OAKSHIRE
ENVIRONMENTAL

Report type	Remediation Options Appraisal
Date	8 June 2022
Client	Mark Godfrey
Site address	Station House, Station Road, Gedney, Spalding, PE12 0DD
Report prepared by	Mr Louis Turner BSc (Hons)
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1. Introduction

The following document is a Remediation Options Appraisal carried out by Oakshire Environmental, commissioned by Mark Godfrey, and includes details of the site, previous investigations, an evaluation of remediation options and an assessment of further investigations.

1.1 Project Overview

The client's proposed project involves the conversion of offices to a residential dwelling and associated work at Station House, Station Road, Gedney, Spalding, PE12 0DD. An Intrusive Site Investigation has been carried out by Oakshire Environmental (May 2022). This assessment recommended that remediation of contamination risk should be carried out. Oakshire Environmental have carried out a Remediation Options Appraisal, as described below.

1.2 Purpose of Investigation

The objectives of the Remediation Options Appraisal were to:

- Assess the nature and extent of contamination risk at the site.
- Identify suitable remediation option(s).
- Outline a strategy for the implementation of suitable remediation option(s).
- Determine the requirement or scope of further investigations.

1.3 Scope of Work

- Brief introductory information has been noted to provide context to the report and includes an Introduction, Project Overview, Scope of Work, Limitations.
- Assess the nature and extent of contamination risk, identified as part of previous investigations.
- Identify initial feasible options for remediation at the site, including assessment of potential constraints and generic remediation objectives, based on the costs involved and the practicality of their application. Remediation methods considered include civil engineering, biological, chemical, physical and thermal methods.
- Conduct a detailed evaluation of remediation options, including development of site-specific remediation objectives, in order to determine which option(s) are most appropriate for the site.
- Outline a strategy for the implementation of suitable remediation option(s).
- Recommended remediation option(s) have been assessed to determine the requirement or scope of further investigations at the site.
- Supporting appendix includes photographs, maps and plans of the site.

1.4 Limitations

Quantum Intelligent Trading Ltd is previously and hereafter referred to as “Oakshire Environmental” or “the company”. Oakshire Environmental has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. This report is only valid when used in its entirety and any information or advice contained within the report should not be relied upon until considered in the context of the whole report. Oakshire Environmental disclaims any responsibility to the client and others in respect of any matters outside the scope of this work. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate. This report has been prepared solely for the benefit of the client and any other party using or placing reliance upon any information contained in this report does so at their own risk. Oakshire Environmental accepts no responsibility or liability for the contents of this report being used for any purpose or project for which it was not commissioned. Oakshire Environmental accepts no liability whatsoever for any loss or damage arising from the interpretation or use of the information contained within this report. Furthermore, Oakshire Environmental does not accept any liability for the consequences of any legislative changes or the release of subsequent guidance documentation and following delivery of the report has no obligation to advise the client or any other party of such changes or their repercussions.

This report excludes consideration of potential hazards arising from any activities at the site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities. Oakshire Environmental does not warrant or guarantee that the site is free of hazardous or potentially hazardous materials or conditions. It should be noted that this report has been produced for environmental purposes only.

Oakshire Environmental cannot be held responsible for incorrect analysis of samples as the laboratory analysis presented in this report was carried out by Chemtech Environmental Ltd. The information and conclusions provided in this report are limited to, and representative of, the samples taken and cannot be extended to apply to the whole site, in addition, Oakshire Environmental cannot guarantee the accuracy of analysis for samples not taken at the source by the company or those which deviate due to exceedance of holding time or inappropriate sampling practises. The findings and/or recommendations of this report do not take into account any conditions that may be present but have hitherto not been encountered and as such further investigation and/or a reconsideration of the findings of this report should be undertaken if such conditions are subsequently encountered or an alternative development plan or land use is subsequently proposed.

2. Site

The following section provides a description of the site, location and previous investigations, utilising information obtained from the client and publicly available sources.

2.1 Site Description and Location

The site is located on Station Road to the south east of the village of Gedney and is approximately 1,600m^2. The site is comprised of a dwelling curtailed by patio, with a gravel driveway to the east and south and soft landscaping to the north west and south west. There is also a timber garage at the south east and two timber structures at the north.

The site is bordered by two semi-detached dwellings to the north, a depot to the east, agricultural buildings to the north east and south and Station Road to the west. The surrounding area is predominantly agricultural, with some commercial premises. There are no woodlands, ancient monuments or archaeological sites within 500m of the site.

National Grid Reference: TF 41195 23809

2.2 Previous Investigations

An Intrusive Site Investigation, carried out by Oakshire Environmental in May 2022, considered there to be a moderate risk to residential end users as a result of elevated concentrations of PAHs at a depth of 0.3m in soft landscaping at the north and north east of the site. There was considered to be a low risk to groundwater due to the low water level in the area and the low vulnerability of the unproductive superficial and bedrock aquifers.

