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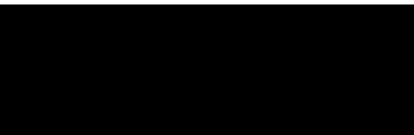
Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Stoke Mandeville, HP22 5BL
Tel: 01296 739400 Email: consultants@subadra.com

Remediation Strategy and Verification Plan



Report Prepared By:



Duncan Eastland

Report Reviewed By:



James Edley

Client: Willowwalk (Thaxted)
Developments Ltd

Subadra Consulting Ltd. Registered in
England No. 4586038
Registered Office 13 Triangle Business
Park, Stoke Mandeville, HP22 5BL

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Attachment One: Notice to Interested Parties

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1 Introduction

1.1 General

We have prepared this Remediation Strategy and Verification Plan for Willowwalk (Thaxted) Developments Ltd in support of the latter's planning application (ref. B/13/00875/FUL) to redevelop the site. The proposed development comprises:

- Demolition of all existing above ground structures (already completed);
- Construction of three detached houses.

1.2 Previous Reports

Our Ref.	Report Title	Prepared By	Prepared on Behalf of	Date of Issue	Report Reference
Ref.1	Site Decommissioning Report	Subadra Consulting Ltd	Total UK Ltd	April 2005	FI03088 CL 003
Ref.2	Letter Report - Groundwater Monitoring			27 th April 2005	FI03088 CL 004
Ref.3	Letter Report - Interceptor Excavation Works			30 th June 2005	FI03088 CL 006
Ref.4	Letter Report - Groundwater Monitoring			27 th August 2005	FI03088 CL 008
Ref.5	Detailed Quantitative Risk Assessment Report			April 2006	FI03088 CL 009
Ref.6	Site Investigation Report, Detailed Quantitative Risk Assessment and Remedial Method Statement	Provectus Remediation Ltd	EA Property Developments Ltd	September 2011	100767/SI/R001

Table One: Previous Environmental Reports Relating to the Site

The Provectus report refers to further investigation and assessment reports prepared by others, both before our first involvement in 2005 and following our most recent involvement in 2006.

1.3 Current Planning Status

Planning consent has been granted by Babergh District Council (Planning Reference 13/00875/FUL). The consent includes conditions relating to soil/groundwater contamination issues. These are reproduced below:

Condition Nine.

No development shall take place until;

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(i) A strategy for investigating any contamination present on site has been submitted for approval by the Local Planning Authority;

(ii) Following approval of the strategy, an investigation shall be carried out in accordance with the strategy.

(iii) A written report shall be submitted detailing the findings of the investigation referred to in (ii) above, and an assessment of the risk posed to receptors by the contamination, for approval by the Local Planning Authority. Subject to the risk assessment, the report shall include a Remediation Scheme as required.

(iv) Any remediation work shall be carried out in accordance with the approved Remediation Scheme.

Following remediation, evidence shall be provided to the Local Planning authority verifying that remediation has been carried out in accordance with the approved remediation scheme.

Condition Ten.

1) No development approved by this planning permission shall take place until a scheme that includes the following components to deal with the risks associated with contamination of the site shall each be submitted to and approved, in writing, by the local planning authority:

1) A preliminary risk assessment which has identified:

- all previous uses*
- potential contaminants associated with those uses*
- a conceptual model of the site indicating sources, pathways and receptors*
- potentially unacceptable risks arising from contamination at the site.*

2) A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.

3) The results of the site investigation and detailed risk assessment referred to in (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.

4) A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action. Any changes to these components require the express written consent of the local planning authority. The scheme shall be implemented as approved.

Condition Eleven.

No occupation of any part of the permitted development shall take place until a verification report demonstrating completion of works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved, in writing, by the local planning authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a "long-term monitoring and maintenance plan") for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan. The long-term monitoring and maintenance plan shall be implemented as approved.

Condition Twelve.

No development should take place until a long-term monitoring and maintenance plan in respect of contamination including a timetable of monitoring and submission of reports to the Local Planning Authority, shall be submitted to and approved in writing by the Local Planning Authority.

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Reports as specified in the approved plan, including details of any necessary contingency action arising from the monitoring, shall be submitted to and approved in writing by the Local Planning Authority. Any necessary contingency measures shall be carried out in accordance with the details in the approved reports.

On completion of the monitoring specified in the plan a final report demonstrating that all long-term remediation works have been carried out and confirming that remedial targets have been achieved shall be submitted to and approved in writing by the Local Planning Authority.

Condition Thirteen.

If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted a remediation strategy to the local planning authority detailing how this unsuspected contamination shall be dealt with and obtained written approval from the local planning authority. The remediation strategy shall be implemented as approved.

1.4 Objectives

Earlier reports have included sufficient information to satisfy, or part satisfy the parts of the planning conditions relating to the assessment and/or investigation of contaminants at the site and that information is not repeated here.

This report is intended to satisfy the parts of the planning conditions relating to the compilation of a Remediation Scheme in order to allow the development (and the remediation works which form a part of the development) to commence without further delay. At the time of writing this report, some of the remedial works have been completed.

A further verification report will be produced once long term monitoring has been completed in order to satisfy the remaining parts of these planning conditions.

1.5 Remediation Strategy Overview

This report presents our Remediation Strategy and Verification Plan, which provided it is fully implemented, will ensure that the site is suitable for its intended future use when developed. The document sets out the methods to be used and the general requirements for mitigation of risks to human health and environmental receptors on and off the site.

In summary, the following remediation requirements have been identified and are covered in this document:

- Excavation and removal of soil that has been significantly impacted with hydrocarbons;
- Chemical treatment of the soil surrounding excavations and of groundwater to reduce the concentrations of dissolved-phase hydrocarbons under the site;
- Long term groundwater monitoring to demonstrate the efficacy of the remedial works outlined above.

Details of planned remediation activities are set out in Section 6 of this report and details of the planned validation activities are set out in Section 8 of this report..

1.6 Remediation Basis

Remediation of land affected by contamination includes putting into effect measures that prevent or mitigate the effects of contamination and as a result will reduce risks to an acceptable level. This Remediation Strategy is based on the findings of previous investigations and assessments as detailed in Section 1.2.

Our Remediation Strategy and Verification Plan has been developed for the site incorporating, where appropriate, the guiding principles listed below:

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General

- Defra and Environment Agency (2004) Model Procedures for the Management of Land Contamination. CLR11
- Environment Agency (2010) Guiding Principles for Land Contamination: GPLC1-3
- Environment Agency (2010) Verification of Remediation of Land Contamination. Science report SC030114/R1.
- Environment Agency (2014) Pollution Prevention Guidance. Basic good environmental practices: PPG1 (Note: This was withdrawn in December 2015 but has not been replaced).

Cover Systems and Landscaping

- British Standards Institution (2015) Specification for topsoil: BS 3882:2015
- BRE (2004) Cover systems for land regeneration: BRE 465
- NHBC (2012) Technical Extra: Verification of cover systems – testing criteria for subsoil and topsoil. Issue 08.

