Provectus Remediation Limited
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Ref: 100993/Maw Green/MTL/001.

5 May 2022

Environment Agency
Permitting Services Centre
Quadrant 2
99 Parkway Avenue
Sheffield
S9 4WG

Dear Sirs

Mobile Treatment Licence EA/EPR/EB3636AK/A001 (EAWML105284) – PROVECTUS REMEDIATION LTD, Deployment Form – Maw Green Soil Treatment Facility, Maw Green Road, Crewe, Cheshire, CW1 5NG.

Please find included with this letter the deployment form for soil treatment works we wish to undertake at the above site commencing July 2022. We enclose the following:

- Completed Deployment form (including site plans).
- WAMITAB certification.
- Appendices with excerpts from the full environmental permit implemented at the site

The site is currently operated under a permit variation ref: EPR/BS7722ID. The approach provided would be to temporarily consent the site to use a soil treatment method regularly implemented for land remediation work. The approach would reduce the risk of soils entering the facility being rejected and landfilled unnecessarily. Experience on other sites demonstrates that there is no increase in airborne emissions from the process which are designed to meet the prevailing World Health Organisation (WHO) guidelines for air quality in Europe. This method may then be implemented longer term under a formal permit variation.

The documents listed above contains the answers to the questions included in the form. We would like to pay by debit card over the phone; to process this deployment submission. Please contact Sarah Detheridge on 01902 810084, with email at: invoices@provectusgroup.com.

Section A – Your Organisation

A1.3 – Contact Details

Provectus Remediation Ltd
Regent House,
Bath Avenue,
Wolverhampton
WV1 4EG

Contact name: Mr Jon Owens
Phone: 01902 810085
Mobile: 07932 910175
Email: jon.owens@provectusgroup.com

A1.4 – Preferred method of correspondence is by email.

A1.4 – The permit number is EA/EPR/EB3636AK/A001 (EAWML105284)

A2.2 – The address of the permit holder is detailed below;

Provectus Remediation Ltd
Regent House,
Bath Avenue,
Wolverhampton
WV1 4EG

Section B – Deployment Details

B1.1 Site Address

Maw Green Soil Treatment Facility, Maw Green Road, Crewe, Cheshire, CW1 5NG – currently operated under EPR ref: EPR/BS7722ID

B1.2 - Site Plan

We attach a site plan (Appendix A) showing the location of the MTL operation on the site outlined in a red boundary. The plan in Appendix B shows the location of the immediate receptors and also the proposed location of the pollution control measures as described in the following sections. The Environmental risk assessment report is included in Appendix B and details of the site can be found in Section 2.

The purpose of the temporary soil treatment facility is to support the restoration of the site to meet the final levels for the site. Planning consent for both areas of the site used for soil treatment is included in Appendix F.

B1.3 – The operating site is covered by another Environmental Permit EPR ref: EPR/BS7722ID.

B2 – Specific activities to be carried out at the site

B2.1 – The contaminants to be treated are;

- Removal of sporadic bound ACM debris with asbestos fibre levels limited to: <0.1% for chrysotile and <0.01% for other forms of asbestos – this is known to be an effective threshold to prevent airborne emissions of asbestos in air

B2.2 – Authorised Activities

Provectus will be conducting the following activity within the soil treatment pad at the site to improve operate safety and reduce emissions from mobile plant:

- Screening of soils to remove oversize hard materials (concrete/bricks) prior to hand picking of any residual ACM debris

Asbestos in Soil
Hand picking of soil has been undertaken on many remediation projects by Provectus using soil screening equipment and hand picking stations identical to the approach proposed for the Maw Green site. The soil screening approach is authorised for use under mobile treatment licences, and this is highlighted in the pan European publication in Appendix I.

It is proposed to implement the soil screening approach at the site within the soil treatment building. Asbestos has been monitored in air within on all occasions that soil treatment is undertaken and this has never exceeded standard asbestos reoccupation threshold of <0.01f/ml or the operator proposed threshold of <0.0005f/ml.

The only difference between the approach proposed here and on other contaminated soil remediation project is that the acceptance criteria for asbestos fibres in soil are far stricter than on a remediation project. The soil screening approach proposed for this MTL deployment will remove oversize materials from soil and separate out soil fractions that can be handpicked more effectively.

The soil screening will therefore reduce damage to the picking station that has occurred historically from oversize inclusions. This will reduce the timescale for hand picking and result in reduced emissions from mobile plant. The soil screener will have daily asbestos monitoring to confirm that no emissions above 0.0005f/ml are occurring and ensure that the permit limit of 0.01f/ml is always respected.

B2.3 – The site does not form part of a cluster project.

B3 – Duration of this Deployment

B3.1 – The Duration of this deployment is up to 52 weeks, and we do not anticipate any periodic breaks. The deployment will cease once any formal permit variation is approved for the soil treatment process. In the event that the permit variation is approved prior to this MTL deployment then this deployment will not commence.

B4 – Management Supervision

B4.1 – Andy Clee is to be the technically competent manager overseeing this deployment. The award certificate for Andy is included in Appendix G.

4.2 – Provectus site staff will be present during working hours during the operation of the facility. .

B5 – Waste types and quantities

The specific waste types and maximum quantities that will be treated at the operating site are listed below;

Waste type	EWC Code	Quantity	Medium
Solid wastes	See list below	Equivalent to 25,000m^3 (measured as 50,000t on weighbridge)	Solid
Total		**25,000m^3**	

The list for treatable wastes is detailed below although the vast majority is anticipated to be 17 06 05* other construction materials containing asbestos, or 17 05 03* soil and stones containing hazardous substances. Contaminated soils are limited to 50,000t/annum. No unbound asbestos or insulation material will be treated by this process. A typical set of descriptions for the EWC codes found on other soil treatment sites are as follows below.

Waste code	Description
17	**Construction and demolition wastes (including excavated soil from contaminated sites)**
17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 03*	soil and stones containing hazardous substances (CONTAINS IDENTIFIABLE PIECES OF BONDED ASBESTOS (any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye))
17 05 04	soil and stones other than those mentioned in 17 05 03 (CONTAINS IDENTIFIABLE PIECES OF BONDED ASBESTOS (any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye))
17 06	**insulation materials and asbestos-containing construction materials**
17 06 05*	construction materials containing asbestos (DISCRETE PIECES OF BONDED ASBESTOS WITHIN THE SOIL MATRIX ONLY)

B6 – Acceptance Procedures

The procedure for processing soil is provided in Appendix C – this includes the thresholds for ACM fibres in soil that can be processed by soil screening.

B7 – Conceptual Site Model and Risk Assessment

Please refer to Appendix D - Amenity & Accidents Risk Assessment.

B8 – Pollution Control

The site is secure and is part of the larger waste management facility. Assessments of fugitive and point source emissions from the soil screening are included in the report in Appendix D. Dust is managed effectively with all asbestos monitoring and dust monitoring undertaken and submitted to the EA on a quarterly/annual basis as required.

Surface Water Management

Accumulations of surface water are unlikely to pose a significant problem due to the location of the operation on an engineered pad and associated drainage. However, in the highlight unlikely event that accumulations of water, occur and potentially pose a risk to adjacent areas will be controlled on site to prevent run off. Control measures include an internal drainage system and pumping system to the on site water treatment system.

Groundwater Monitoring

No monitoring is proposed. The wider area has their own agreed monitoring regime for areas surrounding the soil treatment facility.

B9 – Emission Monitoring Plans

The emissions monitoring plans are contained within Appendix D of the Environmental Risk Assessment Report (Appendix D).

B10 – Commissioning, Operating and Maintenance

Operation and maintenance of all plant and equipment required for the treatment process will be conducted by suitably qualified engineers and operators. Checks of all screening plant and equipment will take place on a weekly basis and recorded, a copy of which will be stored on site during days of operation. Daily visual checks of the soil screens are undertaken and cleaned if there is a build up of cohesive soil.

Quantity Measurement Systems

The amount of soil treated by treatment methods will be measured when the loads are measured on the weighbridge. The total amount of contaminated soils will not exceed 50,000t/annum in accordance with the approved planning consent.

We trust the enclosed is acceptable to you, if you have any queries regarding the above, please do not hesitate to contact me on the numbers provided below. We look forward to hearing from you shortly.

Kind Regards,

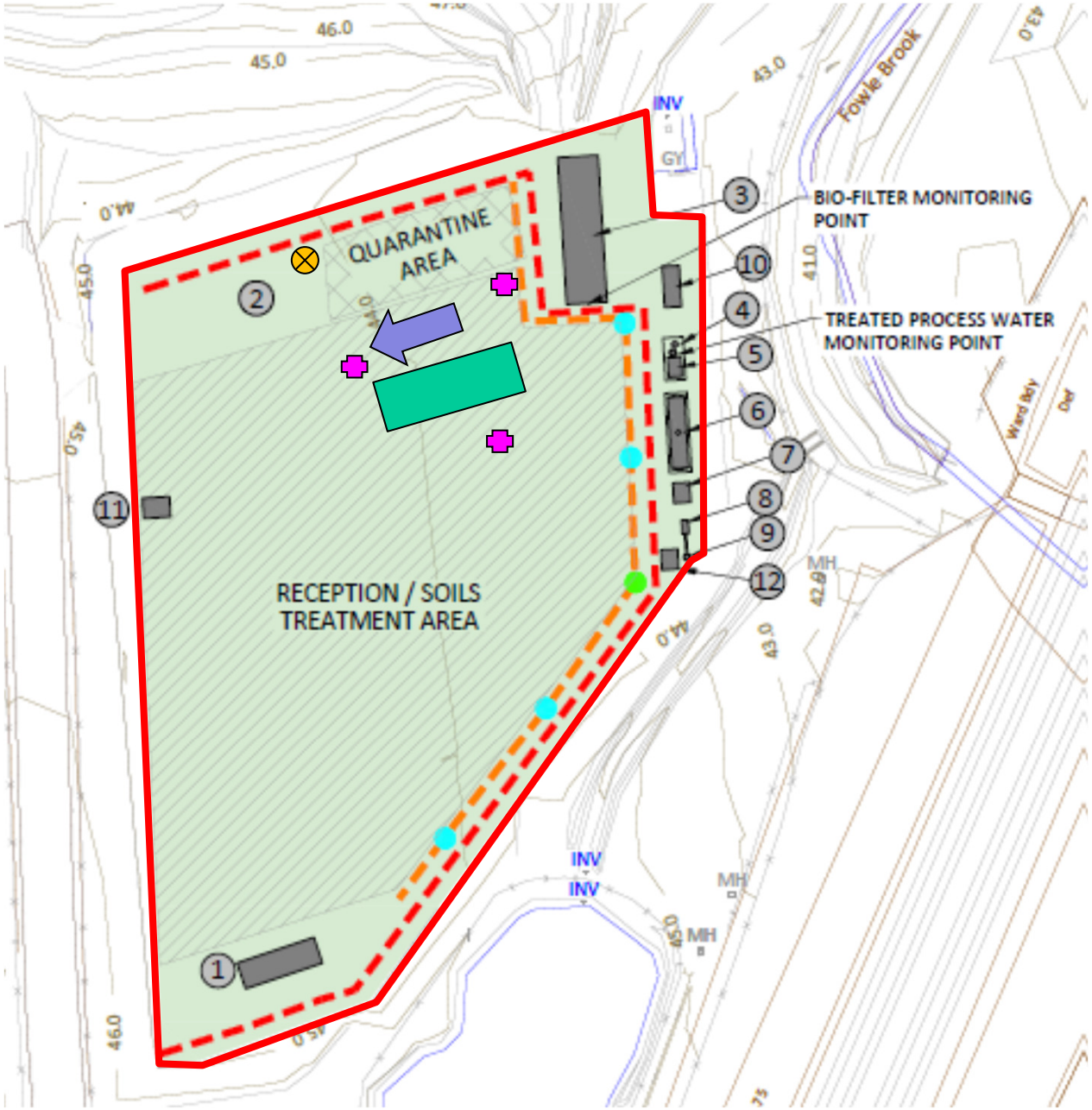
Jon Owens
Director, Soil Treatment

Direct Dial 01902 810084
Mobile 07932 910175
Direct Email jon.owens@provectusgroup.com

Enc.

- **Appendix A – Site Drawings**
- **Appendix B – Soil Reception Procedure**
- **Appendix C – Soil Processing Procedure**
- **Appendix D – Amenity and Accident Risk Assessment**
- **Appendix E – Planning Permission**
- **Appendix F – COTC Certificates**
- **Appendix G – Asbestos in Soil, Nicole 2021.**

APPENDIX A – Site Drawings



Existing Infrastructure

LEGEND

- CONCRETE IMPERMEABLE PAVING
- BOUNDARY KERB LINE
- WATER DRAINAGE PIPE
- DRAINAGE GULLY
- PUMPING CHAMBER
- 1 SITE OFFICE
- 2 NUTRIENT STORAGE
- 3 BIOFILTER
- 4 GRANULAR ACTIVATED CARBON FILTERS
- 5 TRANSFER TANK
- 6 PROCESS WATER SETTLEMENT TANK
- 7 10ft CONTAINER WITH CONTROL PANEL
- 8 BLOWER
- 9 AIR WATER SEPERATOR
- 10 20ft TOOL STORE
- 11 FUEL STORAGE
- 12 3WV

MTL Infrastructure

- Soil Screener
- Picking Station
- Air sampling: asbestos
- Lockable Skip: asbestos
- Extent of MTL boundary

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Client: FCC Environment

Project: MTL Layout: Maw Green

Job No.: 100993/MTL

Title: Site Layout

Scale: NTS

Date Drawn: May 2022

Drawing No.: 100993/MTL – Asbestos DWG4/Rev1

APPENDIX B – Soil Reception Procedure

STF – FO02 - SOIL RECEPTION PROCEDURE

Document No:	STF - RR - FO02	**Issue No:**	2
Author:	Jon Owens	**Approved By:**	Steve Langford
Issue Date:	19/01/18	**Approval Date:**	19/01/18

Introduction

This procedure relates to the measures to be undertaken for the assessment of data and inspection of waste received at the soil treatment facility. It allows rejection of non-conforming waste to ensure no contaminated soils are accepted which cannot be treated by the treatment facility to a standard suitable for reuse, or which breach the list of permitted wastes as shown in the site's Environmental permit.

Principle of Operation

The inspection will allow the following to be assessed prior to acceptance:

1. Presence of untreatable and hazardous materials (e.g. tars, clinker, asbestos insulation etc.) in the contaminated soil.
2. Presence of excessive litter/debris in the contaminated soil.
3. Compliance with the previously supplied chemical/physical analysis information (supplied by waste producer).
4. Potential for the waste to behave as a liquid or have free water/oil in the waste

If the waste material is not compliant with the agreed conditions of the Environmental Permit and pre-acceptance assessment then the waste will be declined/rejected. As a note, the forms of untreatable asbestos described in point 1 are predominantly insulation products as follows in Table 1.

Table 1. Unacceptable Forms of Asbestos Insulation Products

Form of asbestos	Example
Asbestos pipe lagging	
Loose asbestos fill	
Asbestos insulation board (AIB)	

Procedure

Pre-Acceptance Assessment

This is undertaken by Provectus to confirm treatability to meet the reuse criteria. A set of Terms and Conditions for acceptance are sent to the Waste Producer including a clear statememt of any waste characterisation samples that are deemed untreatable. These are agreed in writing between the Waste Producer and Provectus prior to an authorisation number (contract line) being issued by FCC at the weighbridge for deposit at the Soil Treatment Facility.

Where data gaps exist or queries remain about the suitability of material for treatment, Provectus or FCC will offer to attend the site of origin to undertake pre-acceptance analysis and visually inspect the material and obtain further information about the waste description.

In the event that the moisture content of the waste being in the range of 25-30% then the potential for free water or oil will be further reviewed. Where moisture contents are at this level or even higher and the material does not behave as a liquid, have the potential for releasing water/oil etc and is suitable for the site infrastructure then it would be accepted on a case by case basis.

Should either Provectus, or after consultation, FCC determine that there is the high potential for material to contain untreatable inclusions or to behave as a liquid or contain free water or oil then the waste will be declined for acceptance.

Duty of Care Documentation

Duty of Care Documentation and other legal procedures (registration of hazardous waste site *etc*.) are completed between the Waste Producer and forwarded to FCC. No tipping on the STF will be permitted without relevant documentation from the waste producer. This must be checked on-site at the STF to ensure that the load is indeed destined for the STF, and that the documents are correctly completed. In the case of hazardous waste, the consignment note shall be filled in by a member of Provectus staff; and in the case of non-hazardous waste, the waste transfer note shall be inspected at the STF site office, and the load checked by a Provectus staff member at the STF.