The Intrusive Site Investigation, therefore, recommended that a Remediation Options Appraisal should be carried out to include analysis of feasible remediation options to address contamination risk at the site. As per the recommendations of the Intrusive Site Investigation, Oakshire Environmental has carried out a Remediation Options Appraisal to include an assessment of the feasible remediation options available.

3. Remediation Options

The Environment Agency's Land Contamination: Risk Management guidance for the development of an options appraisal requires the initial identification of feasible options for remediation at a site, based on the costs involved and the practicality of their application. There are a number of remediation methods available including civil engineering, biological, chemical, physical and thermal methods. Some methods may not be appropriate to a particular site as some can only be used on certain types of media and some may not be cost effective. Other site specific constraints such as time and access can also determine the feasibility of a particular remediation option. The following section outlines the generic remediation objectives for the site, taking into account potential constraints, and includes a selection of feasible remediation options.

3.1 Site Context and Objectives

The site was previously Gedney Train Station, comprising the station building at the centre and railway line at the north. The railway line was later removed and the station building was redeveloped into offices. The proposed development involves the conversion of the former train station building from offices into a dwelling, with associated hard and soft landscaping. Soft landscaping at the north west and south west includes the placement of between 0.3m and 0.75m of topsoil. This report, therefore, considers the feasibility of redeveloping the site for residential use.

3.2 Potential Constraints

Given the size of the site and its location, there are not likely to be significant limitations with regards to space or access for machinery from Station Road. Cost will likely be a limiting factor, due to the small scale of the development, in addition, the localised nature of contamination at the site will most likely not require an extensive remediation option. There are sensitive human receptors on the site and bordering the site to the north. The on-site contamination is not expected to be ongoing so there are no specific time constraints with regards the implementation of remediation.

3.3 Generic Remediation Objectives

The following table outlines the generic objectives of remediation at the site.

Table 1: Summary of Generic Remediation Objectives

Remediation Objective	Objective Type
Enable the site to be redeveloped for residential end use	General
Enable development of a remediation strategy that meets regulatory requirements	Management
Enable development of a remediation strategy that meets the developers requirements	Management
Avoid unacceptable environmental impacts from implementation of remediation strategy	Management
Avoid long term monitoring requirements	Management

3.4 Feasible Remediation Options

Contamination risk from organic contaminants in shallow soil has been identified at the site, therefore, a number of remediation options have been discounted as they are inappropriate for the site the identified contamination risk.

Soil flushing, soil washing and hydraulic binders are likely to be too costly and unnecessarily extensive for the site given the relatively localised contamination and minimal material expected to require remediation. Contamination is not likely to have impacted groundwater or surface water, which was not encountered during ground investigation works, so remediation will only need to consider soil contamination and ground gas production. Therefore, the following remediation options are considered appropriate for the site and will be subject to a more detailed evaluation in the following section.

Table 2: Summary of Feasible Remediation Options

Remediation Option	Method	Linkage Element Addressed
Excavation and Disposal	Civil Engineering	Source Management
Containment - Cover System	Civil Engineering	Pathway Interruption
Amendment of Development Proposal	Behaviour Modification	Pathway Interruption

4. Evaluation of Remediation Options

Following the identification of feasible remediation options, a detailed evaluation of options, including development of site-specific remediation objectives, is required to determine which option(s) are most appropriate for the site.

Table 3: Summary of Site-Specific Remediation Objectives

Remediation Objective	Objective Type	Evaluation Criteria
Enable the site to be redeveloped for residential end use without risk to human health	General/Technical	Concentrations of PAHs in shallow soils on site to be below relevant screening values after remediation
Enable development of a remediation strategy that meets regulatory requirements	Management	Remediation strategy to be agreed with Local Authority and carried out in accordance with relevant regulations
Enable development of a remediation strategy that meets the developers requirements	Management	Remediation strategy to be agreed with developer
Avoid unacceptable environmental impacts from implementation of remediation strategy	Management	Compliance with regulations on the control of noise, dust odour, traffic and generation of waste
Utilise remediation option with a proven track record	Management	Selected option to have proven success on sites with similar contamination issues
Avoid long term monitoring requirements	Management	No site-specific evaluation criteria

4.1 Excavation and Off-Site Disposal and Containment

Excavation and off-site disposal of contaminated soil at the north and north east of the site should be carried out to remove the source of contamination. Containment should then be carried out, through placement of imported clean material, to interrupt the contamination pathway, protect against residual contamination risk and re-instate site levels. Site-won material should not be used given the potential for unidentified localised contamination in untested areas and the need to maintain existing site levels.

