JNP GROUP

CONSULTING ENGINEERS

Options Appraisal and Remediation Strategy Report

Project: 105 Highgate Lane,
Lepton,
Huddersfield,
HD8 0HQ

Client: Capewell Construction & Developments Ltd.

Reference: S11169-JNP-XX-XX-RP-G-1002

Date: June 2021

DOCUMENT CONTROL SHEET

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FOR AND ON BEHALF OF JNP GROUP

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1 INTRODUCTION

1.1.1 JNP Group was instructed by the client to undertake an options appraisal, and design a remediation strategy, for a site known as 105 Highgate Lane, Lepton, Huddersfield, West Yorkshire, HD8 0HQ (hereinafter referred to as 'the site'). This report is subject to the limitations presented in Appendix A.

1.1.2 It is understood that the existing garage in the centre of the site is to be demolished, and this area of the site, along with the driveway and garden areas to the west of the existing property are to be redeveloped with two residential properties, with areas of hardstanding for access, servicing, and parking, and with private gardens. The site location is shown in Figure 1. The proposed redevelopment layout is shown on external Drawing Reference 001-21-PL01, Rev A, dated 10/01/2021.

1.1.3 All comments given are based on the understanding that the proposed redevelopment will be as detailed above.

1.1.4 It should be noted that if there are any changes to the proposed redevelopment it may affect whether the remediation strategy outlined in this report is still appropriate, and hence warrants further consideration.

1.1.5 Should there be any deviation from the agreed remediation strategy, then it may affect whether final discharge of any planning conditions pertaining to the site is granted by the Local Authority.

1.2 Objectives

1.2.1 The purpose of this report is to identify the Best Practicable Techniques(s) (BPT) for the remediation of the site. This has been achieved by undertaking an options appraisal of potential remediation techniques and then designing a sustainable remediation strategy including verification plan.

1.3 Methodology

1.3.1 This report has been compiled in accordance with the on-line Land contamination: risk management (LCRM) guidance produced by the Environment Agency (June 2019). This can be found on the UK government website: https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks.

1.3.2 The LCRM guidance outlines a three-stage process in deriving a remediation strategy:

- Identification of Feasible Remediation Options – this considers the general and technical factors that may affect the remedial option as well as the remediation and managerial objectives and produces a short list of potential BPT.
- Detailed Evaluation of Options – this considers the characterisation of the short-listed remedial options and remediation costs. An evaluation of environmental attributes is undertaken to select the BPT most suitable for the site.
- Remediation Strategy Design – this identifies the areas of the site requiring remediation and how the works are to be phased. It outlines the verification process and plan which ensure that the remediation works are complete in line with the desired remediation and managerial objectives.

1.3.3 This report should be read in conjunction with the following reports:

- JNP Group S11169-JNP-XX-XX_RP-G-1001 Phase II Geoenvironmental and Geotechnical Report.

2 REMEDIATION REQUIREMENTS

2.1 Pollutant Linkages

2.1.1 From the ground investigation at the site, and the subsequent assessment undertaken (see JNP Group report, Ref: S11169-JNP-XX-XX-RP-G-1001), contamination was recorded within the topsoil across the raised garden area across the northern portion of the site in the following locations:

- HP01 @ 0.2m bgl: dibenz(a,h)anthracene (0.79mg/kg).
- HP02 @ 0.3m bgl: dibenz(a,h)anthracene (0.37mg/kg), arsenic (41mg/kg).

2.1.2 The topsoil across the garden area was described as a brown loamy clay topsoil in HP01 and a brown loamy gravelly topsoil in HP02. The topsoil was encountered between ground level and 0.20m bgl in HP01, and between ground level and 0.40m bgl in HP02.

2.1.3 Hence remediation at the site is required in the proposed private back garden areas of the redevelopment to break the source-pathway-receptor linkages and ensure that the site is suitable for use. The back garden areas requiring remediation are shown on the proposed redevelopment layout external Drawing Ref: 001-21-PL01, Rev A, dated 10/01/2021, at the north-eastern end of the site.

2.2 Remediation Objectives

2.2.1 The overall remediation objective is to ensure that the site is suitable for use and to protect the identified receptors (future site residents).

2.2.2 The following remediation objectives specific to the contaminants apply to the site:

- To remove the risk to receptors from PAH - and heavy metal-contaminated topsoil in all garden areas and areas of soft landscaping.
- Any amount of material going off site to hazardous landfill must be kept to a minimum.

2.3 Material Volumes

2.3.1 The existing and proposed sections across the site indicate that the levels in the proposed rear gardens will be raised slightly above the level of the existing garden. The existing and proposed sections are shown on the following external drawings: external Drawing Ref: 105HG-20-PL04, Rev A, 02/09/2020; external Drawing Ref: 001-21-PL05, Rev A, 22/01/2021; external Drawing Ref: 001-21-PL06, Rev A, 22/01/2021.

2.3.2 In the private rear garden areas, the made ground topsoil material should be remediated.

2.3.3 From external Drawing Ref: 001-21-PL01, Rev A, 10/01/2021 and the intrusive investigation, the total area requiring remediation is estimated to be around 70m^2. This equates to an estimated volume of 28m^3 of material requiring remediation assuming an average 400mm thickness and that all material requires removal from site. The actual volume will be determined based on the selected remedial option from section 3.0 as should levels allow a simple capping system could be utilised.

2.4 Remediation Target Values

2.4.1 The initial Remedial Target Values (RTV), given in Table 2.1 that follows, have been suggested for the remediation works based on the exceedances to date. In addition, the proposed RTV

has been selected to ensure that following remediation the site cannot be classified as "Contaminated Land" under Part IIA of the Environmental Protection Act 1990.

