REMEDIATION STATEMENT FOR TOPSOIL

AT

DEWSBURY RIVERSIDE
RAVENSTHORPE ROAD, THORNHILL LEES
DEWSBURY, WF12 9EG

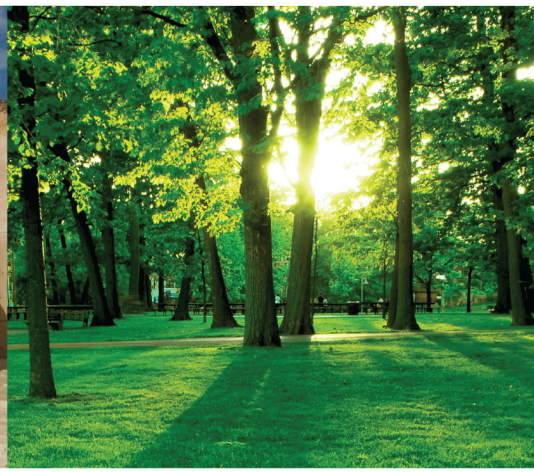
FOR

KIRKLEES COUNCIL

REPORT REF: KC 3464REM Rev 1

Engineering Geologists and Environmental Scientists





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JANUARY 2021

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REMEDIATION STATEMENT

1 INTRODUCTION

Kirklees Council propose to repurpose a field for allotments. The field is known as Dewsbury Riveside and lies off Ravensthorpe Road, Thornhill Lees in Dewsbury, WF12 9EG.

This report describes the remediation proposed to enable the arsenic contamination detected in the topsoil on the site to be removed and the underlying strata sealed with imported good quality and uncontaminated topsoil so that the topsoil is suitable for the purposes of allotments. The report was commissioned by AHR Architects and Building Consultants, on behalf of Kirklees Council and was carried out by the Ashton Bennett Consultancy.

This Remediation Statement details the proposed Remediation Strategy and Validation Strategy. If contamination is detected during the construction works then an Amended Remediation Statement will be forwarded to Kirklees Council planning for approval.

The Remediation Strategy aims to satisfy the local Environmental Protection Department that the remediated topsoil will be suitable as a growing medium. It aims to satisfy the requirements of the Local Building Control and Building Insurance and aims to ensure that construction workers and future site users are not detrimentally affected by the topsoil imported.

This report describes the Remediation Strategy for the site work, the Validation Strategy and will be followed by a Validation Report on completion of remediation of the topsoil to confirm by evidence that the Contractors and any other parties involved in the remediation have undertaken the work diligently and strictly in accordance with this Remediation Statement.

This Remediation Statement refers solely to the arsenic detected in the topsoil and does not include remediation of any mine shafts, bell pits, potentially contaminated minewater or other potential to contaminate the site.

2 THE SITE

The site is at present occupied by open fields and lies to the immediate west of Ravenshall School off Ravensthorpe Road, in Thornhill Lees to the south of Dewsbury.

The site is centered at National Grid Reference 423172E 419700N at a height of approximately 50m above Ordnance Datum. A Site Location Plan is presented as Figure 1, a Site Plan is presented as Figure 2. A Presumed Location of Mine Shaft Plan is presented as Figure 3. A Photograph of a shallow broken drain is presented as Figure 4. An RGS Trial Pit Location Plan is presented as Figure 5 and a Geology Plan is presented as Figure 6.

The site lies as open ground at the present time as shown in Figure 2.

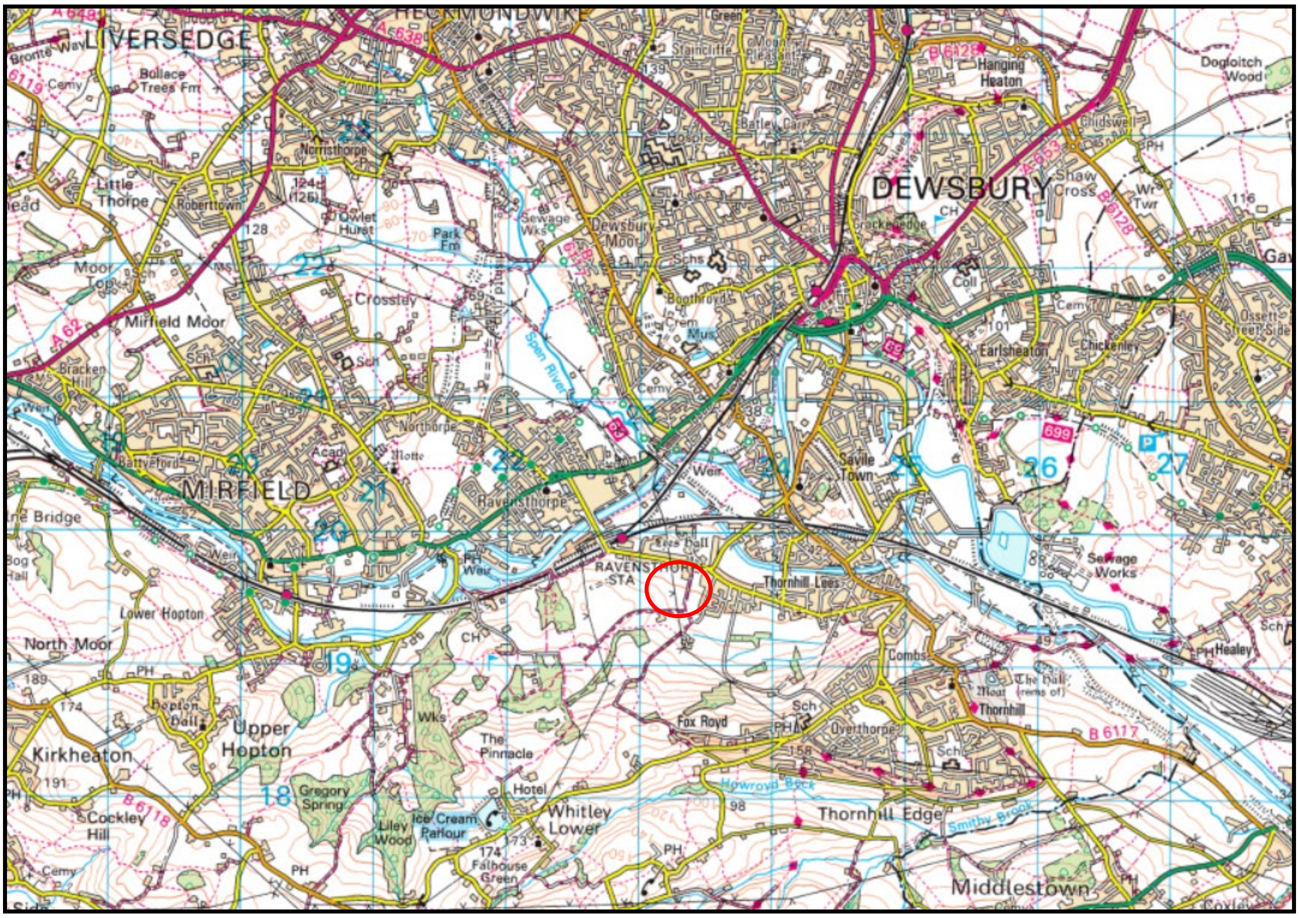

Figure 1 Site Location Plan

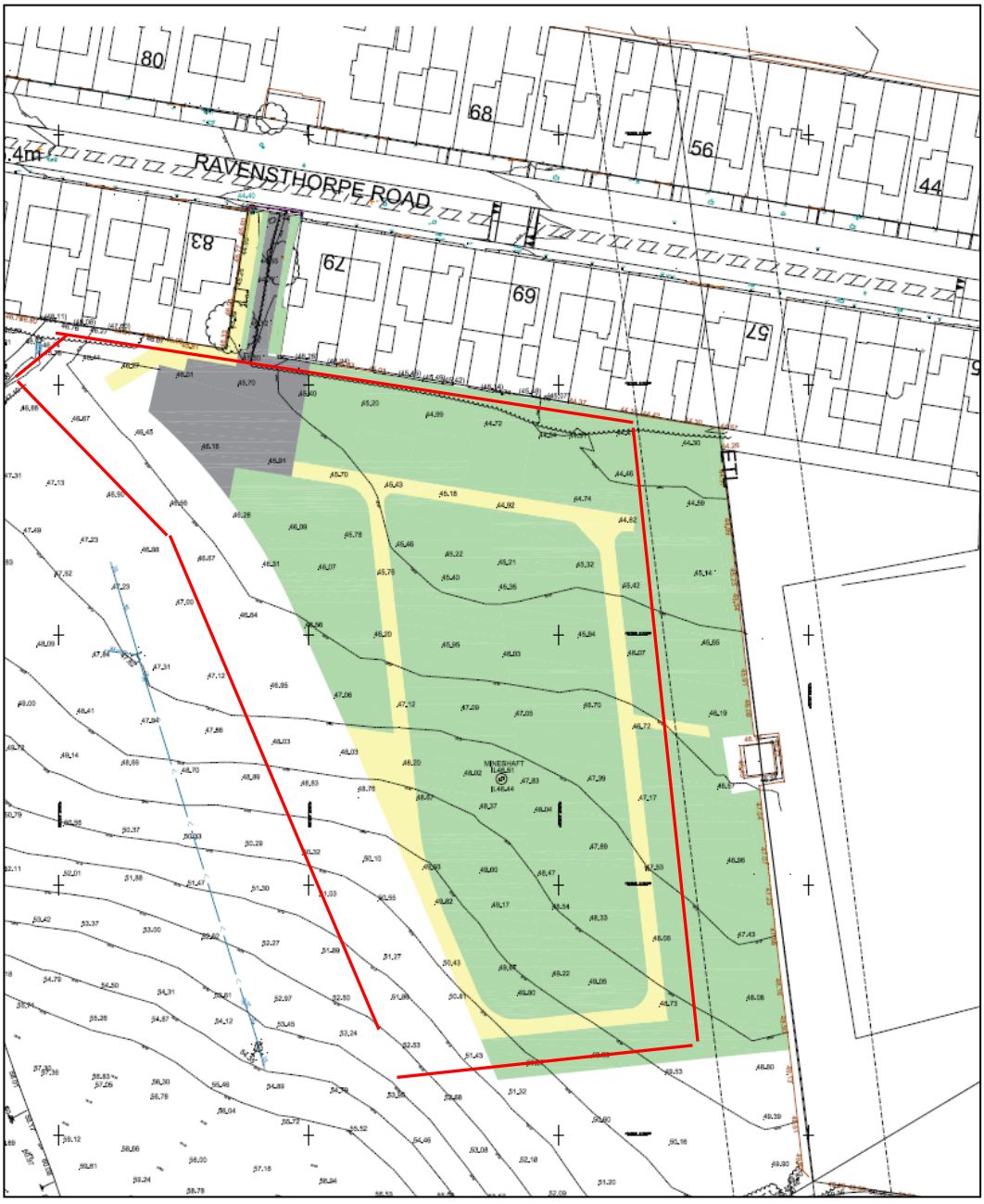

Figure 2 Site Plan

3 PREVIOUS SITE INVESTIGATIONS

3.1 Previous Site Investigations

In 2020 and 2021 Rogers Geotechnical Services (RGS) completed a Phase I Environmental Desk Study, Environmental Report of topsoil quality on the site and a Coal Investigation.

Previous site invesigations undertaken on the site:

1. *Phase I Environmental Desk Study on Land off Ravensthorpe Road, Dewsbury Riverside, Dewsbury WF12 9EG for Kirklees Council, Reference C1035/20/E/1613, October 2020.*
2. *Environmental Report on Land off Ravensthorpe Road, Dewsbury Riverside, Thornhill Lees, Dewsbury WF12 9EG for Kirklees Council, Report C1035/20/E/1613, November 2020.*
3. *Coal Investigation, Land off Ravensthorpe Road, Dewsbury Riverside, Dewsbury WF12 9EG for Kirklees Council, Report C1035/20/E/1902, January 2021.*

These Reports identify the former uses of the site and the various contaminants detected within the topsoil on the site. These Reports have been used to clarify the Remediation Strategy for the topsoil. There are no boreholes sunk deeper than the topsoil, no contamination testing of strata beneath the topsoil, no gas monitoring or groundwater monitoring available.

3.2 Results of Previous Desk Studies and Site Investigations

3.2.1 RGS Environmental Desk Study 2020 and Coal Investigation 2021

The RGS Desk Study Report was a preliminary geoenvironmental study without intrusive investigation.

The area of the site was indicated to be arable farmland underlain by topsoil with coal fragments / made ground, superficial deposits and Coal Measures strata with two coal seams crossing the site and more coal seams underlying the site. Several of the coal seams are recorded as having been mined in the past, some at shallow <30m bgl depth, the shallowest being 13m bgl.

The report identified the presence of two mine shafts on the site with the probability that more may be present. The recorded shafts lie at SE23117 19464 and SE23140 19622. Two pits with broken land drains at the base were recorded carrying water in a westward direction. One is illustrated in Figure 4.

The report identified landfill sites within 73m to 237m to the north and north west and that the site lies within an area requiring radon protection for any proposed buildings.

Figure 3 Presumed Location of Mine Shafts

Figure 4 Broken Land Drain

3.2.2 RGS Topsoil Investigation Report 2020

RGS undertook a ground investigation on the site in order to assess the quality of the topsoil and the presence of any contamination in the topsoil in order to assess the sites suitability for use for allotments.

TABLE 1
Ground Conditions

Investigative Location	Topsoil In mbgl	Made Ground in mbgl	CLAY In mbgl
TP1	Gl-0.60		
TP2	GL-0.60		0.60-0.70
TP3	GL-0.30		0.30-0.60
TP4	GL-0.30		0.30-0.70
TP5	GL-0.40		0.40-0.60
TP6	GL-0.20		0.20-0.50
TP7	GL-0.25		0.25-0.60
TP8	GL-0.40	0.40-0.60	
TP9	GL-0.30		0.30-1.30
TP10	GL-0.30		0.30-0.40
TP11	GL-0.40		0.40-0.60
TP12	GL-0.25		0.25-0.30
TP13	GL-0.20		0.20-0.60
TP14	GL-0.35		0.35-0.50
TP15	GL-0.30		0.30-0.90

Topsoil thicknesses and nature of immediate underlying strata is presented in Table 1.

Groundwater was not encountered in the trial pits with the exception of TP 5 in the north east corner of the site. Soakaway tests indicated that soakaways will not work on the site. Testing of soils was undertaken for BS3882 suite of tests to assess topsoil quality plus a suite of heavy metals, PAHs, TPHs, pH, organic content, soluble sulphate and asbestos screen. In addition a suite for Waste Acceptance Criteria (WACS) tests was undertaken.

Soil test results were assessed against the CLEA SGVs software, as calculated by Atkins ATRISK soil screening values for residential land with plant uptake. The values of arsenic detected in the topsoil were 12, 15, 15, 15, 31, 34, 37, 38, 53, 100 and 110 mg/kg. This indicates 4 results above the SSV of 37mg/kg. No other contamination was detected, although the topsoil testing indicated the topsoil to be of poor quality and of limited thickness of generally 0.20m to 0.40m.

In order to remediate the site, RGS recommended a cover system over the site of 500mm of inert material overlying a granular capillary break of 100mm of free draining granular soil.

Figure 5 RGS Trial Pit Location Plan

3.2.3 Comments on Previous Site Investigations

RGS used Atrisk SSVs for a residential site use with plant uptake to assess soil tests for presence of contamination.

ATRISK in 2017 gave SSVs for use of the site for allotments based on DEFRA C4SL. This figure for arsenic is 49mg/kg, indicating that only 3 test results fall above the SSV for allotments. The bioavailability test result is <0.25% of this figure.

The three test results that exceed the SSV for allotments are widespread across the field. The level of 53mg/kg was detected in TP8 in made ground in the west of the site, the level of 100mg/kg was detected in TP8 on the eastern site boundary and the level of 110mg/kg was detected in TP 11 in the south of the site.

Based on the above it is considered that the site does not represent a significant risk of significant harm to humans and the environment as required to determine contaminated land for action under Part 2A.

The BGS does not hold records of any non confidendial boreholes sunk on the site and the Coal Authority record the site as in a high risk area for development with two coal seams outcropping on the site and shallow mining haven taken place beneath the site. Two mine shafts are recorded to exist on the site. As shallow mining has taken place it is likely that the ground in part comprises waste from the coal workings and this may be the source of the arsenic.

The test results for the quality of the topsoil indicate that the soil is thin being 0.20m in places and is of low quality as a growing medium without import of good quality topsoil and / or manure. In its

present condition the site is unlikely to be an ideal site for allotments due to the elevated arsenic, thin topsoil and low quality of topsoil.

4. SITE GEOLOGY

The published British Geological Survey (BGS) Map SE21NW at 1:10,000 scale shows the site to be underlain by strata of the Carboniferous Lower Coal Measures comprising mudstone and sandstones with interbdded coal seams. The BGS maps indicate that superficial deposits only overlie the solid strata in the extreme north east corner of the site.

At least one coal seam outcrops across the site and further coal seams are present beneath the site some of which have been mined in the past, and one of which was mined at a shallow depth of 13m bgl.

The BGS map does not indicate the presence of any known or recorded geological faults on the site area. It is possible that small faults may exist in the strata causing fissuring and fracturing to the rock. Due to the cessation of tectonic activity in the area, faulting is unlikely to detrimentally affect the site stability.

The topsoil / made ground present on the site are expected to be in a loose to very loose state of compaction and of low strength. The bedrock is expected to comprise a low to high strength clay as the weathered product underlain by strong mudstone / sandstone which generally provide good bearing strata where unweathered. Any excavations for services and the like will require temporary support and may require sump pumping if groundwater is encountered.

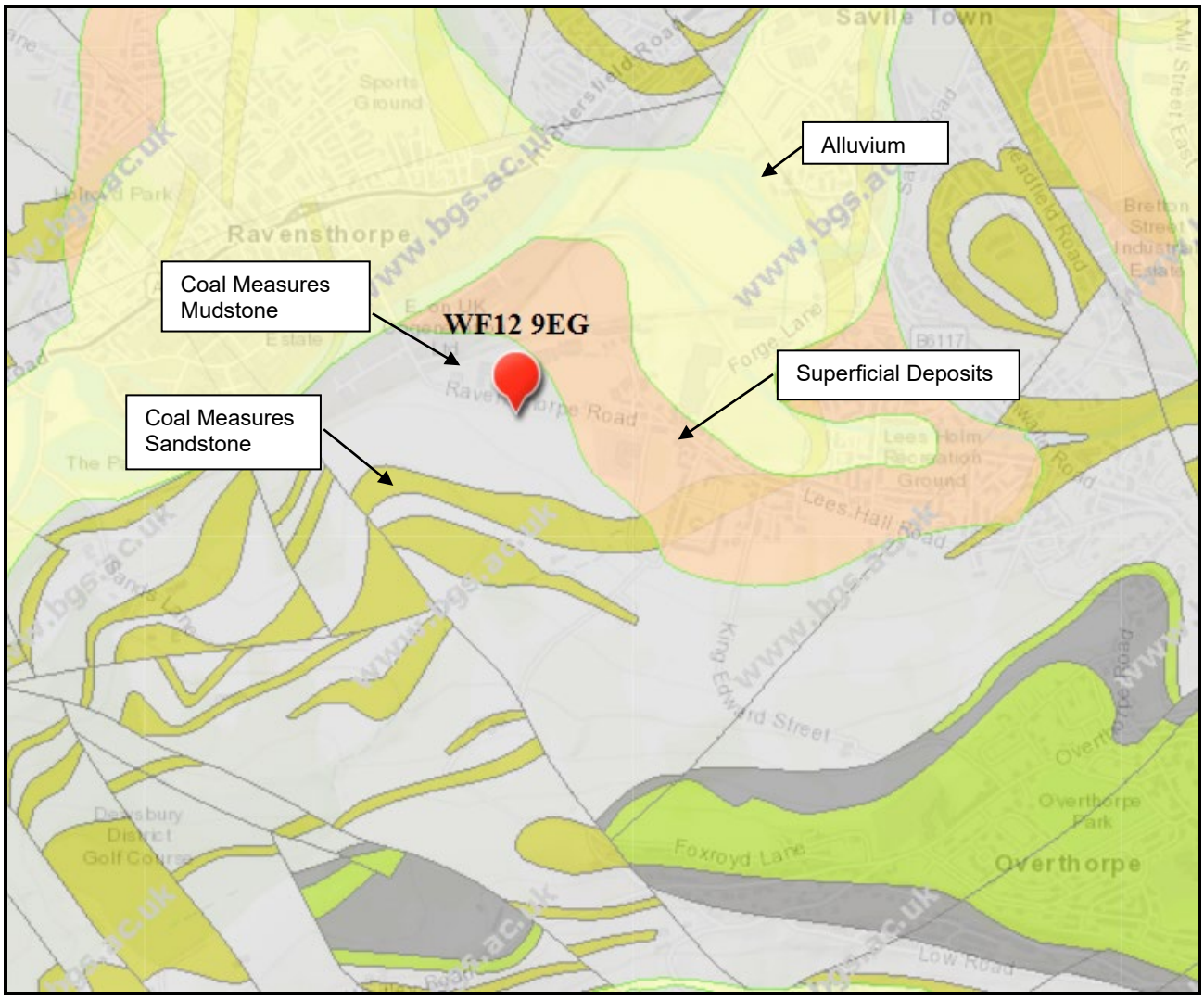

Figure 6 Geology Plan

5 HYDROGEOLOGY AND HYDROLOGY

5.1 Hydrogeology

The sandstone in the Lower Coal Measures is classified by the Environment Agency as a Secondary a Aquifer. These are formations which do not have a high permeability and do not generally produce water on a regional scale, but are fractured or potentially fractured and provide water on a local scale and supply base flow to rivers.

The remediation proposed is unlikely to detrimentally affect the hydrogeology of the site. This does not take into account any mine water or mine water drains beneath the site.

5.2 Hydrology

The nearest surfacewater is the River Colne which flows west to east to the north of the site.

The remediation proposed is unlikely to detrimentally affect the local hydrology.

6 REMEDIATION STRATEGY

6.1 Objectives

The objective of a Remediation Strategy is to ensure, according to the 1990 Environment Act the condition of the land is unlikely to cause pollution to the environment or harm to human health. The objective of this Remediation Strategy is to remove the contaminated topsoil and replace it with good quality uncontaminated topsoil to provide a good growing medium for allotments.

The site investigations and soil testing undertaken by RGS indicate a level of arsenic in the existing topsoil that in places exceeds the ATRISK SSV for use of the site for residential with plant uptake. Several levels also exceeded the recommended ATRISK SSV for use of the site for allotments. The topsoil tested as of low quality and in places of inadequate thickness for planting without roots penetrating the underlying strata. The underlying strata may be made ground from the local mining or may be the weathered product of coal bearing mudstone. In either case there are likely to be levels of arsenic in the strata derived from coal.

Remediation is therefore required to remove the low quality topsoil containing arsenic and to replace it with good quality tested as uncontaminated topsoil. In addition, to protect any future buildings such as sheds and greenhouses against methane from local landfill and shallow mining, and radon, and to ensure any new water supply pipes are compliant with regulations.

In addition there may be mitigating measures required if any soil of an unusual colour or odour is detected during the excavation and remediation.

The objectives include making the topsoil suitable for use as allotments by:

- Removal of 600mm of topsoil / made ground / weathered strata from the site.
- Removal and / or sealing with concrete of any coal encountered.
- Import of 100mm of granular material to act as capillary zone.
- Import of 500mm of tested as uncontaminated and tested as good quality topsoil in line with ATRISK SSV denoted in Tables 2 and 3 and in line with BS3882.
- Environmental Testing of any soil with an unusual odour or colour
- Incorporation of methane and radon protection measures in any buildings proposed.
- Sulphate resisting cement for any underground concrete for building bases.
- Water supply pipe should be a water barrier pipe PE-AL-PE in case of undetected contamination.
- Investigation and mending of any broken land drains.
- Supervision of all work by a suitably qualified Environmental Scientist with CGeol and CEnv.
- Validation of Remediation to confirm and evidence the remediation is undertaken diligently and in accordance with the Remediation Strategy and Validation Strategy and in accordance with legislation.

7. REMEDIATION METHODOLOGY

7.1 Introduction

The methodology for remediation is to define the works required.

7.2 Scope of Works

The works are to include the removal of 600mm of unsuitable topsoil and underlying weathered strata across the site and disposal to landfill, importation of good quality uncontaminated soil and topsoil, repairing land drains, installing mitigating measures against landfill and radon gases and laying suitable pipework for water supply pipes.

Existing topsoil test results and WACS tests, as undertaken by RGS, will be used to ascertain the appropriate landfill site for disposal. Additional WACS tests will be undertaken of the strata below the topsoil where it will be removed to landfill. All material will be carried by a carrier licensed to carry such waste and deposited at the appropriate landfill according to the nature of the waste. It is the site owners responsibility to ensure this is carried out according to legislation.

The excavated area will be covered in up to 100mm of granular subsoil, tested as uncontaminated (in line with Tables 2 and 3) to act as a capillary break to prevent any mobile contamination rising upwards. The subsoil will be overlain by at least 500mm of tested as uncontaminated (in line with SSVs in Tables 2 and 3) topsoil and tested as a good quality topsoil inline with BS3882.

Imported sub soil and topsoil will be tested every 250m3 for 10 heavy metals, (As, Cd, Cr(VI), Cu, Hg, Ni, Pb, Se, Zn), PAH (16 USEPA) and asbestos screen in line with *YALPAG Technical Guidance for Developers, Landowners and Consultants-Verification Requirements for Cover Systems V3.3, Appendix 1a, October 2016.* Testing will be undertaken at a UKAS accredited and MCERTS laboratory. Test results will comply with screening values indicated in Tables 2 and 3.

This Remediation statement does not cover stabilisation of the mine shafts or remediation of any minewater drains.

Any drainage pipes that are broken will be mended before importation of soil.

If the coal seam becomes exposed it will be sealed with concrete to reduce the risk of spontaneous combustion on exposure to air.

All proposed water supply pipes will be a water barrier pipe PE-AL-PE in case of undetected contamination.

Topographic surveys will be undertaking before and after excavation and on completion to inform depth of soil removal and depth of imported soil over the site.

8 VALIDATION STRATEGY

8.1 General

The Validation Strategy is to ensure and to collect evidence that the site remediation is being undertaken diligently and in accordance with the Remediation Statement and with legislation. A Validation Engineer will be appointed to undertake the validation on commencement of the Works. Such person will be independent of the client and of the Contractor and will have the minimum qualifications of Chartered Geologist, CGeol and Chartered Environmental Engineer CEnv.

All work will be photographed to provide a comprehensive diary of work undertaken and to aid Validation.

8.2 Excavation and Landfill

All waste slips for landfill will be retained and will also be logged onto a spreadsheet to validate the amount of soil removed from site. The carriers licence and landfill licence will be recorded and checked to ensure the licences are current and registered with the local authority and the Environment Agency respectively. Copies of all correspondence relating to landfill will be retained.

All waste slips will be checked for licences and for appropriate disposal.

Photographs will be undertaken of the excavated ground and the validation engineer will confirm that all unsuitable and contaminated topsoil has been removed before import of granular subsoil and topsoil.

8.3 Importation of Soil

All imported soil will evidence certification that it has been tested as uncontaminated in accordance the screening values in Tables 2 and 3 and will evidence certification that it classifies as a good quality topsoil in accordace with BS3882.

In addition, all soil imported will be tested every 250m3 for the potential contaminants listed in Tables 2 and 3 and will comply with the screening values listed in these Tables. Imported material will be stockpiled until test results are available.

All material slips for imported soil will be checked for licences and for origin of material imported and will be retained and logged onto a spreadsheet.

Test results will comply with Table 2 and Table 3 and will comply with BS3882 for good quality topsoil. Any material that does comply as above will be returned to source.

TABLE 2
Metal Screening Values for Imported Soil / Topsoil

Contaminant	Screening Value in mg/kg For Allotment use	Reference
Arsenic	49	C4SL
Cadmium	3.9	C4SL
Chromium VI	171	C4SL
Copper	1450	Atrisk soil SSVs
Mercury	94.1	Atrisk soil SSVs
Nickel	67.3	Atrisk soil SSVs
Lead	79.1	C4SL
Selenium	143	Atrisk soil SSVs
Vanadium	33.2	Atrisk soil SSVs
Zinc	5230	Atrisk soil SSVs
PAH 16 USEPA	See Table 3	Atrisk soil SSVs
Asbestos screen	NAD	No Asbestos Detected

C4SL=DETR SP1010 guidelines (2014)
LQM=LQM/CIEH S4ULS (2014) Human Health Risk Assessment
Atrisk SSV=guidelines deived by Atkins from CLEA

TABLE 3
Hydrocarbon Screening Values for Imported Soil / Topsoil

Contaminant	Screening Value in mg/kg For Allotment use	Reference
Acenaphthene	680	Atrisk soil SSVs/LQM
Acenaphthylene	920	Atrisk soil SSVs/LQM
Anthracene	11,300	Atrisk soil SSVs/LQM
Benzo(a)anthracene	10.3	Atrisk soil SSVs/LQM
Benzo(a)pyrene	5.72	C4SL
Benzo(b)fluoranthene	7.29	Atrisk soil SSVs/LQM
Benzo(ghi)perylene	0.112	Atrisk soil SSVs/LQM
Benzo(k)fluoranthene	4.12	Atrisk soil SSVs/LQM
Chrysene	2.64	Atrisk soil SSVs/LQM
Dibenzo(ah)anthracene	0.0236	Atrisk soil SSVs/LQM
Fluoranthene	1010	Atrisk soil SSVs/LQM
Fluorene	796	Atrisk soil SSVs/LQM
Indeno (1,2,3,cd)pyrene	0.368	Atrisk soil SSVs/LQM
Naphthalene	27.4	Atrisk soil SSVs/LQM
Phenanthrene	440	Atrisk soil SSVs/LQM
Pyrene	679	Atrisk soil SSVs/LQM

C4SL=DETR SP1010 guidelines (2014)
LQM=LQM/CIEH S4ULS (2014) Human Health Risk Assessment
Atrisk SSV=guidelines deived by Atkins from CLEA

8.4 Mining and Mine Shafts

The Validation Strategy does not include location or stabilisation of the mine shafts or location of minewater drainage pipes.

If the coal seam is encountered photographs will evidence the seam being sealed by concrete to prevent spontaneous combustion on contact with the air.

8.5 Buildings

Due to presence of shallow mining beneath the site and landfill sites within 250m, any buildings or sheds erected on site will have a 2000 gauge methane and radon protective membrane incorporated into the ground slab in line with CIRIA recommendations.

As buildings will not initially be constructed on site, this requirement will be written into any contract that Kirklees Council signs with future allotment holders.

8.6 Water Pipes and Drains

Evidence will be collected by photographs of the mending of any broken drains on site.

Evidence will be provided of the nature of the pipes carrying the proposed water supply to confirm they are PE-AL-PE constructed pipes.

There is no provision in the Remediation Statement to investigate existing drains or Coal Authority minewater drains or to install new land drains.

9. VALIDATION

The remediation work will be validated by selective laboratory testing in the areas of remediation and reporting of results to Planning Services, plus olfactory and visual observations during selected site visits. The planning of works, consents and licenses and site management will be undertaken by Kirklees Council and its Contractors.

The assessment of the risks to users on the site will be undertaken within the framework set out in guidance published by DEFRA and the Environment Agency for the assessment of risks to human health associated with chronic long term exposure to contaminated soils. The figures used for assessment of lead are from DEFRA(2014b), Category 4 Screening Levels, which are based on the 'low level of toxicological concern (LLTC)'. C4SLs are 'estimates of contamination cocncentration in soil that present acceptable risk within the context of Part 2A'. In addition, assessment will use the LQM/CIEH S4ULs (2014) for Human Health Risk Assessment. The S4ULs are based on the principles of 'minimal' or 'tolerable' risk enshrined in SR2 (EA2009A), which has not been withdrawn and are based on the EA CLEA 1.71 (2016) software. The guidance set out in these documents has been used by Atkins to produce ATRISK SSVs (2017) which will be used to establish acceptable levels of compounds and to establish a conceptual model of any environmental risks on the site.

Clean up standards will be assessed against CLEA or derived SSVs but also as a risk assessment as to whether the contaminant has the potential to harm sensitive receptors. The CLEA guidelines used will be those for allotment use where they are available and SSVs will be used where CLEA is not available.

Planning Services will be informed when the Remediation will be undertaken.

If during the excavation for development and services encounters soil or groundwater withan unusual odour or colour, Ashton Bennett will be informed and the soil/water will be tested for potential contamination, and an assessment made if it requires remediation. If remediation is required then an Amended Remediation Statement will be forewarded to planning.

A Validation Report will be issued to Planning Services on completion of the Remediation and should include.

- Details of qualifications and experience of Validating Engineer
- Plans of all topographic surveys, before work commences, on excavation and on completion
- Details and photographs of all work undertaken
- Scan of waste slips and table of all quantities of material sent to landfill
- Copy of carriers licence and landfill licence where material was deposited
- Copy of all correspondence sent and received from Local Authority and Environment Agency regarding landfill
- Copy of WACS tests confirming material sent to suitable landfill
- Photographs of excavated ground to confirm topsoil removed
- Details of any coal encountered and removed and / or sealed
- Photographs of any coal encountered and removed / sealed
- Details of all certification and test results on imported sub soil and topsoil confirming they fall with acceptable guidelines asset out in Tables 2 and 3.

- Details of test results for every 250m3 and confirmation the results fall within Tables 2 and 3 and fall within a good quality topsoil as defined by BS3882
- Details of any unexpected contaminated material detected and proof of disposal to landfill or treatment.
- Details and installation of water supply pipe and confirmation of nature of pipe
- Plans and photographs to aid validation
- Any other information or test results that are considered necessary during remediation

If any material is excavated by the Contractor that has an unusual odour/nature, then Ashton Bennett Consultancy will be notified by the site, samples will be collected for environmental testing and any necessary new remediation strategy reported to the Planning Services. In addition, Kirklees Council will be notified in writing immediately, should any unexpected contamination be encountered at any stage of the development process. Revision to the Remediation Statement will be submitted to and approved in writing by the Local Planning Authority and works will thereafter be carried out in accordance with the approved revised Remediation Statement.

10. GENERAL REMARKS

This report truly reflects the conditions found during the Remediation Statement. Whilst the Remediation Statement was undertaken in a professional manner taking due regard of additional information which became available as a result of ongoing research the results portrayed only pertain to the information attained and it is possible that other undetected information and undetected ground and gas conditions and undetected contamination and undetected mining may exist. The Remediation Statement was only undertaken within the site boundaries and should not be used for interpretation purposes elsewhere. These conclusions are only a brief summary of the report, and it is recommended that the Report KC 3464REM Rev 1 is read in full to ensure that all recommendations have been understood.

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