Considering the low volatility of contaminants identified in the soil, clean cover should be a minimum thickness of 0.6m. This would allow an adequate depth for growth of plants, in addition to, removing contaminant linkages, to enable the site to be redeveloped for residential use without risk to human health.

Results of soil testing from the Intrusive Site Investigation suggest that sampled soil from the site would be classified as Non-Hazardous, with an EWC code of 17 05 04, for off-site disposal to landfill or treatment facility.

This remediation option meets all the relevant objectives outlined in this report and is considered to be appropriate for the site. Excavation and off-site disposal and containment will be more cost effective if conducted alongside proposed development at the site, however, this option is still likely to be the most cost effective feasible remediation options. There are not likely to be excessive environmental nuisances, such as noise and dust, in addition, excavation and containment are very common remediation techniques, successfully used on multiple sites with similar contamination issues, and is not likely to need extensive post-remediation verification work.

4.2 Amendment of Development Proposal

An alternative remediation method would be to amend the development proposal to remove any soft landscaping from the north and north east of the site and replace this with hardstanding. Given the low volatility of the identified contamination on-site, this would sufficiently interrupt the contamination pathway between the contamination source and the sensitive on-site receptors.

This remediation option will meet most of the objectives outlined in this report as it will be less costly and there will be minimal environmental nuisances, such as noise and dust. This is also a common remediation technique, successfully used on multiple sites with similar contamination issues and will not require any post-remediation verification work.

It should be noted that the placement of hardstanding may increase the flood risk at the site and may not be satisfactory for the developer, as a result, the efficacy of this option will depend on the developer's requirements and Lead Local Flood Authority (LLFA) approval.

5. Recommendations

Based on the detailed evaluation of feasible remediation options in this report, the most appropriate remediation option is considered to be via source management and pathway interruption by way of excavation and off-site disposal of contaminated soil and containment through the placement of a clean cover layer. The details regarding this remediation are outlined below.

5.1 Remediation Strategy

Soil from the north and north east of the site should be excavated and disposed of off-site. Sampled soil from the site is classified as Non-Hazardous and should be disposed of accordingly by a licensed waste carrier. Excavations should be carried out by a suitability qualified groundworks contractor and a photographic record of the excavation works should be kept, including the base and faces of each excavation.

Excavation should be carried out to a minimum depth of 0.3m, however, it is likely to be practical to excavate to a depth equal to the thickness of the clean cover layer, in order to re-instate appropriate site levels.

A cover layer of clean imported material should then be placed in excavated areas, to a minimum thickness of 0.6m. Imported soil to be utilised as soft landscaping cover material must be shown to be uncontaminated and compliant with British Standard 3882:2015. Photographic evidence of the depth of cover is required to verify that the required thickness of cover has been implemented.

If unforeseen visible or olfactory evidence of contamination is identified during excavations at the site, work should cease in order to allow further investigation to be carried out.

5.2 Further Investigation

Following the implementation of remediation, verification will be required, to ensure remediation has been successful and the site is safe for its proposed use, and should include the following.

Imported soil to be used as cover is likely to be classified as ‘greenfield’ or ‘manufactured’ soil and will, therefore, require verification testing in accordance with YALPAG Technical Guidance.

In order to confirm the suitability of imported cover soil, 3 x samples should be taken from cover soil at the site and analysed for Metals (As,Be,Cd,Co,Cu,Fe, Hg,Pb,Ni,Mn,Se,V,Zn), Chromium (III & VI), PAHs (16 USEPA speciation), pH, Organic Matter and Asbestos in a UKAS accredited laboratory. This can be carried out while the soil is stockpiled, prior to placement, or in-situ.

Borehole logs should be produced as part of the sampling process to assess ground conditions encountered at the site, with photographic evidence taken throughout. This information will be used to inform recommendations and conclusions. Results of laboratory testing should be assessed with reference to LQM/CIEH Suitable 4 Use Levels (S4ULs) and CL:AIRE Category 4 Screening Levels (C4SLs), to assess the risk to human health and the environment.

A supporting appendix should be produced, including photographic evidence of the thickness of clean cover, to verify that the required depth of cover has been implemented.

The findings of this validation assessment should be used to update the Conceptual Site Model, produced as part of the Intrusive Site Investigation, to identify contaminant linkages at the site, in order to determine the efficacy of remediation and the requirement for any further investigations or remediation work.