Health and Safety

The site technician or PM is to provide guidance to the location for soil to be tipped, and any relevant safety information prior to tipping of soil.

Technicians and site personnel are to stand well away from the lorry when tipping so as to avoid any crush injuries/incidents as a result of being in close proximity to the tipping lorry. Any drivers must be informed of the requirement to wear a hard hat and high visibility vest when outside of the lorry cabin.

Lorries shall be informed to check that any waste/debris is removed from their lorry prior to leaving the STF.

Visual Inspection: Waste Input

The following locations will be used for accepting wastes:

- Hydrocarbons only: biopile treatment area
- Asbestos only, or asbestos and hydrocarbons: asbestos processing shed

The following plant and personnel are required as part of this procedure:

- Provectus STF Technician
- Excavator / loading shovel (if available)

Each load of soil for inspection will be tipped onto the nominated quarantine area by the tipper lorry. The technician will inform the tipper lorry driver to remain at the stockpiling area until the inspection has been completed.

In the event of the material containing free water or oil, the load will be immediately rejected.

In the event of untreatable forms of asbestos being present, the load will be immediately rejected

The excavator will be used to expose any unsuitable materials and allow a comprehensive visual assessment. The technician will determine the next action when this has been completed, this will comprise of the following:

- Waste is accepted and tipper lorry is permitted to leave the STF with the accompanying paperwork, or;
- Waste is not accepted and the unsuitable element of waste load, either partial or complete load is removed by excavator and placed back into the tipper lorry. A rejection form is filled in on-site and both Landfill Manager (LM) and Sales Manager (SM) are informed. It is the duty of FCC to inform the Environment Agency of any rejected loads.

At the end of the formal waste acceptance procedure the soil will be prepared for processing or biotreatment. Coordination of further treatment/processing events is to be decided by the Site Manager/Site Operator.

Chemical Analysis: Waste Input

Based on visual inspection, sampling frequency will be considered; this is in relation to the volume from each hazardous waste production site. Sampling will be undertaken on soils using composite sampling methods described in BS812.

The chemical analysis of soils generally takes 5-7 days to complete, therefrore limited storage times are required. Materials will be placed into treatment as soon as practicable from the receipt of chemical analysis and formal acceptance of the waste.

The range of contaminants for analysis will be based upon the original contaminating substances. A copy of the analysis shall be checked by the PM for verification against the original client data. In the event of non-conformity, the PM shall liaise with the LM and SM, and a decision on the next course of action will be taken.

For avoidance of doubt, the limits for asbestos from laboratory testing will be as follows:

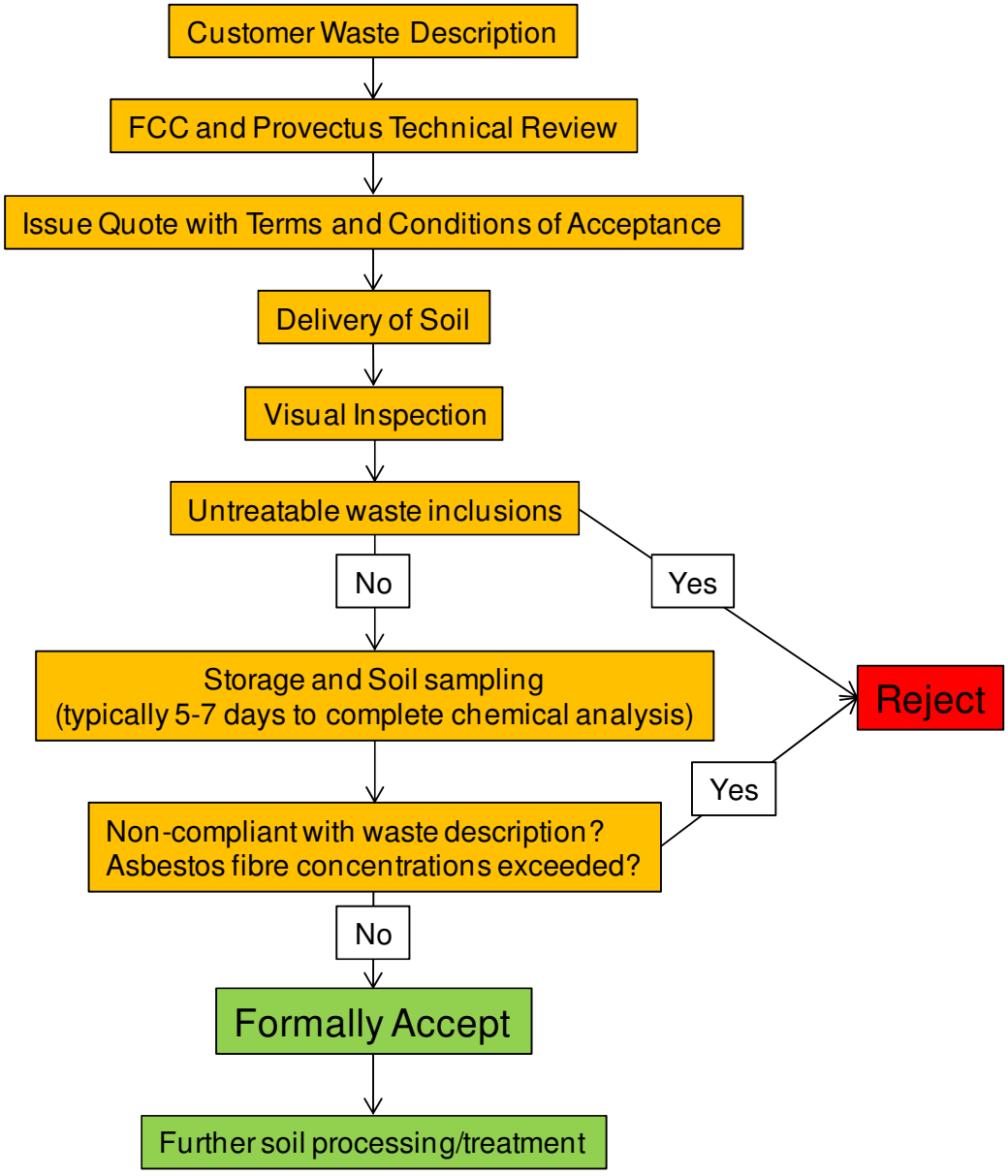
- Chrysotile only: 0.1%
- Other forms of asbestos (or chrysotile and others): 0.01%
- Asbestos debris limited to those which can be removed as Notifiable Non-Licensed Works (NNLW)

The waste will only be formally accepted once initial reception analyses is received in accordance with procedure STF PR02.

Summary of Waste Reception

Figure 1 is a flow diagram for the waste reception procedure. The procedure is implemented to ensure that the waste is only formally accepted once visual inspections and chemical analysis of received wastes has been successfully completed. This ensures that any soils that are formally accepted are suitable for further soil processing/treatment. All non-compliant wastes will be rejected.

Figure 1. Summary of Waste Acceptance Procedure



APPENDIX C – Soil Processing Procedure

STC – WI 011 – PROCESSING OF SOILS WITH VISIBLE ASBESTOS DEBRIS

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
6	Changes for permit variation application to increase storage and screen soils prior to hand picking.	08.04.19

Definitions and Abbreviations

ACM – Asbestos Containing Materials
NNLW – Notifiable non-licensed works

Introduction

This procedure relates to the measures to be undertaken for the removal of visible ACM fragments from soil received at the site. The purpose of the removal of asbestos debris would be to allow further treatment of soils by biotreatment or to stockpile processed soils for disposal in the non-hazardous void.

Principle of Operation

The general principle of the operation is to receive and treat soils at the site with visible asbestos fragments that would be classified as hazardous waste under Environment Agency guidance WM3.

The aim of the processing works would be to remove visible fragments from the soil to facilitate direct reuse in the adjacent non-hazardous void or for further biotreatment to reduce hydrocarbons to concentrations suitable for reuse in the adjacent non-hazardous void.

Pre-acceptance checks and analysis of the received soil and processed soil will ensure that no unsuitable soil is received at the facility either for treatment, or disposal in the non-hazardous void. Air monitoring during the soil processing works will ensure the protection of site workers and surrounding receptors.

The works would be notified to the HSE as notifiable non-licensed works (NNLW) on the basis that ACMs are potentially broken/degraded and require effective management to ensure the protection of workers and surrounding receptors. No licensed works are proposed for treating soils at the site.

Procedure

Analysis for soils impacted with visible asbestos fragments would be reviewed prior to any offer to accept at the Edwin Richards Quarry. Waste acceptance limits for asbestos fibres in soils would be **0.1%** for serpentine asbestos (chrysotile) and **0.01%** for amphibole asbestos types. Site visits will be undertaken and any supplementary analysis undertaken to comply with STC-WI 002 and STC – WI 003 to ensure that soils are suitable for treatment using the available methodology at the site.

Should any non-compliant wastes be encountered the standard rejection procedure should be implemented. In the event that the works to reject waste would constitute licensed asbestos works in accordance with HSE guidance, the standard notification would be made and works would cease until the non-compliant waste is removed.

Soils would be received at the site and placed on to the external asbestos storage area. Soils will be visually inspected to ensure non-compliant materials (e.g. insulation products) are not present, sampled and covered with a tarpaulin to ensure control of any potential emissions during the reception analysis phase. The reception analysis will be reviewed and only soils that are deemed to have no potential to generate asbestos fibres above the detection limit of <0.01f/ml will be formally accepted. Soils that have the potential to generate airborne asbestos fibres, i.e. they exceed the asbestos fibre acceptance criteria or contain non-compliant products (e.g lagging, asbestos insulation board etc) will be rejected and removed from site.

Stockpiled soils will be transferred into the asbestos building by dumper and loaded onto a three way screen with a fines, mid range and oversize separation system. The mid range fraction will be loaded directly onto the picking station with asbestos operatives removing visible fragments and double bagging prior to storage in a locked skip. The fines and oversize will be visually inspected prior to storage in the internal storage bays for validation testing. If visually identifiable asbestos is present in the fines or overzsize fraction these will be loaded onto the picking station for picking prior to validation testing.

The locked asbestos skip will be removed from site when full and taken to a hazardous landfill for disposal.

All personnel will enter and leave the building via the designated decontamination facility.

Plant/Equipment to be Used:

- Tarpaulins
- Asbestos air monitoring equipment
- 360 excavator
- Front loading dumper
- 3 way screener
- Picking station
- Decontamination Unit

Plant/Operator Certification Required:

- CPCS/CSCS Cards
- Asbestos Awareness

Summary of Known or Suspected Hazards (either construction, physical or contamination hazards identified):

- The stored soil from a variety of sources will contain low levels of ACM debris and asbestos fibre concentrations lower than the waste acceptance limits previously described. The potential for airborne asbestos fibres being generated is considered extremely low.
- The potential routes of asbestos exposure are by inhalation of dust.
- Potential exposure to plant exhaust gases from undertaking the works inside a building are mitigated by having large entrance and exit openings that allow continuous ventilation of the building
- Construction hazards (slips, trips and falls on uneven ground, machinery)
- Physical hazards associated with moving equipment & machinery.

General Description of Work

- Soils received will be covered with tarpaulins whilst awaiting reception analysis
- Reception analysis to be reviewed and approved by the Operations Manager prior to any transfer of soil into the asbestos processing building
- All screening and hand picking works to be undertaken with background air monitoring to confirm if asbestos fibres are being generated
- Enter clean end of decontamination unit and pick up disposable overalls/overshoes (if used) and disposable RPE if used
- Don PPE and where required RPE (as specified) prior to entering designated area of site via dirty exit of decontamination unit
- Excavate stockpiled soils in a controlled manner with handpicking of debris into waste asbestos sack directly where possible. Where required, use the surfactant spray if any asbestiform materials appear dry/friable. Place double bagged ACM debris in the dedicated lockable skip at the end of each work period.
- Wipe all tools, etc. with a dampened cloth.
- Place used damp rags in a waste sack and seal.
- At the edge of the work area, clean the outside of all waste sacks and seal.
- Wipe off boots and face mask (if worn) with a cloth and bucket provided.
- Disposable overalls (turned inside out), gloves and where required, any used disposable respirators in asbestos waste bag. Seal the clear bag.
- Once soils have nil visible asbestos and are chemically approved as suitable for further treatment or reuse, remove from the building as required
- Ambient asbestos monitoring in air to be undertaken daily during screening/hand picking works. Works must cease to allow damping down measures to be implemented if fibre concentrations exceed **0.01f/cm3**.

Site Manager to conduct a visual inspection of work areas and transit routes. If a satisfactory level of cleanliness has been achieved they shall complete an interim sign off in the site diary.

Personal Protection

PPE:

- Hi-Visibility vest/jacket
- Hard Hat
- Protective boots (steel toecap/midsole)
- Disposable overalls: Type 5 (BS EN ISO 13982-1)
- Disposable overshoes where required
- Disposable gloves

RPE:

- disposable respirator to standards EN149 (type FFP3) or EN1827 (type
- FMP3);
- half or full mask respirator (to standard EN140) with P3 filter; or semi-disposable respirator (to EN405) with P3 filter. Masks would be positive or negative pressure depending on face fit requirements. Should negative

pressure masks be used then a break every hour of continuous use should be undertaken.

Also:

- Surfactant spay (e.g. Idenden Dampstrip Asbestos Penetrant 30-330 or similar)
- First Aid Kit
- Mobile Phone

Emergency Procedures

Personnel injury/overexposure:

Remove to fresh air and provide first aid procedures as required; Contact Emergency services if accident/injuries warrants; Decontaminate personnel if required (remove overalls and PPE, wash hands and forearms).

Fire or Explosion:

Evacuate the work area and summon local Fire Brigade. Do not attempt to fight fire. Remain upwind of smoke in safe area. Follow existing Site Procedures.

Decontamination Procedure

Personnel: 1) Remove disposable contaminated clothing and discard in the designated waste container.
2) Wash hands/face/forearms prior to leaving decontamination unit.

Site Rules

- **NO SMOKING**, No eating, drinking, or chewing of gum.
- Wear protective equipment specified above.
- Utilise good personal hygiene habits – wash hands and exposed skin with soap and water prior to leaving site.
- Remove and dispose of contaminated clothing as described above before leaving the working area.

The safe working procedures detailed in this method statement must be adhered to.

DECLARATION

I have read, understood and will comply with the requirements of this Safety Method Statement			
Name	Work Position	Signature	Date

APPENDIX D – Environmental Risk Assessment Report

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Maw Green Landfill Soil Treatment Facility

3C Waste Limited

Amenity and Accidents Risk Assessment

Environmental Permit Variation Application

Prepared by:

Caulmert Limited
Nottingham Office, Strelley Hall, Main Street, Strelley, Nottingham, NG8 6PE
Tel: 01773 749132
Email: andystocks@caulmert.com
Web: www.caulmert.com

Doc ref: 5193-CAU-XX-XX-RP-V-0301-A0.C1

December 2021

Caulmert
engineering environmental planning

APPROVAL RECORD

Site: Maw Green Landfill Soil Treatment Facility

Operator: 3C Waste Limited

Project Title: Environmental Permit Variation Application

Document Title: Amenity and Accidents Risk Assessment

Document Ref: 5193-CAU-XX-XX-RP-V-0301-A0.C1

Report Status: **Final**

Project Manager: Andy Stocks

Caulmert Limited: Nottingham Office, Strelley Hall, Main Street, Strelley, Nottingham, NG8 6PE

Telephone: 01773 749132

Author	Samantha Bowler Environmental Consultant	**Date**	19/10/2021
Reviewer	Kellie-Marie Burston Senior Environmental Consultant	**Date**	27/10/2021
Approved	Andy Stocks Director of Environment	**Date**	19/11/2021

Revision Log			
Revision	**Description of Change**	**Approved**	**Effective Date**
C1	Initial Release	AS	14/12/2021

DISCLAIMER

MAW GREEN LANDFILL SOIL TREATMENT FACILITY – ENVIRONMENTAL PERMIT VARIATION APPLICATION

AMENITY & ACCIDENTS RISK ASSESSMENT

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DRAWINGS

TABLES

1. INTRODUCTION

1.1 Background

1.1.1 This report is an Amenity and Accidents Risk Assessment of the impact of the increase in annual throughput of hazardous waste at the Soil Treatment Facility (STF) at Maw Green Landfill Site, as part of a permit variation application for environmental permit ref. EPR/BS7722ID. The site is operated by 3C Waste (hereafter referred to as 'the operator', which is a wholly owned subsidiary of FCC Environment Limited).