Table 2-1: Proposed RTV

Determinant	RTV (mg/kg)	Source
Arsenic	37	C4SL (Residential with plant uptake)
Dibenz(a,h)anthracene	0.24	S4UL (Residential with plant uptake)

3 EVALUATION OF REMEDIATION OPTIONS

3.1 Management Objectives Affecting Remediation Options

3.1.1 The following management objectives are considered to be appropriate for the site:

- To reduce the amount of hazardous waste being landfilled in line with current UK waste hierarchy (reduce - re-use – recycle – recover – disposal).
- To achieve a remediation strategy that can be agreed by all key stakeholders (client, regulators).
- To meet all regulatory requirements relevant to the installation or operation of remediation options.
- To avoid unacceptable health and safety, and adverse environmental impacts during remediation.
- To minimise long term liabilities.
- To avoid long term maintenance or monitoring obligations.
- To ensure the scheme takes into account any design requirements of the overall redevelopment.
- To undertake remediation in accordance with good technical practice.
- To achieve successful remediation within a particular timescale and budget.

3.2 Design Requirements Affecting Remediation Options

3.2.1 The proposed sections mentioned previously indicate that there is a design requirement to raise ground elevation slightly in the rear garden areas, between 0m – 0.5m above the existing levels.

3.3 Technical Factors Affecting Soil Remediation Options

3.3.1 Contaminant type and soil type are the two key factors that affect the choice of any remediation option being considered.

3.3.2 To treat loamy and gravelly clay soils contaminated with PAHs and metals, the following are options:

- Chemical: accelerated natural attenuation.
- Solidification / stabilisation: cement and pozzolan based system, e-clays, vitrification.
- Thermal: thermal desorption.
- Other: cover; disposal to landfill.

3.3.3 The following options are considered potentially available should any asbestos be identified with the ground following demolition:

- Cover-containment (should there be an option to raise ground levels and subject to regulatory approval).
- Excavation and disposal to landfill.

3.4 Evaluation of Remediation Options

3.4.1 Using the site constraints and management objections, the available remediation options have been evaluated further to establish the best practicable remediation techniques for the site.

3.4.2 Given the small scale of the site, and the very small area of the site requiring remediation, all of the available chemical, solidification / stabilisation, and thermal, remediation options are considered unsuitable. Instead, a cover system placed above the contaminated soils, or excavation and disposal to landfill of the contaminated soils, or a combination of both, are considered the most suitable options.

3.4.3 As the proposed levels in the back garden areas are slightly higher than the existing levels, a 600mm thick cover system would be the most suitable option. Any soils within 600mm of the proposed ground level in the back gardens should be removed and replaced with a clean cover/capping layer of subsoil and topsoil.

3.4.4 The natural subsoil on site has been confirmed as clean and as such should this be encountered during removal of the contaminated ground then the excavation can cease and arisings from the foundation excavations could be utilised as part of the capping layer.

3.5 Best Practicable Technique

3.5.1 Given the small volume of material requiring remediation is has been determined that further chemical analysis would be uneconomical and as such the most suitable option is:

- 600mm cover / capping layer of clean subsoil 450mm and topsoil 150mm. The existing topsoil within 600mm of the proposed ground level in the back garden areas should be excavated to allow the placement of the capping layer. This material can then either be disposed of offsite or placed in an area requiring fill greater than 600mm prior to capping or placed beneath hardstanding if geotechnically suitable.

4 REMEDIATION STRATEGY – IMPLEMENTATION PLAN

4.1 Introduction

4.1.1 The main works shall be undertaken by a suitably qualified earthworks Contractor and the works shall be supervised by JNP Group on an "as and when" required basis.

4.1.2 All works on site shall be undertaken following the guidance given in C762 Environmental Good Practice on-site (CIRIA C762) and Construction Site Safety GE700E/18 (CITB 2018).

4.1.3 A Construction Environmental Management Plan (CEMP) and method statements for all aspects of work shall be provided to JNP Group by the earthworks Contractor, and any specialised subcontractors. These will include any details of proposed toolbox talks. The CEMP and method statements shall require approval prior to commencement of the works on site. The CEMP should cover, as a minimum, the following items: nuisance dust; asbestos fibres release; odours; noise and traffic management. An outline CEMP is given in in Appendix B.

4.1.4 It is recommended that the proposed works are undertaken in accordance with the Definition of Waste Code of Practice (DoWCoP); in following this guidance and to ensure materials are managed correctly, a Materials Management Plan will need to be prepared and declared in advance by a Qualified Person, then implemented and documented in a Verification Report. If this process is not undertaken, then following recent changes in landfill tax regulations by HMRC, there is a risk of penalties equating to twice the landfill tax rate being applied to the re-use of material on site. If the proposed works are to be undertaken outside of the DoWCoP, there would need to be some form of Environmental Permitting, the requirements of such are likely to be more onerous and may take longer to be granted.

4.2 Programme of Works

4.2.1 In order to ensure the works are undertaken in a suitable order, the following are proposed:

- Surface strip, vegetation clearance and demolition of existing garage.
- Excavation of back garden areas to 600mm below the proposed finished ground level or to natural, and replacement with clean material. The natural soils on site would be suitable for reuse as part of the capping layer.

4.3 Surface Strip, Vegetation and Tree Removal

4.3.1 A general surface strip is to be undertaken across the whole of the site, this includes soft landscaping and hard standing. Overgrown vegetation, and the trees along the north-western and south-western margins of the site not being retained, are to be removed.

4.4 Demolition of Existing Buildings

4.4.1 The garage building in the centre of the site will be demolished before the main / earthworks / remediation work commences.

4.5 Material Requiring Excavation

4.5.1 If practicable, the ground requiring excavation shall be directly excavated onto haulage lorries, or if this is not achievable, stockpiled in a designated area to await disposal. Any stockpiled material shall be placed on tarpaulin sheets to avoid any cross contamination.

4.5.2 Should hydrocarbon impacted material associated with any underground tanks, or unexpected contamination, be encountered, the earthworks contractor shall make the necessary arrangements with the waste receiver, and programme in further excavation work.

4.5.3 Should asbestos impacted material be encountered during the demolition, then the earthworks contractor shall arrange for its suitable disposal. In the case of any visual asbestos sheeting, this is likely to be a hand-picking exercise to be undertaken by the earthworks contractor with the sheeting being bagged and disposed of appropriately. Any soils impacted with loose fibres shall require disposal to a suitable licenced landfill site and shall be transported using a suitably licenced haulier.

