

APPENDICES

APPENDIX 1 LQM PROPOSAL



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Our Ref: 1607-1

Stroud District Council
Ebley Mill,
Ebley Wharf
Stroud,
Gloucestershire GL5 4UB

FAO: Katie Larner

9 April 2026

Dear Katie

**ASBESTOS CONTAMINATION AT
THE CHALFORD VALE RECREATION GROUND, STROUD
SITE INVESTIGATION, RISK ASSESSMENT AND PUBLIC MEETING**

Land Quality Management Ltd (LQM) are pleased to provide you with this Proposal and Quotation, which is valid for 90 days from the date of issue.

PROPOSAL

Background

Land Quality Management Ltd reviewed the Site Investigation Report for the Chalford Vale Recreation Ground, Stroud from Sanctus Limited (Ref S3565 – Chalford Vale Recreation Centre, Revision C dated 5 December 2025) commissioned by Stroud Council. The LQM review focused on asbestos.

The LQM review identified gaps in the information and recommended sampling of shallow soil and the execution of paired respirable dust and fibre release tests to inform a quantitative human health risk assessment.

Materials for Review

The following report has been provided:

- Sanctus Limited Site Investigation Report for the Chalford Vale Recreation Ground, Stroud, Ref S3565 – Chalford Vale Recreation Centre, Revision C dated 5 December 2025 (242 pp).
- LQM Letter Report, 31 March 2026. Chalford Vale Recreation Ground, Stroud 3rd Party Review - Asbestos Site, reference LQM1607-0

Aim

To carry out a quantitative human health risk assessment of asbestos contamination at the Chalford Vale Recreation Ground.

Objectives

The following objectives need to be completed to achieve the above aim:

1. Take samples from the Chalford Vale Recreation Ground site focusing on shallow soils and material brought to the surface by moles. Samples to be tested for respirable dust and fibre release.
2. Assess the risks to human from asbestos in the ground in the context of Part 2A of the Environmental Protection Act 1990 (As amended) using the above results
3. Attend and contribute to a public meeting on the asbestos at the Chalford Vale Recreation Ground.

Tasks

The above objectives will be achieved by undertaking the following tasks:

1. Attend the Chalford Vale Recreation Ground to take shallow/ near surface soil samples focusing on material brought to the surface by moles
2. Commission paired respirable dust and fibre release tests for between 5 and 10 locations.
3. Conduct a quantitative risk assessment using the information collected and that in the Sanctus report
4. Attend a public meeting provisionally scheduled for the evening of 23 April 2026

Health, Safety, Environment and Waste Considerations

A site specific safety, health and environment (SHE) plan in accordance with the Control of Asbestos Regulations 2012 will be prepared.

The sampling work is considered to be Non Licenced Work with Asbestos (NLW) under CAR (2012).

We rely on Stroud DC to provide access to the Site for sampling purposes.

Reporting

LQM will detail their findings for each task in a full report with supporting appendices.

All reports prepared by LQM undergo internal review prior to final release to the Client. The Client is offered the opportunity to review a draft report prior to it being issued as a final. Any subsequent revision and reissue of the report will be charged at our standard rates with a minimum charge of £xxx.

All LQM reports will be addressed to the organisation commissioning the work (i.e. the signatory on the attached order confirmation letter) and they are the sole party entitled to rely on it.

All reports will be issued in a digital format (usually PDF), which may be distributed and copied as required by the Client. The Client can also be provided with a single signed hard copy, if required. Further printed copies can be provided at additional cost.

Programme

On receipt of a signed Order Confirmation Letter, we will liaise with you to agree final details. At the time of writing, we have capacity to undertake the sampling work on Thursday 23 April 2026 – the same date as the public meeting.

The laboratories carrying out the two tests have a turnaround time of 15 working days from receipt of the samples. Assuming they receive the samples on Monday 27 April we would expect results by 15 May 2026 and would provide a draft report by 22 May allowing Stroud a week for comments and a final would be issued on 5 June 2026.

Invoicing

We will invoice the half the amount upon completion of the sampling works (to cover the analytical costs) and the remainder on issue of our report.

Project Team

Our staff are highly qualified and responsible professionals. LQM staff have been responsible for guidance relating to human health risk assessment, controlled waters risk assessment, the use of bioavailability for DQRA, sustainable remediation. LQM have undertaken a range of projects for local authorities and consultants under planning and Part 2A contexts and thus are familiar with your requirements.

The work would be carried out by Paul Nathanail, who reviewed the Sanctus report.

Dr Paul Nathanail (Director) is a Specialist in Land Condition (SiLC) and a Suitably Qualified Person under the National Quality Mark Scheme (NQMS). He is a former member of the Defra Contaminated Land Expert Panel. Paul brings broad and rare, if not unique, skills and knowledge base to his work in contaminated land related consultancy, research, education and training. He is an active member of the wider community in the UK, elsewhere in Europe and the rest of the world. He brings a meticulous, thorough and unbiased approach to his work as an expert witness that has been much welcomed in the many cases he has been involved in. Paul is past Chair of the National Brownfield Forum and Chair of the board of Directors for the SiLC Register Ltd. He was the SQP for the additional environmental checks around Grenfell Tower.

Paul is the lead author of the CIRIA C733 guidance on asbestos in soil and made ground. He developed the CIRIA online training on non-licensed work with asbestos. He has carried out previous work for Stroud on asbestos in a Part 2A context and has carried out detailed quantitative risk assessments for

asbestos in soil in both Part 2A and planning contexts across England and Wales. He has acted as an expert witness on cases involving asbestos in soil and made ground.

Limitation of Liability

For your information, Land Quality Management Ltd reports carry the following disclaimer:

"This document has been prepared by Land Quality Management Ltd within the terms of the Contract, scope of work, and resources agreed in writing with the Client indicated in this report.

Land Quality Management Ltd has no responsibility to the Client and/or others for any matters outside the scope of the agreement.

This document is intended for the sole use of the Client. Any third party using this report does so entirely at their own risk. LQM makes no warranty or representation whatsoever, express or implied, with respect to the use by a third party of any information contained in this report or its suitability for any purpose. LQM assumes no responsibility for any costs, claims, damages or expenses (including any consequential damages) resulting from use of this report or any information contained within this report by a third party.

LQM obtained, reviewed and evaluated information from the Client and other sources as detailed in the report. LQM's conclusions, opinions and recommendations are based solely on this information.

The conclusions and recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with accepted industry practices at this time and location and as such are not a guarantee that the Site is free from hazardous materials or conditions.

Land Quality Management Ltd possess a non-exclusive and non-transferable Ordnance Survey Licence, but do not possess any right to sub-license any of the rights granted by this licence to any party. Under the terms of Land Quality Management Ltd Ordnance Survey Licence, copying of figures containing Ordnance Survey data or using figures for any purpose other than as part of this report is not permitted."

Terms and Conditions

All work would be undertaken in accordance with our terms and conditions, a copy of which is attached. If you wish us to progress with the work as detailed in this quotation we would require that a signed copy of the order confirmation letter is returned to us. Please note that no work can be undertaken until we are in receipt of the signed order confirmation letter.

Please do not hesitate to contact me on [REDACTED] or via [REDACTED] should you have any queries on this matter.

QUOTATION

The Services will be provided by Paul Nathanail at the cost shown below excluding VAT which we are obliged to charge at the prevailing rate. Testing of samples will be undertaken by Normec laboratories (DETS for respirable dust testing and i2 for fibre release test).

Other tasks to be costed as they are agreed at an hourly rate of £xxx exc VAT.

Assuming sampling and public meeting take place on 23 April 2026

Allow £xxx minimum for five sample locations (£xxx max for 10 locations)

The tests are about £xxx + VAT for each pair of tests (respirable dust & fibre release). The proposed number of samples is a minimum of 5 and a maximum of 10. Sample numbers will depend on how many molehills there are, what they look like on the day and whether there are any other locations with bare earth/ sparse vegetation cover with artificial materials (e.g. potential ACM or glass or ceramics) visible.

Five days at £xxx per day, £xxx + VAT

One day on site (inc T&S); three days reporting (specifically to include advising on which Category the land should be placed in and what actions if; 1 day project management, CAR risk assessment (the work will be NLW) and engagement with laboratory.

ORDER CONFIRMATION

If you wish us to progress with the work as detailed in this Proposal and Quotation we would require that a signed copy of the order confirmation letter is returned to us. Please note that no work can be undertaken until we are in receipt of the signed order confirmation letter.

Please do not hesitate to contact me on [REDACTED] or via [REDACTED] should you have any queries on this matter.

Yours sincerely,

PAUL NATHANAIL

For and on behalf of Land Quality Management Ltd

Enc: Order Confirmation Letter
LQM Terms and Conditions

APPENDIX 2 SANCTUS REPORT



Land Quality Management Ltd
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Our Ref: LQM1607

Stroud District Council
Ebley Mill,
Ebley Wharf
Stroud,
Gloucestershire GL5 4UB
FAO: Katie Larner

31 March 2026

Dear Katie

CHALFORD VALE RECREATION GROUND, STROUD

3RD PARTY REVIEW - ASBESTOS SITE

1. The Chalford Vale Recreation Ground, Stroud has been closed due to the discovery of asbestos following “mole activity bought pieces of glass, ceramics plus pieces of cement bound asbestos to the surface”¹.
2. In December 2025 Stroud District Council (Stroud) commissioned Land Quality Management Ltd (LQM) to undertake a review of previous report work and carry out further risk assessment under Part 2A of the Environmental Protection Act 1990 (as amended) in relation to the aim and objectives listed below. Our original proposal, dated 16 December 2025, (minus cost information) is included as Appendix 1. A signed Order Confirmation letter was received on 18 December 2025.

BACKGROUND

3. Stroud commissioned a Site Investigation Report for the Chalford Vale Recreation Ground, Stroud from Sanctus Limited (Ref S3565 – Chalford Vale Recreation Centre, Revision D dated 17 December 2025). Among other land contamination issues the report considers risks from asbestos in the ground. Stroud have asked for an independent review of the report and assessment of the risks to human health with respect to asbestos.
4. Asbestos is made up of tiny, invisible fibres that can be breathed in or rest on your clothes. Asbestos was used in many industries and buildings until it was banned in 1999. When soil that contains asbestos fibres is disturbed, fibres can be released into the air. When people inhale these fibres they can, some considerable time after exposure, cause mesothelioma and lung cancer.
5. In the UK, Asbestos in the ground is the result of deliberate or accidental human activity. Asbestos can be present as bound/ cemented into solid fragments (referred to as Asbestos Containing Material

¹ Stroud News. 25 September 2025. Valley playing field in Chalford closed due to asbestos.
<https://www.stroudnewsandjournal.co.uk/news/25495740.valley-playing-field-chalford-closed-due-asbestos/>

or ACM in this report), in products such as disk brakes from which fibres can be released or as individual or bundles of fibres. Further details are available on the HSE website² and in CIRIA report C733 “*Asbestos in soil and made ground: a guide to understanding and managing risk*”³.

Materials for Review

6. The following report has been provided:

- Sanctus Limited Site Investigation Report for the Chalford Vale Recreation Ground, Stroud, Ref S3565 – Chalford Vale Recreation Centre, Revision D dated 17 December 2025 (242 pp).

AIM

7. To assess the adequacy of the Sanctus report in understanding the risks to human health from asbestos in the ground.

OBJECTIVES

8. The following objectives need to be completed to achieve the above aim:

1. Assess the adequacy of the evidence in the Sanctus report and evaluate its conformity to current good practice in assessing risks to human health, specifically with respect to asbestos in ground, under Part 2A
2. Assess the risks to human from asbestos in the ground in the context of Part 2A of the Environmental Protection Act 1990 (As amended) using the information in the Sanctus report.
3. Assess the need for further investigation to ensure the quantitative risk assessment is robust.

LIMITATION OF LIABILITY

9. This document has been prepared by Land Quality Management Ltd within the terms of the Contract, scope of work, and resources agreed in writing with the Client indicated in this report.
10. Land Quality Management Ltd has no responsibility to the Client and/or others for any matters outside the scope of the agreement.
11. This document is intended for the sole use of the Client. Any third party using this report does so entirely at their own risk. LQM makes no warranty or representation whatsoever, express or implied, with respect to the use by a third party of any information contained in this report or its suitability for any purpose. LQM assumes no responsibility for any costs, claims, damages or expenses (including any consequential damages) resulting from use of this report or any information contained within this report by a third party.
12. LQM obtained, reviewed and evaluated information from the Client and other sources as detailed in the report. LQM’s conclusions, opinions and recommendations are based solely on this information.
13. The conclusions and recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with accepted industry practices at this time and location and as such are not a guarantee that the Site is free from hazardous materials or conditions.

² <https://www.hse.gov.uk/asbestos/location-materials.htm>

³ Nathanail et al. 2014 <https://www.ciria.org/ItemDetail?iProductCode=C733>

14. Land Quality Management Ltd possess a non-exclusive and non-transferable Ordnance Survey Licence, but do not possess any right to sub-license any of the rights granted by this licence to any party. Under the terms of Land Quality Management Ltd Ordnance Survey Licence, copying of figures containing Ordnance Survey data or using figures for any purpose other than as part of this report is not permitted.

REVIEW OF SANCTUS REPORT

15. The completed review of the Sanctus report is presented in Appendix 2.
16. The review has been carried out by following the process for auditing a report that is outlined in the National Quality Mark Scheme (NQMS) prior to a declaration of document adequacy by a Suitably Qualified Person (SQP) although a declaration is not intended to be submitted for this project.
17. In order to have confidence in the conclusions that are presented within any report it is necessary for clients, regulators and stakeholders to know that the data has been audited in a way that ensures that it is fit for purpose. To this end the SQP is directed to apply a list of critical questions and challenges in using their experience to assess the suitability of any product.
18. The questions have been compiled by regulators and practitioners experienced in the peer review of land contamination management data. They are not meant to be exhaustive in their coverage, but they do focus attention on those aspects of submissions that tend to have the most influence on decisions made and regulatory acceptability. The lists are not meant to duplicate or replace other standard checklists or quality management and control measures that are also used to ensure the factual (as opposed to interpretative) content, accuracy or style of reports.
19. The completed review of the Sanctus report is presented in Appendix 2. Detailed comments are included in the review. The main concerns revolve around insufficient samples tested for fibre release, the absence of respirable dust testing, the failure to use the 2021 SoBRA risk assessment tool and a risk evaluation that does not reflect the Part 2A legal context.

ASBESTOS IN SOIL

20. Sanctus reported visible potential asbestos containing material (pACM) in disturbed ground brought to the surface by moles. Potential ACM were encountered in 10 pACM fragments from 4 no hand pit locations:
- STP03 at 0.40 m bgl (two fragments possible originally one but broken before sampling),
 - STP11 at 0.40 m bgl (five fragments),
 - STP16 at 0.30 m bgl, and
 - STP17 at 0.10 m bgl, and
 - also at surface in the vicinity of STP11.
21. These locations are in the centre of the playing field area. All these samples were described as “chrysotile cement” but no quantification information was provided (Sanctus Table 5-1).
22. Asbestos was also reported (Table 1) after testing of 15 samples of soil from 13 locations was carried out and reported in Sanctus Table 5-2. Fourteen of these samples contained chrysotile. One sample (STP12 at 0.15 – 0.60m) contained a mixture of Amosite, Crocidolite and Chrysotile as Loose Fibrous Debris; the shallower sample (STP12 at 0.05 – 0.15 m bgl) at that location comprised chrysotile in the form of “Chrysotile – Loose Fibrous Debris”.

23. ACM were identified by Sanctus (Section 5.1.1 page 16) primarily in the eastern part of the site, particularly within the playing field, in 10 out of 13 locations excavated. In the western part of the site (specifically the play area) asbestos contamination was encountered in 3 out of 7 locations. Ongoing mole activity could bring further soils impacted with asbestos to the surface.

Table 1 Summary of asbestos analysis within soil matrices during further investigation work undertaken in October 2025 (Sanctus Table 5-2)

Asbestos in Soils – Free Fibre Identification			
Hand Pit Location and Sample ID	Sample Depth (m bgl)	Asbestos Type	Quantification (w/w %)
STP02	0.05 – 0.50	Chrysotile – Loose Fibres	<0.10
STP03	0.05 – 0.60	Chrysotile – Loose Fibrous Debris, Asbestos Cement	0.26
STP04	0.05 – 0.20	Chrysotile – Sheeting/Board Debris, Asbestos Cement	9.801
STP04	0.20 – 0.60	Chrysotile – Loose Fibrous Debris, Sheeting/Board Debris	2.29
STP08	0.40 – 0.60	Chrysotile – Loose Fibres	<0.001
STP09	0.05 – 0.30	Chrysotile – Loose Fibres	<0.001
STP10	0.25 – 0.60	Chrysotile – Loose Fibres	<0.001
STP11*	0.05 – 0.20	Chrysotile – Asbestos Cement, Loose Fibrous Debris	0.78
STP12	0.05 – 0.15	Chrysotile – Loose Fibrous Debris	0.002
STP12	0.15 – 0.60	Amosite, Crocidolite and Chrysotile – Loose Fibrous Debris	1.36
STP13	0.05 – 0.20	Chrysotile – Loose Fibres	<0.001
STP15	0.15 – 0.60	Chrysotile – Loose Fibrous Debris	0.102
STP16	0.05 – 0.20	Chrysotile – Loose Fibres	<0.001
STP17*	0.40 – 0.60	Chrysotile – Loose Fibres	<0.001
STP19	0.05 – 0.60	Chrysotile – Loose Fibres	<0.001

* “Two soil samples from STP11 and STP17 were analysed for asbestos dustiness”

24. Sanctus reported that background air monitoring during the investigation while soils containing asbestos were being disturbed had been carried out. No exceedances of the clearance indicator⁴ of <0.010 f/ml, let alone the control limit⁵ of 0.1f/ml, were recorded.
25. Sanctus report that they commissioned two “asbestos dustiness tests”, including on “the ‘worst case’ sample retrieved from the Chalford Vale Recreational Centre.” However the two samples did not

⁴ HSE (<https://www.hse.gov.uk/pubns/priced/hsg248.pdf>) notes that “The clearance threshold specifies a maximum acceptable limit for airborne fibre levels following asbestos removal.”

⁵ HSE (<https://www.hse.gov.uk/asbestos/faq.htm>) notes that the control limit of 0.1 asbestos fibres per cubic centimetre of air (0.1 f/cm³) is the concentration of asbestos fibres in any localised atmosphere, measured and averaged over a continuous period of four hours; it is not a 'safe' level and work activities involving asbestos should be designed to be as far below the control limit as possible.

have the highest concentration of fibres (Table 1) indeed one had asbestos at a concentration below the limit of quantification.

26. There is no suggestion that the material reportedly brought to the surface by mole activity was sampled. Testing such material has in LQM's experience been found to be very informative. It has the advantage that the material is preferentially focused on the finer fraction of the soil and therefore on the most likely to contain and hence release asbestos fibres. It is also at the surface and unvegetated to more likely to be dessicated and hence release asbestos fibres.

QUANTITATIVE RISK ASSESSMENT USING THE INFORMATION IN THE SANCTUS REPORT

27. A quantitative risk assessment based on the information in the Sanctus report has been carried out using the "Guidelines for Airborne Concentrations of Asbestos Fibres in Ambient Air: Implications for Quantitative Risk Assessment"⁶ released by SoBRA in January 2021 and supported by an Excel spreadsheet to calculate excess lifetime risk of lung cancer and mesothelioma. This approach provides a more robust quantitative risk assessment than that presented in CIRIA C733 that was relied upon by Sanctus.
28. Sanctus provided parameter values to populate a quantitative risk assessment (Table 2). and the values for the way people use the land have been supported by Stroud as being reasonable.

Table 2 Dustiness Modelling assumptions and input values (Sanctus Table 5-6)

Model Parameter	Input Value
Critical receptor	Visiting children, as most likely to have a greater exposure frequency (weekly)
The age at which exposure started	1 years old
The age at which exposure will finish	18 years old
Total exposure years (Yi)	17 years
Exposure duration (Ti)	2 hours
Exposure frequency (Fi)	52 visits per year (reduced to 14.56 visits assuming 28% dry day visits per year)
Estimated airborne concentrations (Ci)	0.02 (Addison et al 1988 Sandy Soil) f/ml
Realistic observed airborne concentrations (Ci2) Dustiness testing	9.00 f/ml (limit of quantification from the i2 laboratory testing equipment) – reduced to 0.001 f/ml from the worst case actual fibre count concentration during dustiness test.

29. The receptor parameter values in Table 2 can be used in the SoBRA spreadsheet to estimate the excess lifetime risk of lung cancer and mesothelioma. The tool also requires the concentration of fibres and the type of asbestos.
30. The most prevalent type of asbestos is chrysotile (Table 1) and this is present in samples described as comprising loose fibres.

⁶ <https://sobra.org.uk/asbestos/guidelines-for-airborne-concentrations-of-asbestos-fibres-in-ambient-air-implications-for-quantitative-risk-assessment/>

-
31. The laboratory tests did not give a concentration of airborne fibres as their reporting limit was not exceeded. However this reporting limit is much higher than the levels needed to inform human health risk assessment for inhalation of asbestos fibres.
32. For each of the two samples, 4 litres of air were analysed and the fibre release process was carried out 3 times for each sample. For STP11 3, 4 and 2.5 (sic) fibres were counted on 200 graticules under the microscope. For STP17 0, 1 and 2 fibres were counted on 200 graticules. Normec i2 confirmed that counting more than 200 graticules was not possible as it “would deviate from the requirements of fibre counting that we are mandated to by UKAS.”
33. Taking the highest fibre count of 4 in 4 litres of air would give an unaccredited concentration of 0.001 fibre per cubic centimetre, some 1% of the asbestos clearance indicator discussed above. It should be noted that the test records all fibres and not specifically asbestos fibres.
34. Assuming a concentration of 0.001 f/ml would give a combined risk of lung cancer and mesothelioma of 3.1×10^{-8} for chrysotile and 1.6×10^{-5} for crocidolite. Given the results in Table 1 the chrysotile value is considered to be a more realistic risk estimate but in either case there are considerable uncertainties. I have not been able to follow or reproduce the calculations that led to the Sanctus estimate of excess lifetime risk of 17.5×10^{-5} assuming crocidolite however this figure is based on default rather than site specific values from idealised soils report in CIRIA C733 from the work of Hogson and Darnton.
35. Sanctus assume exposure from only half the site (Sanctus Table 5-7). This would have the effect of halving the above combined risk assuming the receptors spent time across the whole Site. Sanctus also consider the extent of vegetation and soil moisture content – both of which would reduce fibre release and hence risk. However Sanctus also report “the presence of site vegetation cover” - “>95% of the park’s surface during the summer’s investigation period” was vegetated and “mean average soils [moisture] concentrations [sic] of 23%, and a maximum of 45%”. The fibre release test was carried out on dry soils and so would represent an overestimate of real world fibre release. If only 5% of the Site had disturbed or partially vegetated surface than the above risk estimates would be reduced by a factor of 20.
36. The limited information available suggests that the combined excess lifetime cancer risk for lung cancer and mesothelioma from the materials Sanctus tested is less than 10^{-6} , a conservative level of minimal risk.
37. The actual risk could be lower if:
- the respirable dust fraction of the soils is considered
 - not all the fibres released by the two tested samples were asbestos
 - asbestos fibres comprised chrysotile rather than crocidolite
38. The actual risk could be higher if:
- material brought to the surface by mole action is preferentially contaminated with asbestos fibres due to the finer fraction that moles will disturb
 - asbestos fibres comprised crocidolite rather than chrysotile
-

FURTHER INVESTIGATION IF ANY TO ENSURE THE QUANTITATIVE RISK ASSESSMENT IS ROBUST

39. The following additional information would help reduce uncertainty in the understanding of the Site:

- Characterisation and sampling of mole hills
- Sampling of materials around potential ACM at the surface as shown on some of the Sanctus photographs
- PAIRED Respirable Fibres in Respirable Dust (offered by Normec DETS) and Asbestos Dustiness (offered by Normec i2) testing

CONCLUSIONS

40. The review of the Sanctus report (Appendix 2) identified concerns around insufficient samples having been tested for fibre release, the absence of respirable dust testing, the failure to use the 2021 SoBRA risk assessment tool and a risk evaluation that does not reflect the Part 2A legal context.
41. The evidence does not indicate that the Site meets the definition of contaminated land under Part 2A – i.e. does not fall within categories 1 or 2. However the available evidence does not allow a decision on whether or not the Site falls into Category 4.

Yours sincerely,



PAUL NATHANAIL

For and on behalf of Land Quality Management Ltd

Enc: Appendix 1 LQM Proposal
Appendix 2 Review of Sanctus Report
Appendix 3 Risk worksheets

Appendix 1 LQM Proposal



Land Quality Management Ltd
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Our Ref: 1607

Stroud District Council
Ebley Mill,
Ebley Wharf
Stroud,
Gloucestershire GL5 4UB
FAO: Katie Larner

16 December 2025

Dear Katie

CHALFORD VALE RECREATION GROUND, STROUD

3RD PARTY REVIEW - ASBESTOS SITE

Land Quality Management Ltd (LQM) are pleased to provide you with this Proposal and Quotation, which is valid for 30 days from the date of issue.

PROPOSAL

Background

Stroud have commissioned a Site Investigation Report for the Chalford Vale Recreation Ground, Stroud from Sanctus Limited (Ref S3565 – Chalford Vale Recreation Centre, Revision C dated 5 December 2025). Among other land contamination issues the report considers risks from asbestos in the ground. Stroud have asked for an independent review of the report and assessment of the risks to human health with respect to asbestos.

Materials for Review

The following report has been provided:

- Sanctus Limited Site Investigation Report for the Chalford Vale Recreation Ground, Stroud, Ref S3565 – Chalford Vale Recreation Centre, Revision C dated 5 December 2025 (242 pp).

Aim

To assess the adequacy of the Sanctus report in understanding the risks to human health from asbestos in the ground.

Objectives

The following objectives need to be completed to achieve the above aim:

1. Assess the adequacy of the evidence in the Sanctus report
2. Assess the risks to human from asbestos in the ground in the context of Part 2A of the Environmental Protection Act 1990 (As amended)

Tasks

The above objectives will be achieved by undertaking the following tasks:

1. Review the Sanctus report and evaluate its conformity to current good practice in assessing risks to human health, specifically with respect to asbestos in ground, under Part 2A
2. Conduct a quantitative risk assessment using the information in the Sanctus report
3. Advise on the need for any further investigation if any to ensure the quantitative risk assessment is robust

Health, Safety, Environment and Waste Considerations

No site work is envisaged. Should any site visits become necessary will be carried out under a site specific safety, health and environment (SHE) plan.

Reporting

LQM will detail their findings for each task in a Letter Report or full report with supporting appendices.

All reports prepared by LQM undergo internal review prior to final release to the Client. Any subsequent revision and reissue of the report will be charged at our standard rates with a minimum charge of £xxx.

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Invoicing

We will invoice the full amount upon issue of our report.

Project Team

Our staff are highly qualified and responsible professionals. LQM staff have been responsible for guidance relating to human health risk assessment, controlled waters risk assessment, the use of bioavailability for DQRA, sustainable remediation. LQM have undertaken a range of projects for local authorities and consultants under planning and Part 2A contexts and thus are familiar with your requirements.

The work would be carried out by Paul Nathanail.

Dr Paul Nathanail (Director) is a Specialist in Land Condition (SiLC) and a Suitably Qualified Person under the National Quality Mark Scheme (NQMS). He is a former member of the Defra Contaminated Land Expert Panel. Paul brings broad and rare, if not unique, skills and knowledge base to his work in contaminated land related consultancy, research, education and training. He is an active member of the wider community in the UK, elsewhere in Europe and the rest of the world. He brings a meticulous, thorough and unbiased approach to his work as an expert witness that has been much welcomed in the many cases he has been involved in. Paul is past Chair of the National Brownfield Forum and Chair of the board of Directors for the SiLC Register Ltd. He was the SQP for the additional environmental checks around Grenfell Tower.

Paul is the lead author of the CIRIA C733 guidance on asbestos in soil and made ground. He developed the CIRIA online training on non-licenced work with asbestos. He has carried out previous work for Stroud on asbestos in a Part 2A context and has carried out detailed quantitative risk assessments for asbestos in soil in both Part 2A and planning contexts across England and Wales. He has acted as an expert witness on cases involving asbestos in soil and made ground.

Limitation of Liability

For your information, Land Quality Management Ltd reports carry the following disclaimer:

"This document has been prepared by Land Quality Management Ltd within the terms of the Contract, scope of work, and resources agreed in writing with the Client indicated in this report.

Land Quality Management Ltd has no responsibility to the Client and/or others for any matters outside the scope of the agreement.

This document is intended for the sole use of the Client. Any third party using this report does so entirely at their own risk. LQM makes no warranty or representation whatsoever, express or implied, with respect to the use by a third party of any information contained in this report or its suitability for any purpose. LQM assumes no responsibility for any costs, claims, damages or expenses (including any consequential damages) resulting from use of this report or any information contained within this report by a third party.

LQM obtained, reviewed and evaluated information from the Client and other sources as detailed in the report. LQM's conclusions, opinions and recommendations are based solely on this information.

The conclusions and recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with accepted industry practices at this time and location and as such are not a guarantee that the Site is free from hazardous materials or conditions.

Land Quality Management Ltd possess a non-exclusive and non-transferable Ordnance Survey Licence, but do not possess any right to sub-license any of the rights granted by this licence to any party. Under the terms of Land Quality Management Ltd Ordnance Survey Licence, copying of figures containing Ordnance Survey data or using figures for any purpose other than as part of this report is not permitted."

Terms and Conditions

All work would be undertaken in accordance with our terms and conditions, a copy of which is attached. If you wish us to progress with the work as detailed in this quotation we would require that a signed copy of the order confirmation letter is returned to us. Please note that no work can be undertaken until we are in receipt of the signed order confirmation letter.

Please do not hesitate to contact me on [REDACTED] or via [REDACTED] should you have any queries on this matter.

QUOTATION

The Services will be provided by Paul Nathanail at a cost of £xxxx excluding VAT which we are obliged to charge at the prevailing rate. Other tasks to be costed as they are agreed at an hourly rate of £xxx exc VAT.

ORDER CONFIRMATION

If you wish us to progress with the work as detailed in this Proposal and Quotation we would require that a signed copy of the order confirmation letter is returned to us. Please note that no work can be undertaken until we are in receipt of the signed order confirmation letter.

Please do not hesitate to contact me on [REDACTED] or via [REDACTED] should you have any queries on this matter.

Yours sincerely,

[REDACTED]

PAUL NATHANAIL

For and on behalf of Land Quality Management Ltd

Enc: Order Confirmation Letter
LQM Terms and Conditions

ORDER CONFIRMATION LETTER

Stroud District Council
 Ebley Mill,
 Ebley Wharf
 Stroud,
 Gloucestershire GL5 4UB
 FAO: Katie Larner

16 December 2025

Dear Katie

3RD PARTY REVIEW - ASBESTOS SITE

Further to our letter (ref: 1607) of 16 December 2025 detailing our proposal ("Proposal") and our related quotation ("Quotation"), Land Quality Management Ltd hereby agrees to carry out the activities and services specified in the Proposal ("Services") in consideration for the fees set out in the Quotation and in accordance with our standard terms and conditions ("Conditions"), which are attached to the Quotation.

Kindly confirm acceptance of the Proposal, the Quotation and the Conditions by signing and dating this letter and returning a copy to us.

Yours sincerely,

Paul Nathanail

Director

The signatory of this letter must either be the Client, or someone with actual authority to sign this letter on the Client's behalf and bind the Client contractually (i.e. a Director or Partner of the Client).

I confirm that I have this authority:

YES ☐ / NO ☐

I/We of..... ("the Client" for the purposes of the Conditions) hereby appoint Land Quality Management Ltd to carry out the Services and confirm that we have read, have understood and accept the Proposal, the Quotation and the Conditions.

The purchase order number for the Services is

Name

Date.....

Signature

Position.....

Terms and Conditions

1 Introduction

1.1 These terms and conditions ("Conditions") set out the basis upon which LQM shall provide the Services to the Client under the Contract and, save as otherwise expressly agreed in writing and signed by a Director of LQM, these Conditions shall apply to the exclusion of any terms and conditions of the Client.

1.2 The Contract takes effect upon signature of the Order Confirmation Letter by the Client or on the Client's behalf. Where the Order Confirmation Letter is signed on the Client's behalf, the Client hereby confirms that: (i) the signatory has the authority to act on behalf of the Client and to bind the Client to the Contract; (ii) all details of the Client inserted in the Order Confirmation Letter are accurate and up-to-date; and (iii) by the signatory signing the Order Confirmation Letter on the Client's behalf, the Client accepts the Proposal, the Quotation and these Conditions and agrees to be bound by the Contract.

1.3 In the event that the Proposal, the Quotation and these Conditions are not expressly accepted by signature of the Order Confirmation Letter by the Client or on the Client's behalf, they shall be deemed to have been accepted by the Client and the Contract shall come into effect upon LQM starting to provide the Services at the Client's request.

1.4 In the event of any conflict between these Conditions and any additional conditions set out in the Proposal, those additional conditions shall take precedence subject to Condition 1.7.

1.5 There are Special Conditions for Training Courses (Section 16), Webinars (Section 17), Publications (Section 18) and Software (Section 19).

1.6 In the event of any conflict between these Conditions and any Special Conditions listed below under Special Conditions (Conditions 16, 17, 18 or 19) those Special Conditions shall take precedence.

1.7 Any variation to these Conditions (including Special Conditions below in Conditions 16, 17, 18 or 19) shall be inapplicable unless expressly agreed in writing and signed by a Director of LQM.

2 Definitions

2.1 In these Conditions the following words and phrases shall have the following meanings:

- (a) "Client" means the contracting party to whom LQM shall provide the Services under the Contract;
- (b) "Contract" means the contract between LQM and the Client for the provision of the Services, consisting of the Proposal, the Quotation and these Conditions;
- (c) "LQM" means Land Quality Management Ltd and includes, unless the context otherwise requires, its subcontractors, agents and employees;
- (d) "Order Confirmation Letter" means the letter attached to these Conditions, by which the Client confirms its acceptance of the Proposal, the Quotation and these Conditions and agreement to be bound by the Contract through signature of the letter by the Client or on its behalf;
- (e) "Proposal" means the written document in which LQM details the activities and services it shall provide to the Client under the Contract;
- (f) "Quotation" means the written quote in which LQM details the fees it shall charge for providing the Services to the Client under the Contract;
- (g) "Services" means the activities and services to be provided by LQM to the Client under the Contract. Services include: Consultancy Services, Courses, Webinars, Publications and Software;
- (h) "Consultancy Services" means professional advice or other expert assistance and comprises the activities and services to be provided by LQM to the Client under the Contract as set out in the Proposal. For the avoidance of doubt, Courses, Webinars and Publications are not Consultancy Services;
- (i) "Courses" means presentation(s), lecture(s), workshop(s) or seminar(s) delivered in person for the purpose of providing training;
- (j) "Webinars" means presentation, lecture, workshop or seminar that is transmitted online and delivered for the purpose of providing training; and
- (k) "Publications" means a book or similar which provides generic information on a subject and is sold for the purpose of providing information not advice.
- (l) "Software" means a program which runs on a computer. It includes standalone programs (eg KeyCSM) and software built on other programs eg excel sheets for specific purposes (eg PAH Profiling Tool). The term "Software" includes licences to use software.

2.2 Headings have been included for convenience only and shall not affect the construction or interpretation of these Conditions.

3 LQM's Obligations

3.1 LQM shall exercise all reasonable skill, care and diligence in providing the Services to the Client in accordance with the Proposal.

3.2 LQM intends to employ the methods, procedures, techniques, personnel and sources of information set out in the Proposal but reserves the right to vary these at its discretion. Any significant variations will be undertaken in consultation with the Client.

3.3 Except where it is difficult for LQM to specify in the Proposal the precise nature and scope of the activities required to perform the Services prior to their commencement, the nature and scope of the Services will not be materially altered by LQM without the Client's consent. In the event that LQM or the Client considers during the provision of any Services that a material change or addition to the nature and/or scope of those Services will be required in order for them to be properly carried out, it shall notify the other of such change or addition and enter into negotiations with the other in good faith in order to effect any consequent changes required to the terms of the Proposal, the Quotation and/or any other terms of the Contract.

4 Fees and Payment

4.1 In consideration of the provision of the Services the Client shall pay LQM the fees as set out in the Quotation (as amended from time to time in the light of any agreed change or addition to the nature and/or scope of Services). All fees do not include: (i) VAT, which will be charged to the Client at the prevailing rate; and (ii) any reasonable out-of-pocket expenses incurred by LQM in providing the Services to the Client and agreed with the Client in advance, which will be charged to the Client at cost.

4.2 All payments to LQM shall be made against LQM's invoices, which (unless otherwise agreed in writing) LQM shall be entitled to present to the Client on or at any time after the supply of the Services to which the invoice relates. All payments shall be made within 30 days of the date of LQM's invoice. All payments shall be made by the Client by cheque or bank transfer to the account of LQM at a bank to be nominated in writing by LQM.

4.3 Where any payment owed by the Client to LQM under the Contract is overdue: (i) interest will be chargeable on the sum due before and after judgment on a day-to-day basis at an annual rate of 8 per cent above the Bank of England base rate from time to time applicable, until the sum due is paid; and (ii) LQM may withhold any supply of Services due to be made under the Contract until arrangements as to payment or credit have been established which are satisfactory to LQM.

5 Rights

5.1 The ownership of all intellectual property rights and proprietary rights in any report, survey, opinion or other document prepared by LQM as part of the Services, whether provided in writing or on magnetic or any other media, shall remain vested in LQM.

5.2 In respect of Consultancy Services, LQM grants the Client a non-exclusive, irrevocable, royalty-free licence to use and reproduce any report, survey, opinion or other document prepared by LQM as part of the Services and all intellectual property rights in any such report, survey, opinion or document for any purposes for which the same was prepared ("Purposes"), provided that LQM shall not have any liability for any use or reproduction by the Client or any third party of any such report, survey, opinion or document or any of the intellectual property rights therein for any purpose other than the Purposes and the Client shall indemnify LQM against any loss, damage, costs or expenses of whatsoever nature suffered by LQM as a result of any such use or reproduction. For the avoidance of doubt para 5.2 does not apply to Courses, Webinars, Publications or Software.

5.3 In respect of Courses, Webinars and Publications LQM are the sole owner of intellectual property rights. It is the Client's responsibility to ensure materials from Courses and Webinars Publications and Software are not reproduced, stored or transmitted to others without prior consent from LQM. The Client shall indemnify LQM against any loss, damage, costs or expenses of whatsoever nature suffered by LQM as a result of any unauthorised reproduction or infringement of copyright.

5.4 In respect of Software, LQM may be the sole owner, joint owner or have a licence to sell the Software. It is the Client's responsibility to ensure that Software is not reproduced or transmitted to others without prior consent from LQM. The Client shall indemnify LQM against any loss, damage, costs or expenses of whatsoever nature suffered by LQM as a result of any unauthorised reproduction or infringement of copyright.

5.5 All reports, surveys, opinions and other documents prepared or commissioned by LQM as part of the Consultancy Services will be treated by LQM as confidential information of the Client and will not be disclosed or passed to any third party by LQM without the prior consent of the Client, unless the same shall have already been made public by the Client or otherwise shall have entered the public domain otherwise than through a breach by LQM of this Condition.

5.6 All the reports, surveys, opinions and other documents referred to in Condition 3.1 will be prepared exclusively for the Client. LQM will accept no liability of whatsoever nature for any claims from any third parties to whom the contents of such reports, surveys, opinions and other documents are made known directly or indirectly by the Client and the Client shall indemnify LQM against any loss, damage, costs or expenses of whatsoever nature suffered by LQM as a result of any such claim.

5.7 Save as otherwise expressly agreed in writing between the parties, the Client warrants that its publication in the open literature of any reports prepared in whole or in part by LQM as part of the Services, or of any other works derived in whole or in part from any such report, will acknowledge the authorship, co-authorship or other contribution of LQM in accordance with usual academic conventions.

5.8 Save as otherwise expressly agreed in writing between the parties, LQM retains the right to include reference to the Services in its promotional material, provided that no such reference shall include any confidential material of the Client.

5.9 Materials provided by LQM may not be published on the web except by express agreement in writing between the parties. The Client warrants that any materials which are to be published on the web will be in a view only format.

6 Obligations of the Client

6.1 Throughout the continuation of the Contract, the Client shall insofar as is reasonably possible afford LQM such access to such sites and facilities, samples, information, records and other material of the Client as LQM may require to provide the Services to the Client under the Contract, provided that the Client shall be obliged to afford such access only during its normal business hours. Furthermore, the Client shall:

6.2 advise LQM of the rules and regulations which are then in force for the conduct of personnel at any site at which LQM is providing the Services and LQM shall comply with all rules and regulations of which it is advised by the Client;

6.3 make available all such working space and facilities at any site at which LQM is providing the Services as LQM may reasonably require. Such working space shall be comparable to but not better than those given by the Client to its own personnel of similar status;

6.4 make available such appropriate personnel to liaise with LQM as LQM may reasonably require to provide the Services to the Client under the Contract;

6.5 secure and otherwise keep safe all and any property of LQM located at any site at which LQM is providing the Services; and

6.6 take all reasonable steps to comply with applicable health and safety requirements while LQM is present at any site at which it is providing the Services.

7 Limitation of LQM's Liability

7.1 LQM does not exclude or restrict its liability for death or personal injury resulting from its negligence or for fraudulent misrepresentation.

7.2 Save as otherwise expressly provided in these Conditions, in the event that any of the Services are materially deficient as a result of LQM failing to provide the same in accordance with Condition 3.1, the extent of LQM's liability shall be limited to the re-performance of those Services at its own cost up to the amount paid by the Client for such Services under the Contract.

7.3 Save as otherwise expressly provided in these Conditions, LQM shall not be liable for any economic loss (including, but not limited to, loss of profits, business, contracts, revenue, goodwill, data and anticipated savings) or any indirect or consequential loss of whatever nature or kind and howsoever sustained or occasioned.

7.4 Save as otherwise expressly provided in these Conditions, LQM's liability to the Client under the Contract shall cease upon the expiry of one year from the termination of the Contract, save in respect of proceedings issued to LQM in writing by the Client prior to the expiry of such period.

8 Insurance

LQM undertakes to obtain and maintain insurance cover for Public Liability and, on request, Professional Indemnity Insurance during the course of providing the Services to the Client under the Contract. Details of these Insurance policies will be made available by LQM to the Client upon request.

9 Confidentiality

Neither party shall disclose to any third party any confidential information of or about the other received in the course of the Contract, except for information in the public domain other than through a breach of this Condition or any other obligation of confidence.

10 Termination

10.1 The Contract shall terminate automatically on completion of the Services by LQM in accordance with the Proposal.

10.2 Either party may immediately terminate the Contract by giving the other notice in writing if the other: (i) commits a breach of the Contract, which (in the case of a breach capable of remedy) shall not have been remedied within 30 days of the receipt by the other of a notice from the innocent party identifying the breach and requiring its remedy; or (ii) becomes unable to pay its debts or ceases to carry on business.

10.3 Termination of the Contract for any reason shall not affect any rights and liabilities that have accrued to either party prior to termination, including (but not limited to) LQM's right to receive payment for work done under the Contract up to and including any notice period.

11 Force Majeure

11.1 LQM shall not be in breach of the Contract if the provision of any of the Services is delayed or prevented by the Client's failure to provide any access, facilities, samples, information, records or other material, fire, storm or tempest, unavailability of labour, materials or services, process shutdown, Acts of God or the public enemy, riot, civil commotion, war or terrorism, strikes, labour disputes or industrial action, act of government or state or any other event beyond LQM's reasonable control ("Event of Force Majeure").

11.2 If at any time LQM has to rely on Condition 11.1, LQM shall promptly notify the Client of the nature and extent of the Event of Force Majeure giving rise to its reliance on Condition 11.1.

11.3 If any Event of Force Majeure lasts for a continuous period in excess of 30 calendar days after the date on which it began, either party may give notice to the other party terminating the Contract and LQM shall not have any liability to the Client in respect of any termination of the Contract due to an Event of Force Majeure.

12 General

12.1 The Contract embodies and sets forth the entire agreement and understanding of the parties and supersedes all prior oral and written agreements, representations, understandings and arrangements relating to the subject matter of the Contract.

12.2 No failure or delay on the part of either party to exercise any right or remedy under the Contract shall be construed or operate as a waiver thereof, nor shall any single or partial exercise of any right or remedy as the case may be.

12.3 LQM shall be entitled to sub-contract any of its obligations under the Contract to any third party without the Client's consent.

13 Notices

Any notice to be given under the Contract shall be in writing and sent by telex or facsimile transmission or forwarded by first class prepaid post to the receiving party at its business address as last notified in writing to the other party and shall be deemed to have been given on the date of the telex or facsimile transmission or on the day following that on which the notice was posted.

14 Third Party Rights

The Contract does not create any right enforceable under the Contracts (Rights of Third Parties) Act 1999 by any person not a party to it.

15 Governing Law and Jurisdiction

The Contract shall be governed by English Law and the parties hereby submit to the exclusive jurisdiction of the English Courts.

SPECIAL CONDITIONS

16. Special Conditions for Training Courses

16.1 Training Courses may be delivered face to face, by live online or be pre-recorded. For the avoidance of doubt, all Training Courses are offered under LQM's Terms & Conditions (Conditions 1 - 15) above together with these Special Conditions as set out in Condition 16.

16.2 Training Courses may be offered via a Proposal and Quotation, in which case the contract takes effect as set out in Conditions 1.2 and 1.3.

16.3 Training Courses may be offered via www.lqm.co.uk in which case the Contract takes effect upon clicking the Place Order button via www.lqm.co.uk.

16.4 Payment must be received before attendance on the Training Course.

16.5 Cancellations will be accepted up to 14 days before the Training Course, an administration charge of 25% of the course fees will apply. Cancellations received less than 14 days prior to the course date will incur full costs. Personnel may be substituted at any time.

16.6 LQM reserve the right to cancel a Training Course; at least 5 days notice will be given. LQM cannot accept any liability for costs incurred as a result of such cancellation although all course fees will be returned in full.

16.7 The intellectual property rights in all Training Course materials belongs to LQM and Quality Management Ltd and they should not be passed to any party other than the named course delegates agreed with LQM.

17 Special Conditions for Webinars

17.1 Webinars are named as webinars on www.lqm.co.uk. For the avoidance of doubt, all webinars are offered under LQM's Terms & Conditions (Conditions 1 - 15) above together with these Special Conditions for Webinars as set out in Conditions 17.

17.2 Webinars are offered via www.lqm.co.uk. The Contract takes effect upon clicking the Place Order button.

17.3 Payment for webinars can only be by online credit card payment.

17.4 There is no refund of the fee for a webinar in the event of a delegate cancelling their registration or failing to attend a webinar. This does not affect your statutory rights.

17.5 LQM reserve the right to cancel a webinar. LQM cannot accept any liability for costs incurred as a result of such cancellation although all webinar fees will be returned in full.

17.6 Webinars may be recorded in order to allow delegates to listen again and/or for quality or training purposes. By placing an order you acknowledge that you understand and agree that any material you contribute in the webinar, including but not limited to voice or input to the chat box, may be included in the recording.

17.7 The intellectual property rights in all webinars, webinar recordings and associated materials eg pdf of slides, belongs to Land Quality Management Ltd and they should not be passed to anyone other than the named individual for whom the webinar has been purchased.

18. Special Conditions for Publications

18.1 For the avoidance of doubt, all publications are offered under LQM's Terms & Conditions (Conditions 1 - 15) above together with these Special Conditions for Publications as set out in Condition 18.

18.2 Publications are offered via www.lqm.co.uk; the Contract takes effect upon clicking the Place Order button.

18.3 Publications are not rendering a professional service and will carry a Not Professional Services Notice. All publications are subject to copyright and will include a Copyright Notice. The terms of the Not Professional Services Notice and Copyright Notice are deemed to be incorporated into these terms and conditions.

18.4 The publication will not be released until payment has been received.

19. Special Conditions for Software

19.1 For the avoidance of doubt, all software is offered under LQM's Terms & Conditions (Conditions 1 - 15) above together with these Special Conditions for Software as set out in Condition 19.

19.2 All software is provided with a licence or EULA ("Product Licence") for use of the software. The terms and conditions of the relevant licence are deemed to be incorporated into these terms and conditions.

19.3 Software may be offered via a Proposal and Quotation, in which case the contract takes effect as set out in Conditions 1.2 and 1.3. Product details are as set out in the Proposal.

19.4 Software may be offered via www.lqm.co.uk in which case the Contract takes effect upon clicking the Place Order button via www.lqm.co.uk. Product details are as set out in the Product Licence and on www.lqm.co.uk at the time of purchase.

19.5 Software may be offered via www.bt.lqm.co.uk in which case the Contract takes effect upon clicking the Pay and subscribe button via www.bt.lqm.co.uk. Product details are as set out in the Product Licence and on www.bt.lqm.co.uk and at the time of purchase.

19.6 The software will not be released until payment has been received.

Appendix 2 Review of Sanctus report



National Quality Mark Scheme Appendix 1

LQM1607 CHALFORD VALE RECREATION GROUND, STROUD 3RD PARTY REVIEW - ASBESTOS SITE

In order to have confidence in the conclusions that are presented within any report it is necessary for clients, regulators and stakeholders to know that the data has been audited in a way that ensures that it is fit for purpose. To this end the SQP is directed to apply the following list of critical questions and challenges in using their experience to assess the suitability of any product and before signing off the declaration which accompanies any report.

The lists below have been compiled by regulators and practitioners experienced in the peer review of land contamination management data. They are not meant to be exhaustive in their coverage, but they do focus attention on those aspects of submissions that tend to have the most influence on decisions made and regulatory acceptability. The lists are not meant to duplicate or replace other standard checklists or quality management and control measures that are also used to ensure the factual (as opposed to interpretative) content, accuracy or style of reports. However, the SQP should indicate which sections of this appendix are applicable and sign and date each page. **This Appendix 1 must be completed, and each page signed and dated prior to submitting the Declaration. The signed appendix should then be kept with the project files (hard copy and/or digital) and made available in the event that the related Declaration is selected for auditing under the NQMS Scheme Audit.** If the appendix has been incorporated into an organisation's internal system, then there must be scope for signing and dating of each page and for copies to be made available in the event of scheme audit or alternatively, if this is not possible, Appendix 1 must be completed in addition.

Project Name:	Chalford Vale Recreation Ground, Stroud –review only considers risks to human health from asbestos in soils
Project Report Reference:	LQM1607
SQP Name:	CP Nathanail
SQP Number:	SQP0103

Signature:

Dated:

National Quality Mark Scheme Appendix 1

LQM1607 CHALFORD VALE RECREATION GROUND, STROUD 3RD PARTY REVIEW - ASBESTOS SITE



For all Land Contamination Management Reports	This section is to be completed for ALL reports
Has the assessment been carried out by appropriately capable people with reference to the National Brownfield Skills Framework (NBSF)? 4. What level of risk does low and very low represent? The excess lifetime cancer risk (ELCR) for low levels and very low levels are subjective and relevant to the likelihood of the nature of the asbestos types/conditions encountered. As such, with the likelihood of crocidolite compared to chrysotile exposure at this site and the current state of the turf/grass coverage of the site, Sanctus assessed that the current risk posed by asbestos to be low to very low. The overall excess lifetime cancer risk levels within table 5-14 are the closest quantitative modelling values Sanctus could provide with regards to asbestos exposure. 5. Given the risk evaluation can Sanctus confirm if the land falls into category 1-2, 3 or 4. Please redefine what risk levels 1-4 represent.	Yes ☐ No ☒ Don't know ☐ If No, Add comment No information is provided in the report on the author. According to his LinkedIn profile, he has a degree from the University of Gloucestershire in Ecology and Environmental Science, Ecology awarded in 2024. In follow on emails to Stroud the author has confirmed "I completed the HHRA, as a senior Environmental Engineer with 12 years' experience of both consultancy and contracting within the brownfield remediation sector". but did not report any specific asbestos in soil expertise. The person responsible for applying LCRM is expected to be appropriately competent in the tasks they are doing for each stage and to do this they need to "meet the definition of a competent person given in Annex 2 of the National Planning Policy Framework" (NPPF). The NPPF defines a competent person as "A person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation."
Have all specialist aspects been reviewed by appropriately qualified/competent persons with relevant skills and experience in the respective specialist area?	Yes ☐ No ☐ Don't know ☒ If No, Add comment No information is provided on the reviewer. According to her LinkedIn profile, she has a MSc in Applied Environmental Geology (2010) from Cardiff University and a BSc (Hons), Earth Science (2008) from University of Plymouth. I cannot see evidence of a professional qualification.

Note: If site investigation supervision, laboratory analyses, other forms of data acquisition or risk assessment, etc have been carried out by a separate organisation to report preparation and this constitutes a limitation in respect of checking competences, this should be stated in the comments here and in the report.

Signature:

Dated:

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National Quality Mark Scheme Appendix 1

LQM1607 CHALFORD VALE RECREATION GROUND, STROUD 3RD PARTY REVIEW - ASBESTOS SITE

For all Land Contamination Management Reports	This section is to be completed for ALL reports
Are the aims and objectives of the project and the purpose of the report clearly set out?	Yes ☐ No ☒ If No, Add comment The report asserts that it "considers a series of legislation, regulations, guidance and industry best practice, these are multifaceted to cover environmental requirements, such as the Environmental Protection Act (EPA) 1990 and its subsequent additions (1), for potential contamination." The reference to best practice, rather than good practice, is inappropriate and in any case does not match with the contents of the report. Although CAR-SOIL is referred to in the legal and regulatory context it is not referred to anywhere else in the report. "Asbestos regulations have also been considered for the site, principally the Control of Asbestos Regulations 2012 (6) and supporting documents such as CIRIA C733 Asbestos in Soil and Made Ground: a guide to understanding managing risks (7), Control of Asbestos Regulations 2012 Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance (CAR-SOIL (8))." The Compensation Act is referred to in Appendix G but not as forming part of the legal and regulatory context. "However, current case law suggests that landowners and developers could be liable for claims under the Compensation Act 2006 in the future, even if CAR2012 and planning requirements have been satisfied."
Has all information been presented and summarised in a clear and understandable way?	Yes ☐ No ☒ If No, Add comment There is duplication and inconsistency in the discussion of Asbestos risk in Section 5.1 of the Main Report and in Appendix G. This inconsistency is also seen in Section 8 Summary and Conclusion and Appendix G. It is not clear how the Laboratory LOQ of 9.0 f/ml was derived and why a fibre in air concentration could not be derived given a positive fibre count over a specified number of gratcules for a specified volume of air. It is also not clear why a method with such a high LOQ was undertaken given that much lower fibre concentrations are of risk assessment interest – including the control limit cited in the report. The fibre release testing was carried out by the Normec i2 laboratory. They were asked three questions as part of this review and replied as follows:

Signature:

Dated:

Template Version 2.0



National Quality Mark Scheme Appendix 1

LQM1607 CHALFORD VALE RECREATION GROUND, STROUD 3RD PARTY REVIEW - ASBESTOS SITE

	• Could they [Sanctus] have asked for a longer sampling period to give a lower limit of detection? –<i>Not normally– the time taken is routine – longer running generally leads to filter occlusion and the inability to count fibres through dust. However this can be done upon client request if the sample is suitable</i> • Could more than 200 graticules have been counted? –<i>No – this would deviate from the requirements of fibre counting that we are mandated to by UKAS.</i> • Have you now merged the respirable dust (that DETS traditionally offered) and fibre release tests (that i2 traditionally offered) into a single procedure and hence a single certificate of analysis? –<i>We have not actually “merged” with DETS – we are both part of Normec but we are two completely separate legal entities performing our own tests under our own accreditation utilising our own intellectual property. The certificate is only for the dustiness test in accordance with BS EN 15051-2 2013 +A1:2016</i> Sanctus derive a fibre concentration of 0.001 f/ml based on a max of 4 fibres being detected in 4L of air. However the effect of the number of graticules observed on this is not considered and this calculation is outside the UKAS accreditation for the Normec i2 test.
• Have relevant uncertainties/limitations been clearly highlighted in the report together with their implications for any conclusions drawn?	Yes ☐ No ☒ If No, Add comment The quantitative risk estimates have been caveated by scenarios where those estimates might be underestimates but the quantitative significance of those uncertainties has not been considered. No sensitivity analysis has been presented. Equally the samples subjected to fibre release testing were taken from specific rather than representative locations.
• Are the overall conclusions and recommendations robust and justified by the supporting data being presented?	Yes ☐ No ☒ If No, Add comment The risk evaluation has not drawn on the latest guidance – specifically the SoBRA asbestos risk assessment tool. The report refers to - but does not define - a low level of risk. When asked for clarification, Sanctus replied that “The excess lifetime cancer risk (ELCR) for low levels and very low levels are subjective and relevant to the likelihood of the nature of the asbestos types/conditions encountered. As such, with the likelihood of crocidolite compared to chrysotile exposure at this site and the current state of the turf/grass coverage of the site, Sanctus assessed that the current risk posed by asbestos to be low to very low. The overall excess lifetime cancer risk levels within table 5-14 are the closest quantitative modelling values Sanctus could provide with regards to asbestos exposure”.

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	The evaluation of the situation under the Compensation Act is too simplistic and does not demonstrate that the site conditions could lead to exposures likely to result in mesothelioma. An evaluation of the risk in terms of Part 2A of the Environmental Protection Act 1990 (as amended) was not provided. When Sanctus were asked to confirm if the land falls into category 1-2, 3 or 4 they replied saying "Please redefine what risk levels 1-4 represent".
Are the next steps appropriate and clearly justified?	Yes ☐ No ☒ If No, Add comment The recommendations for future controls on using the land are not supported by the preceding evidence in the report.
Has the approach adopted for the site followed best practice and up-to-date guidance?	Yes ☐ No ☒ If No, Add comment For the record it is unreasonable to expect "best practice" to be followed. Nevertheless, the report does not follow the latest guidance available from SoBRA that includes updated epidemiology from HSE's L Darnton.

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For Reports dealing with RISK ASSESSMENT (Stage 1) Preliminary Risk Assessment (PRA)	Is this section relevant?	
	Yes ☒	No ☒ If no, go to the next section
Given the nature and size of the development, has a reasonable desk and site based study been presented to establish the land use history and environmental setting of the site and identified relevant contaminants, pathways and receptors?	Yes ☒	No ☐ If No, add comment
Has a representative conceptual site model (CSM) been presented which identifies and assesses all relevant pollutant linkages having regard to the current and/or future site use (as appropriate)?	Yes ☒	No ☐ If No, Add comment
Have the limitations/uncertainties in the PRA and their effects on conclusions/recommendations been considered?	Yes ☒	No ☐ If No, Add comment
Has the basis of the decisions for the proposed next steps (e.g. no action, remediation or further risk assessment) been clearly presented and justified?	Yes ☒	No ☐ If No, Add comment

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LQM1607 CHALFORD VALE RECREATION GROUND, STROUD 3RD PARTY REVIEW - ASBESTOS SITE

For Reports dealing with RISK ASSESSMENT (Stages 2 & 3) Generic Quantitative Risk Assessment (GQRA)	Is this section relevant? Yes ☒ No ☐ If no, go to the next section
- Is the site investigation design robust enough to gather the necessary site data, having regard to the aims and objectives of the project, the site setting and the CSM? In particular, - Have appropriate generic assessment criteria and tools been identified to enable risk estimation and evaluation and have their data requirements been incorporated into the design? - Are the choices of investigatory techniques appropriate? - Are the number, nature and locations of samples, testing and monitoring regimes sufficient?	Yes ☐ No ☒ If No, Add comment The report correctly recognises there are no GAC for asbestos in soil. The use of asbestos fibre release testing is welcome but only two samples were subject to this test. Sanctus were asked to clarify the basis on which these two samples were selected. They replied that "The two samples (STP11 and STP17) chosen for the additional dustiness test were from locations showing the least amount of grass coverage at the time of the investigation. At the time of completing the dustiness testing, the asbestos quantification was not available. There was an allowance for 2No. samples allowed in the budget for the scheme".
- Has the collected site data been analysed and risks estimated appropriately using the right tools, techniques or methods. In particular, - Have the right substances been quantified with appropriate limits of detection?	Yes ☐ No ☒ If No, Add comment The dustiness test LOQ is too high. The guidance from SoBRA on risk assessment has not been followed.
Have the pollutant linkages and risks to human health/controlled waters/other receptors been evaluated using appropriate generic assessment criteria and assumptions in line with the latest technical or regulatory guidance on compliance?	Yes ☒ No ☐ If No, Add comment The report rightly states that there are no GAC for asbestos in soil.
Have the limitations/uncertainties in the GQRA and their effects on conclusions been considered?	Yes ☒ No ☐ If No, Add comment

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Has the basis of the decisions for the proposed next steps (e.g. further action, no action, remediation or further risk assessment) been clearly presented and justified?	Yes ☒ No ☐ If No, Add comment The report does not stop at the GQRA stage but goes on to what I consider to be DQRA.
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Detailed Quantitative Risk Assessment (DQRA)	Is this section relevant? Yes ☒ No ☐ If no, go to the next section
Is the site investigation design robust enough to be able to gather the necessary data, having regard to the aims and objectives of the project, the site setting, the CSM and other parameters to develop site specific risk estimation models and site specific assessment criteria? (as per GQRA list above).	Yes ☐ No ☒ If No, Add comment Only two samples were subject to fibre release dustiness testing.
- Has the collected site data been analysed and risks estimated appropriately using the right tools, techniques models or methods. In particular, - Have the right substances been quantified with appropriate limits of detection? - Do the data/parameters used in any model adequately reflect actual site conditions? - Has any modelling been subject to sensitivity analysis and are the consequences of adopting more/less conservative data adequately expressed?	Yes ☐ No ☒ If No, Add comment The LOQ of 9f/ml is too high and its derivation is not explained either in the report or in the certificate of analysis. The behaviour on site and the site conditions are reasonable and concur with the Council views. No sensitivity analysis has been carried out. In particular the choice of fibres in air concentration is a central risk driver.
Have the pollutant linkages and risks to human health/controlled waters/other receptors been evaluated using appropriate site specific assessment criteria and assumptions in line with the latest technical or regulatory guidance on compliance?	Yes ☐ No ☒ If No, Add comment The latest guidance from SoBRA ¹ on asbestos fibre exposure and associated updated epidemiology have not been referred to or used.

¹ <https://sobra.org.uk/asbestos/guidelines-for-airborne-concentrations-of-asbestos-fibres-in-ambient-air-implications-for-quantitative-risk-assessment/>

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Have the limitations/uncertainties in the DQRA and their effects on conclusions considered?	Yes ☐ No ☒ If No, Add comment The effect of the chosen fibre in air concentration on the risk estimate is poorly considered.
Has the basis of the decisions for the proposed next steps (e.g. further action, no action, remediation or further risk assessment) been clearly presented and justified?	Yes ☒ No ☐ If No, Add comment The proposed next steps
For Reports dealing with OPTIONS APPRAISAL	
Is this section relevant? Yes ☐ No ☒ If no, go to the next section	
Identification of Feasible Remediation Options Have site specific remediation objectives been clearly identified for each relevant pollutant linkage?	Is this section relevant? Yes ☐ No ☐ If no, go to the next section
Are the remedial objectives appropriate including (where relevant) remedial target concentrations and compliance points having regard to the latest technical or regulatory guidance on those matters?	Yes ☐ No ☐ If No, Add comment
Have other relevant site management objectives or constraints been identified that could influence the choice of feasible remedial options?	Yes ☐ No ☐ If No, Add comment
Has a short list of feasible remediation options been identified for all relevant pollutant linkage?	Yes ☐ No ☐ If No, Add comment

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Has the basis of the decisions for the proposed next steps (e.g. chosen remedial option or further detailed evaluation) been clearly presented and justified?	Yes ☐ No ☐ If No, Add comment
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Detailed Evaluation of Options	Is this section relevant? Yes ☐ No ☐ If no, go to the next section
Are the remediation evaluation criteria clearly presented? Sufficient site data and remediation option information should be presented to assess the merits and limitations of each option against the evaluation criteria.	Yes ☐ No ☐ If No, Add comment
If sustainable remediation is an important attribute in the selection process, is it evident how the options appraisal has been consistent with the SuRF-UK framework?	Yes ☐ No ☐ If No, Add comment
Have appropriate remediation options been identified for all pollutant linkage that are capable of meeting the required remediation objectives?	Yes ☐ No ☐ If No, Add comment
Has the rationale for the preferred remediation option(s) for each pollutant linkage been clearly presented?	Yes ☐ No ☐ If No, Add comment
Developing the Remediation Strategy	Is this section relevant? Yes ☐ No ☐ If no, go to the next section
- Has a remediation strategy been clearly described and presented to include: (i) how it will meet the objectives for individual pollutant linkages and the site as a whole. (ii) any relevant assumptions and caveats; and (iii) how unexpected contamination will be dealt with including procedures and contingency measures.	Yes ☐ No ☐ If No, Add comment

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For Reports dealing with the IMPLEMENTATION OF REMEDIATION STRATEGY	Is this section relevant? Yes ☐ No ☒ If no, go to the next section
Preparation of Implementation Plan	Is this section relevant? Yes ☐ No ☐ If no, go to the next section
Has an implementation plan been presented that clearly details all aspects of the remediation project in a systematic and effective manner? This implementation plan should translate the remediation strategy into a clear set of activities (e.g. design, preparation, implementation, verification etc) that will deliver the objectives for the site in accordance with client and regulatory requirements.	Yes ☐ No ☐ If No, Add comment
Design, Implementation and Verification of Remediation	Is this section relevant? Yes ☐ No ☐ If no, go to the next section
Pre-Implementation: Does the final form of the remediation design include design drawings, specifications and other relevant contract documents sufficient to demonstrate how the project will be executed in order to fulfil the relevant remedial objectives?	Yes ☐ No ☐ If No, Add comment
Pre-Implementation: Has the requirement for any necessary environmental permits or permissions been adequately assessed?	Yes ☐ No ☐ If No, Add comment
Pre-Implementation: Are all necessary H&S plans and site risk assessments in place and detailed within the design for remediation?	Yes ☐ No ☐ If No, Add comment
- Pre-Implementation: Are the measures set out in the Verification Plan sufficient to demonstrate achievement of the remedial objectives? In particular: - Have appropriate indicators and methodologies for measurement been chosen? - Is the frequency of testing and/or the duration of monitoring adequate?	Yes ☐ No ☐ If No, Add comment

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• Post-Implementation: Has the remediation been undertaken in line with the approved remediation methodology, if not, have the variations been clearly documented and justified?	Yes ☐ No ☐ If No, Add comment
• Post-Implementation: Is there sufficient evidence in the verification report to demonstrate that remediation has performed in accordance with the agreed remediation design and has met the agreed remedial objectives and criteria for the regime in question?	Yes ☐ No ☐ If No, Add comment
• If any risks have not been effectively managed are suitable contingency measures in place to manage these residual risks?	Yes ☐ No ☐ If No, Add comment
Long term Monitoring and Maintenance	
• If there is there a need for further monitoring and maintenance work has a suitable monitoring and/or maintenance plan been provided?	Is this section relevant? Yes ☐ No ☐ If no, go to the next section Yes ☐ No ☐ If No, Add comment
• Will any long term monitoring and/or maintenance adequately meet and/or demonstrate compliance with the defined remedial objectives?	Yes ☐ No ☐ If No, Add comment

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OTHER REPORTS, eg Foundation Works Risk Assessment (FWRA) (Sections above headed "For all Land Contamination Management Reports" must also be completed).	Is this section relevant? Yes ☐ No ☒
Type of Report	State:
Does the report comply with the requirements of LCRM?	Yes ☐ No ☐ If No, Add comment
Does the report comply with the relevant supplementary guidance, eg for a FWRA, compliance with the relevant EA guidance would be expected?	State Guidance: Yes ☐ No ☐ If No, Add comment
Given the nature and size of the development, has a reasonable desk and site-based study been presented in other reports to establish the land use history and environmental setting of the site and identified relevant contaminants, pathways and receptors?	Yes ☐ No ☐ If No, Add comment
Has a representative conceptual site model (CSM) been presented in other reports which identifies and assesses all relevant pollutant linkages having regard to the current and/or future site use (as appropriate)?	Yes ☐ No ☐ If No, Add comment
Have the limitations/uncertainties associated with this report and their effects been considered and presented in the report?	Yes ☐ No ☐ If No, Add comment
Have the required actions recommended in the report been clearly presented and justified?	Yes ☐ No ☐ If No, Add comment
If this section OTHER REPORTS is used, please explain why the previous sections are not applicable.	

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Appendix 3 Risk worksheets

Calculation Sheet for risk from cumulative exposure to asbestos in air

Based on The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure, John T. Hodgson and Andrew Darnton, 'Ann Occup Hyg (2000) 44 (8): 565-601', and personal communication with Andrew Darnton and should be read in conjunction with SoBRA's Discussion Paper on Guidelines for Airborne Concentrations of Asbestos Fibres in Ambient Air: Implications for Quantitative Risk Assessment (SoBRA, 2021)
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Default parameters

Asbestos type	Chrysotile
Mesothelioma model	Linear
Lung cancer model	Non-Linear
Lung cancer base risk population	All - population average
Receptor expected lifetime	Lifetime 80 years
Lung cancer age adjustment	Age adjustment based on Latency

For site users ages from birth to age 20

Concentration in air

Assumes exposure to constant average asbestos exposure

Chrysotile

Concentration in air f/ml

1.00E-03

Exposure over five year tranches

Age	Concentration in air f/ml	Exposure Days per year	Hours per day	Years (Actual)	Exposure time hrs per year hrs/year	Exposure over each 5 year tranche (Includes adjustment to occupational years (equal to 2000hrs of exposure per year)) f/ml-yr	X - Cumulative exposure in f/ml-yr = Concentration in air x Exposure time hrs per year x Time period /2000 (hrs in an occupational year) to top of age group
0							X - Cumulative exposure in f/ml-yr
1	0-5	1.00E-03	52	2	4	1.04E+02	2.08E-04
2	5-10	1.00E-03	52	2	5	1.04E+02	2.60E-04
3	10-15	1.00E-03	52	2	5	1.04E+02	2.60E-04
4	15-20	1.00E-03	52	2	3	1.04E+02	1.56E-04
5	20-25	1.00E-03				0.00E+00	0.00E+00
6	25-30	1.00E-03				0.00E+00	0.00E+00
7	30-35	1.00E-03				0.00E+00	0.00E+00
8	35-40	1.00E-03				0.00E+00	0.00E+00
9	40-45	1.00E-03				0.00E+00	0.00E+00
10	45-50	1.00E-03				0.00E+00	0.00E+00
11	50-55	1.00E-03				0.00E+00	0.00E+00
12	55-60	1.00E-03				0.00E+00	0.00E+00

Mesothelioma Risk

$$P_M = A_{pe} X^r + A_{pr} X^t$$

 P_M Percent excess mortality from Mesothelioma (in percent) A_{pe} Constant of proportionality for Pleural risk A_{pr} Constant of proportionality for peritoneal risk X Cumulative exposure in f/ml-yr r Pleural slope of exposure response (on a log-log scale) t Peritoneal slope of exposure response (on a log-log scale)

$$\hat{O}_M = \frac{(A_{pe} X^r + A_{pr} X^t) E_{adj}}{100}$$

 $\hat{O}_M$ the observed meso deaths E_{adj} the expected mortality from all causes adjusted to an age at start of exposure of 30.

Risk estimate based on a 30 year old worker exposed for a five year period with cumulative exposure above.

Reference: Developing risk estimates consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate	Chrysotile	Reference
Asbestos type	Chrysotile	Reference
A_{pe}	0.001	H&D 2000 Table 1: Mesothelioma risk expressed as percentage total expected mortality per f/ml-yr - Adjusted for age at first exposure.
r_{meso}	1	Linear model
A_{pr}	1E-20	H&D 2000 Table 8 Best estimate slope (r=0.75, t=2.1)
t	2.1	H&D 2000 Table 8 Best estimate slope (r=0.75, t=2.1)
Expected mortality from all causes adjusted to an age at start of exposure of 30	0.7	H&D 2000 p. 584 "Absolute risk estimates can therefore be derived from the PM value for a given exposure by multiplying by a factor of 0.7"

Age	Age adjustment Factor for mesothelioma risk Lifetime 80 years	Reference	P_M (%)	Risk	Risk age adjusted assuming Lifetime 80 years
0					
1	0-5		2.1E-07	1.5E-09	1.0E-08
2	5-10		2.6E-07	1.8E-09	9.6E-09
3	10-15		2.6E-07	1.8E-09	7.3E-09
4	15-20		1.6E-07	1.1E-09	3.3E-09
5	20-25		0.0E+00	0.0E+00	0.0E+00
6	25-30		0.0E+00	0.0E+00	0.0E+00
7	30-35		0.0E+00	0.0E+00	0.0E+00
8	35-40		0.0E+00	0.0E+00	0.0E+00
9	40-45		0.0E+00	0.0E+00	0.0E+00
10	45-50		0.0E+00	0.0E+00	0.0E+00
11	50-55		0.0E+00	0.0E+00	0.0E+00
12	55-60		0.0E+00	0.0E+00	0.0E+00

* To get the contribution to the risk for the second period alone the risk due to the cumulative dose from the first period is subtracted... and so on.
Developing risk estimates consistent with Table 11 for extended periods, Hodgson and Darnton 2000

Cumulative risk	Chrysotile	Lifetime 80 years
		3.0E-08

Lung Cancer

$$P_L = A_L \cdot X^r$$

P_L Percentage excess of expected lung cancer mortality

A_L Constant of proportionality for lung cancer risk

r Lung cancer slope of exposure response (on a log-log scale)

X Cumulative exposure in f/ml.yr

$$\text{Predicted excess risk} = O_L - E_L = \frac{A_L \cdot X^r \cdot E_L}{100}$$

E_L Proportion of the specific population that will die of lung cancer between age 40-79

Risk estimate based on a 30 year old worker exposed for a five year period with cumulative exposure above.

Reference: Developing risk estimates consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate	Chrysotile	Reference
A_L	0.028	H&D 2000 Table 10 Best (r=1.3)
r_{lung}	1.3	H&D 2000 Table 10 Best (r=1.3)
Proportion of the specific population that will die of lung cancer between age 40-79	0.033	Based on Average 2016-2018 population statistics

Age	Age adjustment	Age adjustment reference	P_L (%)	Risk (age adjusted)
0-5	1	Developing risk estimates consistent with Table 11 for extended exposures, Hodgson and Darnton 2000	4.6E-07	1.5E-10
5-10	1		8.6E-07	2.8E-10
10-15	1		1.0E-06	3.3E-10
15-20	1		6.7E-07	2.2E-10
20-25	1		0.0E+00	0.0E+00
25-30	1		0.0E+00	0.0E+00
30-35	1		0.0E+00	0.0E+00
35-40	1		0.0E+00	0.0E+00
40-45	1		0.0E+00	0.0E+00
45-50	0.75		0.0E+00	0.0E+00
50-55	0.5		0.0E+00	0.0E+00
55-60	0.25		0.0E+00	0.0E+00

Cumulative risk	Chrysotile	9.8E-10
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Cumulative lifetime Risk Estimate

Asbestos type	Chrysotile		
Risk from Mesothelioma	Lifetime 80 years	Linear	3.0E-08
Risk from Lung Cancer	All - population average	Non-Linear	9.8E-10
TOTAL			3.1E-08

Limitations

This spreadsheet is offered as a free available resource by SoBRA to improve the consistency in, and adoption of, the use of the Hodgson and Darnton algorithms for estimating lifetime cancer risk for low level environmental exposures to airborne asbestos fibres. It has been developed by members of the SoBRA Asbestos-in-soil sub-group acting in a voluntary capacity, and constitutes the work of the individual authors, not those of their employers. Users of this spreadsheet must satisfy themselves that the content is appropriate for the intended use and no guarantee of suitability is made.

Feedback on this spreadsheet is welcome and should be sent to info@sobra.org.uk

Calculation Sheet for risk from cumulative exposure to asbestos in air

Based on The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure, John T. Hodgson and Andrew Darnton, Ann Occup Hyg (2000) 44 (8): 565-601, and personal communication with Andrew Darnton and should be read in conjunction with SoBRA's Discussion Paper on Guidelines for Airborne Concentrations of Asbestos Fibres in Ambient Air: Implications for Quantitative Risk Assessment (SoBRA, 2021)
© SoBRA, 2021

Default parameters

Asbestos type	Chrysotile
Mesothelioma model	Linear
Lung cancer model	Non-Linear
Lung cancer base risk population	All - population average
Receptor expected lifetime	Lifetime 90 years
Lung cancer age adjustment	Age adjustment based on latency

For ground workers

Concentration in air

Constant average asbestos exposure

Chrysotile

5.00E+00

Exposure over five year tranches

Age	Concentration in air f/ml	Exposure			Exposure time hrs per year hrs/year	Exposure over each 5 year tranche (Includes adjustment to occupational years (equal to 2000hrs of exposure per year)) f/ml.yr	X - Cumulative exposure in f/ml.yr = Concentration in air x Exposure time hrs per year x Time period /2000 (hrs in an occupational year) to top of age group
		Days per year	Hours per day	Years (Actual)			
0-5	5.00E+00				0.00E+00	0.00E+00	0.00E+00
5-10	5.00E+00				0.00E+00	0.00E+00	0.00E+00
10-15	5.00E+00				0.00E+00	0.00E+00	0.00E+00
15-20	5.00E+00				0.00E+00	0.00E+00	0.00E+00
20-25	5.00E+00	13	2	5	2.60E+01	3.25E-01	3.25E-01
25-30	5.00E+00	13	2	5	2.60E+01	3.25E-01	6.50E-01
30-35	5.00E+00	13	2	5	2.60E+01	3.25E-01	9.75E-01
35-40	5.00E+00	13	2	5	2.60E+01	3.25E-01	1.30E+00
40-45	5.00E+00	13	2	5	2.60E+01	3.25E-01	1.63E+00
45-50	5.00E+00	13	2	5	2.60E+01	3.25E-01	1.95E+00
50-55	5.00E+00	13	2	5	2.60E+01	3.25E-01	2.28E+00
55-60	5.00E+00	13	2	5	2.60E+01	3.25E-01	2.60E+00

Mesothelioma Risk

$$P_{M} = A_{pl}X^r + A_{pe}X^t$$

 P_M Percent excess mortality from Mesothelioma (in percent) A_{pl} Constant of proportionality for Pleural risk A_{pe} Constant of proportionality for peritoneal risk X Cumulative exposure in f/ml.yr r Pleural slope of exposure response (on a log-log scale) t Peritoneal slope of exposure response (on a log-log scale)

$$\dot{O}_M = \frac{(A_{pl}X^r + A_{pe}X^t)E_{adj}}{100}$$

 O_M the observed meso deaths E_{adj} the expected mortality from all causes adjusted to an age at start of exposure of 30.

Worker exposed for a five year period with cumulative exposure above:
consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate		
Asbestos type	Chrysotile	Reference
A_{pl}	0.001	H&D 2000 Table 1 Mesothelioma risk expressed as percentage total expected mortality per f/ml.yr - Adjusted for age at first exposure
r meso	1	Linear model
A_{pe}	1E-20	H&D 2000 Table 8 Best estimate slope ($r=0.75$, $t=2.1$)
t	2.1	H&D 2000 Table 8 Best estimate slope ($r=0.75$, $t=2.1$)
Expected mortality from all causes adjusted to an age at start of exposure of 30	0.7	H&D 2000 p. 584 "Absolute risk estimates can therefore be derived from the PM value for a given exposure by multiplying by a factor of 0.7"

Age	Age adjustment Factor for mesothelioma risk Lifetime 90 years	Reference	P_M (%)*	Risk	Risk age adjusted assuming Lifetime 90 years
			0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00
			3.3E-04	2.3E-06	9.1E-06
			3.3E-04	2.3E-06	6.5E-06
			3.3E-04	2.3E-06	4.3E-06
			3.3E-04	2.3E-06	1.4E-06
			3.3E-04	2.3E-06	9.1E-07
			3.3E-04	2.3E-06	6.8E-07
			3.3E-04	2.3E-06	4.6E-07
	0.1		3.3E-04	2.3E-06	2.3E-07

* To get the contribution to the risk for the second period alone the risk due to the cumulative dose from the first period is subtracted... and so on.
Developing risk estimates consistent with Table 11 for extended periods, Hodgson and Darnton 2000

Cumulative risk		Lifetime 90 years	
	Chrysotile		2.4E-05

Lung Cancer

$$P_L = A_L \cdot X^r$$

P_L : Percentage excess of expected lung cancer mortality
 A_L : Constant of proportionality for lung cancer risk
 r : Lung cancer slope of exposure response (on a log-log scale)
 X : Cumulative exposure in f/ml.yr

$$\text{Predicted excess risk} = O_L - E_L = \frac{A_L \cdot X^r \cdot E_L}{100}$$

E_L : Proportion of the specific population that will die of lung cancer between age 40-79

ear old worker exposed for a five year period with cumulative exposure above.
 ates consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate		
	Chrysotile	Reference
A_L	0.028	H&D 2000 Table 10 Best (r=1.3)
r_{lung}	1.3	H&D 2000 Table 10 Best (r=1.3)
Proportion of the specific population that will die of lung cancer between age 40-79	0.033	Based on Average 2016-2018 populations statistics

Age	Age adjustment	Age adjustment reference	P_L (%)	Risk (age adjusted)
			0.0E+00	0.0E+00
			0.0E+00	0.0E+00
			0.0E+00	0.0E+00
			0.0E+00	0.0E+00
			6.5E-03	2.1E-06
			9.5E-03	3.1E-06
			1.1E-02	3.6E-06
			1.2E-02	4.0E-06
			1.3E-02	4.3E-06
			1.4E-02	3.5E-06
			1.5E-02	2.4E-06
	0.25		1.5E-02	1.3E-06

Cumulative risk	Chrysotile	2.4E-05
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Cumulative lifetime Risk Estimate

Asbestos type	Chrysotile		
Risk from Mesothelioma	Lifetime 90 years	Linear	2.4E-05
Risk from Lung Cancer	All - population average	Non-Linear	2.4E-05
TOTAL			4.8E-05

Limitations

This spreadsheet is offered as a free available resource by SoBRA to improve the consistency in, and adoption of, the use of the Hodgson and Darnton algorithms for estimating lifetime cancer risk for low level environmental exposures to airborne asbestos fibres. It has been developed by members of the SoBRA Asbestos-in-soil sub-group acting in a voluntary capacity, and constitutes the work of the individual authors, not those of their employers. Users of this spreadsheet must satisfy themselves that the content is appropriate for the intended use and no guarantee of suitability is made.

Feedback on this spreadsheet is welcome and should be sent to info@sobra.org.uk

APPENDIX 4 Photographs and sample locations