1.1.2 The operator proposes to vary their existing permit in relation to the Soils Treatment Facility (STF) that forms part of the Maw Green Landfill Installation Permit to remove the 30,000 tonnes per annum restriction for hazardous waste and increase the capacity to 50,000 tonnes per annum (tpa). The STF currently undertakes the physico/chemical and biological treatment of hazardous and non-hazardous wastes, with an overall tonnage limited of 50,000 tonnes per annum (tpa). The overall annual tonnage limit will remain unchanged at 50,000 tonnes per annum.

1.1.3 The bioremediation process at the STF utilises industry standard biopile technology and operates through the use of use of biopiles and moisture control, addition of suitable amendments to the soil, forced air extraction to encourage micro-organism growth and breakdown of hydrocarbons into by products such as carbon dioxide and water vapour. Any surplus contaminated surface water is discharged to sewer under the existing trade effluent consent.

1.2 Identification of Receptors

1.2.1 The site is located off Maw Green Road, Coppenhall, Crewe, Cheshire, postcode CW1 5NG. The southern boundary of the site is located approximately 2km north of the centre of Crewe (i.e. on the outskirts of Crewe). The site is centred on national grid reference SJ 71859 57401. The site is in a low-lying area, with general ground elevations around 45m Above Ordnance Datum (AOD). The site location is shown in Figure 1 below:

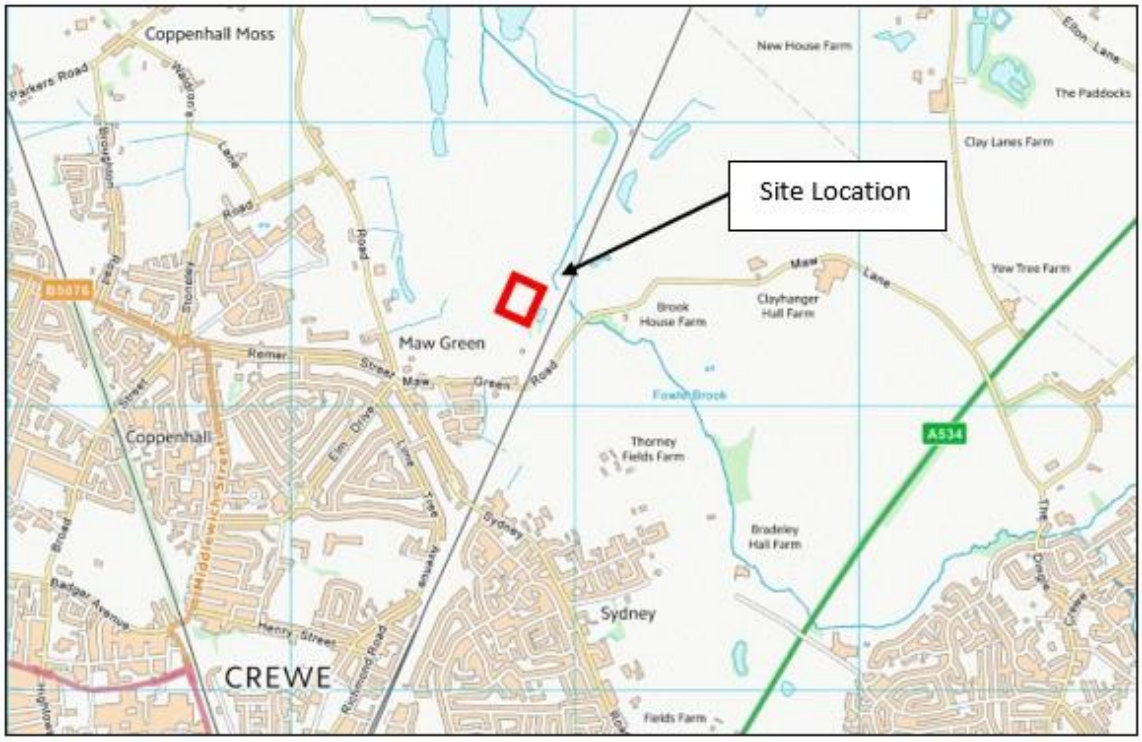


Figure 1 – Site Location

1.2.2 The ground rises very gently to both the west and the east, indicating that the site lies in a wide, open valley. The Fowle Brook flows through this valley in a northerly direction. This brook has been diverted around the site.

1.2.3 The site is in a predominantly agricultural setting on the north-eastern outskirts of the town of Crewe. As such, potential environmental receptors include domestic dwellings both within the town and farmlands surrounding the site. In addition, surface water receptors are present within the Sandbach Flashes Site of Special Scientific Interest (SSSI) to the north and the diverted Fowle Brook to the east being the closest to the site.

1.2.4 The Sandbach Flashes are made up of 14 live units, which are all found north of the site within a 5km radius. The 3 units within 900m of the site are in favourable condition (closest 615m NNW), with 8 units north of this in an unfavourable (no change) condition, one unit being unfavourable declining, and one more unit 3.4km north being in favourable condition.

1.2.5 Two Local Wildlife Sites (LWSs) have also been identified nearby: Brook House Pools approximately 400m north-northeast, and also Clay Lane Verges approximately 1.5km to the northeast of the site.

1.2.6 A number of housing developments on the outskirts of Crewe have been identified as possible receptors. One housing development is Meadow View, located approximately 350m southwest of the site. Foden Farm is located 580m west and Acton House is located 650m northwest. Another housing development, Stonely Park, is located approximately 800m to the northwest. Also, Monks Coppenhall Primary School is located 645m to the west of the site. As the prevailing wind direction is from the southwest, none of these

developments are considered to be at a high risk from odour or dust nuisance from the site.

1.2.7 The site is situated within a NOx (as NO2) Air quality Management Area (AQMA), as is most of Cheshire. There are no Source Protection Zones (SPZs) within 2km of the site, with nearest (a Zone 3 SPZ) located over 8km away to the southeast.

1.2.8 The site is located on Devensian Glacial Till deposits (silt, clay, sands and gravels) classified by the Environment Agency as a Secondary (undifferentiated) Aquifer. The superficial deposits are underlain by the Wilkesley Halite Member (Halite and Mudstone) of the Mercia Mudstone Group, which has not been given aquifer status by the Environment Agency.

1.2.9 As part of the Pre-Application Advice, the Environment Agency conducted a Habitats Screen (attached as part of this application) which identified an area designated for 'Protected Species – Non-Fish (Code 2)'. This designated area is shown on drawing ref. 5193-CAU-XX-XX-DR-V-1800.

1.2.10 The potential receptors within 1000m of the site boundary are provided on drawing ref. 5193-CAU-XX-XX-DR-V-1800 and are summarised in Table 1 below:

Table 1 - Potential Receptors identified within 1000m of the site boundary

Receptor	Activity	Distance from Site	Direction from Site
Maw Green Landfill Site	Industrial	<10m	W & N
Fowle Brook	Surface Water	30m	E
Railway Line	Commercial	60m	E
Brook house Farm	Residential	240m	ESE
Meadow Croft Cottage	Residential	210m	SSE
Cattle Arch	Residential	270m	SSW
Maw Green Residential Area	Residential	320m	SW
Brookhouse Pools Local Wildlife Site	Habitat/Surface Water	400m	NNE
Maw Green Farm	Residential	440m	SW
Residences	Residential	450m	W
Car Dealership	Industrial/Commercial	500m	WNW
Public Footpath	Recreational	500m	NW
Pond	Surface Water	500m	NW
Thorney Fields Farm	Residential	600m	SE
Sandbach Flashes SSSI	Habitat	615m	NNW

Receptor	Activity	Distance from Site	Direction from Site
Monks Coppenhall Primary School	Residential	630m	WSW
Maw Green Residential Area	Residential	715m	NW
Foxholme Farm	Residential	720m	NE
Residential Area of Sydney	Residential	760m	SE
Public Footpath	Recreational	875m	SE
Clayrange Hall Farm	Residential	940m	NE
Sir William Stanier Community School	Residential	990m	SW

Surface Water

1.2.11 The closest surface water feature is a stream, Fowle Brook, immediately east of the site, which runs parallel to the railway line along the northeast site boundary. Approximately 500m to the northwest is a pond, which is located directly south of the water features which constitute Sandbach Flashes SSSI (which are 615m northwest of the site). Brook House Pools are located approximately 400m to the north, north-east of the site.

1.2.12 The site is not located within a flood risk zone.

Sensitive Sites

1.2.13 Sandbach Flashes is a Site of Special Scientific Interest (SSSI) located approximately 615m north-north-west of the proposed site, and according to natural England:

'Sandbach Flashes is a site of physiographical and biological importance. It consists of a series of pools formed as a result of subsidence due to the solution of underlying salt deposits. The water varies from freshwater, chemically similar to other Cheshire meres, to highly saline. Inland saline habitats are extremely rare and are of considerable interest because of the unusual associations of plants and animals. Most of the flashes are surrounded by semi-improved or improved grassland. Fodens Flash is partly surrounded by an important area of wet woodland.'

1.2.14 Two Local Wildlife Sites (LWSs) have also been identified nearby: Brook House Pools approximately 400m north-northeast, and also Clay Lane Verges approximately 1.5km to the northeast of the site.

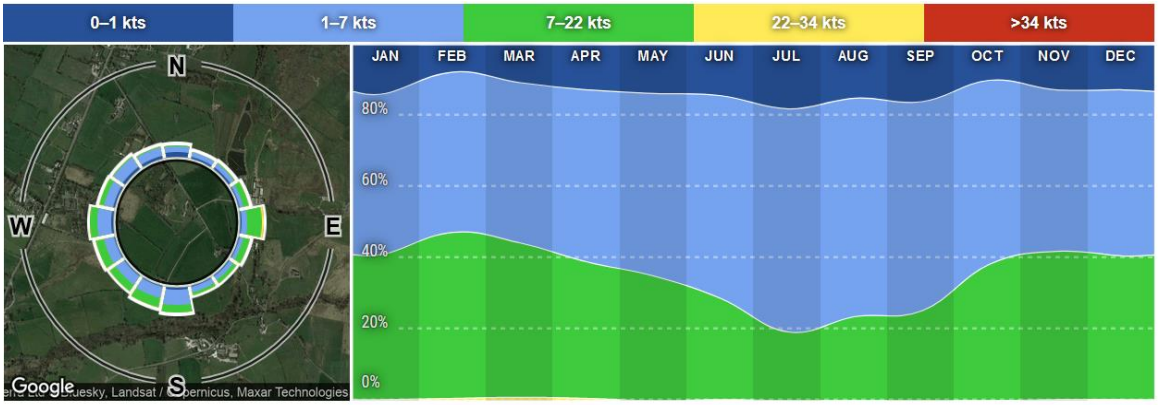
Meteorological Setting

1.2.15 Fugitive emissions of dust, litter, odour and noise from the site are likely to be affected by local weather conditions, in particular by wind direction. Wind statistics observed from the closest weather station, Leek Thorncliffe, located approximately 28km east from the

site are considered to be representative of the typical conditions at the site (Figure 2 below).

1.2.16 A review of the data recorded daily between April 2010 and September 2021 on the Windfinder.com website indicates that the most dominant wind direction is from the south-southwest towards the north-northeast, towards Foxholme Farm, Clayrange Hall Farm and Brookhouse Pools Local Wildlife Site (LWS).

Figure 2 – Leek Thorncliffe wind statistics between 2010 and 2021



RISK ASSESSMENTS

1.3 Odour, noise and vibration, fugitive emissions and accidents risk assessments

1.3.1 Separate risk assessment tables have been completed for odour, noise and vibration, fugitive emissions and accidents in line with the Environment Agency guidance document on 'Risk assessments for your environmental permit' (updated 25th March 2021).

1.3.2 Possible hazards as a result of the proposed operations at the site that require risk assessment comprise:

- Sources of Odour (Table 2);
- Sources of Noise (Table 3);
- Fugitive Emissions (dust, bioaerosols, litter, mud and debris, pests, surface water run-off) (Table 4);
- Visible Emissions (smoke or visible plumes) (Table 5); and,
- Accidents (leaks and spillages, fire etc.) (Table 6).

1.3.3 The hazards identified above have the potential to escape beyond the site boundary and cause an amenity nuisance to sensitive receptors or harm the environment and human health. For each possible hazard, an assessment of the risk that it poses to potential sensitive receptors has been carried out, taking into account the control measures that will be in place.

1.3.4 The following Tables 2 to 6 give further detail on each hazard source, pathway and sensitive receptor, the risk management measures to be implemented, probability of exposure, consequences of exposure and an overall risk rating from Low (little or no risk) to High once all risk management measures have been taken into account.

Table 2: Odour risk assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs – who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence
Odour from the transfer and treatment of contaminated soils.	Workers and visitors to the site. Industrial works located within a 1000m radius of the site. Residential receptors.	Air	Preventative measures include: • General housekeeping, such as sweeping of surfaces and machinery being cleared regularly of residue build up. • A biofilter is in place which will help to reduce odours. • Air forced through the biopiles will pass through a biofilter before being discharged to air, which will reduce any VOC's present that have the potential to create odour. • Meteorological conditions should be considered before activities such as transfer of waste takes place, these activities should be minimised during unfavourable wind conditions, in particular when winds are towards residential receptors to the southwest and southeast. • An Odour Management Plan for the STF is in place, document ref. 5193-CAU-XX-XX-RP-V-0304.	**Fairly unlikely**. Waste acceptance measures will ensure that soils are not overly odorous. Should any particular odorous soils be accepted, the biofilter is in place to mitigate the potential for odour. Odour minimisation and waste acceptance procedures are in place. Waste codes and permit	Seasonal variations such as warmer temperatures in the spring and summer has the potential for increased odour nuisance to human/residential receptors.	**Low – provided management procedures adhered to**

				boundary will remain the same at the site.		
Odour from reception and storage of contaminated soils.	Local human population Industrial works located within a 1000m radius of the site. Residential receptors.	Air transport, then inhalation.	Odour could be generated during delivery and offloading, sorting, or during stockpiling. Measures to prevent odour nuisance from the reception and initial storage of soils will include: • Waste acceptance procedures to ensure that only suitable soils are accepted. This includes hydrocarbon contaminated soils. The potential for odour problems will be assessed on receipt and actions taken if required. • Excessively malodorous soils will be removed from site and a non-conformance note issued. • An Odour Management Plan for the STF is in place, document ref. 5193-CAU-XX-XX-RP-V-0304.	The frequency of exposure is likely to be **low** as: • Human receptors sensitive to odour are some distance away (over 200m). • The prevailing wind direction is from the south west, away from residential receptors. Odour minimisation and waste acceptance procedures are already in place. Waste codes and permit boundary will remain the same at the site.	Nuisance to human receptors.	**Low - provided management procedures adhered to**

Odour from Soil Bioremediation Process	Local human population Industrial works located within a 1000m radius of the site. Residential receptors.	Air transport, then inhalation.	Measures to prevent odour nuisance from soil bioremediation process will include: • Industry standard biopile technology • Moisture control • Forced air extraction to encourage micro-organism growth. • Addition of suitable materials (nutrients and fertilizer) to the soil. • Continuous running of the bioremediation process under vacuum extraction. • A biofilter will be in place to reduce odour as well as filter out any VOC's present. • An Odour Management Plan for the STF is in place, document ref. 5193-CAU-XX-XX-RP-V-0304.	The frequency of exposure is likely to be **low** as: Following industry standards will allow for sufficient oxygen ingress to minimise the impact of odours. Odour minimisation and waste acceptance procedures are already in place. Waste codes and permit boundary will remain the same at the site.	Nuisance, loss of amenity	**Low - provided management procedures adhered to**

Table 3: Noise Risk Assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs – who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence
Noise from soil handling and treatment.	Workers and visitors to the site. Local wildlife and human receptors surrounding the site.	Air	Preventative measures include: • Smooth running surfaces as the site areas are concreted. • Fully trained and competent plant operators to operate machinery. • Daily site inspections include routine checks to ensure noise emissions from site operations are not overly excessive. • Maintenance of mobile plant/equipment in line with manufactures specifications to ensure screening/turning process produces minimal noise. • Vacuum extraction blowers and pumps are housed in acoustic enclosures to significantly reduce noise levels from the soil and water treatment equipment. • The STF will operate within the landfill site's operating times and not during unsociable hours. • Where practicable, mobile plant and site equipment fitted with silencers or acoustic hoods.	**Unlikely** Residential receptors are unlikely to be affected at >200m distance. Noise assessment undertaken concluded that the cumulative effect of the operation of any potential landfill operations and the STF has been considered and the results of analysis show that there	Noise may cause annoyance to people working in the local businesses within 300m of the site and disturbance to local wildlife sensitive to noise.	**Low - provided management procedures adhered to**

			• Avoiding un-necessary revving of engines, engines switched off when not in use or idle for long durations. • Use of broadband type noise reverse alarms (i.e. non-beeper type). • Minimisation of drop heights during tipping.	would not be any significant increase in overall noise levels and the noise conditions for STF operations at sensitive receptors would not be exceeded. There will be no additional noise made as a result of the increase in annual hazardous waste tonnages accepted at the site, due to overall waste tonnages for the site remaining the same. The operating times for the site will also remain the same therefore no increase in noise duration.		