Ground Gas and Organic Vapour Protection

- BRE (2001) Protective measures for housing on gas-contaminated land. BRE414
- British Standards Institution (2007) Code of practice for the characterization and remediation from ground gas in affected developments. BS 8485:2007
- CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings. CIRIA C665
- CIRIA (2012) Remediating and mitigating risks from volatile organic compound vapours from land affected by contamination. CIRIA C716

Asbestos

- CL:AIRE (2016) CAR-SOILTM Control of Asbestos Regulations 2012 Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry Guidance
- CIRIA (2017) Asbestos in soil and made ground: a guide to understanding and managing risks. CIRIA C733.

1.7 Legislative Framework

We consider that the legislation listed below to be relevant to the preparation of this Remediation Strategy and Verification Plan and to the implementation of remediation including measures for the control and prevention of pollution during works involving remediation.

Key Legislation

- Environmental Protection Act 1990 - This Act defines the legal framework for duty of care for waste, contaminated land and statutory nuisance.
- Environment Act 1995 – This Act sets out a system to identify and remediate contaminated land.
- Contaminated Land (England) (Amendment) Regulations 2012 - These Regulations set out provisions relating to the identification and remediation of contaminated land.
- Water Resources Act 1991 (as amended 2009) - This Act sets up the regime to conserve, manage and control pollution of water resources.

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Specific Relevant Legislation

- Environmental Damage (Prevention and Remediation) Regulations 2015 - These Regulations brought into force rules to require polluters to prevent and repair damage to water systems, land quality, species and their habitats and protected sites.
- Pollution Prevention and Control Act 1999 – This Act sets out provisions for regulating activities which are capable of causing pollution and measures for preventing or controlling emissions capable of pollution.
- The Controlled Waste (England and Wales) Regulations 2012 - These Regulations define waste types for waste management licensing purposes.
- The Controlled Waste (Registration of Carriers and Seizure of Vehicles) (Amendment) Regulations 1998 - These Regulations introduced a registration system for carriers of controlled waste.
- The Environmental Protection (Duty of Care) Regulations 1991 (as amended 2003) - These Regulations impose a duty of care on any person who imports, produces, carries, keeps, treats or disposes of controlled waste to ensure there is no unauthorized or harmful depositing, treatment or disposal of the waste.
- The Hazardous Waste (England and Wales) Regulations 2005 (as amended 2009) - These Regulations detail requirements for controlling and tracking the movement of hazardous waste and bans mixing different types of hazardous waste.
- Control of Asbestos Regulations (2012) – These Regulations set out requirements for working with asbestos.
- Water Supply (Water Fittings) Regulations 1999 – These Regulations set out the requirements for the design and installation of service pipes and water mains underground to protect water consumers when laying unprotected water supply pipes in contaminated ground.

1.8 Sustainable Remediation

In line with best practice, we propose to adopt, wherever possible, remediation methods that are compatible with sustainable development principles. The key principles associated with sustainable remediation and which we consider should be included in the design, implementation and reporting of sustainable remediation schemes are listed below:

Principle One - Protection of human health and the wider environment.

The objective of all remediation should be to remove unacceptable risks to human health and protect the wider environment now and in the future for the proposed land use, giving due consideration to the costs, benefits, effectiveness, durability and technical feasibility of the available options.

Principle Two - Safety.

All remediation works must be safe for both construction workers and for all occupants of nearby properties.

Principle Three - Consistent, clear and reproducible, evidence-based decision-making.

Sustainable risk-based remediation decisions should always be made having due regard to environmental, social and economic factors, and considering both current and possible future implications.

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Principle Four - Record keeping and transparent reporting.

All our remediation decisions, including the assumptions and supporting data used to reach them, should be documented in a clear and easily understood format so that we can demonstrate to interested parties that a sustainable solution has been adopted.

Principle Five - Good governance and stakeholder involvement.

Remediation decisions should be made having regard to the views of stakeholders and regulators and following a clear process within which they can participate.

Principle Six - Sound science.

Decisions should be made on the basis of sound science, relevant and accurate data and clearly explained assumptions, uncertainties and professional judgement. This should ensure that our decisions are based upon the best available information and are justifiable and reproducible.

2 Site Background and Environmental Setting

2.1 Site Location

The site forms a roughly triangular area on the eastern side of Southgate Street, at the southern edge of Long Melford, Suffolk. The site's grid reference is 586178 244687 and it is approximately 31m above Ordnance Datum.

2.2 Site Description

The site has previously been used as a retail filling station. We decommissioned the site, removing the forecourt canopy, the known underground tanks and the site's interceptor in 2005/6. The site shop was left in place. Since then we understand that the site has remained derelict.



Figure One: The Site Viewed from the Road - September 2016

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2.3 Site History (Ref.6 Section 2)

Historical maps show that the site was not developed until 1973, at which point a retail filling station was constructed. The filling station comprised four below-ground and two above-ground fuel storage tanks, a shop building and canopy. The site continued to operate as a filling station until 2004 and was decommissioned by us the following year.

2.4 Ground Conditions (Refs. 1, 3, 5 and 6)

The site has been very extensively investigated over a number of years. In summary, the following have been completed:

- 2001/2 - Arcadis constructed nine boreholes and five trial pits;
- 2004/6 - Subadra excavated and removed 575 tonnes of contaminated soil and constructed a further fourteen trial pits;
- 2008/10 - Arcadis constructed ten boreholes and eighteen trial pits;
- 2011 - Provectus constructed nine boreholes and five trial pits.

Given the size of the site, we consider it unlikely that there would be any benefit in carrying out further site investigation.

The previous ground investigations confirmed the following geological strata beneath the site:

- Made Ground - LOOSE to MEDIUM DENSE grey brown slightly clayey sandy GRAVEL. This layer was generally less than 0.5m in thickness other than where tanks etc had been removed.
- River Terrace Deposits/Head Deposits - Interbedded SOFT to FIRM dark grey slightly sandy CLAY and MEDIUM DENSE grey fine to medium SAND with frequent gravel. This layer was present to between 2.2m and 2.8m depth below ground level. The River Terrace Deposits are classified as a Secondary Aquifer.
- Upper Chalk Formation - SOFT white putty CHALK. This layer was present from around 7m depth. The Upper Chalk Formation is classified as Principal Aquifer.

2.5 Groundwater

Our previous ground investigation confirmed groundwater to be present in the River Terrace Deposits at approximately 1.8m to 2.4m below ground level (Ref. 6). The nearest surface water is the River Stour, approximately 180m to the west and the nearest public water abstraction is ~2km to the south-east.

2.6 Contamination Observations from Previous Work - Soil (Ref. 6)

Provectus summarised the contamination in soil as follows:

'Provectus 2011

Made Ground was encountered in some of the exploratory hole positions and Made Ground is commonly associated with the presence of contamination especially as ash and hydrocarbon odours were noted in some of the units. Some strong hydrocarbon odours were noted throughout the clay unit encountered in window sample WS5 (0.5m to 2.2m) and the lower section of the Made Ground unit (between 2.5m and 3.8mbgl) in borehole BHPR01. In addition strong hydrocarbon odours and dark black/blue and grey staining were noted within the top section of the sand and gravel unit in TP5 (1.6m to 2.7m), WS5 (2.2m to 3.2m), WS6 (1.9m to 3.7m and BHPR01 (3.8m to 4.7m).

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The underground tanks have been removed as part of the remedial works along with the two above ground tanks which housed leaded, unleaded, diesel and kerosene respectively (sic). During the works approximately 575 tonnes of non-hazardous classified contaminated material (hydrocarbons) were removed from site to landfill. Residual hydrocarbon contaminated material may still remain in locations where source material has previously been removed. During the works undertaken by Subadra soil samples were collected from the sides and base of the excavation.