6. References

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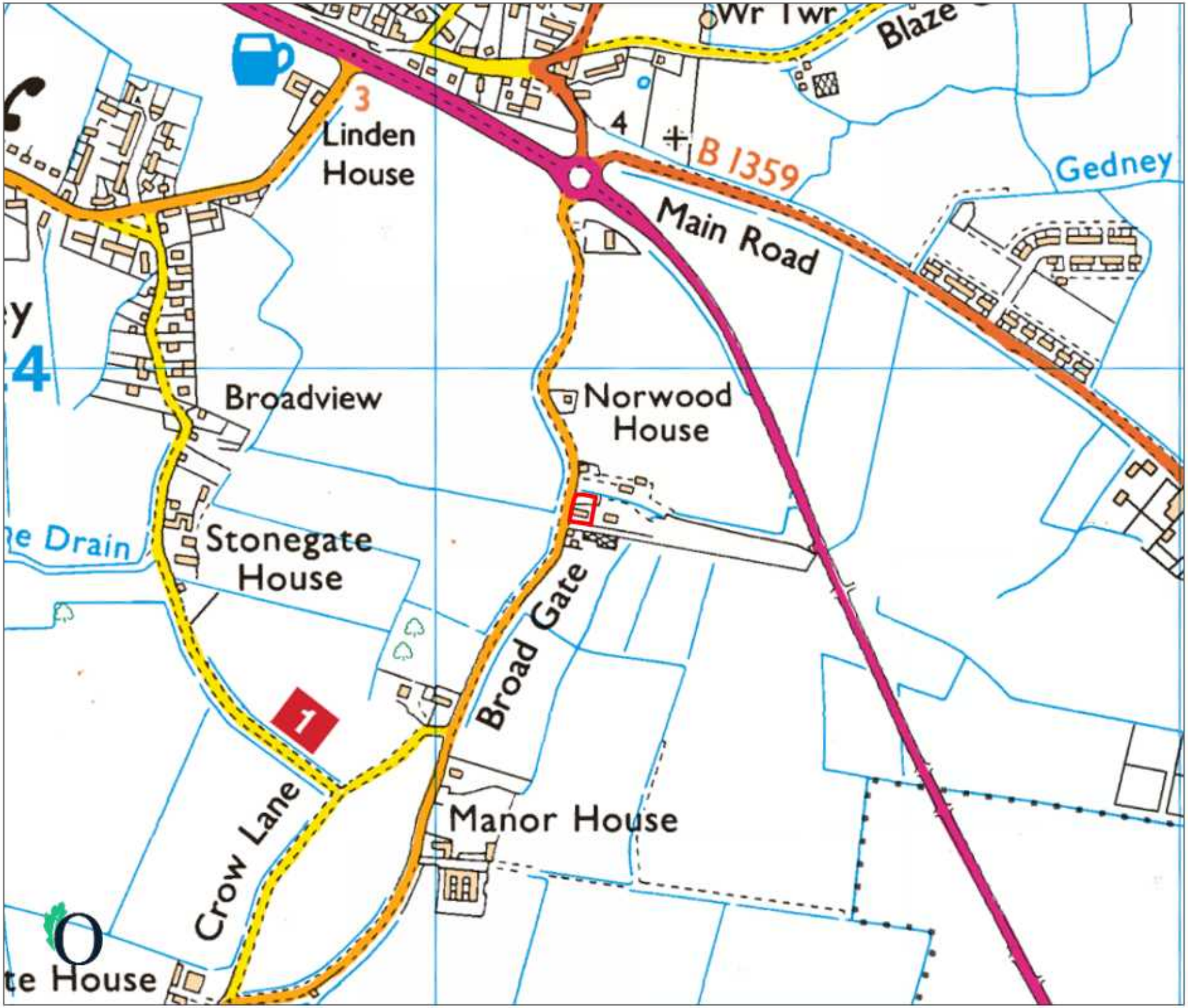
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Oakshire Environmental, 2021. *Phase 1 Preliminary Risk Assessment.*

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Yorkshire and Lincolnshire Pollution Advisory Group (2021). *Technical Guidance for Developers, Landowners and Consultants - Verification Requirements for Cover Systems.*

Oakshire Environmental Available at: <oakshireenvironmental.co.uk>.



Appendix A - Site Maps & Plans	
Description	
OS location plan	
Sources	
Contains OS data © Crown copyright and database rights 2021	
Key	
	Site boundary
Name	Figure 1

N



Appendix A - Site Maps & Plans	
Description	
Existing site plan, showing sample locations	
Sources	
Key	
	Site boundary
	Sample location
	Contaminated sample
Name	Figure 2

N



Appendix A - Site Maps & Plans	
Description	
Proposed site plan, showing sample locations	
Sources	
Julian Warrick	
Key	
	Site boundary
	Sample location
Name	Figure 3



Appendix A - Site Maps & Plans	
Description	
Proposed site plan, showing extent of soft landscaping and clean cover	
Sources	
Julian Warrick	
Key	
	Site boundary
	Sample location
	Approximate extent of clean cover
	Outbuildings
	Paved footpath
Name	Figure 4

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