Table 4: Fugitive Emissions Risk Assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs – who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence
To Air						
Dust from contaminated soil treatment.	Workers and visitors to the site. Industrial works located within a 1000m radius of the site. Residential receptors within 1000m of the site. Sandbach Flashes 615m north-west	Air - wind borne dust.	Preventative measures include: • provision on site of a water bowser equipped with rain gun and adequate year-round water supply and dust suppression by regular spraying in dry conditions; • use of clean water for dust suppression, to avoid re-circulating fine material; • high standards of house-keeping to minimise track-out and windblown dust; • a preventative maintenance programme, including readily available spares, to ensure the efficient operation of plant and equipment; • minimisation of drop heights during tipping; • clear delineation of stockpiles to deter vehicles from running over edges; and	**Unlikely** Residential receptors are largely not downwind of the site, with predominant wind direction blowing away from the SW towards the NE. Sandbach Flashes >600 north-west unlikely to be affected due to distance from site and less likely to	Nuisance - dust on cars, clothing etc. Smothering of fauna and flora within SSSI and LWS	**Low - provided management procedures adhered to**

	Local Wildlife Site 400m NE		• effective staff training in respect of the causes and prevention of dust. **Specific measures** in relation to activities within the treatment facility include: • Misting equipment to be employed if required during summer months. • Meteorological conditions should be considered before activities such as transfer, and this activity should be minimised during unfavourable wind conditions. • A Dust Management Plan for the STF is in place, document ref. 5193-CAU-XX-XX-RP-V-0303.	be downwind most of the time. Local Wildlife Site 400m unlikely to be affected due to distance from site. There will be no additional risk of dust from the site as a result of an increase in the annual tonnage of hazardous waste accepted at the site. This is due to the overall limit of waste accepted at the site remaining the same. The same dust control and prevention measures will be in place.		
To Water						
Runoff from site surfacing directly into surface water.	Surface waters downstream of site Local Wildlife Site – ponds 400m NE	Surface water drainage system	The site is covered in impermeable pavement and sealed drainage, which discharges to the treatment facility.	**Unlikely** given the treatment plant which is in place. (Accidental spillages are dealt with in Table A4).	Contamination of local surface water.	**Low – provided management procedures adhered to**

				No changes to site surfacing or drainage system as a result of the waste tonnage change. Run-off will be contained by site drainage.		
Contaminated run-off percolating through ground.	Groundwater or surface waters close to the site	Migration through site surfacing and underlying soil.	Measures to control contaminated runoff into ground will include: • Offloading of soils to be supervised by suitably trained staff who will be aware of storage requirements for various wastes. • Daily site inspections will include checks to see that soils are stored in their designated storage areas. • All areas used for storage or handling of soils that may have contaminated runoff will be on impermeable concrete slabs which drain to sealed drainage sumps, containing any run-off. • Regular inspections of impermeable ground: Any damage detected that could impair the integrity of the pavement should be recorded and repairs carried out as soon as possible.	**Unlikely** - The areas of the site used for soil activities are located on impermeable concrete slabs which drain to sealed drainage sumps. There will be no changes to the area used for soil activities as a result of this permit variation.	Contamination of groundwater and surface water.	**Very low**
Pests						
Rodents/pests	Workers and visitors to site, nearby agricultural land.	Over ground.	Unlikely due to nature of wastes accepted. Measures taken to prevent infestation: • Daily site inspections will monitor for the presence of rats/pests on site. • Waste acceptance procedures will ensure that non-conforming wastes are rejected.	**Unlikely** However, with any kind of biodegradable waste, occasionally rats/pests can be	General nuisance and health risk from rats being vectors for human pathogens	**Low – provided management procedures adhered to**

			• Soils unlikely to attract rodents if strict waste acceptance procedures adhered to. • In general, good housekeeping with regular sweeping and clearing of waste areas is encouraged. Actions in the event of rodents/pests being detected at the site: - • The incident must be reported to the site manager; • A record must be made of the incident and actions taken; • Waste acceptance and storage procedures should be reviewed; and • Specialist pest control contractor will visit site regularly and on an ad hoc basis and if an infestation is detected a pest control contractor will be employed.	present but the types of wastes are unlikely to result in rats/pests being a significant problem. There will be no change to the waste types accepted at the site as a result of this permit variation.	(e.g. Weil's disease).	
Flies breeding in soils treatment facility.	Workers and visitors to site. Residential receptors > 200 m from site.	Air	Unlikely due to nature of wastes accepted Measures taken to prevent infestation: • Waste acceptance procedures will ensure that non-conforming wastes are rejected. • Daily site inspections will monitor for the presence of flies on site. • In general, good housekeeping with regular sweeping and clearing of waste areas is encouraged. Actions in the event of a fly infestation being detected at the site: - • The incident must be reported to the site manager; • A record must be made of the incident and actions taken;	**Fairly Unlikely** Significant flies are not anticipated. There will be no changes to the waste types accepted at the site as a result of the permit variation.	General nuisance to human receptors and vectors of pathogens to humans and animals.	**Low - provided management procedures adhered to**

			• Waste acceptance and storage procedures should be reviewed; and In the event of severe infestations, the specialist pest control contractor will be employed and visit more regularly and on an ad hoc basis.			
Mud/Litter						
Litter from off-loading and processing of mixed loads including possibility of some light wastes.	Workers and visitors to industrial estate. Local Wildlife Site 400m NE	Air - via wind.	Measures taken to prevent litter leaving the site: • Waste acceptance procedures to ensure the acceptance of only approved waste. Actions in the event of litter being detected leaving the site: - • Litter picking will be carried out. Priority is given to clearing any litter outside the permit boundary furthest away and working inwards. • The incident must be reported to the site manager. • A record must be made of the incident and actions taken. • Waste acceptance, storage and treatment procedures should be reviewed, and additional control imposed as deemed necessary by the site manager.	**Unlikely** Litter may be identified from time to time but likely to be in relatively small quantities and only problematic during high winds. There will be no changes to the risk of litter originating from site as the waste types will remain the same. Litter control measures will remain the same.	Nuisance to nearby receptors.	**Low - provided management procedures adhered to**
Mud being tracked onto surrounding roads.	Workers and visitors to site and users of surrounding roads	Tracking on vehicle tyres entering/leaving the site.	Measures taken to prevent mud leaving the site: • The site is constructed from bound surfaces such as concrete that will minimise the risk of mud being generated. • Roads and site areas will be regularly swept.	**Unlikely** Mud and debris may be tracked onto surrounding roads. The risk will not increase	Nuisance to nearby road users In severe circumstances mud on the	**Low - provided management procedures adhered to.**

			• Drivers will be encouraged to ensure their vehicle tyres are clean before leaving site and that any loose material is in enclosed containers or the loads are sheeted or netted. • Daily site inspections will monitor for mud or debris being tracked from the site. • In general, good housekeeping with regular sweeping and clearing of debris is encouraged. Actions in the event of mud and debris is being tracked onto roads outside the site: - • Affected road areas will be swept. • The incident must be reported to the site manager. • A record must be made of the incident and actions taken.	as the overall annual waste tonnage limit will remain the same, therefore the number of waste deliveries is likely to remain the same.	road could affect road safety.	

Table 5 – Visible Plumes Risk Assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs – who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence
Potential visible plumes.	Nearby receptors.	Air.	N/A – no visible plumes are generated by the existing operations or as a result of this permit variation.	N/A	N/A	N/A

Table 6 - Accidents Risk Assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs – who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence
Spillage or leak of fuel or other hazardous liquids.	Underlying soil, Groundwater and/or Surface water (closest is the Fowle Brook). Connected ponds at the Local Wildlife Site 400m NE	Through site surfacing and ground.	Fuel and various liquid products used in equipment or vehicle maintenance may have hazardous properties. These could leak during storage or spillages could occur during use. **Preventative measures**: • The soil bioremediation operation and associated activities take place on impermeable surfacing with drainage to sealed sumps and a treatment plant. • All fuels and tanks will be appropriately stored and bunded 110% of their capacity and be compliant with CIRIA 'Containment systems for the prevention of pollution: Secondary, Tertiary and other measures for industrial and commercial premises (C736, 2014). • Regular inspections are carried out that check for integrity of site surfacing and correct storage of any hazardous liquids e.g. fuel for mobile plant.	**Unlikely** Impermeable surfacing will prevent migration of spills or leakages to underlying ground. In the event of any uncontained spill, the drainage system will collect any oil spillages and other hazardous liquids would be collected by the drainage system. On that basis, it is very unlikely that any	Contamination of local water course or underlying ground or groundwater.	**Low - provided management procedures adhered to.**

			• All staff involved in soils handling are inducted in the emergency procedures regarding the handling of spills. **Actions** in the event of spillages: • Incidents to be managed in accordance with emergency procedures regarding the handling of spills. • Spillages will be contained using appropriate spill kits or absorbent materials (e.g. soils). • Where the spill is near any drains, drains should be protected. • For larger spills of hazardous materials, any affected interceptors should be isolated and if necessary the interceptor cleaned out. • Depending on the severity of the spill, the Environment Agency will be contacted. The emergency procedure includes incident reporting and, as part of the environmental management system, incidents will be reviewed by management on a regular basis.	spills would reach water courses or groundwater. There will be no additional risk of spills or leaks as part of this permit variation. The control measures in place remain valid		
Fire in processing areas.	Surface water receiving contaminated fire waters (Fowle Brook 30m E).	Air Ground.	Fires could occur as a result of arson, from sources of ignition, or from electrical faults on site. **Preventative measures**: • No smoking policy. • Emergency vehicles will be able to gain access to the processing buildings at all times whilst the site is operational.	Even with measures in place to prevent the occurrence of fires, it is possible that fires could break out. However,	Smoke, local nuisance, risk of fire spreading to other areas or properties.	**Low - as long as management procedures adhered to.**

	Surrounding site facilities. Air.		• All staff involved in soil handling will be inducted in the emergency procedures including the fire action plan and a regular fire drill. • Daily checks and emergency procedures in place to prevent fire risk • Site staff trained in fire risk and how to deal with an incident on site • Any visitors to the site will be inducted and be made aware of the fire risks • **Actions in the event of fire:** • Where it is safe to do so, site staff will use on-site fire-fighting equipment to extinguish fires. • Where a fire may have been caused by electricity or is close to electrical equipment, electricity to that area should be switched off and isolated. • Clear directions will be given to the fire service and a member of staff will wait at the entrance to the site to direct the service to the site on arrival, to ensure that the speediest service is provided. • A list of actions is outlined in the site Fire Prevention Plan and associated Fire Risk Assessment. The emergency procedure includes incident reporting. As part of the environmental management system, incidents will be reviewed by management on a regular basis to	measures in place to prevent the fire spreading or to limit its consequences will significantly reduce the probability of receptors being affected by a fire. There will be no additional risk of fires breaking out as a result of this permit variation. There are no changes to waste types accepted at the site which could increase the fire potential risk. It is considered that mitigation measures in place remain valid.		

			identify whether lessons can be learnt, and procedures improved.			
Flooding	Underlying soil. Groundwater. Surface water.	Flood water from Fowle Brook. Drainage systems.	**Preventative measures**: 90mm kerbing around area to provide additional protection. Surface water drainage collection and treatment system. **Actions** in the event of flooding: • In the event of flood warnings for the area, the site manager or technically competent manager should consider the possibilities of moving waste materials or any other materials with hazardous properties away from areas vulnerable to flood waters. • Where flooding could reach areas where electrical equipment is used, electricity to that area should be switched off and isolated. • After flood waters have receded, the areas outside the site should be inspected and any materials which have escaped the boundary should be picked up.	Unlikely[1] site is assessed to lie outside the 1:1,000 annual probability fluvial flood outlines for Fowle Brook.	Contamination/silting of surface waters or surrounding areas with soil materials could, depending on the properties of the soils (hydrocarbon content), affect water quality or be unsightly.	**Low**.
Soils treatment process failure - material	Local human population	Air transport, then inhalation	Preventative measures will include: • Good management of the treatment process, i.e. good mixing, aeration and	**Unlikely,** the likelihood of soils becoming	Odour nuisance.	**Low**

[1] Maw Green Landfill Soil Treatment Facility Flood Risk and Drainage Assessment March 2019

becoming anaerobic and giving rise to odours			regular monitoring, experienced and competent staff. In the event of failure of the treatment process: • If material has become anaerobic and malodorous, the material may be covered with more soils to minimise odour and, if required, the removal of the failed material to landfill.	anaerobic is low.		

2. CONCLUSION

2.1.1 The risk assessments above enable identification of appropriate mitigation measures to control the amenity and accident risks from the activities in relation to the contaminated soils treatment facility. All identified risk mitigation measures will be incorporated within the management system for the site.

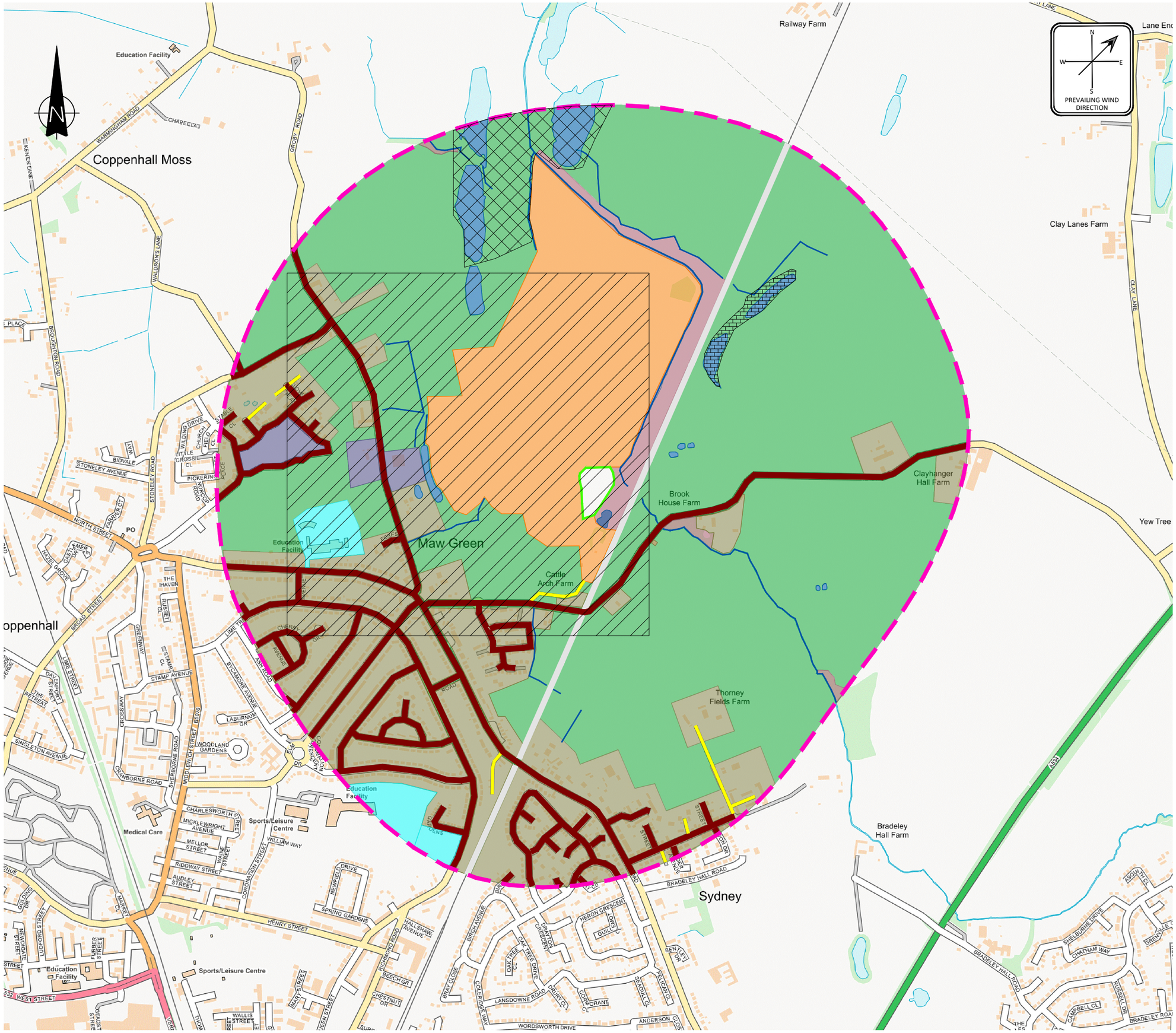
2.1.2 The amenity and accident risk assessment indicates that, provided the identified risk mitigation measures (as identified in the tables above) are implemented, the permit variation proposals are unlikely to create additional risks of nuisance or pollution from odour, noise, dust, other fugitive emissions or accidents, nor increase the severity of environmental impacts. The overall risks of the risks identified are considered to remain low. The risks and control measures within the existing Odour and Dust Management Plans (OMP and DMP) for the Soil Treatment Facility remain valid and therefore only minor amendments have been made to the text to reflect the changes.