Arcadis reported measured concentrations of benzene, toluene, ethylbenzene and xylenes, MTBE, TPH fractions, PAHs and Chromium across the site, from a range of depths, in exceedance of the site specific assessment criteria defined for protection of on-site residents. Black staining was noted on the soil sample from BH301 between 0.6m and 1.5m bgl.

Following additional site investigation and risk assessment in 2009 Arcadis summarised that the following compounds exceeded their respective SSAC.

BH301 (0.6-1.2m)	Benzene, ethylbenzene, xylenes, aliphatic C ₅ -C ₆ , aliphatic C ₈ -C ₁₆ and aromatic C ₈ -C ₁₆
TP303 (0.8-1.0m)	Benzene, aliphatic C ₅ -C ₆ and aromatic C ₈ -C ₁₆
TP304 (1.0-1.5m)	Benzene and xylenes
TP307 (1.0-1.05m)	Aliphatic C ₁₂ -C ₁₆
TP309 (1.5-1.8m)	Benzene, toluene, ethylbenzene and xylenes'

2.7 Contamination Observations from Previous Work - Groundwater (Ref. 6)

Provectus summarised the contamination in soil as follows:

'Provectus 2011

Groundwater was encountered in all the borehole locations during the site investigation works. The cable percussion driller recorded water strikes at 2.8m, 3.0m and 3.1m bgl respectively within the Made Ground and sand and gravel units. Groundwater seepage (fast) was noted during trial pitting at all five locations and levels ranged between 2.5m bgl and 2.9m bgl.

Standing water during the subsequent Provectus monitoring visits was encountered in all borehole locations (Provectus and historic). The water levels ranged between 1.76m to 2.40m within the Made Ground and sand and gravel unit.

As with the previous monitoring undertaken by Arcadis (February and March 2009) Provectus noted free-phase product in BH206 and BH301 and although the exact thickness could not be quantified an approximate thickness of 20mm was noted in both locations.

Arcadis

Arcadis reported the measured concentration of benzene sampled from BH9 (April and July 2008) and BH205 (July 2008) exceeds the Arcadis SSAC defined for the protection of neighbouring residents. Groundwater monitoring undertaken by Arcadis in 2009 measured concentrations of benzene and aromatic C₈-C₁₀ that were in excess of SSAC human health receptors based on residential end-use.

Free-phase product was identified in BH206 and BH301. During February 2009 approximately 110mm of LNAPL was encountered in BH206, laboratory whole oil fingerprint analysis described the samples as a burnt amber liquid identified as gasoline, kerosene residues. During March 2009 a viscous dark brown product was encountered in BH301.

The distribution of the contamination within groundwater was considered to be to the east and south of the former underground storage tanks in the vicinity of the free-phase located in wells BH206 and BH301.'

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3 Sources of Contamination Requiring Remediation

3.1 Contamination Observations - 2018

The Provectus investigation work adds little, if anything to our understanding of the site conditions, which are better represented by the later work completed by Arcadis. Provectus have, however, updated the site specific target levels for the site and we have used these target levels (see Section 3.3) in this report.

Provectus also completed a review of potential remediation technologies and concluded:

'To achieve the remedial objective it is therefore proposed to adopt a combined approach comprising excavation and treatment by ex-situ bioventing or grossly contaminated source areas (soils up to 1m below ground level), removal of free-phase product and ex-situ treatment/removal of any encountered groundwater within the highlighted areas (western area of the site) followed by oxygenation of significantly impacted areas within the sands and gravels unit and effective capping across the site (where required) to break pathway from potential residual contamination to future site users.'

We consider that the Provectus strategy is unrealistic, uneconomic and unlikely to achieve its objectives for the following reasons:

- Our review of the available data confirms that the majority of hydrocarbons remaining in the ground are at, or near the watertable between 2m and 4m depth. Excavation and treatment of the upper 1m of soils therefore has no benefit and would be a waste of time and money;
- Unless the hydrocarbon source in the soil is dealt with treatment of groundwater (using any technology) is unlikely to have any significant beneficial effect, with dissolved-phase concentrations likely to rebound to near pre-treatment levels once treatment ceases;
- Capping at the surface will break the pathway for hydrocarbon vapour to migrate to indoor air in future housing, but will not prevent hydrocarbons continuing to leach into groundwater and migrate off-site towards the nearby River Stour.

In order to confirm the lateral extent of the hydrocarbons in the soil we constructed a series of fifteen trial pits across the site with samples taken from the visually most contaminated layer, in all cases between 2m and 4m depth. Samples were also taken for waste classification analysis to assist with subsequent excavation and off-site disposal of soil.

The location of these trial pits is shown in Figure One on the following page, together with the maximum concentration of Total Petroleum Hydrocarbons and Benzene detected in each trial pit.

The data from the trial pits confirmed the following:

- The hydrocarbons do not extend to the northern boundary of the site (EX112 and EX113);
- The hydrocarbons do not extend to the south western boundary of the site (EX107 and EX109)
- Significant hydrocarbon concentrations were detected in the centre of the site (EX108, EX110, EX114 and EX115).

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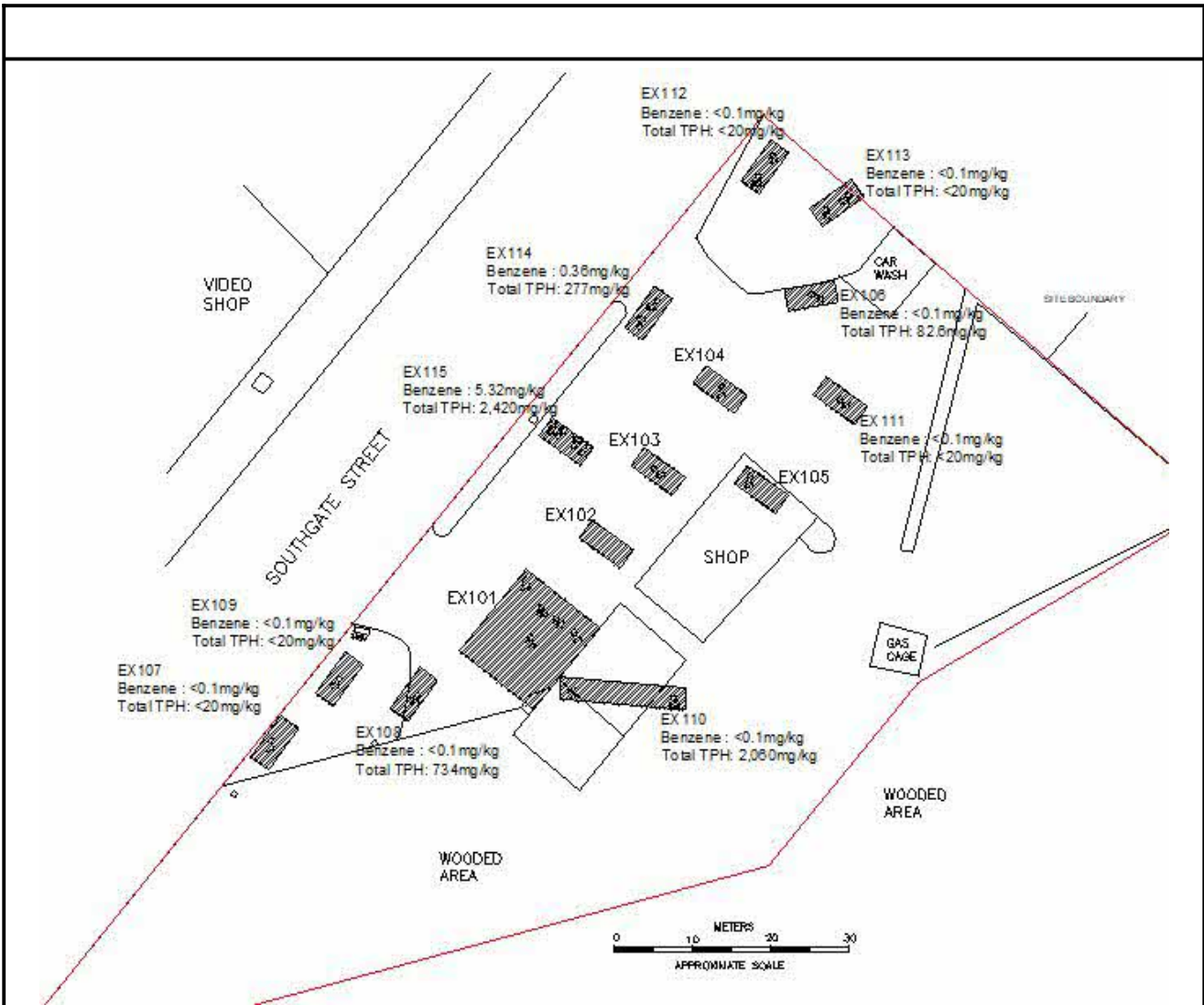


Figure One: Trial Pits to Determine Lateral Extent of Hydrocarbons in the Soil

Based on these data we concluded:

- Any soil excavation should extend to 4m depth;
- The sand and gravel layers in the upper 1m-2m should be stockpiled separately and assessed to determine whether it is suitable for re-use at the site;
- Contaminated soil should be disposed to an appropriately licensed site, with waste management documentation included in a verification report;
- Excavations should be backfilled with clean, inert material and compacted in accordance with relevant current standards.

The extent of soil contamination existing at the site prior to remediation is summarised in Figure Two on the following page.

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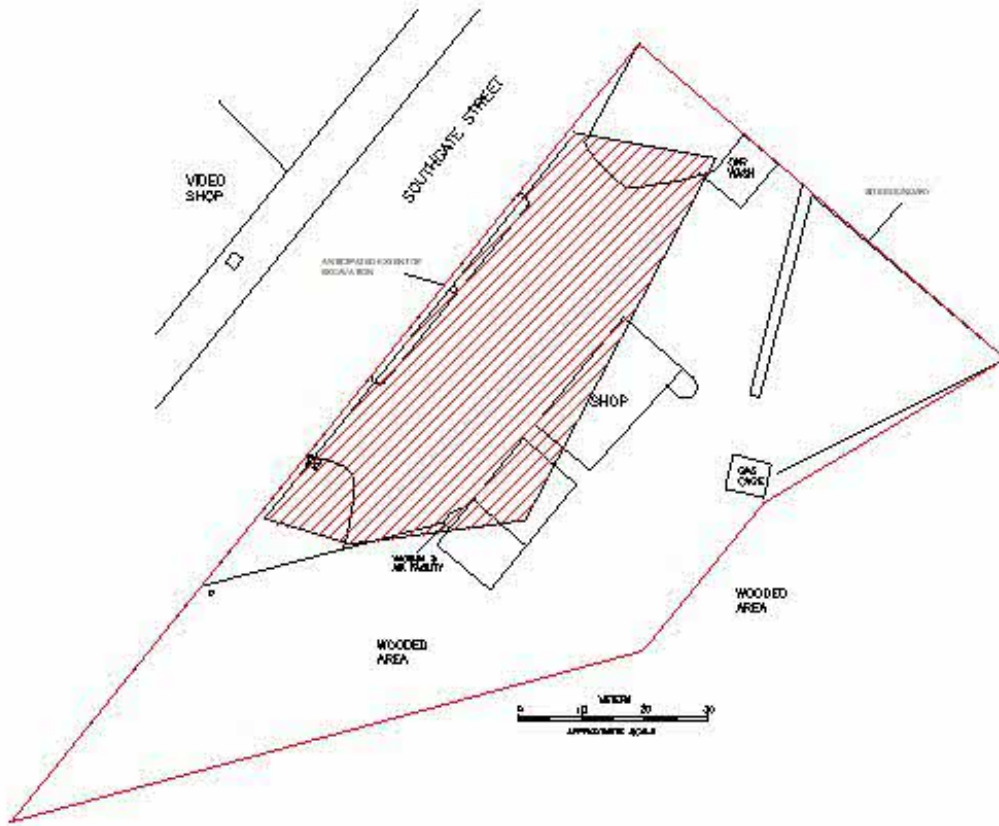


Figure Two: Anticipated Extent of Contaminated Soil Requiring Excavation

3.2 Revised Conceptual Site Model (Ref. 6)

Provectus revised conceptual site model (CSM) is presented (in abridged format) on the following page. This is based on results of all the investigation work carried out at the site together with their generic quantitative risk assessment.

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Contaminants	Areas Affected	Pathways	Receptors	Comment
PAHs Benzene TPH Aliphatic C ₁₂ - C ₁₆ Phytotoxic metals	Made Ground Clay components of River Terrace Deposits	Direct contact, ingestion, inhalation, surface run-off, horizontal and vertical migration of contaminants in permeable soils, uptake by vegetation.	Construction workers, future site occupants Buried services Flora and vegetation	Provision of a cover layer in areas of contamination and on-site treatment of gross contamination (identified hotspots). Dust suppression measures during construction work. Appropriate PPE during works.
Benzene TPH Aliphatic C ₁₂ - C ₃₅	Groundwater within sand and gravel components of River Terrace Deposits	Lateral and vertical migration of contaminants in groundwater	Controlled waters (River Stour) Construction workers, future site occupants Buried services	Localised hydrocarbon/benzene impacted groundwater within the sands and gravels require remedial mitigation measures (ex-situ pump and treat and oxygenation). Appropriate PPE during works.
Sulphates	Made Ground Clay components of River Terrace Deposits	Direct contact	Concrete foundations, building fabric and services	Appropriate sulphate-resistant materials for building foundations and services.
Soil gases and vapours	Made Ground River Terrace Deposits	Inhalation	Construction workers, future site occupants	High risk from methane gas. Elevated hydrocarbons/BTEX for inhalation in Made Ground locally on site and vapours have been identified. Appropriate precautions should be taken to protect groundworkers and the proposed development (appropriate gas protection measures in all buildings).
Free-phase hydrocarbons on groundwater	River Terrace Deposits	Direct contact Percolation through fills/surface run-off	Construction workers, future site occupants Surface water - River Stour	Removal of free-phase and treatment through an approved treatment system during redevelopment. Offsite disposal of recovered product Appropriate PPE during works.

