Contaminated Land
Air Quality
Environmental Audit

SMITH GRANT
Environmental Consultancy
LLP

Partnership No: OC 300776

STAGE 2 CONTAMINATION ASSESSMENT

NANT COTTAGE, LOWER ROAD, COEDPOETH, WREXHAM

For: Mr Mark Davies

May 2016

R2259-R02-v1

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Stage 2 – Contamination Assessment

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LAND ADJACENT TO LOWER ROAD, COEDPOETH, WREXHAM

STAGE 2 CONTAMINATION ASSESSMENT

For Mark Davies

May 2016

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1. Introduction

1.1. Planning permission (ref: COE P/2014/0331) has been granted by Wrexham County Borough Council (WCBC) permitting the construction of one detached dwelling with garage, landscaped areas, vehicular and pedestrian access on a parcel of land adjacent to Lower Road, Coedpoeth, Wrexham. Condition No11 of the outline planning permission requires a phased investigation to identify the extent of contamination and any measures required to remediate the site, including post-development monitoring.

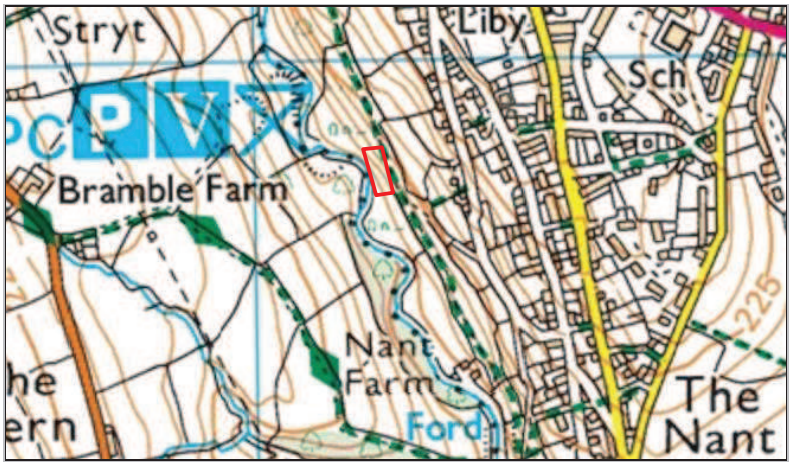
1.2. Mr M. Davies instructed Smith Grant LLP (SGP) to undertake a Stage 2 Contamination Assessment at land off Lower Road Coedpoeth, Wrexham. A site location plan is provided below in Figure 1 and Drawing D01.

1.3. Site details are:

Table 1.1: Site Details

Address	Nant Cottage, Lower Road, Coedpoeth, Wrexham, LL11 3TP
National Grid Reference	328241 350898
Local Authority	Wrexham County Borough Council
Site Area	911m^2
Current Nature of Site	Undeveloped agricultural land
Site Access	Access from Lower Road, Coedpoeth
Proposed use	Detached dwelling, garage and landscaped areas
Planning Ref	COE P/2014/0331

Figure 1.1: Site Location



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1.4. This report describes the Stage 2 (intrusive) investigation undertaken by SGP in accordance with the partial requirements of Condition No. 11 (ref: COE P/2014/0331) and a brief agreed with the client. The assessment methodology follows the framework described in the EA / DEFRA Contaminated Land Report 11: 'Model Procedures for the Management of Land Contamination' 2004.

Table 1.2: Planning Conditions relating to Land Contamination

Condition No11 COE P/2014/0331	No part of the development shall commence until a scheme to deal with potential contamination at the site has been submitted to and approved in writing by the Local Planning Authority. This scheme shall include a phased investigation approach to identify the extent of contamination and any measures required to remediate the site, including post-development monitoring.

1.5. The study comprises a brief summary of previously obtained available information on the environmental setting of the site and the site's previous and current uses with respect to potential risks to the environment or human health. This report contains the results of additional investigations undertaken, a quantitative risk assessment and where appropriate and makes recommendations for intrusive investigations and remedial actions appropriate to the future use of the site.

2. Information Sources

2.1. Previous Investigations

2.1.1. SGP carried out a Stage 1 (Desk Study) assessment of the site in April 2016 (Ref: R2259-R01-V1 07.04.2016). The results indicated that the site was generally at low risk of constraints to redevelopment associate with ground contamination, however the following issues required further assessment or remedial action:

- Removal of small quantity of potential asbestos containing cement sheeting from the site surface;
- Provision of appropriate radon protection measures for new dwellings;
- Confirmation of the status of shallow soils on the site with respect to lead concentrations and co-contaminants zinc and cadmium.