3. REFERENCES

1. Environment Agency, 2021 - 'Risk assessments for your environmental permit' accessed at: https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit. Updated 25th March 2021.

DRAWINGS

5193-CAU-XX-XX-DR-V-1800 Sensitive Receptor Plan



LEGEND

- ACTIVITY BOUNDARY
- 1000m OFFSET
- SURFACE WATER
- WOODLAND
- COMMERCIAL
- LANDFILL SITE
- RESIDENTIAL
- MAJOR ROAD
- MINOR ROAD
- RAIL
- AGRICULTURAL
- EDUCATIONAL
- RECREATIONAL
- SSSI
- PROTECTED SPECIES - NON FISH
- LOCAL WILDLIFE SITE

REV					
P01	ISSUED FOR INFORMATION	EJD	SB	SB	27.10.21
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: FCC Environment

PROJECT:

MAW GREEN
SOILS TREATMENT FACILITY

TITLE:

SENSITIVE RECEPTOR PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
EJD	EJD	AS	AS

DATE	SCALE @ A3	JOB REF:	REVISION
26.10.2021	1:10000	5193	P01

DRAWING NUMBER: 5193-CAU-XX-XX-DR-V-1800

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APPENDIX E – Planning Permission

Mr Alistair Hoyle,
Axis PED
Well House Barns
Chester Road
Bretton
Chester
CH4 0DH

Development Management
PO Box 606
Municipal Buildings
Earle Street
Crewe
CW1 9HP

email: planning@cheshireeast.gov.uk

DECISION NOTICE

Application No: **19/1376N**

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

Particulars of Development

Development and operation of a temporary soil treatment facility at the maw green landfill site.

Location

FCC ENVIRONMENT , MAW GREEN LANDFILL SITE, MAW GREEN ROAD, CREWE, CW1 5NG

for **FCC Enviroment Ltd Maw Green Landfill Site**

In pursuance of its powers under the above Act, the Council hereby GRANTS planning permission for the above development in accordance with the application and accompanying plans submitted by you subject to compliance with the conditions specified hereunder, for the reasons indicated:

1. The development hereby approved shall commence within three years of the date of this permission.

   Reason: To comply with the requirements of Section 91 of the Town and Country Planning Act 1990.

2. Seven days prior written notification shall be given to the Waste Planning Authority (WPA) of the date of the commencement of the development. For

the purposes of this permission commencement of the permission shall be taken to be the commencement of any material operations as referred to in S.56 of the Town and Country Planning Act 1990.

Reason: To enable the Waste Planning Authority to monitor the development and to ensure compliance with this permission in the interests of the environment and the amenities of the surrounding area

3. The soil treatment operations hereby approved shall cease no later than 31st December 2027.

   Reason: To define the life of this permission

4. The soil treatment facility including all associated buildings, hardstanding, plant and machinery; shall be removed from the site and the site restored in accordance with the restoration scheme approved under application number 18/1091D, reference 1351-01-08 Rev A within 12 months following the permanent cessation of all soil treatment operations, or by 31st December 2028 whichever is sooner.

   Reason: To define the life of this permission and ensure satisfactory restoration of the site.

5. The development hereby approved shall be carried out in strict accordance with the following documents, except where these may be modified in the conditions below:
   a) Application Site Location - 2465-01-01 Rev A
   b) Proposed General Arrangement - 2465-01-02
   c) Proposed Elevations - 2465-01-03
   d) Flood Risk and Drainage Assessment Final Report v1.4
   e) Noise Impact Assessment - R19.0202/DRK
   f) Air Quality Assessment - R2598-R01-v3
   g) Odour management plan 3695-CAU-XX-XX-RP-V-0308-A0-C1

   Reason: For the avoidance of doubt to specify the plans to which the permission relates.

6. No waste material other than “contaminated soils” shall be imported on to the Site. Any non-conforming wastes shall be stored in a sealed container or skip (maximum of 2) and removed from the Site within 7 days of container/skip becoming full.

   Reason: To ensure the permission is implemented in accordance with the submitted details and in the interests of the environment and visual and

general amenity

7. No waste or recycled materials shall be burned on the Site at any time

   Reason: In the interests of the environment and visual and general amenity

8. No more than 50,000 tonnes of waste materials shall be imported on to the Site in any 12 month period.

   Reason: in order to control the scale of development

9. The following records shall be kept and provided to the Waste Planning Authority (WPA) within 7 days of a request made in writing by the WPA. In making a request, the WPA shall specify the dates between which the records shall be provided.

   a) The total number of vehicle movements bringing waste materials to the Site per day;
   b) The total number of vehicle movements removing waste or recyclable materials from the Site per day.
   c) The total quantity of waste materials delivered to the Site per day and the total quantity of material removed from the site per day ; and
   d) The time of day that waste was delivered to the Site and waste or recycled materials exported from the Site.

   Reasons: To ensure the permission is implemented in accordance with the submitted details and in the interests of the highway safety and in the interests of the environment and amenity

10. From the commencement of development to its completion, a copy of this permission, including all documents hereby approved and any other documents subsequently approved in accordance with this permission, shall always be available at the site office for inspection during normal working hours

    Reason: For the avoidance of doubt.

11. The mitigation recommended in the Acoustic Report R.19.0202/DRK shall be implemented in full for the duration of the development. The mitigation scheme shall be maintained for the purpose originally intended throughout the use of the development.

    Reason: In accordance with paragraph 180a of the National Planning Policy Framework to avoid noise from giving rise to significant adverse impacts on

health and quality of life.

12. The odour control methods as detailed in the Air Quality Assessment, R2598-R01-v3 section 9.2 and odour management plan 3695-CAU-XX-XX-RP-V-0308-A0-C1 dated October 2019 sections 4 to 7 shall be implemented in full and retained during the operational life of the soil treatment facility.

    Reason: In accordance with paragraph 170e of the National Planning Policy Framework to ensure that residential amenity is not significantly impacted due to the proposed use.

13. The development hereby approved shall be used only for the purpose of soil reception, storage, screening and treatment and shall not be used for any other activities.

    Reason: For the avoidance of doubt to specify the operation to which the permission relates.

14. Stockpiles of waste or recycled materials shall not exceed a maximum height of 4 metres above the surface of the pad, Biopiles of soil shall not exceed a maximum of 6m height.

    Reason: In the interests of visual amenity.

15. Operations authorised by this permission, including the operation of all plant and machinery and movement of Heavy Goods Vehicles shall only take place between the following hours:

    0800 to 1800 hours Monday to Friday
    0800 to 1300 Saturday

    There shall be no operations or vehicle movements assocaited with this permission Sundays and public/bank holidays.

    Reason: In the interest of the amenity of nearby residents and to prevent nuisance arising.

16. Best practicable means shall be taken at all times to ensure that all HGVs leaving the site are in a condition such as not to emit dust or deposit mud or other debris on the highway. Any deposits of dust, mud or other debris deposited or carried onto the public highway as a result of the development shall be removed as soon as practicable.

    Reason: in the interests of highway safety, to avoid the deposit of mud on the

highway.

17. The wheel cleaning facilities on the landfill shall be used by all vehicles involved in the exportation of materials associated with this development for the duration of the development hereby approved.

    Reason: in the interests of highway safety, to avoid the deposit of mud on the highway.

18. From the period of commencement of the development until the cessation of restoration activities* of the Maw Green Landfill, there shall be no more than 400 heavy goods vehicle movements (200 in and 200 out) in any one working day arising from the operation of both Maw Green Landfill site and the soil treatment facility hereby approved.

    Reason: in the interests of highway safety and to protect residential amenity.

19. All loads of open topped vehicles involved in the transport of soil from the development hereby approved shall be securely sheeted in such a manner that no material may at any time be spilled or blown onto the public highway or adjoining land.

    Reason: In the interest of highway safety and local amenity.

20. Any facilities for the storage of oils, fuels or chemicals on the site shall be sited on impervious base and surrounded by impervious bund walls or in proprietary double skinned tanks. The volume of the bunded compound shall be at least equivalent to the capacity of the tank plus 10%. If there is multiple tankage, the compound shall be at least equivalent to the capacity of the largest tank, or the compound capacity of interconnected tanks, plus 10%. All filling points, vents, gauges and sight glasses must be located within the bund. The drainage system of the bund shall be sealed with no discharge to any watercourse, land or underground strata. Associated pipework shall be located above ground and protected from accidental damage. All filling points and tank overflow pipe outlets shall be detailed to discharge downwards into the bund.

    Reason: To prevent pollution of the water environment.

21. Prior to its installation details of the location, height, design, timings and luminance of any proposed lighting shall be submitted to and approved in writing by the Local Planning Authority. The details shall ensure the lighting is designed to minimise the potential loss of amenity caused by light spillage onto adjoining properties. The lighting shall thereafter be installed and

operated in accordance with the approved details.

Reason: To minimise the nuisance and disturbances to neighbours (and the surrounding area).

22. No waste shall be imported to the site in connection with this development hereby approved until a scheme for the disposal of foul and surface waters has been submitted to and approved in writing by the Waste Planning Authority. The approved scheme shall be fully implemented prior to the first receipt of waste associated with this permission and shall be retained thereafter during the operational life of the development.

    Reason: To ensure a satisfactory means of drainage

Informatives:

The applicant is advised that they have a duty to adhere to the regulations of Part 2A of the Environmental Protection Act 1990, the National Planning Policy Framework 2012 and the current Building Control Regulations with regards to contaminated land. The responsibility to ensure the safe development of land affected by contamination rests primarily with the developer.

In order to minimise dust emissions arising during the development, including: site preparations / demolition/ construction activities at the site.

A copy of a 'site specific DMP' shall be retained at the development site; and made available for inspection upon request by Cheshire East Borough Council Officers.

The site specific DMP shall identify the fugitive dust sources at the development site and describe in detail the dust mitigation measures to be employed.

The DMP shall include details:
- of all dust suppression measures
- the methods to monitor emissions of dust arising for the duration of the project

The demolition / construction phase of the development, shall be completed in full compliance with the site specific DMP.

The dust suppression measures shall be maintained and fully operational for the duration of the demolition / construction phase of the development.

The Dust Management Plan shall contain the records of inspections and visual assessments. Records shall be:

- kept on site and
- made available for examination upon request by a Cheshire East Borough Council Officer.

Where visible airborne emissions are brought to the attention of the contractor by:
- pro-active dust monitoring of the site or
- upon receipt of a dust complaint from a member of the public

The contractor shall:
- identify the cause and extent of the dust emission
- detail the remedial dust corrective course of action
- inform Cheshire East Borough Council, Environmental Protection Department of the corrective action and proposed monitoring to assess compliance and prevent a recurrence. For this purpose contact:
0300 123 5015
environmentalprotection@cheshireeast.gov.uk

- Any corrective action shall be recorded in the site log/ DMP retained on site.

Under the Control of Pollution Act 1974, Environmental Health recommend that the hours of noise generative* demolition / groundworks / construction works taking place during the development (and associated deliveries to and from the site) are restricted to:

Monday – Friday	08:00 to 18:00 hrs
Saturday	09:00 to 14:00 hrs
Sundays and Public Holidays	Nil

Noise generative* works outside of these hours may result in action by the Environmental Protection Team to serve a legal notice on the property or construction site under the Control of Pollution Act 1974.

*"Noise Generative" is defined as any works of a construction / demolition nature (including ancillary works such as deliveries) which are likely to generate noise beyond the boundary of the site.

The Local Planning Authority (LPA), in reaching this decision, has followed the guidance in paragraph 38 of the National Planning Policy Framework. The Framework advises that the LPA should work proactively with applicants to secure developments that improve the economic, social and environmental conditions of the area.

Please Note: This decision notice does not convey any approval or consent which may be required under any enactment, bye-laws, order or regulation other than

Section 57 of the Town and Country Planning Act 1990.

This consent is granted subject to conditions and it is the owner(s) and the person(s) responsible for the implementation of the development who will be fully responsible for their compliance throughout the development and beyond. **A fee is payable to us for the discharge of conditions. Please see our Website for details.** If there is a condition that requires work to be carried out or details to be approved prior to the commencement of the development this is called a "condition precedent". The following should be noted with regards to conditions precedent:
(a) If a condition precedent is not complied with, the whole of the development will be unauthorised and you may be liable to enforcement action.
(b) Where a condition precedent is breached and the development is unauthorised, the only way to rectify the development is the submission of a new application.

Other conditions on this permission must also be complied with. Failure to comply with any condition may render the owner(s) and the person(s) responsible for the implementation of the development liable to enforcement action.

This permission is granted in strict accordance with the approved plans. It should be noted however that:
(a) Any variation from the approved plans following commencement of the development, irrespective of the degree of variation, will constitute unauthorised development and may be liable to enforcement action.
(b) Variation to the approved plans will require the submission of a new planning application.

Dated: 30-Oct-2019

Signed

Authorised Officer *for*
Cheshire East Borough Council

APPENDIX F – COTC Certificates

Certificate No. OCC4246

Operator Competence Certificate

Qualification Title:

Managing Physical & Chemical Treatment - Hazardous Waste : Remediation of Contaminated Land - 4MPTHR

This Certificate is awarded to

Andrew Clee

Awarded: 22/10/2013

Authorised

WAMITAB Chief Executive Officer

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

This certificate is jointly awarded by WAMITAB and the Chartered Institution of Wastes Management (CIWM) and provides evidence to meet the Operator Competence requirements of the Environmental Permitting (EP) Regulations, which came into force on 6 April 2008.

00041135

wamitab

Certificate No: 13134

CERTIFICATE OF TECHNICAL COMPETENCE

This Certificate confirms that

Andrew Clee

Has demonstrated the standard of technical competence required for the management of a facility of the type set out below

Facility Type

Level 4 in Waste Management Operations - Managing

Treatment Hazardous Waste (Remediation 4TMHCL)

Authorising Signatures:

Chief Executive Officer

Director:

Date of issue: 22 October 2013

00020194

Continuing Competence Certificate

This certificate confirms that

Andrew Clee

Has met the relevant requirements of the Continuing Competence scheme for the following award(s) which will remain current for two years from 25/11/2021

TMH	Treatment - Hazardous Waste
TMNH	Treatment - Non Hazardous Waste
CLR	Contaminated Land Remediation

Expiry Date: 25/11/2023

Verification date: 24/11/2021

Authorised:

Director of Qualifications and Standards

Learner ID: 19274

Certificate No.: 5189050

Date of Issue: 25/11/2021

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

00160255

APPENDIX G – Asbestos in Soil, Nicole 2021

ASBESTOS IN SOIL

A pan european perspective

Demolition earthworks | AECOM

ASBESTOS IN SOIL

A pan european perspective

NICOLE

Network for Industrially Co-ordinated Sustainable Land Management in Europe

ASBESTOS IN SOIL - A PAN EUROPEAN PERSPECTIVE

Foreword

There are common themes and good practice running throughout Europe with respect to the management of asbestos in soil, although many variations in approach exist.

As with other contaminants, the assessment and management of asbestos risks should follow a risk based assessment approach (source-pathway-receptor analysis) with selection of appropriate remediation following a suitable remedial options appraisal.

However, many decisions regarding the remediation and management of asbestos in soils are based on stakeholder perception and a subjective or emotive response (i.e. hazard based rather than risk-based).

As demonstrated in this report there are few European countries with clear standards and detailed guidance. This document provides an overview of best practice in the industry with a pan European perspective and with some case studies to illustrate typical responses to asbestos in soils impacts.

Contents

Asbestos warning sign | AECOM

1 Introduction

Asbestos is a common and challenging contaminant in soil; a legacy of widespread historic use in buildings and poor historic control of construction waste, building demolition, and re-use of crushed demolition aggregate as made ground.

Hazard, risk perception and acceptance can vary widely amongst stakeholders and the management of asbestos in soil can vary widely as a result.