Table Two: Provectus Revised Conceptual Site Model

3.3 Provectus Site-Specific Target Levels (Ref. 6)

Provectus present site-specific target levels that they have calculated for both soil and groundwater at the site. These are reproduced in the Table on the following page and represent the most recently calculated set of site-specific target levels for the site. The basis for their calculation is detailed in the Provectus report.

As far as we are aware these target levels have not been agreed with either Environment Agency or with the local Planning Authority.

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Contaminant	Target Level for Soil (mg/kg)	Target Level for Groundwater (ug/litre)
Benzene	11,600	9,720
Toluene	144,000	100,000
Ethylbenzene	1,060,000	301,000
m+p Xylenes	217,000	60,200
o Xylenes	217,000	60,200
Benzo(a)pyrene	0.078	20
Naphthalene	383,000	2,890
TPH Aliphatic C ₈ -C ₁₀	13,200,000	43,100
TPH Aliphatic C ₁₀ -C ₁₂	39,000,000	15,300
TPH Aliphatic C ₁₂ -C ₁₆	770,000,000	15,300
TPH Aliphatic C ₁₆ -C ₃₅	156,000,000,000	15,300
TPH Aromatic C ₈ -C ₁₀	15,500,000	1,200,000
TPH Aromatic C ₁₀ -C ₁₂	6,490,000	301,000
TPH Aromatic C ₁₂ -C ₁₆	13,000,000	1,110,000
TPH Aromatic C ₁₆ -C ₂₁	4,190,000	26,600
TPH Aromatic C ₂₁ -C ₃₅	18,500,000	26,600

Table Three: Provectus Site-Specific Target Levels

3.4 Uncertainty and Data Gaps

There remain some areas of uncertainty as detailed below together with our proposed course of action for removing or reducing the uncertainty.

Area of Uncertainty	Response
No groundwater data from areas outside the site, particularly to the west between the site and River Stour	There are obvious difficulties regarding gaining access to investigate any area outside the site boundary. The identified contamination has been present since at least 2004, when the site ceased trading as a retail filling station. If off-site migration were going to have an adverse effect this would most likely already have been observed. The remedial strategy is therefore focussed on removal of the remaining on-site and demonstration that groundwater quality beneath the site has significantly improved.

Table Four: Uncertainty and Data Gaps

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4 Remediation Options Appraisal

4.1 Pollutant Linkages

The three main ways to reduce or control unacceptable risks from contamination are:

- Remove or treat the contamination source;
- Remove or modify the pathway;
- Remove or modify the behaviour of receptors.

There is no economically viable way of achieving the second and third of these for hydrocarbons adsorbed on the soil and dissolved in the groundwater. Therefore any remediation solution needs to focus on removing and/or treating the contamination source.

4.2 Remediation - Key Objectives

- Reduce to an acceptable level the risk to human health and environmental receptors both on and off the site;
- To meet with the requirements of contaminated land planning condition.

4.3 Remediation - Management Objectives

- Produce a plan that can be agreed with the client and regulators;
- Minimise environmental impacts from contamination and from remediation activities;
- Adopt and adhere to sustainable practices;
- Use commercially available techniques that have a proven track record;
- Use techniques that are durable and have few or no long term maintenance requirements;
- Use techniques that are financially viable.

4.4 Remediation - Technical Objectives

- Remediation is implemented and verified.

4.5 Remediation Options Appraisal

We have identified and reviewed a number of feasible remediation options for removing or treating the hydrocarbon contamination in the soil and groundwater beneath the site.

These are summarised in the table on the following page.

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Source to be Remediated	Receptor to be Protected	Remediation Options	Discussion
Contaminants in Made Ground	Future site occupants	Install a barrier layer of clean, inert material in all areas to be soft landscaped.	<p>Conforms with NHBC requirements. Depth of barrier layer should be agreed with relevant regulators before installation.</p> <p>Install a hydrocarbon-impermeable membrane beneath all future buildings.</p> <p>Construct water supply pipework from hydrocarbon-impermeable materials.</p>
Hydrocarbons present between 2m and 4m depth in River Terrace Deposits	<p>Construction workers</p> <p>Future site occupants</p> <p>Occupants of neighbouring properties</p> <p>Controlled water (River Terrace aquifer and River Stour)</p>	<p>Option A: Excavation and removal of hydrocarbon-impacted soils. Disposal to a suitably licensed landfill. Segregation/possible re-use of overlying soils not impacted with hydrocarbons. Reinstatement with clean, inert backfill.</p>	<p>Area to be excavated has been well defined by the multiple ground investigations completed to date.</p> <p>Solution is quick and likely to be cheaper than longer term on-site treatment of soils.</p> <p>Solution provides greatest confidence that all the source has been successfully removed.</p>
		<p>Option B: In situ or ex situ treatment of soils and re-use on site.</p>	<p>Solution recommended by Provectus (albeit only for soil to 1m depth). Treatment likely to exceed one year.</p> <p>In situ treatment unlikely to provide a complete solution, with hotspots remaining and rebound post-treatment likely.</p> <p>Ex situ treatment would leave large excavations open during treatment works, posing a site safety risk. More expensive than off-site disposal.</p>
Hydrocarbons in groundwater.	<p>Future site occupants</p> <p>Occupants of neighbouring properties</p> <p>Controlled water (River Terrace aquifer and River Stour)</p>	<p>Option A: Targeted chemical treatment of groundwater once the hydrocarbon source in the soil has been removed.</p>	<p>Duration of treatment (i.e. Number of treatment rounds) required is dependent on success in removing the soil source.</p>
		<p>Option B: Hydraulic barrier installed around site to prevent groundwater migration.</p>	<p>No aquiclude identified beneath the site.</p> <p>Installation costly.</p>

Table Five: Remedial Options Appraisal

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4.6 Further Investigations and Assessments

We do not consider that any further investigation would allow the risks and/or uncertainties associated with any of the remedial options to be reduced.

4.7 Recommendation

We recommend that Remedial Option A be selected for both treatment of soil and treatment of groundwater.

5 Remediation Sequence

5.1 Project Phasing and Timescales

We anticipate that the development will be carried out in the following sequence:

- Install secure site perimeter fence;
- Demolish shop building, general site clearance, removal of rubbish and building debris left on site;
- Break out of concrete slab/hardstanding as required. Stockpile further future crushing and re-use or off-site disposal;
- Excavation of central area of the site (see Figure Two) to a depth of ~4m;
- Segregate natural sand and gravels excavated from upper ~2m and stockpile for subsequent classification and possible re-use;
- Classify material excavated from below ~2m depth and dispose to a suitably licensed landfill;
- Reinstate excavations, installing groundwater monitoring/remediation wells along western boundary;
- Submission of Verification Report to regulators. Site suitable for redevelopment;
- Treatment of groundwater using chemical oxidants;
- Long term monitoring of groundwater quality;
- Submission of Remediation Close-out Report to regulators.

6 Implementation Plan

6.1 Roles and Responsibilities

The table below sets out who will be involved at each stage of the proposed remediation work:

Role	Name
Client/Project Manager	Willowwalk (Thaxted) Developments Ltd
Groundworks Contractor	Willowwalk (Thaxted) Developments Ltd
Environmental Consultant	Subadra Consulting Ltd
Groundwater Treatment Contractor	Subadra Consulting Ltd

Table Six: Roles and Responsibilities

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6.2 Quality Assurance

Quality assurance is a key component of our remediation strategy. It comprises two key elements:

- i) The need to provide an accurate and permanent record of all the remediation works, and the standard achieved. This will be the primary purpose of the Verification Report we will produce on completion of the works.
- ii) The remediation will require long-term groundwater monitoring to demonstrate the on-going effectiveness of the soil removal. Our Verification Plan details what we will measure on site during our remediation works and how we will record these data.