2.2. Consultation

2.2.1. SGP understands that the report was submitted to WCBC for approval and have received a copy of an internal WCBC note dated 08.04.2016 which confirms the report and recommendations were acceptable.

2.2.2. SGP received separate confirmation by email that the further investigation to characterise the soils on the site with respect to their metal content was required which should include other metals including nickel and that this information was required to discharge the condition prior to commencement of the development.

3. Ground Investigation Methodology and Results

3.1. Objectives and Rationale

3.1.1. The Stage 1 assessment identified the potential presence of elevated concentrations of heavy metals (principally lead, cadmium and zinc), within the shallow soils across the site.

3.1.2. It was therefore determined that representative soil samples should be collected from near-surface locations for chemical analysis of a range of metals / metalloids to inform the human health risk assessment for garden soils following redevelopment.

3.2. Fieldwork

3.2.1. The site investigation comprised 6 hand-dug trial pits to permit visual inspection of shallow strata and to obtain samples from the topsoil and shallow natural strata. Trial pit locations are shown on drawing 001. The investigation was undertaken on 15 May 2016 by SGP Senior Consultant C Salwa.

3.2.2. Works involved:

- excavation of 6 trial holes (TP1-TP6) to depths of between 0.0 and 0.5 bgl (the locations of which are provided in Drawing D01);
- visual inspection of all soil arisings;
- collection of 6 soil samples from varying strata.

3.2.3. Trial pits were backfilled immediately following excavation All trial pits were extended into natural subsoil strata.

3.2.4. The sampling locations were positioned so as to provide representative information from the proposed garden areas at depths where future exposure of residents can reasonably be anticipated.

3.3. Chemical Analysis

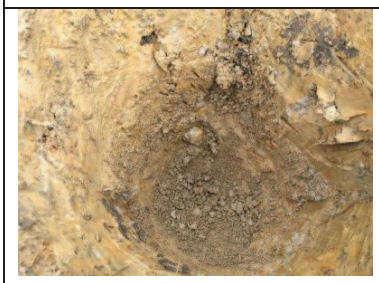
3.3.1. All chemical analysis of soils was carried out by Jones Environmental Laboratories, Deeside, working where possible to MCERTS and / or ISO 17025 accreditation. Soil samples were stored in appropriate containers as advised by the laboratory, placed in a cool box, and delivered to Jones Environmental within 6 hours of collection. Chain of custody documentation was completed and is retained by SGP.

3.3.2. Samples were analysed for arsenic, cadmium, copper, chromium (total and hexavalant), lead, mercury, nickel, selenium and zinc.

3.4. Field Observations

3.4.1. Thin topsoil was present in all entries apart from TP05 which was located in an area where the turf had been stripped and stockpiled. Below the topsoil and at formation in the area of TP5 subsoils were a yellow and grey mottled soft to firm clay with frequent gravel and occasional cobbles of sandstone. Bedrock was not encountered in any location on the site. Photographs of the entries and representative arisings are provided below

Table 3.1: Site Photographs

TP1	TP2	TP3
TP4	TP5	TP6
 Clay subsoil	Clay subsoil	Natural profile top-subsoil

3.5. Results of Soil Chemical Analysis

3.5.1. The complete soil analytical data are presented in Appendix A and are summarised below in Table 3.2.

3.5.2. The results of the soil analyses are compared to human health critical values (CVs) for initial screening purposes. The CVs adopted are appropriate to the environmental setting and proposed future residential with garden use of the site, and are taken primarily from Category 4 Screening Level (C4SL) which is the statutory guidance value for Part 2A of the Environmental Protection Act 1990 where the level of risk posed is defined as 'acceptably low'. This value was therefore used as part of the screening levels for this investigation for the main contaminant of concern; lead.

3.5.3. For other contaminants, SGP have therefore referred to the most up-to-date Generic Assessment Criteria (GACs) for residential land-use in order to carry out a preliminary assessment of the soil test results. The "Suitable for Use" Criteria (S4ULs) published by LQM/CIEH[1]. All criteria assume a low (1%) soil organic matter as a conservative approach.