Differing stakeholder positions on risk acceptance or risk avoidance (zero tolerance) can have a significant impact on project designs, programmes, and costs, and there is little harmonisation in approach across Europe.

Asbestos in soils is increasingly recognised by those involved in the management of brownfield

Degraded asbestos debris in soil | AECOM

Visual detection of asbestos during remediation | NTP

land regeneration as a potentially high-cost, risk-driven issue, and this publication seeks to: provide a pan-European perspective; identifying opportunities for harmonisation; improve awareness and understanding; and promote greater consistency.

The content of this publication reflects the work of the NICOLE Asbestos Working Group from 2017 to 2021.

The aims of the NICOLE Working Group were to:
Compare and contrast current industry approaches, regulatory positions and quality and availability of existing guidance in European Countries as an initial "baselining" exercise to help identify significant differences and opportunities for harmonisation.

Improve awareness and understanding in managing the risks of asbestos in soil (considering its occurrence both on its own and as a co-contaminant with other pollutants) by advocating a pragmatic approach and promoting greater consistency where possible.

These aims were to be achieved by:

1. Collating information on, and benchmarking of, current methods, standards and guidance for the characterisation, risk assessment, remediation and regulation of asbestos in soils that are currently adopted by industry and regulators in European Countries;
2. Identifying how asbestos contaminated soils (including those also contaminated with other pollutants) are currently remediated in different countries, considering different treatment technologies and the availability (or otherwise) of appropriate disposal/ treatment facilities;
3. Identify existing research efforts into characterisation, risk assessment and remediation, and identify research opportunities that could support a sustainable pragmatic approach; and
4. Identifying case studies that support and improve confidence in risk management decisions and in developing best practice.

2 NICOLE Survey of Members

To establish a baseline of current legislation, guidance and practice in European countries, a detailed survey was issued to NICOLE and Common Forum members in 2018. Three years on and very little has changed. The survey comprised 70 questions covering 6 topic areas.

These were:

1. Legislative provision and regulatory position
2. Good practice industry guidance
3. Laboratory methods
4. Waste classification, handling and disposal
5. Remediation options
6. Research and innovation

12 responses were received for 6 countries.

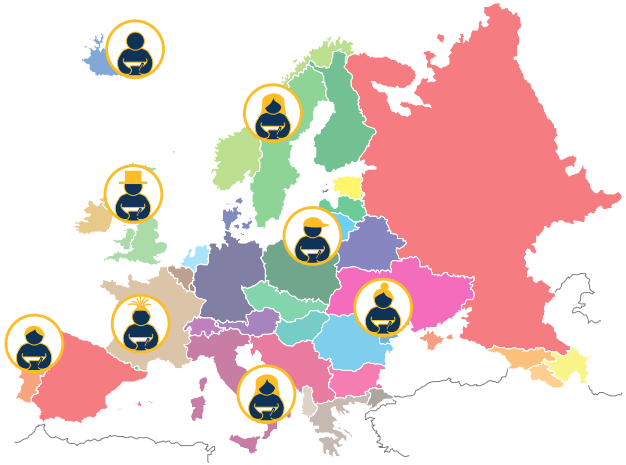


Figure 2.1 NICOLE Network Survey of members

3 Legislative and Regulatory Positions

One potential harmonising factor is EU Directive 2009/148/EC, on the protection of workers from the risks related to exposure to asbestos at work, that sets out occupational health and safety requirements for work involving asbestos. However, even with this in place, the control limits for asbestos in air vary considerably across Europe, ranging from the Directive Control Limit of 0.1f/ml in the UK to 0.002f/ml in The Netherlands (50x lower). No country has specific legal provision solely addressing exposure to asbestos in soil, although it is increasingly recognised that disturbance of asbestos containing soil is an activity that is captured by existing asbestos-specific occupational regulations relating to work in buildings (e.g. maintenance, refurbishment and demolition).

Asbestos cement fragments in soil | AECOM

Country	Occupational exposure limit (f/ml 8hr TWA)
EU limit value (2009/148/EC)	0.1 (100,000f/m^3)
UK	0.1
France	0.01
Italy	0.01
Germany	0.001
Netherlands	0.002 (with intention to reduce to 0.0003)

Table 3.1 Occupational exposure limit

Presence of AiS guidance. Detailed sampling and testing protocols. Air and soil guidelines. Regular testing

Absence of AiS guidance. Reliance on OSH and waste regulations. No regular testing

There is a stark divergence between those countries with detailed regulatory guidance on the risk management of asbestos in soil and those countries with no specific regulatory guidance for asbestos in soil. It was discussed at the NICOLE workshop in Warsaw in November 2019 that asbestos is considered to be an emerging soil contaminant in Germany, and in many Eastern European countries, even though in other countries it has been recognised as a contaminant of concern for decades. Where detailed gui-dance is in place, it is largely based on the research of RIVM and TNO published between 2003-2008.

The only European regulatory guidance levels for asbestos in soil are those published by the Dutch, Belgian and Italian authorities. The Dutch and Belgian authorities adopt a Tiered approach and use the same Tier 1 value, but importantly use different definitions for those values.

Dutch Tier 1 Intervention value = 100mg/kg (sum of chrysotile+10x amphibole as measured by NEN 5707)

Flanders Tier 1 Intervention value = 100mg/kg (sum of fixed + x10 loose fibres (all asbestos types) as measured by TEM)

4 Industry Good Practice

It is only common among a small number of European Countries to test made ground soil samples for asbestos as part of a normal site investigation. Sampling is either carried out using typical practice adopted for contaminated land or using detailed prescriptive practice specific to asbestos (such as for the Netherlands and Belgium). Guidance on sampling strategies, sample plans, laboratory test methods, and requirements for site staff competency/qualifications is mixed, with no common approach across the countries surveyed.

When suspected asbestos is observed in the soil there is a legal requirement under workplace regulations to put in place procedures to manage the associated risks. If suspected asbestos is found onsite during site investigation or remediation works, the general procedure is to stop work, make the work area safe and temporarily vacate the area until the risk assessment and method statements for the work can be revised. Actions can include the use of dust suppression, asbestos survey of the area, confirmatory laboratory testing of the identified material, and use of Licensed contractors to remove the asbestos. Work should only ever continue if safe methods of work can be put in place.

Signing of an asbestos impacted area | NTP

Guidance Questions	Belgium (Flanders)	Belgium (Wallonia)	France	Italy	Portugal	Spain	UK
Is the testing of brownfield sites for asbestos commonplace?	yes	yes	no	yes	yes	not	yes
Is guidance available for the risk management of asbestos in soil?	yes	yes	yes	no	no	no	yes
Does the guidance fill a gap in regulatory guidance?	yes	no	yes	no	no	no	yes
Is the guidance entirely country specific?	no	no	yes	yes	no	no	yes
Does the guidance advocate a tiered approach?	yes	no	no	no	no	no	yes
Does guidance include method on soil sampling if asbestos is present?	yes	yes	no	yes	no	no	yes
Does the guidance recommend air testing during site-based activities?	no	no	yes	yes	yes	no	yes
Does the guidance advocate health and safety precautions during sitebased activities?	yes	yes	yes	yes	yes	yes	yes
Does the guidance advocate a guideline for asbestos in soil?	yes	yes	no	no	no	no	no
Is there any guidance on how to assess risk from asbestos fibres being present in water?	no	no	no	no	no	no	no

Table 4.1 Summary of questionnaire responses on good practice guidance

5 Approaches to Ground Investigation

Some of the specific aspects of ground investigation identified in the survey included:

The importance of desk study and site walkover to establish the likelihood of asbestos being present.
Sampling strategies — can be targeted or random/ systematic.

Sampling approach — size and frequency. Dutch, Belgian, and SoBRA guidance require/advocate the use of much larger sample sizes that typically used for other soil contaminants. The Dutch and Belgian guidance also specify sample frequency, e.g. 1 sample per 50 m^3 or 1 per 1000 m^2.

Activity based sampling is occasionally used. This is in essence what the RIVM/TNO guidance was based on, what is described in US EPA guidance,

Asbestos sampling activities in Belgium | AECOM

and what is advocated in SoBRA guidance to better understand the likelihood of asbestos fibres becoming airborne as a result of soil disturbance.

Other ground condition factors are important to risk, including soil type, vegetation or other surface cover, and moisture content.

Asbestos sampling activities in Belgium | AECOM

Differing views exist as to whether ground investigation falls under occupational regulations for work with asbestos (as per in buildings).

Requirement for suitably trained/experienced staff. For example, Dutch guidance requires specific certification and accreditation for inspection and sampling of soils.

Asbestos was found to be present in up to 20% of made ground samples according to SoBRA research in the UK based on 150,000 soil samples submitted to UK laboratories between 2015 and 2018.

6 Detecting asbestos in soil

Asbestos sampling activity in UK | AECOM

The conceptual understanding of the spatial distribution of asbestos is fundamental to the design of an investigation and the interpretation of the results. Is it a delineable area subject to asbestos disposal? Is it dispersed fragments across a wide area? What is the likelihood of detecting the asbestos using your sampling strategy?

Grid Size	Probability of detecting one ACM fragment	Sample size as a proportion of grid square
100	1 in 100,000	0.01%
50	1 in 10,000	0.04%
10	1 in 1000	1%

Table 6.1 Probability of detecting asbestos based on a soil sample size of 1 litre

The reliability of the site investigation is a function of:

- Sample size
- Sample density

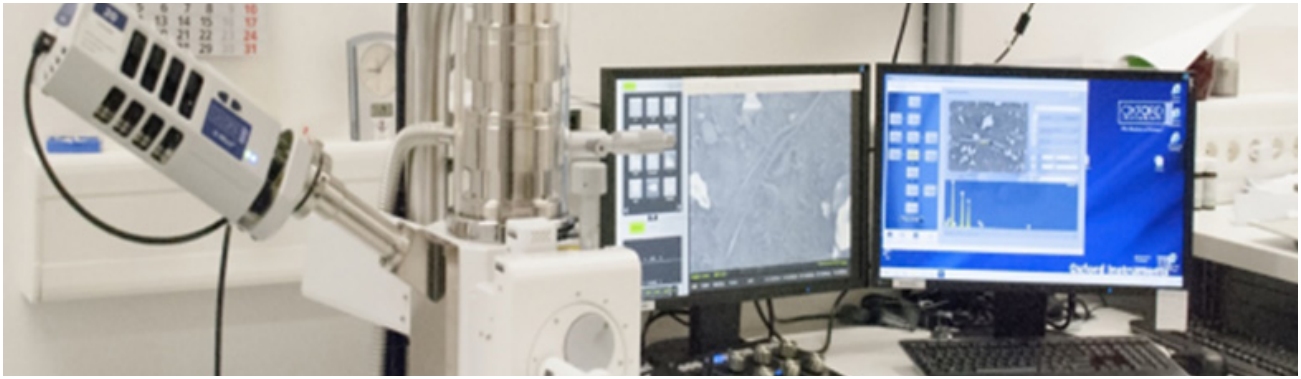
As noted previously the Dutch and Belgian authorities, and SoBRA in the UK, advocate taking larger samples for asbestos compared to typical size of soil samples taken for other contaminant testing because of the greater uncertainties involved in sampling for asbestos in soil.

The theoretical probability of detecting a small area of isolated asbestos fragments in soil can be extremely low. If random fragments are found in soil the probability of more unidentified fragments being present in the soil can be high.

Samples taken in The Netherlands | NTP

7 Laboratory Methods

Electron microscope



Laboratory methods vary widely across Europe. Some countries have very detailed analytical methods that are embedded in the regulatory guidance (for example the Netherlands and NEN Standard 5707). Other countries such as the UK have a mixture of methods published by regulatory bodies (HSE for HSG248) and industry bodies (SCA Blue Book Method*).

Current European Standards specifically for quantifying asbestos in soil include: NEN 5707 (The Netherlands) SCA Blue Book Method (UK)*

** Withdrawn in October 2020 due to concerns over validation triggered by AISS results*

The methods that are available vary depending on the regulatory context and purpose of the test.

The three most common purposes are:

1. Bulk analysis for the presence of asbestos (driven by occupational regulation)
2. Air monitoring (also driven by occupational regulation)
3. Gravimetric quantification for waste classification

The reliability of laboratory test methods can be better understood by studying the inter-laboratory proficiency schemes, such as those provided by the UK Health & Safety Laboratory schemes (including AISS) **[link]**

Detailed standards for quantification in soil are the least common and also tend to have the greatest variability. When a single standard method is not mandated by regulation, interlaboratory variability can be high. Each laboratory undertaking the often multi-stage analytical process slightly differently—be it in the sample preparation, the mass of sub-sample analysed, the magnification of the microscope used, the type of microscopic method (PLM, PCOM, SEM, TEM), the assumed composition of man-made asbestos products, or the fibre counting rules employed.

8 Waste Classification, Handling and Disposal

The classification, handling and disposal of asbestos and soil impacted asbestos waste is addressed by the EU Waste Framework Directive (2008/98/EC) and is potentially the most harmonised aspect of dealing with asbestos in soil across Europe as a result.

All European countries adopt the 0.1% hazardous waste threshold.

Soil that contains identifiable pieces of asbestos containing material (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then the soil is regarded as hazardous waste.

Collection of asbestos fragments should be done using double bagged, be labelled asbestos waste,

Double bagging of asbestos waste in UK | Ramboll

Double bagging of asbestos waste in UK | Ramboll

and shipped using the correct waste transfer documentation.

Large asbestos sheets can be wrapped in 1000 gauge polythene sheeting, labelled as above and placed in an enclosed and locked skip.

The transport of asbestos impacted soils can be either in enclosed containers or in sheeted lorries by a licensed waste carrier.
It is important to note that in accordance with the waste hierarchy, the volume of hazardous waste should be reduced by physical separation of visible asbestos from residual soils (if feasible).

9 Approaches to Risk Assessment

Motor-powered breathing system | NTP

The most established approaches to risk assessment for asbestos in soil in Europe are the frameworks developed by VROM (now IenW) and OVAM, and with the latter OVAM framework being highly influenced by the earlier VROM framework. Further steps to better understand the potential fibre release of asbestos from the affected land are introduced by the US EPA framework that advocates activity-based sampling, and UK good practice that advocates the better understanding of dust and asbestos fibre release from soil disturbance.

Published research on which the frameworks are based is limited, and dated—the research that

forms the basis of the VROM framework dates from the 1990s, and a core piece of research advocated in the UK guidance dates from the 1980s.

Whilst individual frameworks vary in the detail, and the data requirements for those frameworks vary (see section on Ground Investigation), there is a common theme to the frameworks that is illustrated in the diagram below.

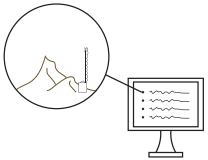
Tier	Tier 1	Tier 2	Tier 3	Tier 4
Data	Basic soil characterisation 	Differentiation in asbestos form and type 	Respirable fibre content in soil. Particle size fraction of interest 	Site-specific fibre-release data 
Criteria	Generic assessment criteria (not asbestos type specific)	Generic assessment criteria for asbestos types and/or forms	Generic assessment criteria for respirable fibre content	Site-specific assessment criteria

Figure 9.1 Common theme in frameworks

Hobmoor School – Birmingham, UK | Google Maps

Ramboll was commissioned by Balfour Beatty Construction Limited to develop and implement an asbestos remediation strategy to enable the construction of a new school.

Previously developed as industrial land, the historic review and site visit established significant volumes of demolition rubble from prefabricated buildings across the site. The proposed development included landscaping, sports areas and

Frequently occurring fragments of asbestos cement and AIB were discovered

Asbestos finds | Ramboll

earthworks reprofiling. This meant significant cut and fill works across the site with soil containing demolition rubble.

Asbestos Containing Material (ACM) was encountered during site clearance, so a specialist survey contractor was commissioned for soil sampling and perimeter air monitoring. The asbestos detected in this survey was asbestos cement (chrysotile), asbestos insulation board (amosite) and found in the topsoil till a depth of 1,00-1,50 meters. The pollutant linkages identified during construction and operation were potential exposure to free fibres from friable materials from the asbestos cement and insulation board.

The remedial options appraisal included:

- Dig contaminated soil and dump on site in vegetation strip; costs over £800 000,
- Hand pick asbestos material, capping with imported top soil (0,3 meters) and install a marker layer between clean top soil and contaminated soil underneath; costs approximately £500 000,
- Assess the risks of in situ reusing the top soil.

Pockets of asbestos covered much of the site at depths up to 5m.

Asbestos finds—hand picking | Ramboll

Processing plant | Ramboll

Based on the options appraisal a bespoke methodology was developed and a comprehensive worldwide review of asbestos legislation and guidelines was undertaken. The final remediation strategy designed comprised of:

1. Hand picking of asbestos cement and asbestos insulation board fragments,
2. Trommel sieving of soil on a 14 mm mesh,
3. Air monitoring for fibres across the perimeter of the site and in the "Control Zone",
4. Works carried out by a licensed contractor with a HSE approved asbestos methodology.

A dust and fibre release experiment was designed to estimate the potential fibre release during school operation, which could be released by soil derived indoor dust. This was done by simulating a realistic and real time situation. For this a 12 m^3 sealed enclosure was built into the school with an air lock entry. The soil in the sealed enclosure was vigorously disturbed to generate dust. The indoor air was monitored and sampled. The samples were tested with Phase Contrast Optical Microscopy (PCOM) analyses.

The remediation delivered a screened top soil which was suitable for re-use in the landscape area

Indoor air experiment | Ramboll

without requirement of a cover layer. The worst case activities were simulated and tested and concluded no residual fibres and low residual risks. All air monitoring results were below detection limit of the standard HSE method i.e. <0.01 f/ml during the earthworks. And the air testing experiment (samples repeatedly disturbed) did not generate airborne fibre concentrations above limit of detection of the standard HSE method (<0.01 f/ml).

The new school is in place and the landscaping offers a nice area around it.

Before and after construction | Ramboll

10 Risk-Based Soil Guidelines

There are few published guideline values for asbestos in soil in Europe. Those that are published are summarised below:

Country/ Region	Guideline Value	Additional Information
The Netherlands	Tier 1: 100mg/kg Tier 2: 1000mg/kg (non-friable) or 100mg/kg friable Tier 3: 10mg/kg respirable fibres	Soil Remediation Circular 2013 Annex 3. Concentrations defined as the sum of chrysotile + x10 amphibole and as the average dry weight concentration over a maximum spatial unit of 1000m2. Samples to be taken and analysed as per SIKB Protocol 2018 and NEN 5707.
Italy	1000mg/kg	D.Lgs 152/06. Analysis required to be either SEM for asbestos content <1% or DRX/FTIR for asbestos contents >1%.
Belgium/ Flanders	100mg/kg	Phase 1—minimum of two 10 litre sieved soil samples per 1000m2 of unpaved ground. If concentration < 100mg/kg or >70cm bgl, no action required. If >100mg/kg, further site-specific inspection (Phase 2) required. Concentrations defined as the sum of fixed fibres + x10 loose fibres.
Belgium/ Wallonia	100mg/kg	Concentrations defined as the sum of bonded fibres + x10 unbound fibres. If concentration is > 100mg/kg but <500mg/kg it is acceptable to use soil beneath 1m clean soil + geotextile.
Belgium/ Brussels	100mg/kg Intervention Value 80mg/kg Remediation Value	If the results obtained for a sample exceed the intervention standard for asbestos or if there is a question of pollution (in the sense of art. 3 25° of the Soil Ordinance), a detailed soil survey must be carried out.

Table 10.1 Published guidelines in Europe

11 Approaches to Risk Management

Risk perception and stakeholder acceptance of a risk-based approach to asbestos is potentially a far stronger driver of intervention than for many other soil contaminants. Zero tolerance or an abundance of caution towards asbestos can drive remediation towards "non-detect" solutions.

There are well established risk assessment decision frameworks available, for example the Australian, US EPA, Dutch, and Belgian approaches. What is not well understood is how often those frameworks are used past "Tier 1".

Is the challenge to prove the worth of the more detailed risk assessment Tiers? Is the scientific evidence sufficient to be able to persuade stakeholders that the risk is acceptable? Does the retention of asbestos-containing soils on-site leave constraints on land-use that is not cost-beneficial? Detailed risk assessment has its place and can be valuable in situations where it is not possible and not sustainable to remove the asbestos entirely. This is illustrated in the decision flowchart on the next page.

The difference in the prescriptive nature and detail of frameworks for individual countries and the sustainability of the output from those frameworks is worth further consideration.

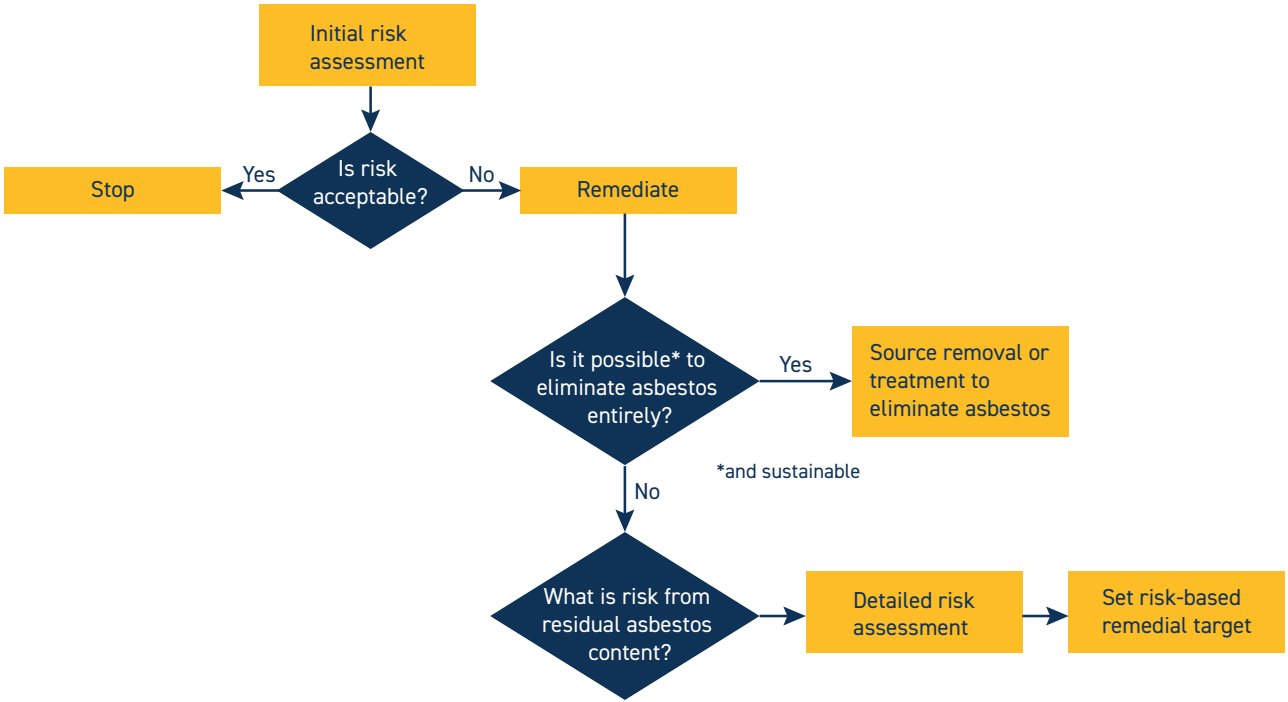


Figure 11.1 Approaches to Risk Management

12 Research and Innovation

Little innovation was specifically identified by the respondents to the questionnaire. A literature review of the most recent developments (within a 5 year time window) in the fields of analytical methodologies, remediation technologies and survey studies has been carried out for NICOLE through the analysis of scientific publications hosted at all the Web of Science databases [Link].

Asbestos investigations have historically focused on commercial asbestos fibers, which were commonly defined in regulations as chrysotile, crocidolite, amosite, tremolite, actinolite, and anthophyllite. Investigations now include other types of elongate mineral particles such as winchite and richterite (van Orden, 2018).

The most common analytical methods for asbestos analysis are polarised light microscopy (PLM), phase contract optical microscopy (PCOM) and electron microscopy (either scanning (SEM) or transmission (TEM).

Cossio et al (2018) improved the sensitivity and precision and enhanced the productivity of a Scanning Electron Microscopy with Energy Dispersive Spectrometry (SEMEDS) methodology for the analysis of asbestos in a natural confining matrix and also with a very low asbestos content.

Wroble et al (2017) compared different soil sampling and analytical methods for asbestos quantification in order develop a toolbox for better assessment in order to overcome the difficulties that exist in the detection of asbestos at low concentrations and its correspondent extrapolation from soil concentrations to air concentra-

tions. Sampling was performed using two distinct methods: traditional discrete ("grab") and incremental sampling methodology (ISM). Analysis was carried out using PLM, TEM and a combination of these two methods were used. Using a Fluidized Bed Asbestos Segregator (FBAS) followed by TEM analysis resulted in the detection of asbestos at locations that were not detected using other analytical methods.

Fibre counting by automated image analysis using fluorescence microscopy has been evaluated by Alexandrov et al (2015). There is the potential from this for faster analysis and less human error, but whilst good validation for medium to high fibre concentrations was achieved, for lower fibre concentrations it was less accurate.

In the last 5 years just a few articles mentioned innovative or upgraded technologies for the asbestos treatment in contaminated sites, mostly considering biological treatment.

Mohanty et al. (2018) examined whether environmentally relevant concentrations of siderophores (exudates from bacteria and fungi that facilitate iron mobilisation and uptake) could alter chrysotile toxicity. Iron removal by siderophores decreased the carcinogenicity of the fibres, the fungal exudates being more effective than those from the bacteria. However, the authors stated that this approach should be more deeply explored in order to develop a viable strategy to manage asbestos-contaminated sites. Native bacteria and fungi from asbestos mines in India (Aspergillus tubingenesis and Coemansia reverse) have

also reportedly been used to detoxify asbestos (Bhattacharya et al. 2015 & 2016).

Gonneau et al. (2017) evaluated the capacity of crop cultivar and grasses for the phytoremediation of soils containing asbestos from natural and anthropogenic causes. The presence of asbestos caused less or no impact on the plant growth when compared to other factors such as the presence of heavy metals or lack of nutrients.

Valouma et al. (2016) used a combined treatment of oxalic acid dihydrate with silicates (tetraethoxysilane and pure water glass (potassium silicate)) to achieve total destruction of chrysotile. Oxalic acid leaching followed by the tetraethoxysilane addition was more appropriate for cases of glushinskite recovery; while an Oxalic acid leaching followed by water glass managed to encapsulate the asbestos fibers, which might be a valid option for onsite asbestos detoxification.

A small number of commercial companies have developed innovative solutions to asbestos remediation:

- An Italian company offers an innovative remediation technology that uses microwave energy to convert asbestos waste to an inert material. The technology involves a movable reactor that can heat the asbestos and produce a reusable inert material [Link].
- A Japanese company Sagasiki offers 'ND Lock', a solidification solution based on calcium polysulphide (CaSx) formulation. The treatment involves a crystallization and decomposition process. Numerous applications relating to asbestos treatment are given on their website.

13 Remediation Options

The most common remediation approach in many countries is still to “dig and dump” (i.e. excavate and dispose to an off-site landfill). A question is whether this is a sustainable approach? The risk is removed by removing the hazard (i.e. the source) but does the context of site use permit a lower impact solution?

The trigger for remediation is also different between countries. For example, mandatory testing for microscopic fibres in soil whenever a construction activity takes place versus action only if visible asbestos waste is encountered. In France, all road asphalt has to be tested for the presence of asbestos as part of any road improvement scheme.

From the questionnaire responses it is clear that there is substantial variation in remediation

Typical remediation earthworks activities in UK | AECOM

Damping down of stockpiled material with water spray | AECOM

triggers, in what restrictions and requirements the identified presence of asbestos introduces, and in the remediation standards enforced. Even if the value of the remediation standard appears at face value to be the same (for example for The Netherlands and Belgium), the detailed definition of that value is different.

What is generally recognised in the questionnaire responses is that the presence of asbestos in the ground can have a significant effect on land use and costs for remediation (either in the cost for remediating the asbestos itself as a risk and remediation driver, or in the additional cost for remediating a different risk driving contaminant because of the co-presence of asbestos).

There are a number of remediation options to consider, some more established than others. From a risk management perspective these options can be grouped as follows:

Monitor
- Risk assessment
- Monitoring strategy

Institutional Controls
- Land-use management
- Signs
- Fencing
- Permit control
- Land-use restrictions

Traditional Remediation Methods
- Excavation and disposal offsite
- In-situ containment (cover system)
- Hand-picking (ground or belt)
- Tilling
- Mechanical screening

Emerging/Innovative/ Alternative Methods
- Mechanical screening (advanced)
- Soil washing
- Vitrification
- ABCOV (acid destruction)
- Microwave destruction
- Modified low temperature thermal desorption
- Soil fungi
- Fine grinding
- Physical stabilisation
- Phytoremediation

The following scheme (next page) presents the risk management based considerations for the remedial options.

What is the context for the decision?	What is the risk characterisation?	Remediation options	Considerations for remediation options
Management of current situation (land condition and use)	Negligible risk and no regulatory driver for further action/intervention	Monitor	Monitoring locations and monitoring frequency Type of monitoring (realtime/continuous or spot monitoring, time duration, dust and/or fibres) Limit of detection and sensitivity of method (e.g. differentiation of fibre types and fibre sizes)
Regulatory intervention	Low risk - potential to manage risk without extensive remedial action	Institutional control	Is control of use/access of area practicable and achievable? Does it require reassurance boundary monitoring? Fencing, signage, specific PPE/RPE requirements
Preparation for site divestment/acquisition	Higher risk - requires more detailed consideration of remediation options	Remove	Can it be treated and re-used on-site? Can it be treated to reduce volume requiring disposal? Can it be treated to reduce handling/ transportation risk?
Preparation for site for new use		Cover	What level/degree of soil disturbance does this need to protect against? Durability. What ground access constraints are present which may restrict/constrain installation of cover (type, extent)?
Construction activity requiring asbestos containing soil to be excavated and/or constructed on		Ex-situ treatment	Treatment type - physical separation, chemical destruction, stabilisation. What is the required post-treatment specification for the material? What is the treatment capable of achieving?
		In-situ treatment	Treatment type - physical separation, chemical destruction, stabilisation. What is the required post-treatment specification for the material? What is the treatment capable of achieving?

Figure 14.2 Example of a Risk Management Decision Flowchart

John F Hunt demolished and remediated this former 44-acre foundry / iron works site in Ipswich. The mixed-use site also held two historic landfills containing inert and 'difficult' waste.

Part of the works involved the management of 35,000 m^3 of previously unidentified fibrous asbestos in soil. This unforeseen event had not been budgeted for and could have potentially rendered the project unviable. John F Hunt worked quickly and pragmatically with the client's consultants and regulators to agree a solution to enable the re-use of materials on site, making the necessary adjustments to the remedial design and Materials Management Plan.

An innovative process engineered approach of complex sorting and cement stabilisation of the

Futura Business Park – Ipswich, UK | John F Hunt

All forms of asbestos were discovered including crocidolite lagging.

Pockets of asbestos covered much of the site at depths up to 5m.

Asbestos finds | John F Hunt

soil was agreed with the regulators to derive site won engineered fill that was suitable for use.

Due to the nature of the asbestos, the remediation works were undertaken as Licensed Asbestos Works managed by John F Hunt.

Contaminated soil was fed into a three-way screener. The oversize material off the screener was proven to be suitable for re-use. The mid-size component was passed to an 'asbestos picking station' where six operatives hand removed visible asbestos products; in some instance the material was passed though the picking station twice to ensure the re-use criteria of <0.1% asbestos (w/w) was achieved. Fine material coming off the screener was passed to a mill unit where

2% cement was added. The stabilised fines were fed onto a stacking conveyor with misting sprays that deposited the material directly into the excavation.

Throughout the works the air was monitored by an independent Asbestos Analyst to demonstrate that the control measures were suitable.

The processed soil was tested to show compliance with the Remediation Strategy, following which it was placed and compacted to form a development platform 1.5m below the finished site level.

John F Hunt were able to successfully treat 65,000 tonnes of asbestos contaminated soil using innovative techniques that ultimately saved the client over £10,000,000 in disposal costs.

Processing plant | John F Hunt

A number of innovations in remediation have either been proposed and/or implemented by remediation specialists, as exemplified in some of the case studies included in this document and the listing of potential options on page 37. Innovation does not have to be a completely new technology, and can include the innovative use of an existing technology.

Examples of this include the use of:

- Cement impregnated geotextiles for cover systems (see photographs to the right)
- Low temperature driers or thermal desorption units to extract loose fibres by drying + extraction of airborne fibres
- Mechanical screening (dry and/or wet)

Installation of surface barrier geotextile | Curtis Barrier Intl

A comprehensive review of remediation technologies is provided in a report by Bureau KLB for the Dutch Ministry for Infrastructure and Water Management published in 2018. This was driven by the need to reduce the unsustainable volume of asbestos contaminated soils being disposed to landfill in the Netherlands.

Mechanical screening of excavated soil | AECOM

Remedial objectives can shape option choices. For example:

Remove ACM fragments and re-use remaining soil at depth on-site	Physical separation of ACMs using hand picking or mechanical screening?
Remove asbestos fibres and re-use remaining soil at surface on-site	Physical separation of fibres by soil washing or drying + vacuum extraction?
Treat soil + asbestos so that material is suitable for re-use	Stabilisation or fibre destruction technology?
Re-use on-site is not possible/ acceptable	Off-site disposal—can pre-treatment reduce cost by minimising hazardous waste volume?

Figure 13.1 Examples of choices for different Remedial objectives

Factors to consider in remedial selection can include:

- Types of asbestos present
- Levels of asbestos present
- Area / volume of impacted soil
- Timescales
- Client risk perception / avoid land blight
- Sustainability
- Presence of other contamination
- Current and/or proposed land-use
- Site location (and proximity to receptors)
- Occupational health constraints
- Remediation standard required
- Other requirements for soil (e.g. geotechnical)

Removing asbestos contaminated soil | NTP

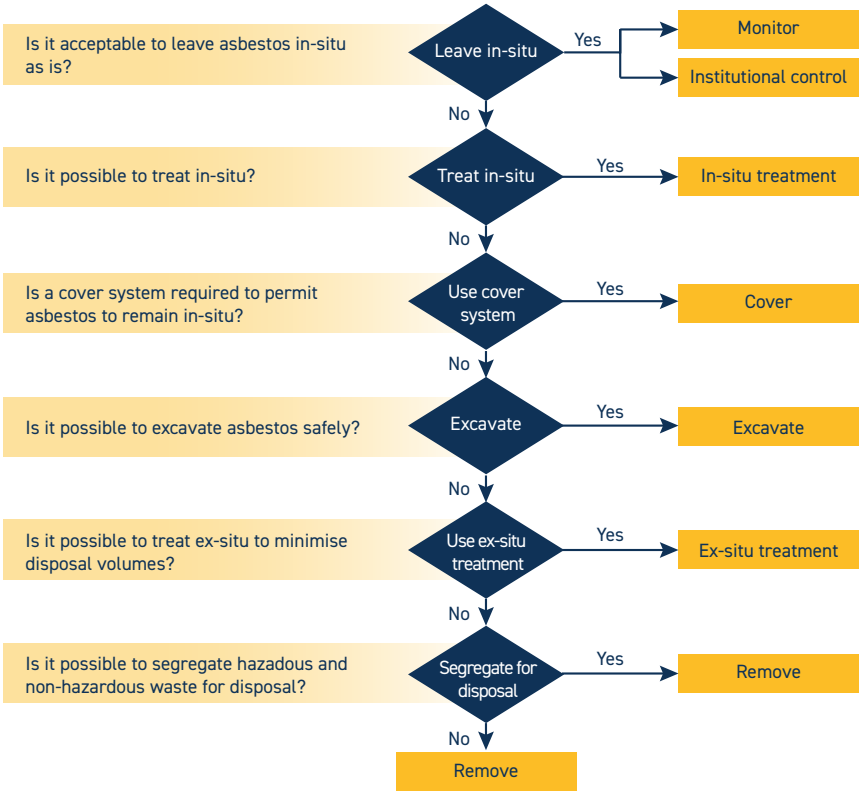


Figure 13.2 Example of a Remediation Decision Flowchart

14 Sustainable Remediation

Trommel screening of excavated soil | McAuliffe

Asbestos in soil remediation options should be considered in accordance with sustainable remediation frameworks (e.g. SuRF). Does the remediation approach represent the best solution when considering environmental, economic and social factors as agreed with stakeholders? How can successful remediation best be achieved with minimal environmental impact? What remedial solution delivers the greatest cost-benefit? Does the selected approach transfer impacts to future generations?

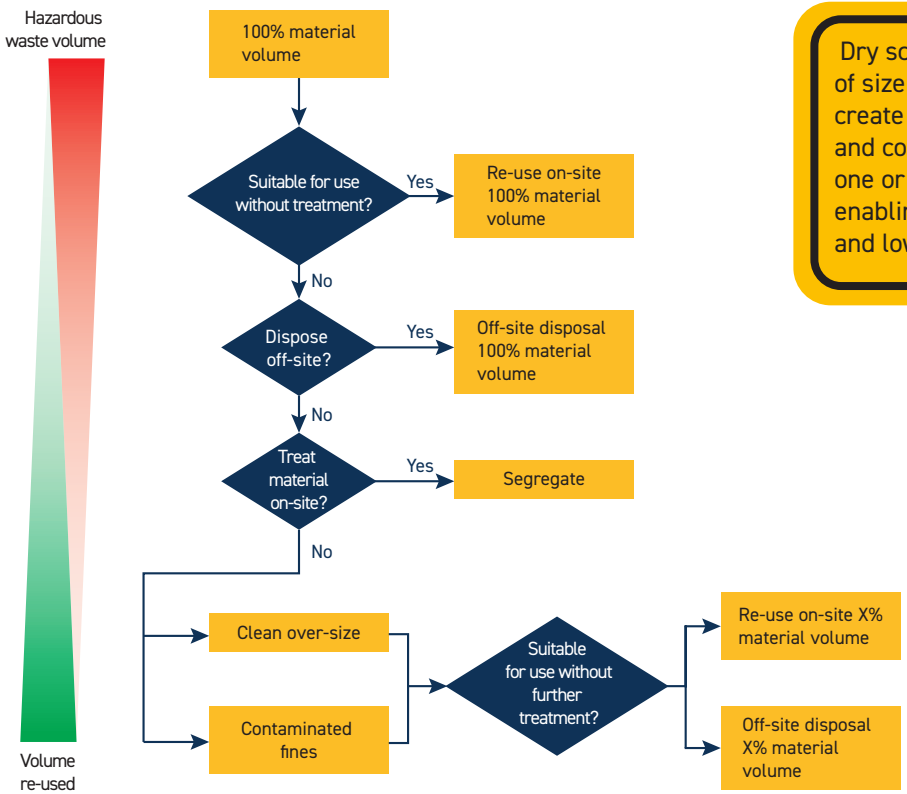
A simple example is the consideration of on-site physical separation to maximise the re-use of

Belt-picking station | McAuliffe


Hand picking of asbestos fragments on a belt | McAuliffe

material on-site and minimise off-site waste disposal. One way of viewing this is via a decision flowchart such as the examples on the following pages which illustrate the decision process and disposal volume reduction created by the adoption of mechanical separation treatment techniques. The use and sequencing of the material screening techniques will be influenced by a number of factors including:

- Cost of treatment versus cost of disposal
- Particle size distribution of material
- Remediation standard



Dry screening and separation of size fractions could create clean size-fractions and concentrate asbestos in one or more size fractions, enabling re-use of some material and lowering disposal volumes

Figure 14.1 An example of a treatment decision process for dry screening as a sustainable option

AECOM developed a remediation and excavated materials management strategy for the redevelopment of a former car part manufacturing facility located in the UK.

The presence of soil contaminants necessitated a remediation and earthworks strategy that had sustainability at its core: maximising reuse of site-won material, and minimising off-site disposal whist at the same time providing a safe development platform. The remediation strategy sought to first treat organic-based contamination through ex-situ bioremediation. Alongside the remediation works, an excavated materials management plan (MMP) was developed under the CL:AIRE Definition of Waste: Development Industry Code of Practice (Code of Practice) to support the earthworks design. Demolition of the former buildings and hard standing occurred alongside the soil remediation under separate contract by a third party. Four stockpiles of screened demolition materials (approx. 26,500 m^3) were prepared for re-use. However, these materials were subsequently found to contain a proportion of asbestos containing materials (ACM) which had in places also contaminated the ground as the stockpiles had been moved around by the contractor.

Asbestos finds | AECOM

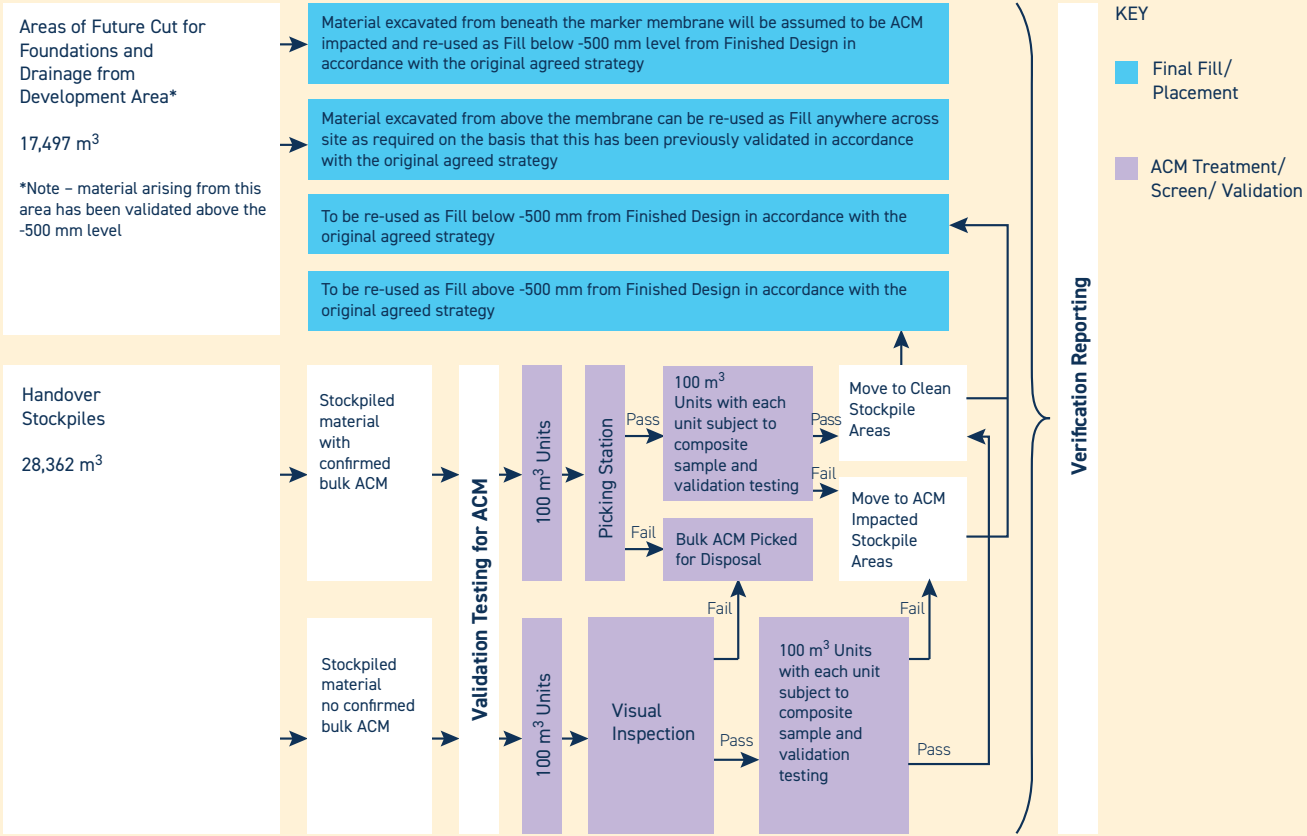


Figure C2.1 Material Management Flowchart

In order for the stockpiled materials to be re-used as part of the consented design a revised strategy was required to ensure the appropriate and safe re-use of these materials. AECOM prepared a detailed assessment on the levels of ACM and asbestos free fibres recorded in the materials and also quantified the level of risk posed by the materials. The soil re-use strategy was developed in accordance with the Control of Asbestos Regulations (2012) and the HSE Approved Code of Practice for managing and working with asbestos (ACoP L143) and gained regulatory agreement.

The strategy developed for the areas of impacted ground centred on a minimum of 500mm validated clean cover being placed below finished design level with the installation of a geotextile marker membrane at the interface of the clean cover and existing ground level. The strategy also made provision for selected 6F2 (UK highway's grade of aggregate) stockpiles impacted with asbestos to be

Installation of the cover system | AECOM

treated through mechanical screening, sorting and hand picking to generate screened material that met agreed validation criteria (<0.001% asbestos). The mechanical screening successfully separating the larger size fractions that were free of asbestos from the smaller size fractions where the asbestos tended to be. The treated larger size fractions could then be recrushed to produce graded material suitable for use in the development without restriction. Stockpiles that were not treated were tracked and used in dedicated areas of the development under 500mm of clean cover with geotextile marker membrane. In areas where soils containing ACM were placed beneath cover, the strategy set out the principles and expectations for a future site management strategy that would need to be adopted upon completion.

The approach taken at this site ensured that the excavated and site-won materials were managed sustainably on site, minimising potential off-site disposal and material import consistent with the original design aspirations and expectations attached to the planning consent.

15 Opportunities for Harmonisation

There are opportunities for and benefits of harmonisation:

- The advocacy of sustainable approaches to risk management
- Greater recognition of the cost-benefit of waste minimisation using ex-situ or in-situ techniques
- A common understanding of risk and a risk-based, proportionate, response to asbestos in soil

There are also barriers to harmonisation that ultimately will limit the degree of harmonisation that is possible. For example:

- Different national legislation and regulatory guidance
- Differing risk perception and/or prioritisation
- Differing scale of issue
- Differing scientific opinion

Figure 15.1 Harmonised approach

16 Concluding Remarks

The problem of asbestos contaminated soil is a common one across Europe, albeit to varying degrees and largely linked to the historic use and management of asbestos in construction and demolition of buildings. It is a recognised challenge for the risk management of existing land use and the re-purposing of brownfield land in some but not all European countries. As result there are well established guidance and procedures in place in some countries and an absence in others. The variability in approaches is marked, with highly detailed and prescriptive regulator-driven guidance in countries such as The Netherlands and Belgium, and less prescriptive industry-led guidance in the UK.

The opportunities for harmonisation across countries are few—certainly in the short-term, and this is driven by the different legislature and regulatory guidance in each country and the large differences in investigation approaches across European countries that have guidance in place. It is also evident that the approaches in countries are not all entirely risk-based. For example, the requirement to remove all visible fragments of asbestos in soil in Italy irrespective of the soil standard in Italy of 1000 mg/kg (which is the EU hazardous waste limit for asbestos). For many countries it is still the case that no risk-based guidance exists for asbestos in soil, and in those countries (unless gross asbestos contamination is identified) the consideration of low or trace levels of asbestos in soil is not a default consideration in site investigation design and land management.

There is therefore a place for advocating good practice in investigation, in risk assessment, and in

remediation, employing the best science and utilising the most sustainable remediation options. This is relevant both for European countries where regulation and guidance is currently absent, and for European countries where guidance is in place.

The pace of change in asbestos regulation and guidance is slow and there are opportunities to learn from countries outside of Europe, for example the work of the US EPA in the USA and the work of the Australasian Land and Groundwater Association (ALGA) and BRANZ Ltd in Australia and New Zealand.

CONTENT DISCLAIMER:
This publication does not necessarily represent the opinions of all NICOLE members.

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Acronyms and Abbreviations

ACM Asbestos containing material

AIB Asbestos insulation board

AISS UK Health and Safety Laboratory (HSL) Proficiency Testing for Asbestos in https://www.hsl.gov.uk/proficiency-testing-schemes/aiss

DRX X-ray diffraction

f/ml a unit of measurement for air (asbestos fibres per millilitre of air sampled)

f/m^3 a unit of measurement for air (asbestos fibres per cubic metre of air sampled)

FTIR Fourier transform infrared spectrometry

HSE UK Health and Safety Executive https://www.hse.gov.uk/

OVAM Public waste agency of Flanders https://www.ovam.be/

PCOM Phase-contrast optical microscopy (alternative acronym used is PCM)

PLM Polarised light microscopy

RIVM Netherlands National Institute for Public Health and the Environment https://www.rivm.nl/en

SCA UK Standing Committee of Analysts
http://standingcommitteeofanalysts.co.uk/

SEM Scanning electron microscopy

SoBRA UK Society of Brownfield Risk Assessment https://sobra.org.uk/

SuRF Sustainable Remediation Forum https://www.sustainableremediation.org/
and https://www.claire.co.uk/projects-and-initiatives/surf-uk

TEM Transmission electron microscopy

TNO Netherlands Organisation for Applied Scientific Research
https://www.tno.nl/en/

VROM Former Netherlands Ministry of Housing, Spatial Planning and the Environment (since 2010 with the Ministry of Infrastructure and the Environment)

US EPA United States Environmental Protection Agency https://www.epa.gov/

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