboratory are held by EPS and will be made available on request.

4 FINDINGS OF THE INVESTIGATION

This section of the report provides a summary of the findings of the various aspects of the ground investigation.

4.1 Ground Conditions

Geological mapping of the area indicates the site to consist of superficial Tidal Flat Deposits underlain by bedrock of the Oxford Clay Formation.

A total of four hand auger boreholes were formed at the site and the ground conditions encountered are briefly summarised as follows:

Geological Strata	Maximum Depth to Base of Strata (m bgl)	Strata Thickness (m)
Made Ground	1.1	0-1.1
Tidal Flat Deposits	>2m	Unproven

4.1.1 Made Ground

Made Ground was identified from the surface at all locations to a maximum depth of 1.1m. It was observed to consist of a dark brown gravelly silt with some rare sand where the gravel is fine and subangular to subrounded and with frequent brick fragments. Black material and plant matter were also noted to be contained within the made ground at the site.

4.1.2 Tidal Flat Deposits

Tidal flat deposits were recorded beneath the Made Ground in all of the boreholes and were observed to be made up of brown clayey silts and silty clays which were locally sandy with rare gravel. They were identified as being soft to very soft and the gravel was fine and subangular.

4.1.3 Groundwater

Groundwater was not encountered at any borehole location.

4.2 Physical Evidence of Contamination

Other than the made ground identified, no palpable evidence of contamination was encountered at any of the borehole locations during the site investigation.

4.3 Laboratory Analysis

A laboratory analysis testing schedule is presented as Table 1 and all environmental sample results obtained from the laboratory are included as Appendix D.

The key results of laboratory testing on environmental soil samples are summarised as follows:

Contaminant	No. of Samples	No of Detections	Range of Detections (mg/kg)		Highest Location & Depth
			Min	Max	
Arsenic	5	5	19.2	27.8	HA3 (0-0.6)
Cadmium	5	4	0.1	0.4	HA3 & HA2 (0-0.6)
Chromium	5	5	20.8	45.2	HA3 (1.2-1.3)
Copper	5	5	31	70	HA3 (0-0.6)
Mercury	5	5	0.1	0.4	HA3 (0-0.6)
Nickel	5	5	20.8	31.3	HA6 (0-0.5)
Lead	5	5	138	289	HA4 (0.5-0.7)
Zinc	5	5	158	335	HA3 (0-0.6)
PAH 16 Total	5	5	2.6	40.6	HA1 (0-0.6)
Benzo(a)pyrene	5	5	0.22	3.59	HA1 (0-0.6)
Naphthalene	5	4	0.09	0.26	HA4 (0-0.5)
Dibenz(ah)anthracene	5	4	0.25	0.52	HA1 (0-0.6)
Total TPH	3	2	121	204	HA3 (0.1-0.3)
BTEX	3	0	-	-	n/a
MTBE	3	0	-	-	n/a
Asbestos (%)	5	1	-	<0.001	n/a

Note: - = Contaminant not found above minimum laboratory detection limit.

- Detectable levels of ACM, in the form of chrysotile fibre bundles were identified in shallow soils recovered from HA2 (0-0.6). However, upon quantification analysis, percentage of ACM by sample mass was identified at below minimum detection limits (MDL) within HA2 (0-0.6).

4.4 Soil Gas Analysis

Results of soil gas monitoring at locations WS1, WS2 and WS3 are presented as Table 2 along with calculated gas screening values, set out in CIRIA document C665 '*Assessing Risks Posed by Hazardous Ground Gases to Buildings*'.

Methane was not reported above the minimum instrument detection limit at any borehole location. Detectable concentrations of carbon dioxide were reported at selected locations, of up to 1.0% at WS1 on 21st April 2017.

Neither positive flow rates or concentrations of organic vapours were reported across the monitoring period.

5 GENERIC QUANTITATIVE RISK ASSESSMENT

The following section summarises the method used to assess the risks posed to human health and controlled waters then identifies any sample results found by this investigation which warrant further consideration.

5.1 Generic Screening - Soils

In order to screen laboratory data for concentrations of contaminants in soil with potential to cause harm to human health in a residential land-use setting, relevant generic screening values for contaminants in soil have been used. The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows:

- *EA Science Reports (SC050021/SR2, SC050021/SR3, and SC050021/SR7)*
- *EA Soil Guideline Value Science Reports*
- *Suitable For Use Levels (S4ULs) for Human Health Risk Assessment – LQM and CIEH (2015)*
- *Soil Generic Assessment Criteria for Human Health Risk Assessment - EIC/AGS/CL:AIRE (2010)*

Category 4 Screening Levels (C4SLs) released in December 2013 by The Department for the Environment, Food and Rural Affairs (DEFRA), (*Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010*) provide generic suitable for use screening values for common contaminants in a variety of land uses and are utilised as appropriate generic screening criteria.

In addition to screening the concentrations of contaminants in soil for risks to human health, EPS has also screened the concentrations for potential to cause harm to water resources. The criteria used for this process were derived by EPS using the following technical guidance:

- *Environment Agency Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination.*

Resource Sensitivity of Area	Screening Criteria
High Groundwater Resource Potential (HGwRP) - Principal aquifers	UK Drinking Water Standards (UKDWS)
Low Groundwater Resource Potential (LGwRP) - Secondary aquifers not being abstracted and Un-productive groundwater strata	UK Environmental Quality Standards (EQS)

Screening criteria for Low Groundwater Resource Potential (LGwRP) have been adopted for this site due to the anticipated low-permeability of underlying ground conditions and as surface waters have been identified as potentially at risk, where EQS would apply.

A summary of the screening criteria and the methodology used to derive them is included in Appendix E.

5.2 Assessment of Soil Results – Human Health

The results of the screening process for on-site human receptors show that relevant screening values for a residential land use have been exceeded for Lead, as shown in the following table:

Contaminant	Screening Criteria (mg/kg)	No. of Exceedances	Highest Exceedance (mg/kg) & Sampling Location (m bgl)
Lead	200	4	289 (HA4 0-0.5)

The C4SL value for lead of 200mg/kg was exceeded in four samples, HA4 (0-0.5m) at a maximum of 289 mg/kg. Given the limited size of the dataset, further statistical analysis of these lead concentrations is not considered appropriate.

The results of the screening process for groundwater show that generic screening criteria, representative of minimal risk values for controlled waters have not been exceeded for any of the contaminants tested for, at any location.

5.3 Ground Gas Risk Assessment

Given the proposed future use of the site for residential purposes, the Wilson and Card classification system has been used to assess the risks from ground gases (in accordance with CIRIA C665). This is detailed in the table below:

Borehole No.	Borehole Flow (l/h)		Carbon Dioxide (CO ₂)		Methane (CH ₄)	
	Min	Max	Min	Max	Min	Max
WS1	-	-	0.9	1.0	-	-
WS2	-	-	0.4	0.7	-	-
WS3	-	-	0.1	0.6	-	-

Notes: - Indicates not encountered above minimum instrument detection limit (MDL)

Concentrations of both methane and carbon dioxide were generally low, and positive borehole flow rates were not encountered across the monitoring period. On this basis, gas screening values were calculated at a maximum of <0.00011/hr for methane and 0.00011/hr for carbon dioxide.

These conditions fall into characteristic situation 1 (very low risk), for which ground gas protection measures are not required in the development of new structures.

6 ENVIRONMENTAL CONCLUSIONS AND RECOMMENDATIONS

A previous Phase I Desk Study established that a plausible contaminant linkage has the potential either to be currently active, or to become active as a result of the proposed redevelopment of the site for residential use associated with identified areas of historically infilled land. These contaminant linkages primarily comprise human health risks associated with exposure of site workers and future users to potentially contaminated shallow soils, particularly domestic garden areas. Risks of migration of organic volatiles and ground gas to indoor and outdoor air as well as the build-up of gas due to the migration of offsite vapours were also identified.

6.1 Human Health

The intrusive Phase II investigation has identified a surface layer of made ground to be present across the site to a maximum depth of 1.1m overlying Tidal Flat Deposits generally consisting of soft brown gravelly clays.

Results of laboratory analysis undertaken on shallow soils at the site reported concentrations of lead that slightly exceed screening criteria. On this basis, consideration of control measures through which any such risks could be appropriately mitigated would need to be considered for the proposed development. One such control measure which is considered appropriate is the installation of a cover system following guidance presented in the BRE publication: *Cover Systems for Land Regeneration: Thickness Design of Cover Systems for Contaminated Land* (BRE, Mar 2004), for which recommendations have been made in Section 6.3, below.

The presence of made ground and the contaminants identified within may also warrant the installation of drinking water supply pipework resistant to contamination (barrier pipe), to mitigate risks posed by the permeation of organic compounds into potable water supplies and it is suggested that the local water provider is consulted with regard to this.

It is considered that any potential short term risks associated with exposure of soils to construction workers involved with redevelopment work can be appropriately controlled through standard health and safety precautions, detailed within Section 5.4.

The underlying Tidal Flat Deposits is defined by the EA as non-productive strata. Screening criteria representative of minimal risk to underlying groundwater and nearby surface water (LGWRP) were not exceeded at any location and no plausible risk is considered to be present.

6.2 Ground Gas analysis

The results of a ground gas monitoring programme has reported concentrations of ground gases to be generally low. Gas screening values fall into characteristic situation 1 (very low risk), for which no special gas protection measures are required.

6.3 Recommendations

In accordance with the *Model Procedures for Management of Land Contamination (Contaminated Land Report 11)* a summary of the work carried out at the site is presented as a flow diagram in Figure 5 of this report.

The following recommendations are made with respect to further environmental assessment and proposed control measures during the forthcoming redevelopment works.

- a) It is recommended that a minimum of **290mm** of certified clean cover material is placed across all proposed soft landscaped areas for the development (it is recognised that some material may have to be removed to achieve this thickness). It should be appreciated that the purpose of the cover system is to comply with modern planning requirements and it is not considered that the levels of lead recorded pose a plausible risk to current users of the site.

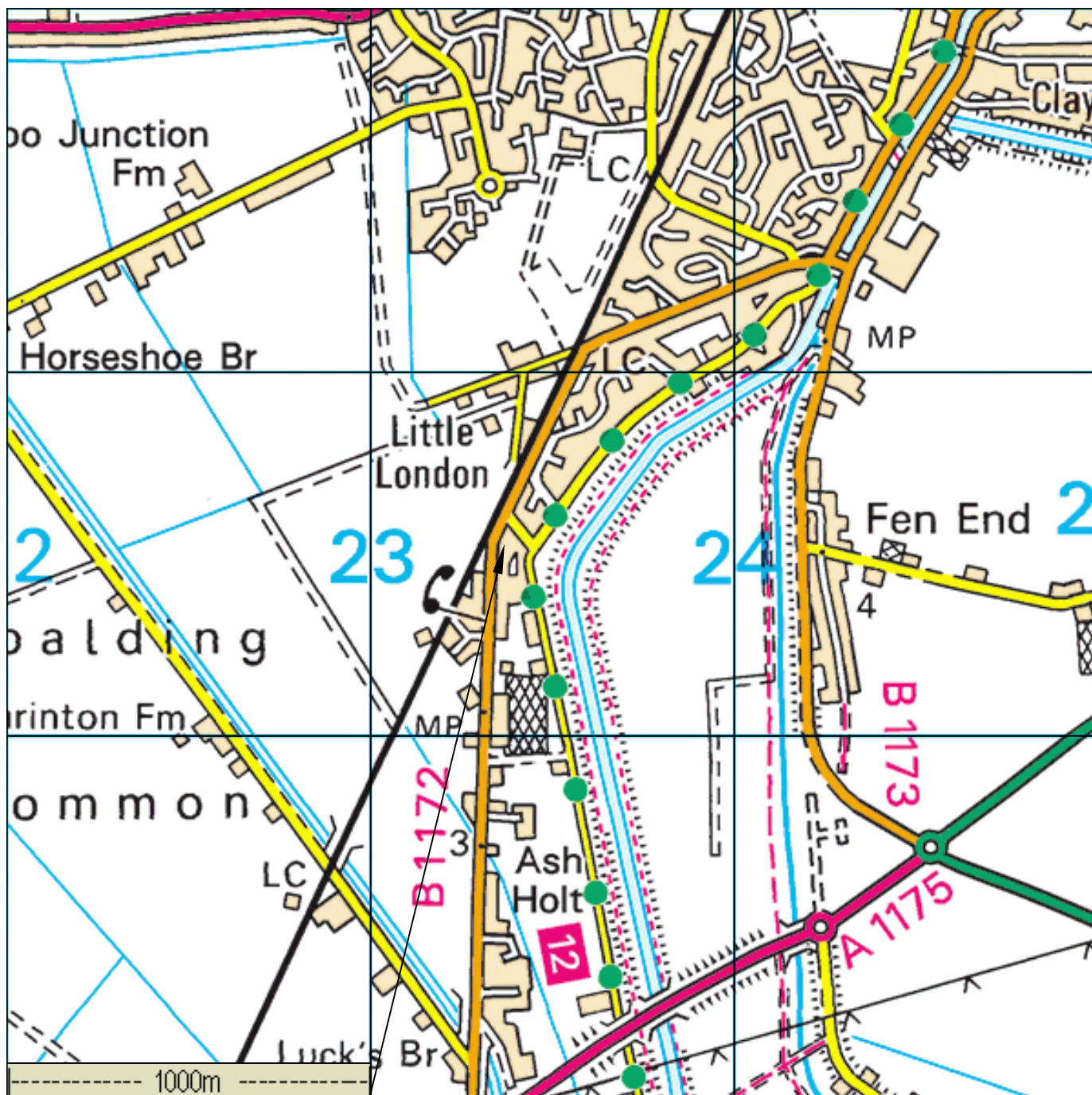
The cover system calculations on which this minimum thickness is broadly based are included as Appendix F. It should be noted that this recommendation is made only for areas of soft landscaping, and there is no such requirement for areas beneath any hard standing or building footprints.

All imported topsoil / subsoil for use within the cover system should be accompanied by appropriate laboratory analysis to demonstrate its chemical and physical suitability for use. The analysis should include TPHs, Asbestos, PAHs and Metals and should also comply with the relevant physical parameters outlined within the British Standard BS 3882:2007 '*Specification for topsoil and requirements for use*'. Upon completion of this work, the cover system should be verified and reported to the Islington South Holland District Council for approval.

- b) All construction workers operating at the site should be advised of the potential for contact with made ground materials within shallow soils. Appropriate health and safety precautions should therefore be adopted during any excavation works to avoid exposure to soils. Reference should be made to the following HSE documents: *Protection of Workers and the General Public during Development of Contaminated Land*.
- c) Should any palpable evidence of unexpected contamination be encountered during the redevelopment work, it should be reported to EPS so that an inspection can be made and appropriate sampling and assessment work carried out, as detailed in Appendix G.
- d) Supply pipe work should be installed in accordance with the requirements of UK Water Industry Research Report 10/WM/03/21 – '*Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites*' (2010).

It is recommended that a copy of this report be provided to the Environmental Health Department of South Holland District Council so that the information may be incorporated into their land quality records and to allow any associated planning conditions to be discharge.

FIGURES



Approximate Site Location

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Title: Site Location Plan

Project: 9 Spalding Common, Spalding,
Lincolnshire, PE11 3AS

Fig No: 1

Scale: As shown

Drawn By: DB **Approved By:** SB

Job No: UK17.2582b

Dwg No: Spalding/0417/01

Date: April 2017



Approximate Site Boundary —

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Title: Current Site Layout

Project: 9 Spalding Common, Spalding,
Lincolnshire, PE11 3AS

Fig No: 2

Scale: NTS

Drawn By: DB **Approved By:** SB

Job No: UK17.2582

Dwg No: Spalding/0417/02

Date: April 2017



Approximate Site Boundary —

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Title: Aerial Photograph

Project: 9 Spalding Common, Spalding,
Lincolnshire, PE11 3AS

Fig No: 3

Scale: NTS

Drawn By: DB **Approved By:** SB

Job No: UK17.2582

Dwg No: Spalding/0417/03

Date: April 2017



KEY:



Approximate Window Sampler Borehole Location

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Title: Borehole Location Plan

Project: 9 Spalding Common, Spalding,
Lincolnshire, PE11 3AS

Fig No: 4

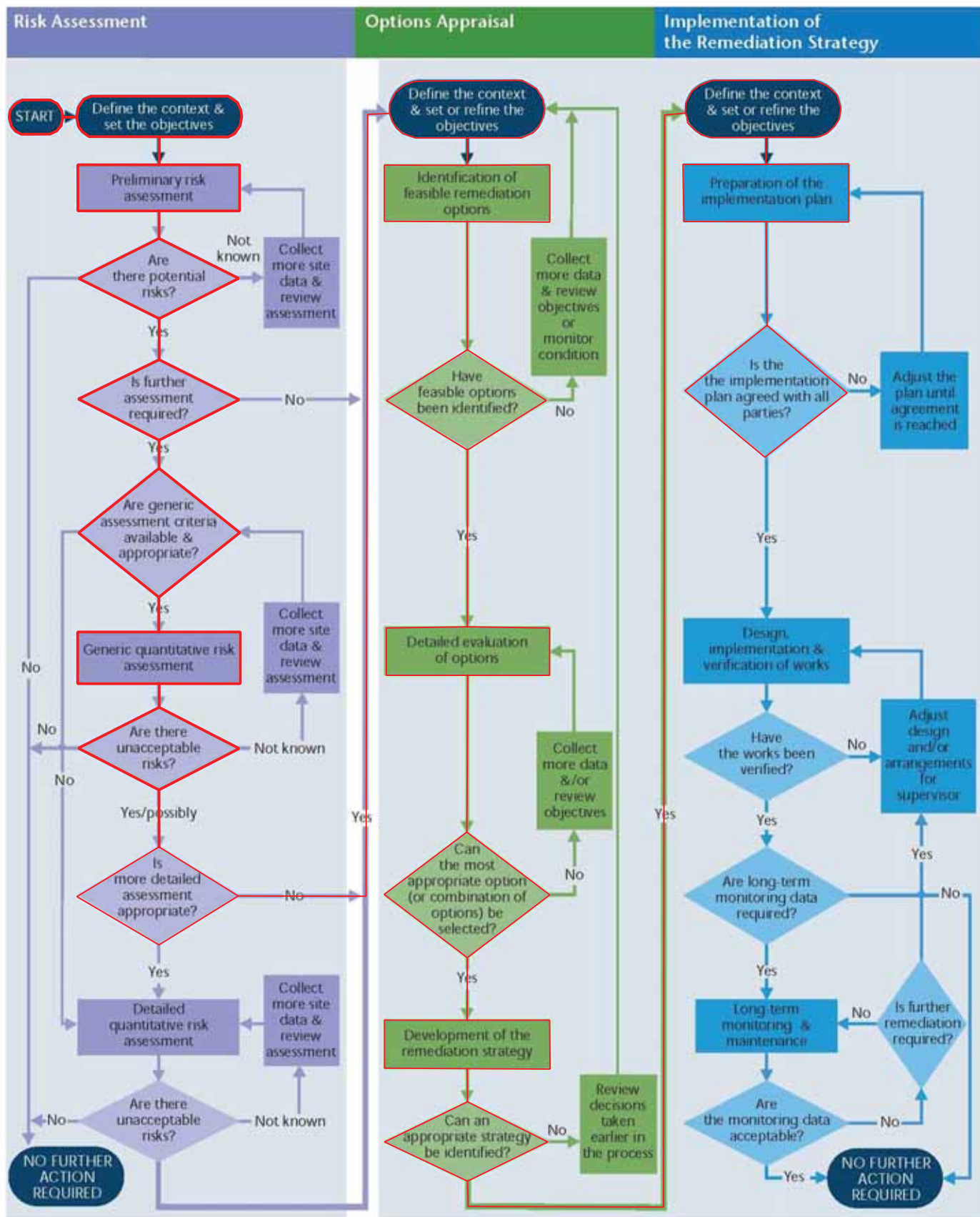
Scale: NTS

Drawn By: DB Approved By: SB

Job No: UK17.2582b

Dwg No: SpaldingCommon/0417/04

Date: April 2017



Assessment Pathway for Site



Title: Site Context - CLR11

Project: 9 Spalding Common, Spalding, Lincolnshire, PE11 3AS

Fig No: 5

Scale: n/a

Drawn By: DB

Approved By: SB

Job No: UK17.2582b

Dwg No: SpaldingCommon/0417/05

Date: April 2017

TABLES



Table 1 – Laboratory Testing Schedule

Sample ID	Sample Depth (m bgl)	EPS Mini Suite	EPS TPH Suite
HA1	0-0.6	1	1
HA2	0-0.6	1	1
HA3	0-0.6	1	-
HA3	1.2-1.3	1	-
HA4	0-0.5	1	-
HA4	0.5-0.7	-	1
HA4	1.2	-	1

Notes:

mbgl	meters below ground level
1	Sample Taken
-	Sample Not Analysed
EPS Mini Suite	Organic Matter, Cyanide, Metals, PAH's, Phenols, Asbestos
EPS TPH Suite	Total Petroleum Hydrocarbons, MTBE, BTEX

Table 2 – Gas Monitoring Data

Sample ID	WS1	WS2	WS4
CH ₄ (%)	<0.1	<0.1	<0.1
CO ₂ (%)	0.9	0.4	0.1
O ₂ (%)	20.8	21.0	20.7
Flow Rate (l/hr)	<0.1	<0.1	<0.1
VOC (ppmV)	0	0	0
Gas Screening Value (l/hr) (CH ₄)	<0.0001	<0.0001	<0.0001
Gas Screening Value (l/hr) (CO ₂)	<0.0009	<0.0004	<0.0001

- Readings collected on 7th April 2017 at a barometric pressure of 1028mb (falling)

Sample ID	WS1	WS2	WS4
CH ₄ (%)	<0.1	<0.1	<0.1
CO ₂ (%)	1.0	0.7	0.6
O ₂ (%)	20.6	20.7	20.7
Flow Rate (l/hr)	<0.1	<0.1	<0.1
VOC (ppmV)	0	0	0
Gas Screening Value (l/hr) (CH ₄)	<0.0001	<0.0001	<0.0001
Gas Screening Value (l/hr) (CO ₂)	<0.001	<0.0007	<0.0006

- Readings collected on 21st April 2017 at a barometric pressure of 1029mb (steady)

APPENDICES

APPENDIX A

Selected Site Photographs



Key:

- Approximate Site Boundary
- 4 → Approximate Photograph Locations and Direction

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Licence Number: 100054115



Title: Photograph Location Plan

Project: 9 Spalding Common, Spalding,
Lincolnshire, PE11 3AS

Fig No: A

Scale: NTS

Drawn By: DB | Approved By: SB

Job No: UK17.2582b

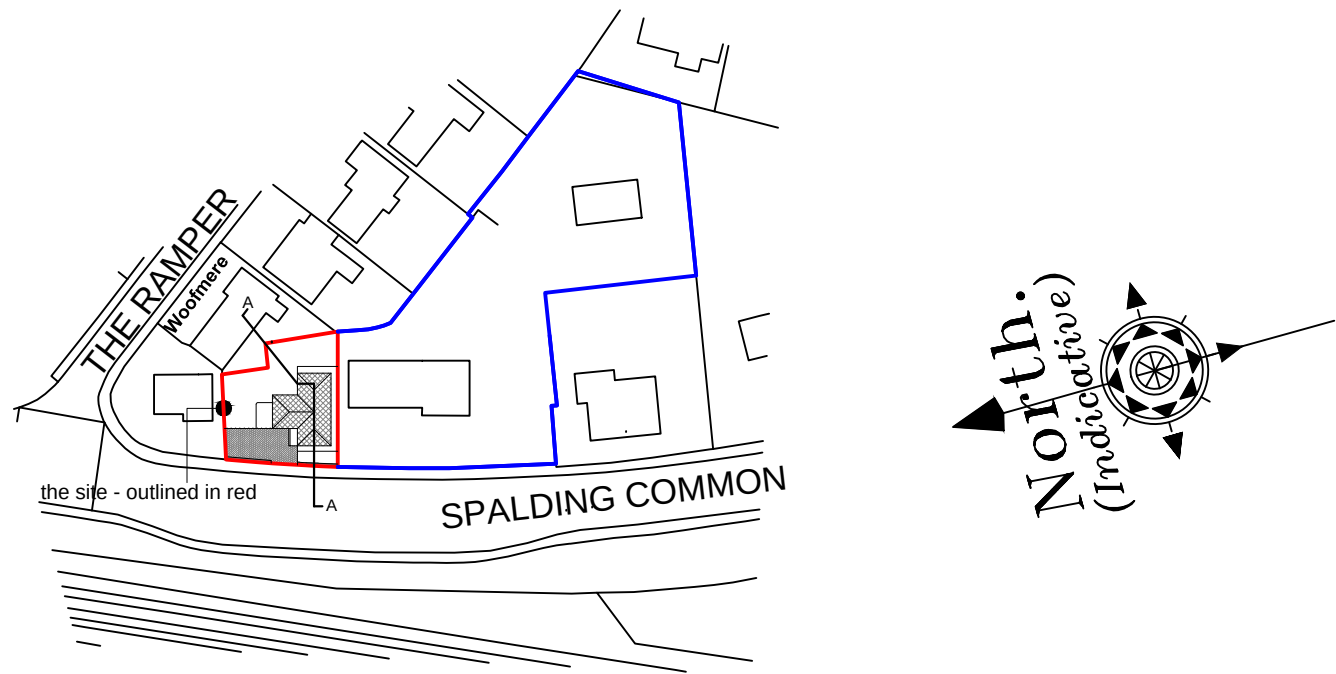
Dwg No: SpaldingCommon/0417/A

Date: April 2017

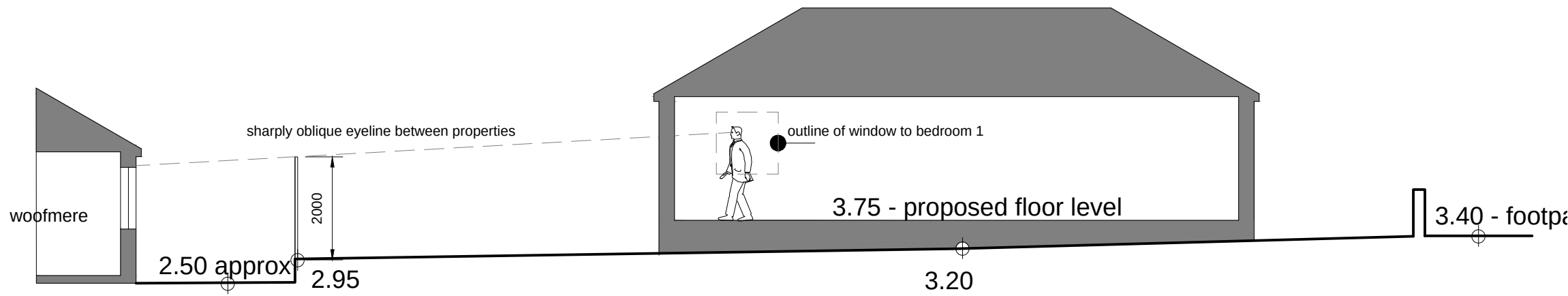
<p>Photo 1: Photograph of location HA3 in the north of the site, facing east.</p>	<p>Photo 2: Photograph of the western half of the site, looking southwest.</p>
	
<p>Photo 3: Location HA2, facing north.</p>	<p>Photo 4: Photograph of location HA1 in the southeastern corner of the site, facing southeast.</p>
	
<p>Photo 5: View of the centre of the site, facing southwest.</p>	<p>Photo 6: View of the northern end of the site looking northwest.</p>
	

APPENDIX B

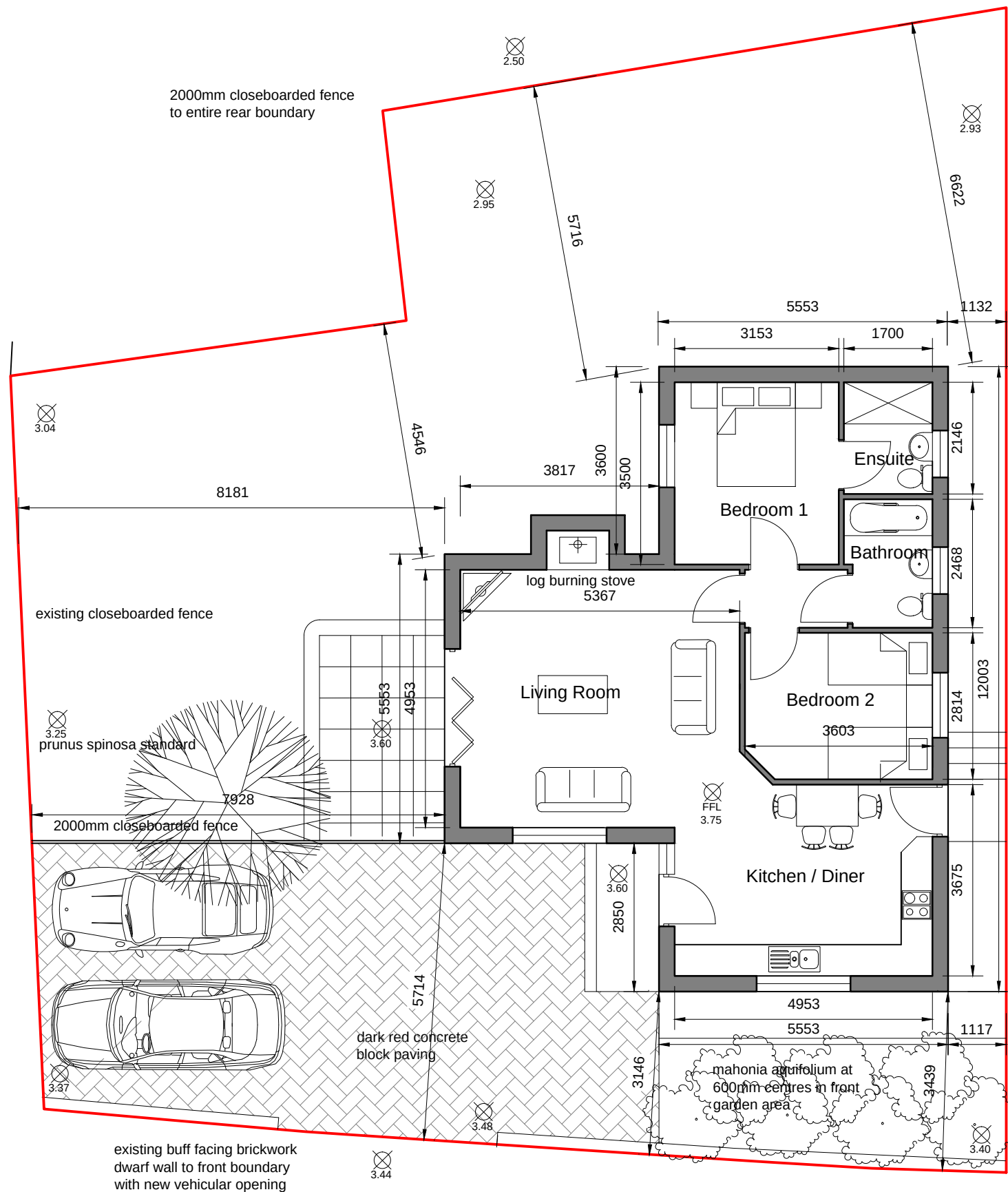
Proposed Development Plan



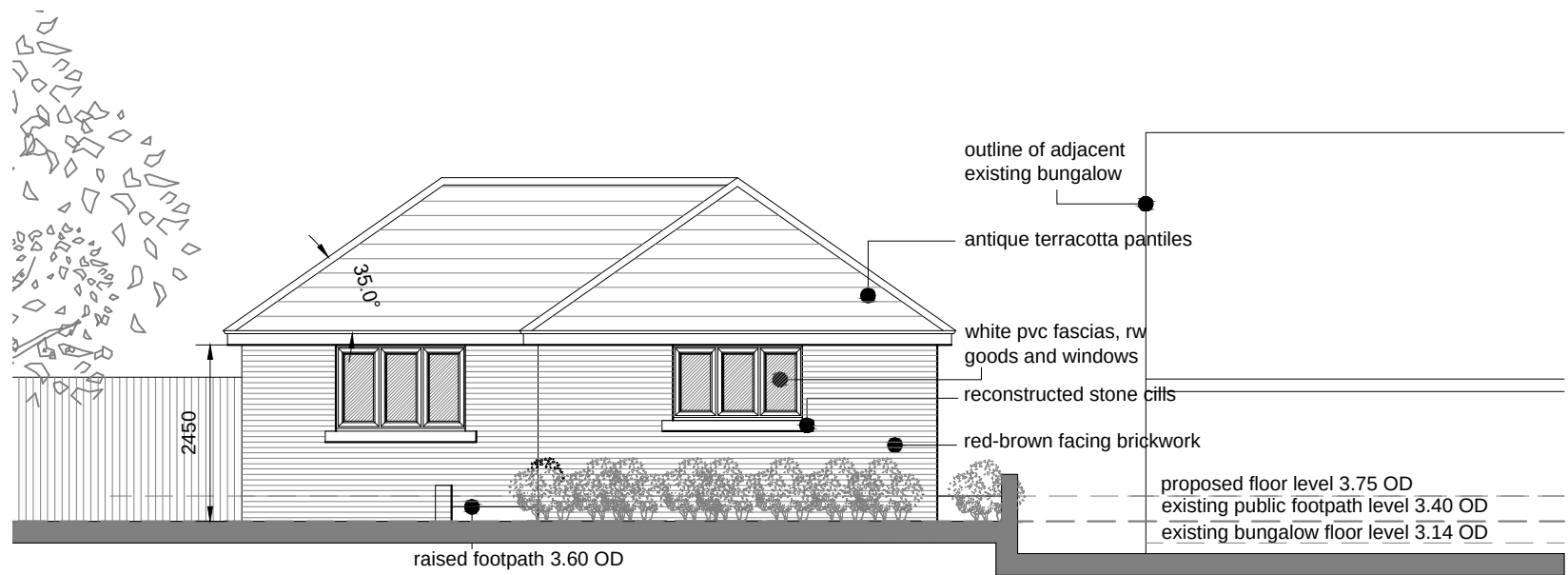
LOCATION PLAN - 1:1250



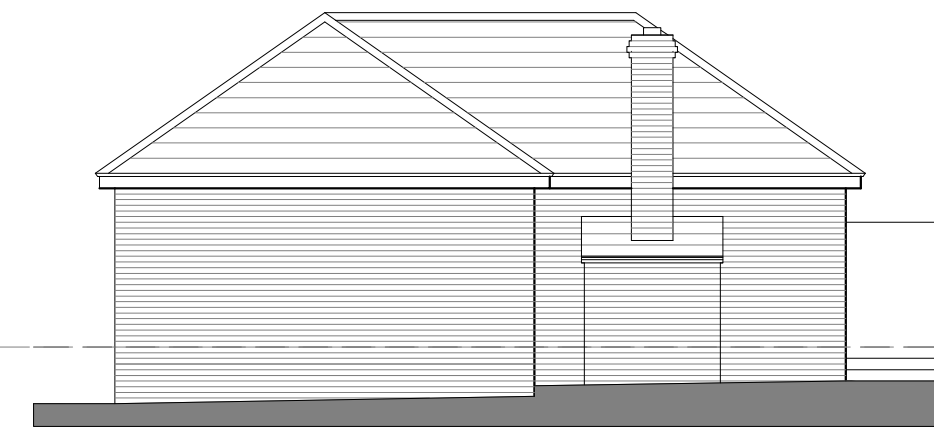
SITE SECTION A-A (see location plan)



FLOOR / SITE PLAN
(site not surveyed)



NORTH WEST ELEVATION - front



SOUTH EAST ELEVATION - rear



NORTH EAST ELEVATION



SOUTH WEST ELEVATION

A	17 November 16	TAC	Client alterations
Revision	Date	Drawn	Description
Client	Mr and Mrs P Martin		
Project	Proposed New Bungalow @ 9 Spalding Common		
Drawing	Planning Application Drawing		
Scale	Drawn	Checked	Date
1:100, 1:1250, @ A2	TAC	AWM	10/11/16
Trevor A Clay RIBA Ltd, 14 Old Fendike Road, Weston Hills, Spalding, Lincs. PE126DD			
01406 380027 07778 597975 trevor@tacarchitects.co.uk			
Drawing No.			15/417/PA/001
			www.tacarchitects.co

APPENDIX C

Site Specific Borehole Logs



Borehole Log

Borehole No.

HA1

Sheet 1 of 1

Project Name: 9 Spalding Common

Project No.
UK17.2582b

Co-ords: -

Hole Type
HA

Location: 9 Spalding Common, Spalding, Lincolnshire, PE11 3AS

Level:

Scale
1:10

Client: TAC Architects

Dates: 07/04/2017 - 07/04/2017

Logged By
DB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.60	ES	PID=0	0.80			Made Ground: Dark brown gravelly SILT with fine gravel and brick pieces with plant material at surface and increasing clay content from 0.5m.	1
				PID=0	2.00			Soft, very dark brown gravelly CLAY with fine rare angular gravel. <i>Poor recovery past 1.5m.</i> End of borehole at 2.00 m	

Remarks





Borehole Log

Borehole No.

HA2

Sheet 1 of 1

Project Name: 9 Spalding Common

Project No.
UK17.2582b

Co-ords: -

Hole Type
HA

Location: 9 Spalding Common, Spalding, Lincolnshire, PE11 3AS

Level:

Scale
1:10

Client: TAC Architects

Dates: 07/04/2017 - 07/04/2017

Logged By
DB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.60	ES	PID=0	0.60		Made Ground; Brown gravelly SILTY with fine angular brick pieces and gravel and inclusions of black clay with a slight odour.	1	
		0.70 - 0.80	ES				PID=0		Light brown very fine sandy SILT with fine brick and black material.
		1.30 - 1.50	ES	PID=0	1.10		Soft brown slightly gravelly silty CLAY with rare fine gravel and poor recovery.		
					2.00		End of borehole at 2.00 m	2	

Remarks





Borehole Log

Borehole No.

HA3

Sheet 1 of 1

Project Name: 9 Spalding Common

Project No.
UK17.2582b

Co-ords: -

Hole Type
HA

Location: 9 Spalding Common, Spalding, Lincolnshire, PE11 3AS

Level:

Scale
1:10

Client: TAC Architects

Dates: 07/04/2017 - 07/04/2017

Logged By
DB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.60	ES					Made Ground: Dark brown gravelly SILT with fine subangular-subrounded gravel and numerous fine brick with black material.	1
		0.60 - 0.80	ES	PID=0	0.60			Made Ground: Dark brown slightly gravelly silty CLAY with rare fine subangular-subrounded gravel and rare brick fragments.	
				PID=0	0.80			Soft-firm light brown-grey very fine sandy CLAY.	
		1.20 - 1.30	ES	PID=0	1.20			Soft brown slightly gravelly, slightly sandy (fine) CLAY with poor recovery.	
					2.00			End of borehole at 2.00 m	2

Remarks





Borehole Log

Borehole No.

HA4

Sheet 1 of 1

Project Name: 9 Spalding Common

Project No.
UK17.2582b

Co-ords: -

Hole Type
HA

Location: 9 Spalding Common, Spalding, Lincolnshire, PE11 3AS

Level:

Scale
1:10

Client: TAC Architects

Dates: 07/04/2017 - 07/04/2017

Logged By
DB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.50	ES	PID=1				Made Ground: Dark brown gravelly SILT with fine subangular-subrounded gravel and numerous fine brick pieces with rare black material and a slight odour.	
		0.50 - 0.70	ES		0.70			Dark grey to black staining.	
				PID=0	0.90			Soft light brown-grey slightly sandy CLAY.	
				PID=0				Soft grey silty CLAY.	1
					2.00			End of borehole at 2.00 m	2

Remarks





APPENDIX D

Laboratory Results - Environmental



Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

EPS Ltd
7B Caxton House
Broad Street
Cambourne
Cambridgeshire
CB23 6JN

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention :	Daryl Bowell
Date :	24th April, 2017
Your reference :	UK17.2582b
Our reference :	Test Report 17/6882 Batch 1
Location :	9 Spalding Common, Spalding, Lincs, PE11 3A:
Date samples received :	12th April, 2017
Status :	Final report
Issue :	1

Seven samples were received for analysis on 12th April, 2017 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: EPS Ltd
 Reference: UK17.2582b
 Location: 9 Spalding Common, Spalding, Lincs, PE11 3AS
 Contact: Daryl Bowell
 JE Job No.: 17/6882

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1	2-3	4	5	6	7-8	9-10				Please see attached notes for all abbreviations and acronyms		
Sample ID	HA1	HA2	HA3	HA3	HA4	HA4	HA4						
Depth	0.00-0.60	0.00-0.60	0.00-0.60	1.20-1.30	0.00-0.50	0.50-0.70	1.20						
COC No / misc													
Containers	J	V J	J	J	T	V J	V J						
Sample Date	07/04/2017	07/04/2017	07/04/2017	07/04/2017	07/04/2017	07/04/2017	07/04/2017						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	12/04/2017	12/04/2017	12/04/2017	12/04/2017	12/04/2017	12/04/2017	12/04/2017				LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 ^{#M}	-	<0.1	-	-	-	<1.0 _{AA}	<0.1				<0.1	mg/kg	TM36/PM12
>C6-C8 ^{#M}	-	<0.1	-	-	-	<1.0 _{AA}	<0.1				<0.1	mg/kg	TM36/PM12
>C8-C10	-	<0.1	-	-	-	<1.0 _{AA}	<0.1				<0.1	mg/kg	TM36/PM12
>C10-C12 ^{#M}	-	<0.2	-	-	-	<0.2	<0.2				<0.2	mg/kg	TM5/PM16
>C12-C16 ^{#M}	-	<4	-	-	-	<4	<4				<4	mg/kg	TM5/PM16
>C16-C21 ^{#M}	-	<7	-	-	-	<7	<7				<7	mg/kg	TM5/PM16
>C21-C35 ^{#M}	-	<7	-	-	-	<7	<7				<7	mg/kg	TM5/PM16
Total aliphatics C5-35	-	<19	-	-	-	<19	<19				<19	mg/kg	TM5/PM16/PM12/PM10
Aromatics													
>C5-EC7 [#]	-	<0.1	-	-	-	<1.0 _{AA}	<0.1				<0.1	mg/kg	TM36/PM12
>EC7-EC8 [#]	-	<0.1	-	-	-	<1.0 _{AA}	<0.1				<0.1	mg/kg	TM36/PM12
>EC8-EC10 ^{#M}	-	<0.1	-	-	-	<1.0 _{AA}	<0.1				<0.1	mg/kg	TM36/PM12
>EC10-EC12 [#]	-	<0.2	-	-	-	<0.2	<0.2				<0.2	mg/kg	TM5/PM16
>EC12-EC16 [#]	-	<4	-	-	-	<4	<4				<4	mg/kg	TM5/PM16
>EC16-EC21 [#]	-	30	-	-	-	17	<7				<7	mg/kg	TM5/PM16
>EC21-EC35 [#]	-	174	-	-	-	104	<7				<7	mg/kg	TM5/PM16
Total aromatics C5-35 [#]	-	204	-	-	-	121	<19				<19	mg/kg	TM5/PM16/PM12/PM10
Total aliphatics and aromatics(C5-35)	-	204	-	-	-	121	<38				<38	mg/kg	TM5/PM16/PM12/PM10
MTBE [#]	-	<5	-	-	-	<50 _{AA}	<5				<5	ug/kg	TM31/PM12
Benzene [#]	-	<5	-	-	-	<50 _{AA}	<5				<5	ug/kg	TM31/PM12
Toluene [#]	-	<5	-	-	-	<50 _{AA}	<5				<5	ug/kg	TM31/PM12
Ethylbenzene [#]	-	<5	-	-	-	<50 _{AA}	<5				<5	ug/kg	TM31/PM12
m/p-Xylene [#]	-	<5	-	-	-	<50 _{AA}	<5				<5	ug/kg	TM31/PM12
o-Xylene [#]	-	<5	-	-	-	<50 _{AA}	<5				<5	ug/kg	TM31/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	-	-				<0.15	mg/kg	TM26/PM21
Natural Moisture Content	25.5	-	18.6	24.2	17.2	21.8	25.4				<0.1	%	PM4/PM0
Natural Moisture Content	-	25.0	-	-	-	-	-				<0.1	%	PM4/PM0
Hexavalent Chromium [#]	<0.3	<0.3	<0.3	<0.3	<0.3	-	-				<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) ^{#M}	0.0425	-	0.0194	0.0141	0.0118	-	-				<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	<0.0015	-	-	-	-	-				<0.0015	g/l	TM38/PM60
Chromium III	39.8	-	34.9	45.2	35.6	-	-				<0.5	mg/kg	NONE/NONE
Chromium III	-	20.8	-	-	-	-	-				<0.5	mg/kg	NONE/NONE
Total Cyanide ^{#M}	<0.5	<0.5	<0.5	<0.5	<0.5	-	-				<0.5	mg/kg	TM89/PM45
Organic Matter	10.4	NDP	13.0	4.9	8.6	-	-				<0.2	%	TM21/PM24
pH ^{#M}	8.05	7.99	8.02	8.15	8.20	-	-				<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Matrix : Solid

[illegible]

Client Name: EPS Ltd
Reference: UK17.2582b
Location: 9 Spalding Common, Spalding, Lincs, PE11 3AS
Contact: Daryl Bowell

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Signed on behalf of Jones Environmental Laboratory:



Ryan Butterworth
 Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
17/6882	1	HA1	0.00-0.60	1	18/04/2017	General Description (Bulk Analysis)	soil-stones
					18/04/2017	Asbestos Fibres	NAD
					18/04/2017	Asbestos Fibres (2)	NAD
					18/04/2017	Asbestos ACM	NAD
					18/04/2017	Asbestos ACM (2)	NAD
					18/04/2017	Asbestos Type	NAD
					18/04/2017	Asbestos Type (2)	NAD
					18/04/2017	Asbestos Level Screen	NAD
17/6882	1	HA2	0.00-0.60	3	18/04/2017	General Description (Bulk Analysis)	soil-stones
					18/04/2017	Asbestos Fibres	Fibre Bundles
					18/04/2017	Asbestos ACM	NAD
					18/04/2017	Asbestos Type	Chrysotile
					18/04/2017	Asbestos Level Screen	<0.1%
					22/04/2017	Asbestos Gravimetric Quantification	<0.001 (mass %)
					22/04/2017	Asbestos PCOM Quantification (Fibres)	<0.001 (mass %)
					22/04/2017	Asbestos Gravimetric & PCOM Total	<0.001 (mass %)
17/6882	1	HA3	0.00-0.60	4	18/04/2017	General Description (Bulk Analysis)	soil-stones
					18/04/2017	Asbestos Fibres	NAD
					18/04/2017	Asbestos Fibres (2)	NAD
					18/04/2017	Asbestos ACM	NAD
					18/04/2017	Asbestos ACM (2)	NAD
					18/04/2017	Asbestos Type	NAD
					18/04/2017	Asbestos Type (2)	NAD
					18/04/2017	Asbestos Level Screen	NAD
17/6882	1	HA3	1.20-1.30	5	18/04/2017	General Description (Bulk Analysis)	soil/stones
					18/04/2017	Asbestos Fibres	NAD
					18/04/2017	Asbestos Fibres (2)	NAD
					18/04/2017	Asbestos ACM	NAD
					18/04/2017	Asbestos ACM (2)	NAD
					18/04/2017	Asbestos Type	NAD
					18/04/2017	Asbestos Type (2)	NAD
					18/04/2017	Asbestos Level Screen	NAD
17/6882	1	HA4	0.00-0.50	6	18/04/2017	General Description (Bulk Analysis)	soil/stones
					18/04/2017	Asbestos Fibres	NAD
					18/04/2017	Asbestos Fibres (2)	NAD

[illegible]

Matrix : Solid

[illegible]

Client Name: EPS Ltd
Reference: UK17.2582b
Location: 9 Spalding Common, Spalding, Lincs, PE11 3AS
Contact: Daryl Bowell

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/6882

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution

JE Job No: 17/6882

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of	PM12/PM16	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis./Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of	PM12/PM16	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis./Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes

JE Job No: 17/6882

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes	Yes	AD	Yes

JE Job No: 17/6882

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes	Yes	AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes	Yes	AR	No
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes	Yes	AR	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes

APPENDIX E

Summary of Screening Criteria



EPS Generic Quantitative Risk Assessment

Low Risk Generic Screening Criteria - All Land Uses

	Soil Targets					
Contaminant	Residential		Allotments	Commercial	Public Open Spaces	
	With Home Grown Produce	Without Home Grown Produce			Residential	Parks
Unit	mg/kg					
Arsenic	37	40	49	640	79	168
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)pyrene	5	5.3	5.7	76	10	21
Cadmium	26	149	4.9	410	220	880
Chromium (VI)	21	21	170	49	23	250
Lead	200	310	80	2330	630	1300

Notes:

Targets for Human Health have been taken from available Category 4 Screening Levels (C4SLs) for assessment of land affected by contamination issued by DEFRA in December 2013.

EPS Generic Quantitative Risk Assessment

Minimal Risk Generic Screening Criteria - Residential Land Use

Contaminant	Human Health	Soil Targets		Groundwater Targets	
		Controlled Waters		Controlled Waters	
		LGwRP	HGwRP	LGwRP	HGwRP
Unit		mg/kg		ug/l	
Arsenic	37	n/c	n/c	50	10
Cadmium	11	n/c	n/c	5	5
Chromium III	910	n/c	n/c	250	50
Chromium VI	6	n/c	n/c	n/c	n/c
Copper	2400	n/c	n/c	28	28
Mercury (elemental)	1.2	n/c	n/c	1	1
Nickel	180	n/c	n/c	200	50
Lead	NA	n/c	n/c	250	10
Selenium	250	n/c	n/c	10	10
Zinc	3700	n/c	n/c	500	500
Benzene	0.087	0.252	0.008	30	1
Toluene	130	1.17	1.17	50	50
Ethylbenzene	47	15.0	10.0	300	200
Xylene (para)	56	0.885	0.885	30	30
MTBE#	49	0.138	0.0276	75	15
Benzo(a)Pyrene	2.2	10	1.44	0.7	0.1
Naphthalene	2.3	0.934	0.02	10	0.1
Dibenz(ah)anthracene	0.24	n/c	n/c	n/c	n/c
Aliphatic C5-C6	42	5.27	1.05	50	10
Aliphatic C6-C8	100	23.2	4.64	50	10
Aliphatic C8-C10	27	175	35.1	50	10
Aliphatic C10-C12	130(48)*	1380	276	50	10
Aliphatic C12-C16	1100(8.48)**	27500	5490	50	10
Aliphatic C16-C35	65000 (8.48)**	3.46E+06	6.91E+05	50	10
Aromatic C8-C10	34	8.74	1.75	50	10
Aromatic C10-C12	74	13.8	2.76	50	10
Aromatic C12-C16	140	27.5	5.5	50	10
Aromatic C16-C21	260	86.9	17.4	50	10
Aromatic C21-C35	1100	690	138	50	10

Notes:

LGwRP - Low Groundwater Resource Potential

HGwRP - High Groundwater Resource Potential

f = Oral, dermal and inhalation exposure compared with oral HCV N/C = Not Calculated

* = S4UL exceeds vapour saturation limit (in brackets)

** = S4UL exceeds solubility saturation limit (in brackets)

Soil Targets

Targets for Human Health have been taken from 'S4ULs Suitable For Use Levels for Human Health Risk Assessment' – LQM and CIEH (2014) derived using standard sandy loam soil with 1% SOM, except (#) = EIC/AGS/CL:AIRE GAC 'Soil Generic Assessment Criteria' (2010). For sites where ground conditions differ significantly from sandy loam or site-specific SOM and pH are available, the generic human health targets may be revised.

Targets for Controlled waters have been derived using EA Remedial Targets Worksheet (v3.1) - using standard Sandy Loam ground conditions as described in Science Report SC050021/SR3, assuming no degradation for a 10m compliance distance with criteria of EQS or UKDWS for LGwRP and HGwRP respectively (see notes for GW targets).

Groundwater Targets

For LGwRP, targets have been taken as Freshwater EQS where available. For Ethylbenzene and BaP the WHO Health limit has been used and for MTBE and individual TPH fractions a 5 times multiplier of taste threshold and UKDWS has been taken respectively.

For HGwRP, targets have been taken as UKDWS where available, with the exception of Copper and Zinc where the EQS is lower than the DWS and therefore the EQS has been used as the groundwater target. For Ethylbenzene the upper WHO ATO limit has been used. For Toluene and Xylene, the WHO ATO limit is higher than the EQS and so the lower value has been taken. For MTBE the taste threshold has been taken.

Work carried out to calculate generic screening criteria for concentrations of contaminant in groundwater with respect of risks to Human Health has generally found that criteria far exceed (by at least 2 orders of magnitude) those listed for the protection of either LGwRP and HGwRP receptors. On this basis, the above Groundwater criteria are also considered protective of human health and further evaluation of these risks should be considered alongside any detailed quantitative risk assessments carried out for groundwater on a site specific basis.

APPENDIX F

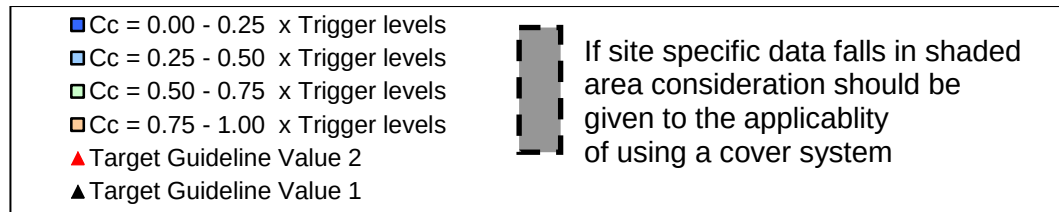
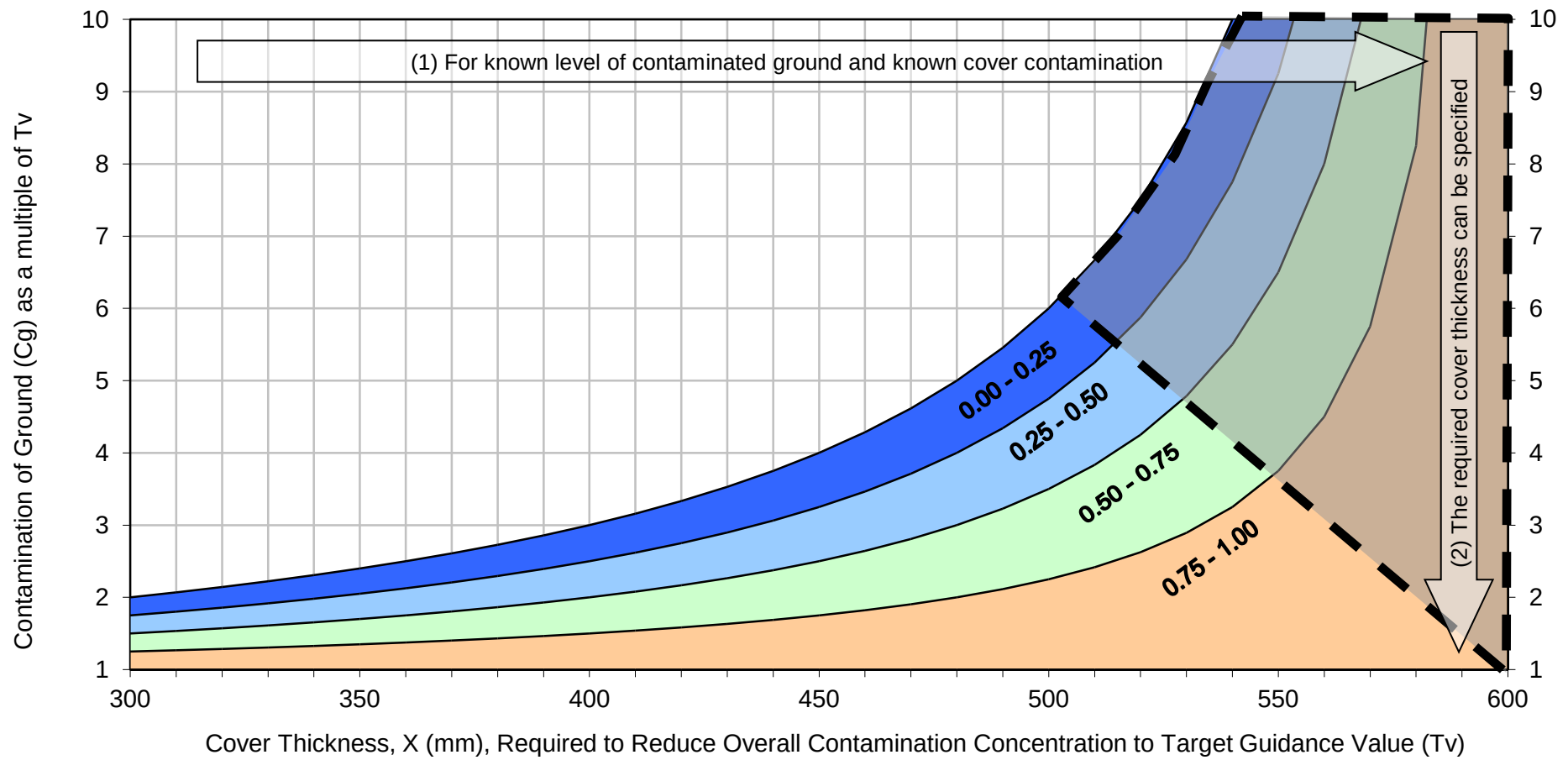
Cover System Calculations

Calculations based on mixed zone (M)	600	mm
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[illegible]

Summary		
	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	2	2
Number of contaminants with no thickness calculation	1	2
Breakdown - Number for which no TV specified	1	2
Breakdown - Number for which no soil specified	1	1
Breakdown - Number for which no cover specified	1	1
Breakdown - Number for which cover > TV	0	0
Number of contaminants with thickness calculation	1	0
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	1	0
Overall thickness of cover required	283	0

Design Chart



APPENDIX G

Method Statement For Encountering Unexpected Contamination



METHOD STATEMENT

ACTIONS TO BE TAKEN IN THE EVENT OF DISCOVERING UNEXPECTED CONTAMINATION DURING INTRUSIVE GROUNDWORKS

If at any point during intrusive groundworks at a site, evidence of unforeseen contamination is encountered in the form of significant noxious odours, discolouration, or instability within soils or sheen/ discolouration in groundwater, the following actions will be taken:

- Intrusive works in the immediate area of the impacted ground will be suspended and the continuation of work in other areas of the site will be considered within the context of the site specific health & safety plan.
- Environmental Protection Strategies Ltd (EPS) will be contacted and appraised of the situation so that arrangements can be made to characterise the impact and determine what action may be necessary in addition to the scheduled site works. Where possible / health & safety plan permits, digital photographs of the impacted ground will be taken and emailed to EPS at the address below to assist in the initial assessment.
- It may well be necessary for EPS to attend site to undertake visual inspection and obtain samples for field and/or laboratory analysis, although the actions taken will be dependent on the nature of what is encountered.
- In cases where EPS consider the unforeseen contamination likely to pose a significant risk of significant harm to adjacent site users or local environmental receptors, the local authority and the Environment Agency will be informed of the situation and the actions being taken.
- Once appropriate action has been agreed and undertaken, a written summary will be produced by EPS for submission to the Local Authority, (and where relevant, the Environment Agency) in accordance with planning requirements. The submission will include details of work undertaken, analytical results of investigative and validation samples obtained and conclusions and recommendations for any further actions considered necessary.
- Where regulatory bodies have been involved, site works should only recommence following their agreement and in all cases should only recommence when the site manager considers it safe to do so within the context of the site specific health & safety plan.

EPS Contact Details:

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Will Evans	Director	Tel: 0781 253 9655
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Email: info@epstrategies.co.uk (Automatically forwarded to the above and office based personnel.)