Table 3.2: Summary of Soils Analysis

Contaminant	Number of Samples	Range of Concentrations (mg/kg or indicated)	Soil standard adopted and concentration (mg/kg or indicated)	Exceedances
Arsenic	6	1.9-15.2	37	None
Cadmium	6	<0.1-2.5	11	None
Chromium (total)	6	56.1-95.7	910	None
Chromium (VI)	6	<0.3	6	None
Copper	6	18-46	2400	None
Lead	6	7-1133	200	TP1-S1 (0.30m) TP2-S1 (0.35m) TP3-S1 (0.10m) TP4-S1 (0.30m)
Mercury (inorganic)	6	<0.1-0.1	40	None
Nickel	6	23.8-45.6	130	None
Selenium	6	<1-2	250	None
Zinc	6	73-479	3700	None

3.5.4. Four of the six samples tested for lead exceeded the C4SL. Concentrations were below the C4SL in the two samples from deeper subsoil (0.4m-0.5 bgl in TP5 & TP6 respectively), moderately elevated in samples from the upper subsoil (~0.3m bgl in TP1, TP2 & TP4), and most highly elevated in the sample of topsoil 0.1m bgl in TP3).

[1] Copyright Land Quality Management Ltd, reproduced with permission; Publication Number S4UL3102. All rights reserved

4. Updated Conceptual Model and Risk Assessment

4.1. Methodology

4.1.1. Information from the desk study and site investigation has been used to identify the likely source-pathway-target relationships that may exist at the site during and following the proposed development. Principal factors that may determine potential sources of contamination at the site, receptor vulnerability and potential pathways have been identified and each assessed in turn to revise the Conceptual Site Model (CSM).

4.2. Sources of Contamination

4.2.1. Apart from the suspected asbestos cement sheeting and possible radon, which already have mitigation measures recommended to reduce risks, the only source of contamination identified in the site is the moderately elevated lead recorded in the topsoil and upper subsoil.

4.2.2. Lead may be absent at deeper levels, reflecting the likely source aerial deposition by either dust from the nearby lead mines and associated spoil tips, or particulates form the former historical smelters elsewhere in the village.

4.3. Revised Risk Assessment

4.3.1. The presence of elevated lead, potentially poses a risk to human health primarily via direct contact, ingestion or inhalation of soils and dusts and / or through ingestion of soils attached to garden vegetables. Metals do not pose a significant risk to human health if present under areas of permanent hardstanding/structures, or are at sufficient depth to prevent disturbance and redeposition at shallow depth.

5.1.1. Samples exceeded the C4SL threshold value of 200mg/kg; this is not indicative of an immediate risk to human health, the value only reflects the limit below which the land cannot be classified as contaminated. However, the values for lead on the are significantly above both the C4SL and the withdrawn former SGV and therefore shallow soils on the site represent a potential long term risk to human health, in particular to the most sensitive receptors (infants, children and foetuses), if the site was redeveloped for housing without any remediation.

4.3.2. Lead is not present in the shallow soils at concentrations considered likely to pose an acute risk to construction workers providing good working practices and occupational hygiene are maintained.

4.3.3. The typical form of metal mineralisation in the area is highly insoluble metal sulphides such as galena and sphalerite, indicating that leaching and water pollution from the site is likely to be insignificant, particularly in the context of the surrounding area. The concentrations of zinc and copper within the shallow soils are unlikely to pose a risk to plant growth.

5. Conclusions and Recommendations

5.1. The site is impacted by moderate lead contamination, which may only be present at relatively shallow depth in the soils, based on the site conceptual model.

5.2. These soils must be removed or isolated from future gardens. The preferred Remediation solution is dependent on how the levels will be changed as a result of the development. If levels are to be substantially built up, the soils could remain in-situ subject to any physical constraints relating to their stability under structures or surfaces. Given the fairly moderate concentrations, a clean cover of 600mm (equivalent to a 'double dig' depth usually employed during more intense domestic cultivation) is considered adequate for this purpose.

5.3. If final levels across the site do not allow build up by this thickness, then the material must be removed and either redeposited at depth or disposed of as waste.

5.4. In either case validation and verification that the measures have been successfully implemented arte most readily obtained by collection of soil samples from depths of 0-600mm from garden areas following completion of the soil cover system.

5.5. If imported soils are to be used to make up levels and provide clean cover, these must also be clean and suitable for use. Provision of details of the sources and sampling at an appropriate frequency of 1 sample per 50m^3 for materials from brownfield, unknown or manufactured/recycled sources, and 1 sample per 100m^3 from well characterised sources, with a minimum of three samples per source are recommended.