4.5.4 Records shall be kept of any material removed off-site either for treatment and re-use or as a waste destined for landfill. The Waste License and Permit Register form, as given in Appendix C, detailing the waste codes, haulier and waste receiver details should be completed by the Contractor for each waste material generated requiring removal. In addition, all material removed off-site shall be logged on the Waste Disposal Log form given in Appendix D. The completed waste management form, duty of care and consignment notes shall be provided to JNP Group for inclusion in the verification report.

4.6 Specifics for Capping Layer

4.6.1 A capping layer is required in the proposed back garden areas and should comprise 450mm of clean subsoil (can be natural as dug material) and 150mm topsoil. Within the top 600 mm, JNP Group would suggest that there is no deleterious material (for example wire, brick, glass, plastics, treated wood or textiles).

4.6.2 The requirements of Section 4.8 also apply.

4.7 Imported Fill

4.7.1 Any imported fill such as subsoil or topsoil used at the site should be sourced from a suitable provider of such material, who should provide chemical testing certificates of the material destined for the site. These certificates should be issued to JNP Group for approval prior to accepting the material. In addition, the imported fill should be free of any deleterious material such as glass fragments, wire, wood and a visual inspection should be undertaken once the material arrives on site.

4.7.2 Any topsoil and subsoil imported to site shall be classified and characterised in accordance with the requirements of BS3882:2015 [Specification for topsoil and requirements for use] and BS8601:2013 [Specification for subsoil and requirements for use] respectively as well as the chemical testing criteria given in Tables 5.1 and 5.2.

4.7.3 The reader is referred to Section 5 for chemical testing requirements.

4.8 Dealing with Unexpected Contamination

4.8.1 Whilst investigation works have been undertaken at the site, it remains possible that unexpected soil contamination, groundwater contamination, or visible asbestos containing materials may be encountered during the process of any site demolition, clearance, excavation and / or construction.

4.8.2 There is the potential for areas of previously unidentified and unexpected contamination to be present at the site such as ashy soils, brightly coloured soil, significantly oily or odorous material, asbestos impacted soils, and underground tanks.

4.8.3 If during the works such material is encountered, the earthworks Contractor shall inform JNP Group immediately who shall then advise on the best course of action. Photographic and written records should be kept by the earthworks Contractor detailing any such material.

4.8.4 A copy of this strategy for dealing with unexpected contamination should be made available on site and ground workers should be made aware of it.

4.9 Environmental Incidents

4.9.1 In the event of an unforeseen environmental incident (pollution occurrence) on-site, work should be stopped in the area immediately affected, and the Environmental Agency should be contacted via their incident hotline 0800 807 060.

4.9.2 Emergency spill kits shall be kept on-site in strategic locations, and a member of staff who is trained to use them shall be always present on-site.

5 REMEDIATION STRATEGY – VALIDATION PLAN

5.1 Validation Chemical Testing – Imported Fill

5.1.1 Chemical testing certificates should be available for any imported fill including subsoil or topsoil. Each imported material used must be tested at the frequency detailed within the YAHPAC Verification Requirements for Consultants, a copy of which is included as Appendix F and an extract is included below. It is anticipated that only topsoil will require importing to site.

Type	Number of Samples	Testing Schedule	Assessment Criteria
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As,Cd,Cr,CrVI,Cu,Hg,Ni,Pb,Se,Zn)	This needs to be agreed with the Local Authority. The Assessment criteria needs to be UK based, e.g. SGV's, LQM or other similarly derived GAC's.
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m^3	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Greenfield/ Manufactured Soils	Minimum 3 or 1 per 250m^3 (whichever is greater)	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Brownfield/ Screened Soils	Minimum 6 or 1 per 100m^3 (whichever is greater)	Standard metals/ metalloids (As above) PAH (16 USEPA speciation) TPH (CWG banded) Asbestos Any additional analysis dependant on the history of the donor site.	

5.1.2 All chemical testing shall be undertaken by a UKAS and MCERTS accredited testing laboratory.

5.1.3 Any chemical testing results shall be compared to the screening values given in Table 5.1. As the end use of the site is two residential properties with private gardens, current UK residential with plant uptake guideline values have been selected for use.

5.1.4 In addition, as copper, nickel and zinc are considered phytotoxic in nature, the criteria given in Table 5.2 should be used (these values are less than the published UK screening values and hence are considered protective of human health).

Table 5-1: Imported Fill Screening Values

Determinant	Screening Criteria (mg/kg)	Source		Determinant	Screening Criteria (mg/kg)	Source
TPH Aliphatic $C_5 - C_6$	42	LQM S4UL		Acenaphthylene	5.0	Professional judgement[6]
TPH Aliphatic $C_6 - C_8$	100	LQM S4UL		Acenaphthene	5.0	Professional judgement[6]
TPH Aliphatic $C_8 - C_{10}$	27	LQM S4UL		Anthracene	5.0	Professional judgement[6]
TPH Aliphatic $C_{10} - C_{12}$	130	LQM S4UL		Benzo(a)anthracene	5.0	Professional judgement[6]
TPH Aliphatic $C_{12} - C_{16}$	250	Professional judgement[1]		Benzo(a)pyrene	5.0	Defra C4SL[4]
TPH Aliphatic $C_{16} - C_{21}$	250	Professional judgement[1]		Benzo(b)fluoranthene	2.6	Professional judgement[6]
TPH Aliphatic $C_{21} - C_{35}$	250	Professional judgement[1]		Benzo(k)fluoranthene	5.0	Professional judgement[6]
TPH Aromatic $C_5 - C_7$	0.87	Professional judgement[6]		Benzo(g,h,i)perylene	5.0	Professional judgement[6]
TPH Aromatic $C_7 - C_8$	130	LQM S4UL		Chrysene	5.0	Professional judgement[6]
TPH Aromatic $C_8 - C_{10}$	34	LQM S4UL		Dibenzo(a,h)anthracene	0.24	LQM S4UL
TPH Aromatic $C_{10} - C_{12}$	74	LQM S4UL		Fluoranthene	5.0	Professional judgement[6]
TPH Aromatic $C_{12} - C_{16}$	140	Professional judgement[1]		Fluorene	5.0	Professional judgement[6]
TPH Aromatic $C_{16} - C_{21}$	260	Professional judgement[1]		Indeno(1,2,3,c-d)pyrene	5.0	Professional judgement[6]
TPH Aromatic $C_{21} - C_{35}$		Professional judgement[1]		Naphthalene	2.3	LQM S4UL
				Pyrene	5.0	Professional judgement[6]
Arsenic	37	Defra C4SL[4]		Phenanthrene	5.0	Professional judgement[6]
Cadmium	26	Defra C4SL[4]				
Chromium	910[2]	LQM S4UL		Nickel	pH dependent	Refer to Table 5.2
Mercury	40[3]	LQM S4UL		Selenium	250	LQM S4UL
Lead	200	Defra C4SL[4]		Benzene	0.87	Defra C4SL[4]
Copper	pH dependent	Refer to Table 5.2		Toluene	130	LQM S4UL
Zinc	pH dependent	Refer to Table 5.2		Ethylbenzene	47	LQM S4UL
asbestos	None present	CIRIA C733		Xylene	56[5]	LQM S4UL

LQM S4UL selected for organics based on 1% SOM for conservatism

1 Professional judgement – conservative value selected, less than LQM S4UL

2 Based on LQM S4UL for chromium III, assumes no chromium VI is likely to be present

3 Based on LQM S4UL for inorganic mercury, assumes that no elemental or methyl mercury is likely to be present
4 defra category 4 screening value
5 Based on LQM S4UL for p-xylene for conservatism
6 Professional judgment – cannot be classified as contaminated land under Part IIA

Table 5.2: Imported Fill Screening Values – Phytotoxic Metals

Determinant	Screening Criteria (mg/kg)			Source
	pH <6	pH 6-7	pH >7	
Copper (nitric acid extractable)	<100	<135	<200	BS 3882:2015 and BS 8601:2013
Nickel (nitric acid extractable)	<60	<75	<110	BS 3882:2015 and BS 8601:2013
Zinc (nitric acid extractable)	<200	<200	<300	BS 3882:2015 and BS 8601:2013

5.2 Gas Membrane Verification

5.2.1 The risk of ground gas is subject to the completion of the gas monitoring period as set out in the Phase II report (Ref: S11169-JNP-XX-XX-RP-G-1001). The potential requirement for gas protection measures will be addressed following this.

5.3 Verification Reporting

5.3.1 Following placement of the capping layer, hand excavated trial pits inspected by JNP Group will need to be undertaken in each of the rear garden areas to confirm that a suitable capping layer thickness has been placed. From these hand excavated trial pits, the following pieces of evidence will need to be gathered and included in the verification report:

- Photographs, and records of the locations, of each hand excavated trial pit in each plot.
- Photographs of a tape measure against the capping layer in each hand excavated trial pit to confirm whether it is the correct thickness.
- Chemical testing records of all imported capping layer materials.

5.3.2 Following the completion of the remediation works, all records of works undertaken (including drawings and photographs), duty of care certificates and imported soil chemical testing certificates shall be provided to JNP Group.

5.3.3 Following the completion of the remediation works, a verification report shall be produced by JNP Group that details the remediation work undertaken, the validation testing undertaken, and the details of any material removed from or brought to the site.

5.4 Recommendations

5.4.1 It is recommended that a copy of this options appraisal and remediation strategy be submitted to the Regulatory Authorities for their approval.

6 REFERENCES

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Figures / Drawings

Figure 1

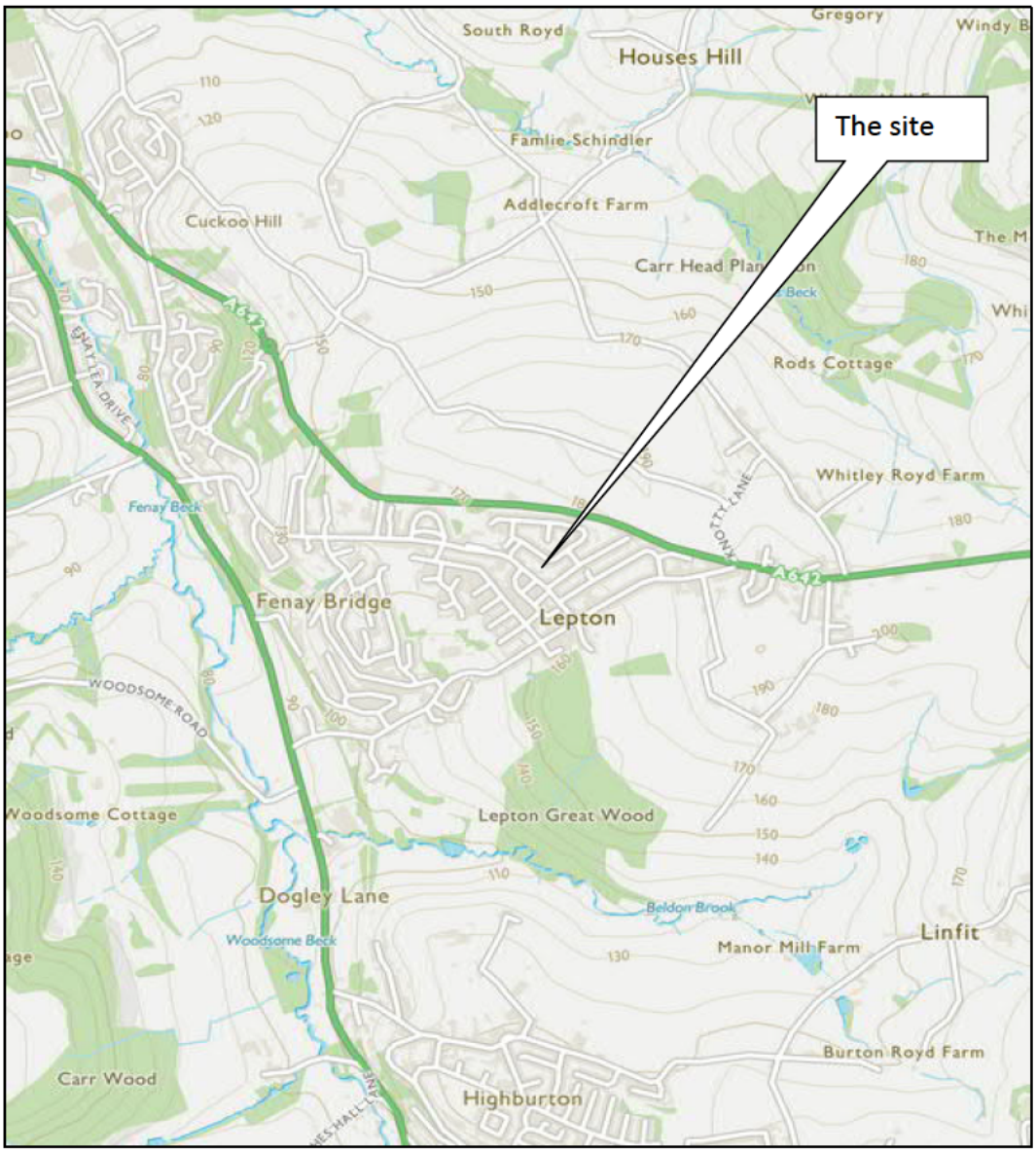
Site Location Plan

Project:

105 Highgate Lane, Lepton, Huddersfield

Project No:

S11169



Appendix A Limitations

1 INTRODUCTION

1.1.1 This report is confidential and has been prepared solely for the benefit of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from JNP Group; a charge may be levied against such approval. JNP Group accepts no responsibility or liability for the consequences of this document being used for any purpose or project other than for which it was commissioned, and: this document to any third party with whom and agreement has not been executed.

1.1.2 Any comments given within this report are based on the understanding that the proposed works to be undertaken will be as described in the introduction and the information referred to and provided by others and will be assumed to be correct and will not have been checked by JNP Group and JNP Group will not accept any liability or responsibility for any inaccuracy in such information.

1.1.3 Any deviation from the recommendations or conclusions contained in this report should be referred to JNP Group in writing for comment and JNP Group reserve the right to reconsider their recommendations and conclusions contained within. JNP Group will not accept any liability or responsibility for any changes or deviations from the recommendations noted in this report without prior consultation and our full approval.

1.1.4 The details contained within this report reflect the site conditions prevailing at the time of investigation. JNP Group warrants the accuracy of this report up to and including that date. Additional information, improved practice or changes in legislation may necessitate this report having to be reviewed in whole or in part after that date. If necessary, this report should be referred back to JNP Group for re-assessment and, if necessary, re-appraisal.

1.1.5 This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report. Whilst this report and the opinion made herein are correct to the best of JNP Groups' belief, JNP Group cannot guarantee the accuracy or completeness of any information provided by third parties.

1.1.6 The report represents the finding and opinions of experience geotechnical and geoenvironmental engineers. JNP Group does not provide legal advice and the advice of lawyers may also be required.

1.1.7 It should be noted that the following were not included as part of the agreed scope of works with the client: detailed ecological surveys and assessment.

1.1.8 JNP Group has provided advice and made recommendations based on the findings of the work undertaken, however this is subject to the approval / acceptance by the relevant regulatory authorities.

1.2 Objectives

1.2.1 The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be

considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, JNP Group reserves the right to review such information and, if warranted, to modify the opinions accordingly. It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

1.3 Remediation and Verification Reports Limitations

1.3.1 The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

1.3.2 Where intrusive investigations have been undertaken they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature sampling, no investigation technique is capable of identifying all conditions present in all areas. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised "hotspots" of contamination where concentrations may be significantly higher than those actually encountered.

1.3.3 If costs have been included in relation to the site remediation these must be confirmed by a qualified quantity surveyor. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed from Third Party should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, JNP Group reserves the right to review such information and, if warranted, to modify the opinions accordingly.

1.3.4 Whilst this report and the opinion made herein are correct to the best of JNP Groups' belief, JNP Group cannot guarantee the accuracy or completeness of any information provided by third parties.

1.3.5 Gas and groundwater levels may vary from those reported due to seasonal, or other effects.

Appendix B CEMP / Method Statement

Appendix C Waste License and Environmental Permit

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Waste License and Permit Register

Material Description	EWC	Origin	Material carrier			Disposal site/Treatment works	
			Name	License Number	Expiry Date	Name	License No: Exemption Ref.
Scrap Metal							
Topsoil							
Non-hazardous waste							
Asbestos impacted hazardous waste							
Hazardous waste							
Construction / demolition rubble							
Free product contamination water							

Appendix D Waste Disposal Records

Waste Disposal Log

Waste Disposal Records

Date Removed	Waste Type	Identifying of the person removing the waste	Site the waste of being taken to and whether licensed or exempt	Waste carrier and registration number	Confirmation of delivery*

*Evidence of waste carrier registration and waste transfer or hazardous waste consignment notes for each removal of waste should be provided either as part of the plan, or filed and cross references

Appendix E Imported Soil Documentation

Appendix F YAHPAC Verification Requirements for Capping Systems

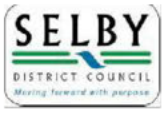
VERIFICATION REQUIREMENTS FOR COVER SYSTEMS

Technical Guidance for Developers, Landowners and Consultants

Yorkshire and Humberside Pollution Advisory Council

Version 3.2 – October 2014

The purpose of this guidance is to promote consistency and good practice for development on land affected by contamination. The local authorities in Yorkshire, Lincolnshire and the North East of England who have adopted this guidance are shown below:



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Acknowledgments

The author, Wakefield Council, would like to acknowledge the assistance provided by the following organisations: City of York Council, City of Lincoln Council, Leeds City Council and City of Sheffield Council. The author would also like to acknowledge Liverpool City Council's Contaminated Land Team, Coopers Consulting Engineers for allowing us to use their guidance document and photographs and WSP Environmental Ltd for also donating photographs.

Consultation

39 Local Authorities and 6 Environmental Consultants were consulted over a four week period in 2010 during the production of the initial guidance. At that time, consultation comments were considered by the review panel and a number of revisions were made to the guidance to reflect these comments. Given that no major changes have subsequently taken place, only Local Authorities were consulted during the production of this version [3.1] of the guidance.

Introduction

This guidance has been produced to help developers ensure that they can demonstrate that material brought onto a development site for gardens or areas of soft landscaping are suitable for use and do not present harm to people, the environment and/or property. It is intended to improve the quality of reports submitted to Local Authorities on this matter and to give contractors/consultants a point of reference to obtain approval for such work from their client. This guidance does not cover the geotechnical suitability of soils or material or chemical suitability that does not affect human health e.g. sulphates.

The verification of cover systems should be an integral part of the remediation project and agreed between developers and regulators at an early stage in the project.

There are some UK guidelines regarding verification, for example CLR 11[1] and the document on verification of remediation[2]. This guidance note should be considered as supplementary advice in conjunction with these documents.

This guidance relates to the remediation of land contamination by using cover systems; however, the verification of the quality of imported material is equally important in other situations, such as raising levels for flood prevention or general landscaping works. This guidance could also be used in such instances.

The Process of Verification

Implementation plans for remedial works should always be site specific. Where a cover system and potentially, excavation, is the main remedial method or a component of an overall site remediation, specific goals will need to be set that are linked directly to the risk management strategy for the site in question.

For cover and containment systems, verification will normally depend upon the provision of defensible measurements, observations and records. Critical factors to be considered are:

- What should be measured?
- When should they be measured?
- Where measurements need to be taken, what is the appropriate monitoring regime i.e. number and frequency of samples?
- Statistical constraints on sampling.

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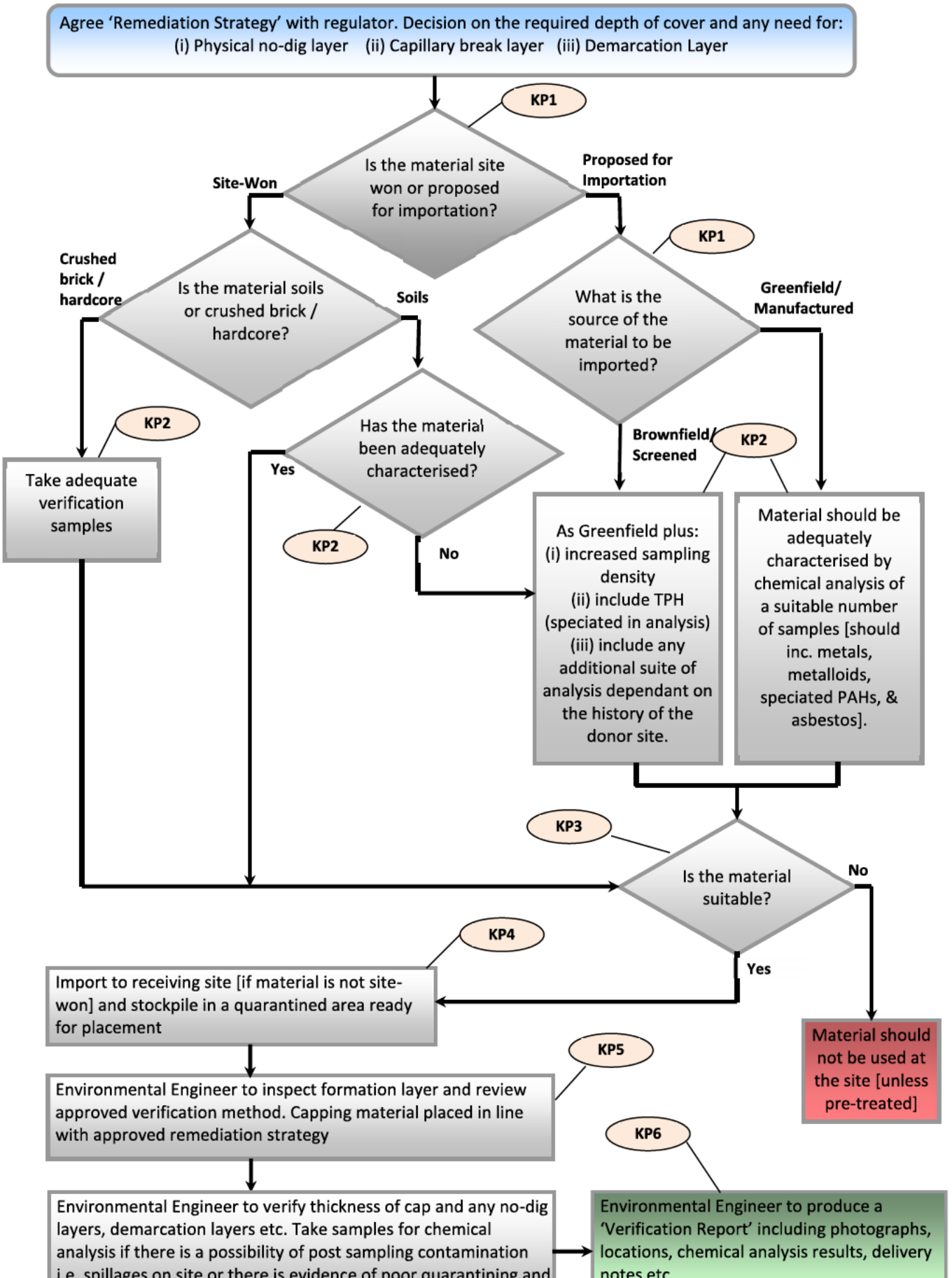
1 "Contaminated Land Report 11 - Model Procedures for the Management of Contaminated Land". Environment Agency, September 2004.

2 "Verification of Remediation of Contaminated Land. Environment Agency, 2010 [draft report].

Overview Flowchart



Key Points

KP1 Source of Material	Material can be sourced from site won material i.e. crushed brick /hardcore or site-won soils from existing open or landscaped areas. In the interest of sustainability, Local Authorities promote the use of such site-won material providing that they are suitable for the intended end use of the site. Alternatively, material can be sourced from other developments and commercial companies. Dependent on the source of the material it can be classified as either from a 'Greenfield/Manufactured' or 'Brownfield/Screened' source. Broadly speaking material can be classified as follows: Greenfield - if it can be demonstrated that it has not been developed and that no past contaminative uses have occurred at the site. Manufactured – from a commercial company who manufacture material by mixing or blending mineral soils (subsoil or sand) with an organic amendment (compost). Brownfield – material from a donor site that has previously been developed Screened – material from a company who deal with skip/demolition waste which is screened for unsuitable material i.e. bricks, wood, plastic etc.
KP2 Characterisation of Material	It is essential that material is inert and suitable for its intended use. Evidence of the source of the material should be provided to the Local Authority. What is required is a defensible method to ensure the verification proposals are site specific and that the level of sampling reflects the need to ensure that imported material are suitable for their intended use. **When Should this be Done?** Sampling of material should be undertaken as early as possible i.e. prior to placement [for site won material] and prior to importation [for imported material]. This is to avoid the costly exercise of re-excavating unsuitable material and the possibility of cross contamination. Where the assessor has confidence that the material is of sufficient quality (i.e. tested by supplier, used previously) it is acceptable to test the material on site but prior to placement. Although, if it is deemed unsuitable it would have to be either removed off site or pre-treated at the cost and time of the developer. **What about Certificates from Commercial Suppliers?** Where the material is provided by a commercial company, certificates or other industry Quality Protocol compliance i.e. WRAP, will normally be

	accepted. This is on the proviso that it (i) relates to the actual material being imported to the site and the type and amount of analysis is in line with what is prescribed in Appendix 1a and (ii) the certificates are less than two months old. Extreme caution should be given to importing material that has been recycled from demolition or skip waste as they could be easily be contaminated e.g. asbestos containing materials. [Please refer to questions you should be asking your supplier in Appendix 1b and include the responses in your report] **British Standard** Imported topsoils should be as specified in BS 3882:2007 as 'suitable for their intended purpose'. BS3882:2007 relates to nutrient content of topsoil and phytotoxic contamination and does not consider contaminants that pose a risk specifically to human health. Soils should be tested for contaminants that are considered to pose a risk to human health in addition to BS3882:2007 to ensure that they are suitable for their intended use. **Initial Screening** A visual / olfactory inspection of the material should be carried out by an Environmental Engineer to ensure that: - it is a suitable growing medium - it is free from obvious contamination i.e. staining / free product etc - it has not come from areas where Japanese Knotweed or other invasive or injurious plants, as specified by the Environment Agency, are suspected to have been growing. - it is not odorous (could be considered a statutory nuisance) - it is free from unsuitable material i.e. bricks, brick ties, timber and glass etc) - there are no visible signs of asbestos containing material (ACM's) **Testing Schedule & Number of Samples** Chemical testing will normally be required on any materials that are to be used as cover material, even where this includes first generation quarried material. This should be carried out by a suitably qualified Environmental Engineer. Please refer to the Characterisation of Material Matrix in Appendix 1a which details the number of samples to be taken; the testing schedule to be utilised dependant on the nature and source of the material and the acceptance criteria to be used.

KP3 Suitability of Material	Based on the characterisation of material above, the material should be either deemed suitable or unsuitable. Obviously unsuitable material should not be used [unless it is treated to reduce levels of contaminants below agreed target levels i.e. bioremediation – this would have to be agreed and included within the Remediation Strategy] and an alternative source of material should be sought by the developer. If the material is considered suitable it can be imported [if not site won] and stockpiled in a suitably quarantined area [refer to KP4].
KP4 Stockpiling & Quarantining of Material	It is essential that the 'suitable' material is either placed in its intended area straight away i.e. soft / landscaped areas or stockpiled in a suitable quarantine area to prevent on-site contamination. In the event that an assessor finds material has been stored in an unsuitable area, samples should be taken to confirm that no cross contamination has occurred [including a visual/olfactory check of the material]. The material should then be suitably quarantined or placed at its intended location immediately.
KP5 Verification of Required Depth	In line with the agreed 'Remediation Strategy', it is important to establish that the required depth has been achieved and is consistent across the site. There are two main ways to achieve this: Depth testing in situ – small trial pit excavated to allow measurement of its depth by tape measure or measuring staff. Topographical surveys – accurate survey of the base and final formation layer height to establish the depth of cover. **Specific Local Authority Policy** Please check with the local Contaminated Land Officer to establish: • which type of method for testing depth is accepted; and • the number of verification areas per property, plot, landscaped area or garden area [some Local Authorities recommend at least 2 per plot] **Important Note:** Where demarcation, physical no-dig and capillary break layers exist they should be verified for their thickness and presence during the time of their installation. Details of the demarcation layer should be agreed with the Contaminated Land Officer prior to placement. This will include the design, type and strength of the geotextile separator or visual warning membrane. The verification of depth and confirmation of such layers should be carried out by a suitably qualified environmental engineer.
KP6 Reporting	The purpose of verification documentation is to provide transparent reasoning why the remediation was required, a methodology about how it was to be undertaken and proof that the specified works have been

undertaken and to provide confirmation that the site is 'suitable for its intended use'.

The document is utilised not only to satisfy conditions of planning permissions but also is to be kept on record by the Local Authority should queries be raised during the lifetime of the development and to confirm to future purchasers that the site is suitable for use. Therefore, the presence of good quality photographs is essential to prove beyond doubt that the remediation has been done as specified both by method and position.

It is also essential that other supporting documentation is included within a report e.g. laboratory analysis results, delivery tickets for material, certificates for imported material, trial pit logs etc. A checklist has been included in Appendix 2 to give an idea on what information should be recorded.

The reporting should be carried out by a suitably qualified Environmental Engineer.

To include details of any measures required to maintain the cover system integrity in the future e.g. successive construction phases (management plans) and longer term (restrictive covenants on title deeds).

Photographic Evidence for Validating the Depth of Cover

The Local Authority ideally would recommend the following programme of photographs to be taken of the placement of inert cover:

- Photographs of any stockpiles and quarantine areas
- Proof that the depth of inert cover has been installed
- Proof of the quality of the material to be used as inert cover
- Proof there is a geotextile separator and visual warning membranes if used between the made ground and suitable for use soils.
- Proof of the method of placement and different layers if appropriate
- Proof of the completed project
- Inclusion of geographic background features which will aid locating the photograph
- Inclusion of site identification boards within the photos which show the date, position taken i.e. corner of plot 3 and the site name.
- Inclusion of photographs of site stockpiles and quarantine areas.

The photographs have to prove beyond doubt that the images have been taken from the specific area stated.

Refer to Appendix 3 for examples of good photographic evidence.

Appendix 1a – Sampling & Testing Matrix

Type	Number of Samples	Testing Schedule	Assessment Criteria
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As,Cd,Cr,CrVI,Cu,Hg,Ni,Pb,Se,Zn)	This needs to be agreed with the Local Authority. The Assessment criteria needs to be UK based, e.g. SGV's, LQM or other similarly derived GAC's.
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m^3	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Greenfield/ Manufactured Soils	Minimum 3 or 1 per 250m^3 (whichever is greater)	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Brownfield/ Screened Soils	Minimum 6 or 1 per 100m^3 (whichever is greater)	Standard metals/ metalloids (As above) PAH (16 USEPA speciation) TPH (CWG banded) Asbestos Any additional analysis dependant on the history of the donor site.	

Appendix 1b – Questions to Ask Your Soil Supplier Relating to Soil Quality

- What is the source of the material (refer to KP1)?
- Will all of the material be coming from the same source?
- Are you satisfied that the material is a suitable growing medium for the proposed end use?
- Has the supplier used an appropriate sampling protocol to ensure a representative sample is analysed? What volume of soil is represented by the analysis and does it comply with Appendix 1a?
- Does the testing include analysis of contaminants identified in Appendix 1a?
- Does the laboratory conducting the analysis have UKAS and MCERTS accreditation for the tests they are carrying out?
- Can I have a copy of the whole analysts report and does it include an interpretive section?
- Will the provided certificate be dated within the last 2 months?

Appendix 2 – Checklist for Verification Reports

Example only. Not to be considered as typical minimum requirements. Additional information should be included for non cover systems aspects of the remediation i.e. gas protection measures etc.

Site Details	
Site Name / location	
Developer name	
Development use	
Plot No / description of landscaped area (inc plan of inspection areas)	
National Grid Reference	
Inspection visit date	
Supporting Evidence	
Description of remediation (as per agreed Remediation Method Statement including depths / thickness checks, topographical readings)	
Material tracking information (including way tickets etc)	
Name of groundwork's remediation contractor	
Name of supervising environmental consultant	
Site Specific chemical analysis results	
Verification Photographs (inc. remarks)	
Recommendations	
Pass / fail	
If material fail, how will this be managed i.e. removed, treated	
Detail any further remedial works and / or inspection	
Signed off	

Failure to provide any of the above information may prevent planning conditions from being discharged.

Appendix 3 – Examples of Good Quality Photographs

Photograph 1: Depth check of inert cover within area of public open space. Physical break layer and topsoil visible.

Photograph 2: Depth check of inert cover with Site & Location Information Board.

Photographs 3 & 4: Depth check of inert cover within areas of front gardens.

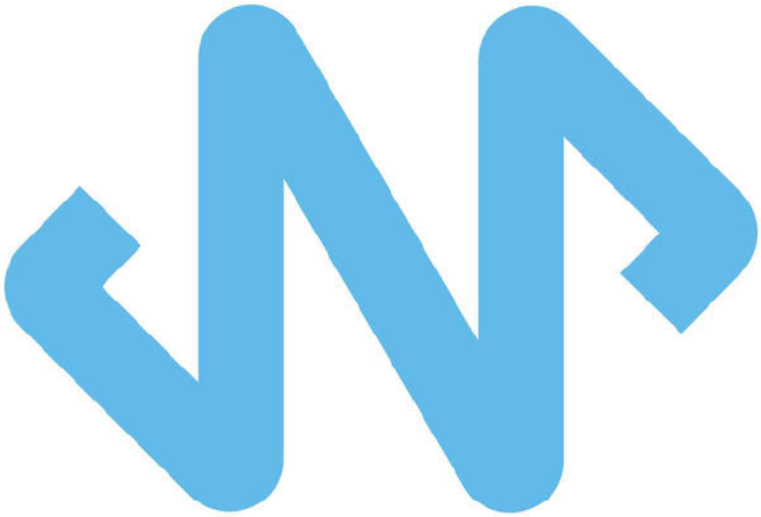
Photographs 5 and 6: Depth check of inert cover within rear gardens. Taut string line spans across excavation.

Photograph 7 shows the spatial location of the verification pit.

Photograph 8: Excavation within public open space and verification pit showing the presence of a remediation break layer at the base, a crushed sandstone inert fill overlain by topsoil.

Photographs 9 and 10: Inert crushed sandstone being delivered with remediation break layer visible in Photograph 10. The spatial area of the remediation can be observed from these photographs (old terrace housing in Photograph 9 and traffic lights in photograph 10).

Photographs 11 and 12 show the remediation of the rear garden, with a significant depth (1.0m) of inert cover. Remediation break layer visible at the base of the excavation. Photograph 11 has been stitched to form a panoramic photograph and hence there is slight distortion



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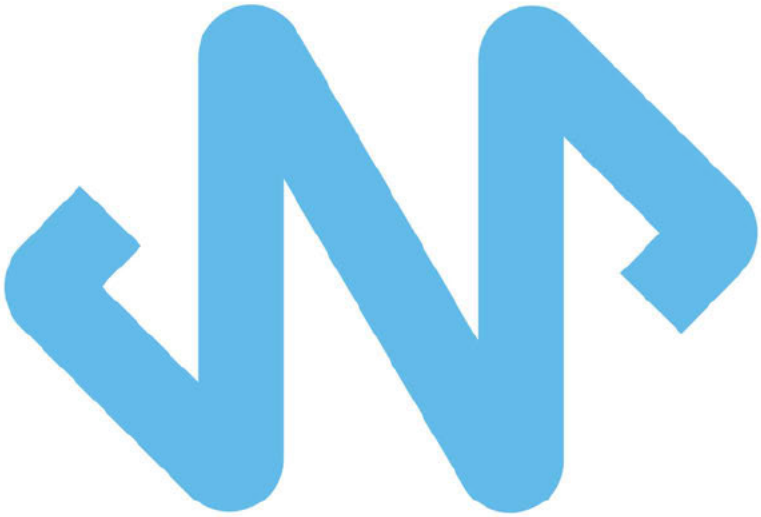

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