6.3 Permits and Approvals

Some aspects of the remediation could require permits and approvals as follows:

- Planning Permission – Agreement is required from Babergh District Council and the Environment Agency of this Remediation Strategy and Verification Plan.
- If any groundwater is to be discharged to a foul sewer during the remediation works and/or during foundation construction then a trade effluent discharge consent will be required from the local sewerage undertaker.

6.4 Changes to Design

Our Remediation Strategy and Verification Plan should be considered a 'live document' and we will review and update it in light of any further information from either additional investigation of excavation works by others, or due to changes to the proposed construction plan.

6.5 Variation and Contingency Plan

No amount of previous investigation can completely identify all possible soil and contamination conditions across the site and there is the potential for unforeseen circumstances and contamination to be encountered during construction that are not covered by this Remediation Strategy and Verification Plan. These will need to be dealt with during the site works. We propose the following procedure be adopted in the event that unforeseen contamination is encountered during the remediation works and/or foundation excavations:

- The groundworks contractor will take whatever action is required to prevent immediate harm to health and safety of site workers and the general public or environment;
- The groundworks contractor will, as soon as practicable, inform the Project manager and ourselves;
- We will notify the relevant regulator;
- We will attend site, identify and delineate the source and severity of the contamination;
- We will make any necessary revisions to this Remediation Strategy and Verification Plan;
- We will agree any variation with the relevant regulators before implementing them.

6.6 Verification

We propose to verify that objectives of the remediation works have been met. Our Verification Plan sets out the detailed data requirements, including compliance criteria, sampling frequencies and analytical suites necessary to demonstrate that remediation objectives have been met.

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We will compile a Verification Report at the end of the remediation works. This will incorporate all site test data and measurements of quality-critical parameters, as well as records of the management of recovery or disposal of materials at the site. This includes all materials taken off site for treatment or imported as backfill. We do not anticipate that any excavated materials will be re-used at the site.

Our Verification Report will demonstrate that remediation has complied with all the relevant legislation, the planning conditions for the site and that the outcome of the project has met its remediation objectives.

6.7 Maintenance

Protected services can require maintenance (e.g. like for like repair of water supply barrier pipe) and following their installation it will be necessary for a copy of this document to be kept in the site's Health and Safety file. No other permanent structures requiring maintenance will be constructed as part of remediation.

6.8 Monitoring

We do not anticipate that any long-term monitoring of remediation or contamination will be required after submission of the Remediation Close-Out Report.

7 Remediation Activities

The proposed remediation activities are described in this section.

7.1 Enabling Works

The site perimeter fence has been installed and the above ground structures at the site have already been demolished. The concrete paving and other hardstanding have been broken out and stockpiled on the site pending crushing and re-use or off-site disposal.

7.2 Temporary Excavation of Uncontaminated Soil

Uncontaminated natural sands and gravels excavated from the upper ~2m (above the watertable) will be stockpiled on the site and classified in order to determine whether they are suitable for re-use or require off-site disposal. Note that the Waste Framework Directive states that this material may only be re-used if it meets the following criterion:

'Uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated.'

Made Ground and uncontaminated clay excavated from the upper ~2m (above the watertable) will be classified and disposed of off-site as inert/non-hazardous waste.

The anticipated extent of excavation is shown in Figure Two.

7.3 Excavation and Removal of Hydrocarbon-Contaminated Soils

All hydrocarbon-impacted soil excavated from the site will be classified and disposed of off-site to a suitably licensed landfill site.

7.4 Reinstatement of Excavations and Installation of Wells

All excavations will be reinstated using clean, inert granular fill material. This will be rolled and compacted in accordance with relevant specifications.

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Six groundwater monitoring/treatment wells will be installed in the backfill to allow future groundwater treatment and/or monitoring. The wells will be a minimum of 50mm in diameter and will be installed to a minimum of 4m depth and screened between 1.5m and 4m depth. Each well will be secured beneath a traffic-rated cover and will be located at locations to be agreed with the Environmental Consultant and such that it will not be disturbed during the proposed redevelopment.

7.5 Groundwater Treatment

Once the hydrocarbon source in the soils has been removed we propose treating the groundwater using a combination of RegenOx chemical oxidant and ORC Advanced Oxygen Release Compound. These will be introduced into the groundwater via the monitoring wells previously installed, supplemented in necessary by further temporary injection points. We anticipate that three rounds of chemical treatment, at two month intervals, is likely to be required. The dosage and infiltration rates will be assessed and amended to suit the conditions prevailing after the soil removal.

Groundwater samples will be taken from each well prior to treatment and will be analysed for BTEX compounds and for TPHCWG. The treatment at any given location may be terminated early if all the site-specific targets have been met at that location.

7.6 Reinstatement - Soft Landscaping

All areas of soft landscaping will be reinstated with a layer of clean, inert topsoil. The thickness of this layer will be agreed with the relevant regulator(s) and (if appropriate) with NHBC but will, in any case, be a minimum of 100mm in thickness underlain by a geotextile membrane to act as a boundary marker and to reduce inter-mixing of soils.

7.7 Installation of Hydrocarbon Vapour Barrier Membrane Beneath Buildings

A hydrocarbon-impermeable vapour barrier will be installed under all buildings constructed on the site. The development contractor will be responsible for verifying the design and installation of the membrane and providing the Environmental Consultant with relevant details for inclusion in the Remediation Close-out Report.

7.8 Water Supply Pipes

The water supply pipework will be constructed from a hydrocarbon-impervious material and installed within clean fill material. The development contractor will be responsible for verifying the design and installation of the pipework and providing the Environmental Consultant with relevant details for inclusion in the Remediation Close-out report.

7.9 Long-Term Groundwater Monitoring

Following completion of the groundwater treatment, we propose completing a minimum of three groundwater sampling/analysis visits at three monthly intervals. Groundwater samples will be taken from each of the six wells and analysed for BTEX compounds and for TPHCWG. Monitoring visits will continue until all the site-specific groundwater targets have been met in all the wells, at which point we will deem the remediation has been completed and will compile and issue our Remediation Close-out Report.

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8 Verification of Remediation

8.1 Verification Requirements

Remediation	Verification Works
Uncontaminated natural sands and gravels excavated from the upper ~2m	Sufficient testing to confirm that the material meets the criterion outlined in Section 7.2.
Made Ground and uncontaminated clay excavated from the upper ~2m	Sufficient testing to classify the material for waste classification purposes. Waste management documentation including waste transfer documentation and landfill tickets.
Hydrocarbon-impacted soil	Sufficient testing to classify the material for waste classification purposes. Waste management documentation including waste transfer documentation and landfill tickets.
Imported topsoil	All imported material should be tested/certified by the supplier and/or the Contractor, with all test certificates provided to us for inclusion in the Verification Report. Testing should be carried out at a frequency of at least one test per lorry load and include, as a minimum, analysis for CLEA metals, PAHs, TPHCWG (including BTEX compounds) and asbestos.
Imported backfill material	All imported material should be tested/certified by the supplier and/or the Contractor, with all test certificates provided to us for inclusion in the Verification Report. Testing should be carried out at a frequency of at least one test per 50m ³ and include, as a minimum, analysis for CLEA metals, PAHs, TPHCWG (including BTEX compounds) and asbestos.
Installation of hydrocarbon-impermeable membrane	The Contractor will keep a record of the membrane design and construction, including a photographic log of its installation and subsequent third-party integrity testing, and photographic evidence of the thickness of topsoil placed above it, for inclusion in the Remediation Close-out Report.
Installation of water supply pipework	The Contractor will keep a record of the water supply pipework construction, including a photographic log of its installation and details of the material used, for inclusion in the Remediation Close-out Report.
Groundwater quality - Treatment	Pre-treatment sampling of groundwater from each well. Each sample analysed for BTEX and TPHCWG.
Groundwater quality - Post-treatment	Sampling of groundwater from each well at three monthly intervals. Each sample analysed for BTEX and TPHCWG. A minimum of three sampling visits.
Unforeseen circumstances	Appropriate records to be kept as agreed with the regulators.

Table Seven: Verification Requirement

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8.2 Remediation Targets

The remediation targets to be achieved are as follows:

Remediation	Remedial Target
Groundwater quality	See Table Three.
Imported soil or backfill material	S4ULs for residential use (see below).
Installation of water supply pipework	Upgraded water supply pipework installed.
Unforeseen circumstances	As agreed with the relevant regulators.

Table Eight: Summary of Overall Remediation Targets

9 Verification and Remediation Close-out Reporting

The Verification Report provides a complete record of all the remediation activities that took place on a site. It will include all the data that we will collect (as detailed in this Verification Plan) to support compliance with agreed remediation objectives and criteria. It will also include a description of the work undertaken and details of any unexpected conditions found during remediation and how we dealt with them.

Compound	S4UL Target (mg/kg)	Compound	S4UL Target (mg/kg)
Benzene	3.3	Aromatic TPH C ₁₂₋₁₆	2,500
Toluene	3,900	Aromatic TPH C ₁₆₋₂₁	1,900
Ethylbenzene	440	Aromatic TPH C ₂₁₋₃₅	1,900
Xylenes	450	Acenaphthene	6,000*
Aliphatic TPH C ₈₋₁₀	150	Acenaphthylene	6,000*
Aliphatic TPH C ₁₀₋₁₂	770**	Anthracene	37,000
Aliphatic TPH C ₁₂₋₁₆	4,400*	Benzo(a)pyrene	5.3
Aliphatic TPH C ₁₆₋₃₅	110,000*	Fluorene	4,500*
Aromatic TPH C ₈₋₁₀	270	Naphthalene	13
Aromatic TPH C ₁₀₋₁₂	1,200	Phenanthrene	1,500

Notes: 1. All values based on Soil Organic Matter = 6%
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* S4UL Target exceeds solubility saturation limit

** S\$UL Target exceeds vapour saturation limit

Table Nine: Summary of S4UL Verification Targets

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9.1 Verification Report

Our Verification Report will include the following:

- Plans showing areas where existing foundations and/or hardstanding have been broken out and/or removed;
- Plans showing where soils have been excavated;
- Analysis certificates for all soil and groundwater testing carried out;
- Plans showing all verification sample locations;
- Analysis certificates for any materials imported to site;
- Waste consignment notes for any soil or other materials removed from the site;
- Documentation of variations and unforeseen contamination;
- Waste management documentation for all materials disposed off-site;
- Copies of all relevant consents, permits and approvals;
- Any other relevant records, such as photographs and correspondence.

9.2 Remediation Close-out Report

In addition to the Verification Report, we will issue a Remediation Close-out Report. This will confirm if the remediation objectives and the verification criteria were met. The report will include:

- Records of protected services installation;
- Records of membrane installation beneath buildings and relevant test certificate(s);
- Analysis certificates for groundwater samples taken during and post-treatment;
- Relevant details of the chemical treatment of groundwater;
- Any other relevant records, such as photographs and correspondence.

We will document any instances where the standard of remediation falls short of the original objectives and/or verification criteria or where these were amended in light of additional data. In such circumstances we will:

- Demonstrate that we made all reasonable efforts to complete the remediation and/or detail what alternative remedial actions were carried out to ensure the remediation objectives were met;
- Set out what residual risks we consider may exist;
- Detail any monitoring, maintenance or other provisions that we consider may be needed to reduce any residual risks to manageable or acceptable levels.

9.3 Submission

Our Verification Report and our Remediation Close-out Reports will be submitted to the local Planning Authority in support of discharge of the remaining planning conditions.

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10 Working Practices

This section covers requirements for dealing with soil, groundwater and gas/vapour contamination generally when undertaking remediation and associated works on site.

10.1 Health and Safety

There will be provision for the health and safety of site workers during the construction phase of the development for remediation in accordance with current health and safety legislation, principally the Health and Safety at Work etc Act 1974.

The remediation will come under the Construction Design and Management Regulations 2015 (CDM) and the following will be required.

- Induction of all site workers and visitors;
- Completion of risk assessments and method statements for all activities;
- Identification and handling of potentially hazardous materials;
- Use of appropriate Personal Protective Equipment by all site workers;
- Operation of an appropriate permit to work system, including implementation of restricted areas and prohibited operations if appropriate;
- Provision of appropriate welfare facilities and the implementation of appropriate personal hygiene and good housekeeping practices;
- Identification and dissemination of the actions to be taken in an emergency.

Additional guidance can be found in HSE Publication (1991) Protection of Workers and the General Public during Development of Contaminated Land: HSG66

10.2 Dust Control

Dust can be generated by plant and machinery undertaking remedial activities, particularly in dry and windy conditions. Minimisation of dust nuisance and windblown pollution can be undertaken by one or more of the following.

- Damping down roads, stockpiles etc. with water;
- Water mist curtains;
- Maintain grass and/or hardstanding or tree cover for as long as possible;
- Screen working areas with hoardings;
- Plan work carefully in advance to avoid double-handling of materials;
- Adopt careful handling of materials (e.g. when digging through soils keep bucket heights low);
- Traffic management;
- Sheet all muck-away vehicles leaving site;
- Avoid tracking soil onto the public highway;
- Sweep hardstanding regularly to reduce the build up of dust;
- Any concrete crushing plant must not be run without an appropriate dust suppression measure and must be licensed;

- All site workers should be inducted to explain the actions necessary for each phase of work;
- Maintain skips and haulage vehicles to a safe level, avoiding overfilling;
- There will be no burning of material on site;
- Waste will be dealt with in accordance with a site waste management plan.

Additional guidance can be found in HSE Publication (1991) Protection of Workers and the General Public During Development of Contaminated Land: HSG66 and Environment Agency (2014) Pollution Prevention Guidance. Construction and Demolition Sites: PPG6.

10.3 Control of Surface Run-off

Surface run-off from the site may contain sediment and contamination in solid and/or dissolved-phase, which could enter the drainage network on surrounding land. We propose to minimise any contaminated run-off by one or a combination of the following.

- Carefully manage damping down of dust activities to avoid run-off in the first place;
- Maintaining hardstanding for as long as possible;
- Placing any stockpiles away from site drains;
- Avoiding the creation of steep slopes on stockpiles that might increase potential for run-off;
- Avoiding tracking soil onto the highway;
- If necessary, providing temporary surface water management measures (eg. bunding, stopping off of drains, creation of settlement lagoons).

Additional guidance can be found in Environment Agency (2014) Pollution Prevention Guidance. Works in, near or over watercourses: PPG5 and Environment Agency (2014) Pollution Prevention Guidance. Construction and demolition sites: PPG6.

10.4 Protection of Soil and Groundwater during Remediation

Certain remediation works may, inadvertently, increase the extent or volume of contamination and we recommend that the following practices should be adopted:

- The Contractor will store any potentially contaminated soils on either hardstanding or plastic liners to prevent contamination leaching into the ground;
- The Contractor will adhere to the 'Control of Surface Runoff' measures listed above;
- The Contractor will not dispose of groundwater by discharging this into the ground where there is a risk that it is contaminated;
- The Contractor, or their supplier, will carry out appropriate testing of imported soils and backfill materials;
- The Contractor will put in place appropriate procedures and facilities for refuelling, vehicle maintenance, storage of all hazardous substances and waste
- Any soil excavated during the construction of services and/or foundations will only be re-used in the permanent works if it is used below future buildings and/or hardstanding and it has been tested to confirm that it will not to present a risk to human health or environmental receptors.

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**Former Southgate Service
Station, Long Melford CO10
9HF**

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL
Tel: 01296 739400 Email: consultants@subadra.com

Additional guidance can be found in Environment Agency (2014) Pollution Prevention Guidance. Basic good environmental practices: PPG1; Environment Agency (2014) Pollution Prevention Guidance. Works in, near or over watercourses: PPG5; Environment Agency (2014) Pollution Prevention Guidance. Construction and demolition sites: PPG6; and Environment Agency (2011) Pollution Prevention Guidance. The safe operation of refuelling facilities: PPG7 (Note: These were withdrawn in December 2015 but have not been replaced and therefore remain in common use).

10.5 Groundwater Disposal

Any discharge of groundwater to sewer will require a discharge consent from the local sewerage undertaking. Effluent may require treatment prior to its discharge.

10.6 Transport and Disposal Records

Our Verification Report will include records in the form of waste transfer/consignment notes for contaminated soil and groundwater together with details of receiving landfills or treatment plant licenses. These will be collected by the Contractor and provided to us as part of the remediation validation process.

10.7 Working near Water

We do not anticipate that any of the proposed works will take place near water.

10.8 Stockpiles

During the course of demolition/remediation/construction the Contractor may need to stockpile limited volumes of various materials. We provide the following general guidance:

- Stockpiles should be formed away from surface watercourses and drains
- Stockpile side slopes should be battered back to prevent spalling and at gradients which minimise surface run-off.
- Stockpiling activities should be planned in advance to reduce fuel use, emissions and dust from vehicle movements and handling
- All contaminated, or potentially contaminated soils should be stockpiled on an impermeable surface such as hardstanding or plastic sheeting and be bunded where necessary.

10.9 Materials Management Plan

Soils excavated during the remediation and/or foundation construction could potentially be deemed a controlled waste and require off-site disposal even though they could be suitable for re-use within the development. When excavated materials are deemed suitable for use and certainty of use can be demonstrated, a Materials Management Plan (MMP) may be used to demonstrate that the material is not a waste or has ceased to be a waste.

10.10 Site Security

The site will be secured against unauthorised access at all times to ensure the following:

- Vehicles and plant are not interfered with and to prevent contamination from fuels, oil or hydraulic fluids;
- Trespassers are not exposed to potentially contaminated materials;
- Skips are covered and locked where possible.

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13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL

Tel. 01296 739400 Email: consultants@subadra.com

**ATTACHMENT ONE:
NOTICE TO INTERESTED PARTIES**

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13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL
Tel. 01296 739400 Email: consultants@subadra.com

NOTICE TO INTERESTED PARTIES

The purpose of our site assessment is to provide general information on the environmental and/or geotechnical conditions existing at the site and related to soil and/or groundwater. The Client or others specified the scope of the investigation and the validity of our conclusions is limited by the scope of work specified. We are not responsible for any such limitations or omissions.

Where stated in this report, we have used information supplied by third parties. While we have evaluated as far as possible the validity of this information, we cannot guarantee its accuracy in any way whatsoever.

No investigation technique is capable of completely identifying all of the contaminants that might be present in the soil or groundwater under a site. Where specified in our report, we have examined the ground by constructing a number of boreholes and/or trial pits. We recovered samples of soil and/or groundwater from available exposures.

The depth and spacing of our Sampling locations were selected to ensure with a reasonable probability that they would be representative of the actual conditions across the whole site. However, safety considerations relating to existing site infrastructure may have restricted our ability to investigate all potential contaminant sources. Specifically, we were unable to investigate the soil and groundwater condition immediately adjacent to the underground structures and/or buried services. These limitations must be borne in mind when considering the conclusions reached in this report.

Soil is intrinsically variable and the spread of contaminants within the soil is therefore subject to a degree of non-uniformity. For these reasons no sampling technique can completely eliminate the possibility of obtaining samples that are not representative of the actual conditions. Our sampling techniques are intended to reduce the possibility to an acceptable level, within the limits imposed by the scope of the investigation.

Groundwater levels and soil vapour levels that we report were accurate at the time of the investigation. Groundwater and soil vapour levels are variable. Long term monitoring may be required to ensure that the levels recorded during our investigation are representative of long term and possible 'worst case' conditions. In accepting our recommendations and/or conclusions the Client acknowledges that further, more detailed investigation would allow a more accurate assessment of site conditions to be made and that this would reduce any consequential risk to the Client.

This investigation was carried out to assess the significance of contamination resulting from use of the site as identified in this report. Unless we have indicated otherwise, no assessment of the potential impact of any other previous uses has been made. No investigation was carried out to determine whether or not any deleterious or hazardous materials (such as asbestos) have been used in the construction of the buildings present on the site. Unless otherwise stated no investigation or assessment has been made of the presence or otherwise of invasive plant species including but not limited to Japanese Knotweed.

We do not accept any responsibility for the cost of remedial works or other costs incurred in whatever way whatsoever as a result of any omissions, errors or other shortcomings in this report unless we have been given reasonable opportunity to verify ourselves that such faults exist and we have been given a reasonable opportunity to carry out works to remedy such faults ourselves using the most practicable means available to us. We do not accept liability for any consequential losses incurred by you while either we or others carry out any remedial works we deem necessary.

This report has been prepared for the Client, as specified on the cover page of this report. In accepting our recommendations and/or conclusions the Client accepts that the terms of our appointment were as detailed in the Proposal, or Proposals, that we provided to the Client before being appointed and that these terms supersede any other terms and/or conditions set out in any contracts agreed between ourselves and the Client, regardless of when such terms and/or conditions were agreed and/or signed.

Use of, and reliance on, this report by other third parties will be at such third parties own risk, and we are unable to accept any liability or responsibility to third parties.

Neither the whole nor any part of this report, or any reference to it, may be included in any published document circular or statement or published in any way without our prior written approval.

This report and its contents, together with any supporting correspondence or other documentation, remain the property of Subadra Consulting Limited until paid for in full.

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