5.6. Samples should be representative and to allow confidence in the results should be collected by an appropriately qualified and experienced person with detailed notes including soil descriptions made for inclusion in a verification report. Unless information relating to the source indicates the possibility of other contaminants a general soil suite comprising asbestos, metals, hydrocarbons and PAHs should be used to assess the materials with comparison to similar CVs as those adopted in this report.

5.7. The previous recommendations regarding radon protection and removal of the suspected asbestos containing materials should be adhered to, records kept in the form of floor design details and receipts/delivery notes for materials and waste transfer documentation for soils and other materials removed from the site should be provided in verification reporting to support the final discharge of conditions relating to Land Contamination.

<u>Limitations</u>

5.2. SGP reserves the right to alter any of the foregoing information in the event of new information

being disclosed or provided and in the light of changes to legislation, guidelines and responses by the statutory and regulatory authorities.

5.3. This report has been prepared by Smith Grant LLP, for the sole and exclusive use of Mr Mark Davies. The benefit of this report may not be assigned to any other party without the prior agreement in writing of Smith Grant LLP. Reasonable skill, care and diligence have been exercised within the timescale and budget available, and in accordance with the technical requirements of the brief.

5.4. Notwithstanding the efforts made by the professional team in undertaking the assessment and preparing this report, it is possible that other ground conditions and contamination as yet undetected may exist. Reliance on the findings of this report must therefore be limited accordingly. Such reliance must be based on the whole report and not on extracts which may lead to incomplete or

DRAWING D01

Sampling Locations

N

Hand Dug Trial Pit

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Project: Lower Road, Coedpoeth	
Drawing: Site Location & Investigations	
Drawn: BJT	Checked: CS
Date: 05/04/2016	Scale: 1:2,500
Job No: R2259	Drg No: D01

APPENDIX A

Analytical Results

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Smith Grant LLP
Station House
Station Road
Ruabon
Wrexham
LL14 6DL

Attention :	Ben Thomas
Date :	18th May, 2016
Your reference :	R2259
Our reference :	Test Report 16/8754 Batch 1
Location :	Lower Road. Coedpoeth
Date samples received :	11th May, 2016
Status :	Final report
Issue :	1

Six samples were received for analysis on 11th May, 2016 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Jones Environmental Laboratory

Client Name: Smith Grant LLP
Reference: R2259
Location: Lower Road. Coedpoeth
Contact: Ben Thomas
JE Job No.: 16/8754

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1	2	3	4	5	6					LOD/LOR	Units	Method No.
Sample ID	TP1S1	TP2S1	TP3S1	TP4S1	TP5S1	TP6S1							
Depth	0.30	0.35	0.10	0.30	0.50	0.40							
COC No / misc													
Containers	T	T	T	T	T	T							
Sample Date	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016							
Arsenic #M	14.3	15.2	14.6	12.7	1.9	8.0					<0.5	mg/kg	TM30/PM15
Cadmium #M	0.3	0.2	2.5	0.9	<0.1	0.6					<0.1	mg/kg	TM30/PM15
Chromium #M	71.5	95.7	81.4	72.6	56.1	71.0					<0.5	mg/kg	TM30/PM15
Copper #M	36	20	46	21	29	18					<1	mg/kg	TM30/PM15
Lead #M	278	497	1133	435	7	141					<5	mg/kg	TM30/PM15
Mercury #M	<0.1	<0.1	0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM30/PM15
Nickel #M	62.7	26.7	32.9	25.4	45.6	23.8					<0.7	mg/kg	TM30/PM15
Selenium #M	2	2	1	2	<1	1					<1	mg/kg	TM30/PM15
Zinc #M	230	187	479	263	73	156					<5	mg/kg	TM30/PM15
Natural Moisture Content	27.5	27.2	37.3	28.9	13.3	19.5					<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.3	mg/kg	TM38/PM20
Chromium III	71.5	95.7	81.4	72.6	56.1	71.0					<0.5	mg/kg	NONE/NONE
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay						None	PM13/PM0
Sample Colour	Medium Brown	Light Brown	Medium Brown	Medium Brown	Light Brown	Light Brown						None	PM13/PM0
Other Items	stones and roots	stones	stones, roots and laom	stones and roots	stones	stones						None	PM13/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Smith Grant LLP
Reference: R2259
Location: Lower Road. Coedpoeth
Contact: Ben Thomas

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 16/8754						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/8754

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 16/8754

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes