

Method Statements for Wrexham Project:

DETS 046 (DETSC 1004): MOISTURE CONTENT/LOSS ON DRYING OF SOIL

Loss on drying is determined by loss of mass on drying in an oven set at 28°C or 50°C. Moisture content is determined by loss of mass on drying in an oven set at 105°C. The procedure is carried out during the sample preparation stage.

DETS 062 (DETSC 3321): BTEX, MTBE & PRO IN SOILS BY HEADSPACE GC-FID

BTEX, MTBE and PRO in soils are determined via Headspace GC-FID. Individual aromatic compounds are quantified by external calibration against known standards. PRO range is banded using alkane markers to define retention time windows.

DETSC 1003: STONE AND GLASS/METAL/PLASTIC CONTENT OF SOIL

The Stone and Glass/Metal/Plastic content of soil samples is carried out during the sample preparation stage. A defined weight of sample is sieved and all stone/glass/metal/plastic from the portion removed and weighed.

DETSC 1101: ASBESTOS BULK ANALYSIS

Samples are examined visually for the presence of asbestos containing materials or asbestos fibres. Suspect fibres are removed from the sample and examined using polarised light microscopy to determine whether they are asbestos fibres.

If no asbestos fibres are identified by the method after an adequate length of examination time, and after at least two small pinch samples have been examined, then the sample may be reported as 'NAD' (no asbestos detected).

DETSC 1102: GRAVIMETRIC QUANTIFICATION OF ASBESTOS IN SOILS, LOOSE AGGREGATES AND BALLAST

The method of quantification is divided into three procedures: Gravimetric analysis, detailed gravimetric analysis and PCOM analysis. The analysis may be affected by the client's requirements as determined by contract review, and by the nature of the asbestos found in the sample, e.g. whether ACMs are present, and whether fibre bundles large enough to pick out using tweezers are have been found in the sample.

Gravimetric Analysis

The entire sample is weighed using a calibrated balance, and then examined inside a fume cabinet. Any items that may contain asbestos are removed from the sample for identification. All suspect ACMs are identified using stereomicroscopy and Polarised Light Microscopy as described in DETSC 1101 and HSG 248. Items confirmed as containing asbestos are weighed using a calibrated balance, and the mass percentage ACM content of the sample is calculated. The asbestos content of the sample is then calculated based on the typical asbestos content of the particular ACMs found, with reference to HSG 264, Appendix 2.

DETSC 1102 GRAVIMETRIC QUANTIFICATION OF ASBESTOS IN SOILS, LOOSE AGGREGATES AND BALLAST (Continued)

Detailed Gravimetric Analysis

Any bundles of asbestos fibres observed during asbestos identification analysis that are large enough to be removed using tweezers are removed and weighed using a calibrated balance. The mass% asbestos in the subsample is calculated, and the total mass% in the entire sample is calculated based on the relative weights of the greater than/less than 1cm fractions. The analyst should spend no more than approximately 20 minutes on the detailed gravimetric analysis. If bundles are too numerous to pick out then PCOM analysis should be undertaken.

PCOM Analysis

If asbestos fibres are still present in the subsample following the detailed gravimetric analysis stage, or if the clients' requirements state that it should be carried out, PCOM analysis can be undertaken in order to assess the mass% and / or number of free fibres. A known mass of between 8g and 12g is removed and made up to 1000ml using water. The mixture is stirred for 1 hour using a magnetic stirrer then a known quantity is filtered through four cellulose-ester filter papers. Each filter is then placed onto a microscope slide, allowed to air dry, and then cleared and fixed using the acetone/triacetin method described in HSG 248. The slides are then evaluated using PCOM. From the number and size of the fibres observed on the slides the mass percentage of asbestos in the sample is estimated, and, if required, the number of potentially respirable fibres calculated.

DETSC 2003: LOSS ON IGNITION

Soil is ignited at 440°C ±25°C and the amount of sample lost on ignition is determined gravimetrically. Other specified temperatures may be used but are not accredited.

DETSC 2008: pH VALUE OF SOIL AND WATER

The pH value of a soil suspension in water or of a groundwater or leachate sample is determined by the electrometric method using a glass electrode.

DETSC 2009: ELECTRICAL CONDUCTIVITY OF SOIL AND WATER

The electrical conductance of a soil suspension in water or of a water sample is determined by voltammetry using a conductivity meter.

In some cases, the soil may need to be extracted with an aqueous solution of an inorganic salt e.g. the conductivity of topsoil is determined by preparing a suspension of the soil in saturated calcium sulphate.

DETSC 2033: TOTAL AND DISSOLVED ORGANIC CARBON IN WATER

The term TOC (Total Organic Carbon) is used to describe the total content of organically bound carbon in dissolved and undissolved compounds. The TOC content is expressed in mg/l. If DOC (Dissolved Organic Carbon) is required, samples are filtered through a 0.45µm filter paper prior to analysis.

Inorganic carbon is expelled by acidification of the sample. TOC is then determined by digestion of the sample with sulphuric acid and peroxodisulphate. Carbon containing compounds are transformed into carbon dioxide. The carbon dioxide evolves and reacts with an indicator solution. The colour change is measured using a spectrophotometer.

DETSC 2034: SUSPENDED AND SETTLEABLE SOLIDS IN WATER

Suspended matter is removed from a measured volume of sample by filtration under reduced pressure through a pre-treated, pre-weighed glass fibre filter paper. The paper is washed with deionised water to remove dissolved salts and the total suspended matter is determined gravimetrically after drying at $105 \pm 5^\circ\text{C}$

Settleable solids are determined by subtracting the solids left in suspension after settlement for 1 hour (or other agreed time) from the total suspended matter in the sample.

DETSC 2055: ANIONS IN WATER AND AQUEOUS SOIL EXTRACTS BY ION CHROMATOGRAPHY

Groundwater, wastewater, leachate samples and aqueous soil extracts are filtered through a $0.22\mu\text{m}$ syringe filter. The filtered samples are injected into an Ion Chromatograph. The anions of interest are separated on the basis of their affinity for the active sites of the column packing material. The separated anions are converted into their highly conductive acid forms and measured by conductivity. The anions are identified on the basis of retention time as compared to standards and quantisation is by measurement of peak area.

DETSC 2076: SULPHATE AND MAGNESIUM CONTENT OF 2:1 AQUEOUS EXTRACT OF SOIL BY ICP-OES

The sulphate and magnesium in the soil are extracted in an aqueous extract having water: soil ratio of 2:1 and the insoluble material is removed by filtration. The concentrations of sulphate and magnesium in the filtrate are determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). The wavelengths used for identification and quantification are 181.972nm for sulphate and 285.213nm for magnesium.

DETSC 2084: TOTAL ORGANIC CARBON BY PRIMACS^{ATC} ANALYSER

Soil samples are treated with phosphoric acid to expel any inorganic carbonates. The samples are then heated at high temperature in a continuous flow of air so that any organic carbon is oxidised to carbon dioxide. The gas is then allowed to cool and analysed by an infra-red detector.

DETSC 2085: TOTAL AND DISSOLVED ORGANIC CARBON IN WATER

Direct TOC Analysis. The sample is acidified, stirred and purged to remove the IC before the sample is injected and handled as in the TC Analysis.

TC Analysis

The sample is injected by an automated septum less rotary port into a high temperature reactor. In the reactor, at a temperature of $750 - 950^\circ\text{C}$ all organic and inorganic carbon is oxidized to the gaseous carbon dioxide (CO_2). The catalyst that is present in the reactor catalysis the oxidation to completion. A flow of air transports these oxidation products to the detectors. The oxygen required for reaction is taken from the airflow. The products are led into the non-dispersive infrared detector where the carbon dioxide is determined. The carbon dioxide is measured at a wavelength of $4.2\mu\text{m}$ by NDIR detection.

Auto sampler

Sample pre-treatment for direct TOC determination is fully controlled by the operational software and can be set in preferred mode by the operator. The instrument has a dual needle set-up to acidify and purge the following sample while analysing the current one to save analysis time. Stirring is possible either by top stirrer or magnetic stirrer. An option for making automatic working standards, as well as pre- and post-dilutions is available in the software

DETSC 2119: EXCHANGEABLE AMMONIA IN SOIL

An intense blue-green complex, related to indophenol blue, is formed by the reaction of ammonia with hypochlorite and sodium salicylate, in the presence of sodium nitroprusside acting as a catalyst. The complex is measured spectrophotometrically at wavelength 655nm and is related to the ammonia concentration by means of a calibration curve. Sodium citrate is added to overcome interfering ions.

DETSC 2123: WATER SOLUBLE BORON IN SOIL & BORON IN WATER

Boron in soil is extracted in boiling saline water.

Waters are filtered prior to analysis to remove any particulates in suspension.

The water soluble boron in the extract or filtrate reacts with azomethine-H to produce a yellow coloured complex. The resulting colour absorbance is measured at 420nm using a suitable visible spectrophotometer.

DETSC 2130: CYANIDES & MONOHYDRIC PHENOLS BY SKALAR

Solid samples are extracted with 1M caustic soda prior to analysis on the automated flow analyzer.

The method determines total cyanide, easily liberated cyanide, thiocyanate and monohydric phenols. The automated procedure is based on the following reactions.

DETSC 2207: LOW LEVEL AMMONIA IN WATERS & LEACHATES BY KONELAB 60i

Ammonia reacts with hypochlorite ions generated by the alkaline hydrolysis of sodium dichloroisocyanurate to form monochloramine. Monochloramine reacts with salicylate ions in the presence of sodium nitroprusside at around pH 12.6 to form a blue compound. The absorbance of this compound is measured spectrophotometrically at wavelength 660nm and is related to the ammonia concentration by means of a calibration curve.

The Konelab60i analyses a series of manually prepared standards. These standards are used to produce a calibration graph. Filtered samples are analysed and the Ammonia content determined by plotting the result on the calibration graph.

DETSC 2208: SULPHIDE IN WATERS & LEACHATES BY KONELAB 60i

Sulphide is determined colorimetrically using the Konelab 60i autoanalyser. Potassium Dichromate converts N-N-Diethyl-p-phenylene-diamine to the free radical which reacts rapidly with sulphide to produce the coloured 'DPD Blue' or 'Ethylene Blue'. The absorbance can then be measured at wavelength 660nm.

The Konelab 60i analyses a series of manually prepared standards. These standards are used to produce a calibration graph. Filtered samples are analysed and the Sulphide content determined by plotting the result on the calibration graph.

DETSC 2301: METALS IN SOILS BY ICP-OES

Metals in soil are extracted by microwave or hot-block using a mixture of aqua regia and hydrogen peroxide. Their concentrations are determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). The wavelengths used for identification and quantification of each metal are given in Table 4.1.

DETSC 2306: METALS IN WATERS BY ICP-MS

Concentrations of metals in water are determined by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS).

DETSC 2325: MERCURY IN SOIL BY ATOMIC FLUORESCENCE SPECTROSCOPY

The mercury is extracted from soil in aqua regia with gentle refluxing. The extract is filtered to remove particulates and diluted to volume. Treatment with tin (II) chloride reduces mercury (II) to mercury (0) vapour which is detected using atomic fluorescence spectrometry.

DETSC 3049: ELEMENTAL SULPHUR IN SOILS AND WATERS BY HPLC

The method is suitable for all soil samples and is validated for the following matrices to the MCERT's Standard for Soils: Sandy soil, loam and clay

The method is UKAS accredited for the following aqueous matrices: Clean water (non regulatory) River water, Groundwater, Trade effluent, prepared and landfill leachates.

DETSC 3072: ALIPHATIC / AROMATIC TPH BY GC-FID

Aliphatic and aromatic petroleum hydrocarbons (C_{10} - C_{35}) are extracted from soil and water using n-Hexane. The fractions are separated by solid phase extraction using silica columns, whereby the aliphatic fraction is eluted first with n-Hexane and the aromatic portion is eluted second with dichloromethane. The total, aliphatic, and aromatic concentrations are determined by gas chromatography flame ionisation detection (GC-FID) using a capillary column and hydrogen as the carrier gas. The chromatographic data is further characterized by subdivision into approximate boiling point/carbon number ranges with respect to n-alkane retention time markers.

DETSC 3301: PAH IN SOIL BY GC-FID

Soils are extracted in dichloromethane (DCM) using sonication. The PAH concentration is recorded both as "Total PAH" and as "Speciated PAH", specified in terms of the 16 US EPA "Priority Pollutant" Polycyclic Aromatic Hydrocarbons. Concentrations are determined by gas chromatography using a BPX 50 (30m; 0.25 μ m ID; 0.25 μ m film) capillary column (or equivalent).

DETSC 3311: EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) IN SOIL, BALLAST AND WATER

This method is designed to determine total concentrations of extractable petroleum hydrocarbons (EPH) in solid and aqueous matrices. This method uses a dichloromethane (DCM) extraction followed by quantification using gas chromatography/flame ionisation detection (GC-FID) analysis using a 1:1 mixture of diesel and mineral oil as calibration standards and n-alkane markers to establish the boiling point ranges. This method is used for the quantitative analysis of "Total EPH" (C_{10} - C_{40}) and as "Speciated EPH", specified in terms of the "diesel range" (C_{10} - C_{24}), and "mineral oil range" (C_{24} - C_{40}).

DETSC 3322 BTEX, MTBE & PRO IN WATERS & LEACHATES BY HEADSPACE GC-FID

BTEX, MTBE and PRO in soils are determined via Headspace GC-FID. Individual aromatic compounds are quantified by external calibration against known standards. PRO range is banded using alkane markers to define retention time windows.

Analytical Quality Control Summary

KEY

Det	Determination code (Test)
Aqc name	Name of Analytical Quality Control (AQC) sample
Target	Target value for AQC from validation or AQC chart review
Target sd	Target standard deviation (sd) used as basis for 2sd (warning) and 3sd (action) limits
Mean	Mean value of data plotted on AQC chart for summary period
Sd	sd value of data plotted on AQC chart for summary period
% Rsd	Precision of results expressed as percent relative standard deviation
Bias	Target value minus Mean value
Max	Maximum AQC value on chart for summary period
Min	Minimum AQC value on chart for summary period
Count	Number of AQC values on chart for summary period

12/06/2014

Analytical Quality Control Summary

Page

1

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
B-WS-3iS	AQC 0612 B INO 066	9.6068	0.67293	9.62800	0.789107	8.196	0.0212	11.2300	7.9100	135
Cl-2:1i3S	AQC 0510 INO 021	99.0920	12.15514	106.84181	8.061837	7.546	7.7498	126.3300	91.0100	36
Cl-2:1i3S	AQC 0510 INO 085	100.6936	11.62492	104.60455	6.880844	6.578	3.9110	121.5048	91.8073	30
Cl-2:1i3S	AQC 0510 INO 086	104.0017	11.10522	98.63310	5.884708	5.966	-5.3839	114.9665	91.8069	24
CN-FREE3iS	AQC 0513 INO 087	9.2913	0.63619	9.19540	0.646304	7.029	-0.0959	10.5200	7.4670	119
CN-FREE3iS	AQC 0513 INO 050	9.4077	0.52043	9.38112	0.500546	5.336	-0.0266	10.3500	8.0300	76
CN-TOT3iS	AQC 0513 INO 087	14.1133	0.78518	13.11988	0.693574	5.286	-0.9934	15.0320	11.0330	144
CN-TOT3iS	AQC 0513 INO 050	13.9063	0.87951	13.12986	0.529172	4.030	-0.7764	14.3060	12.0050	81
LOI-1iS	AQC LOI 0613	5.2378	0.22131	5.26937	0.219257	4.161	0.0316	5.8380	4.9300	56
NH4-N3iS	AQC 0613 NH3 INO 066	7.5199	0.52440	7.65475	0.825221	10.781	0.1348	9.4700	5.9500	40
pH-iS	AQC 0513 PH INO 036	8.1322	0.07357	8.13489	0.076553	0.941	0.0027	8.2900	7.9800	47
pH-iS	AQC 0513 PH INO 094	8.1453	0.05475	8.17887	0.054322	0.664	0.0336	8.3200	8.0400	390
SCN-3iS	AQC 0513 INO 087	97.9451	5.19077	100.05760	5.759523	5.756	2.1125	111.5460	87.5650	43
SCN-3iS	AQC 0513 INO 050	100.7359	5.53453	101.69941	5.611231	5.517	0.9635	110.3650	87.4520	32
SO4oe2:1iS	AQC 0613 MET NV	292.7392	22.65028	294.56303	23.422685	7.952	1.8238	356.5130	251.2970	185
SO4oe2:1iS	AQC 0613 MET 006	304.5264	19.53227	276.95983	7.105640	2.566	-27.5666	288.7850	268.5410	6
SO4oe2:1iS	AQC 0114 MET 006	693.6633	41.83930	707.70621	43.390806	6.131	14.0429	815.8660	577.7060	33
SO4oe2:1iS	AQC 0114 MET NV	656.2603	58.57172	702.31545	51.040454	7.267	46.0551	821.3330	564.1990	92
TOC-man1iS	AQC 0109 OM	1.9170	0.05634	1.91658	0.055524	2.897	-0.0004	2.0540	1.8000	206

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12/06/2014

Analytical Quality Control Summary

Page

1

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
As-oe3iS	AQC 0910 MET NV	7.6664	0.36568	7.46714	0.372234	4.985	-0.1993	8.6883	6.8983	29
As-oe3iS	AQC 0910 MET 005	7.9034	0.36796	8.02749	0.396871	4.944	0.1241	9.2517	7.0156	279
Cd-oe3iS	AQC 0910 MET NV	12.7516	0.45516	12.54160	0.345974	2.759	-0.2100	13.0172	11.4392	29
Cd-oe3iS	AQC 0910 MET 005	11.8669	0.39572	12.38964	0.559070	4.512	0.5227	13.5544	10.7354	278
Cr-oe3iS	AQC 0910 MET NV	32.7974	1.99786	34.64716	1.954359	5.641	1.8498	38.5609	29.9867	29
Cr-oe3iS	AQC 0910 MET 005	36.4382	1.90980	35.02287	2.224558	6.352	-1.4153	40.7642	28.5990	278
Cu-oe3iS	AQC 0910 MET 005	60.9469	2.26147	59.58753	3.694307	6.200	-1.3594	69.2802	48.8418	279
Cu-oe3iS	AQC 0910 MET NV	57.5251	3.38585	60.07794	2.805437	4.670	2.5528	67.4854	55.4025	29
Hg-ps3iS	AQC HG 0911 MET 014	1.6089	0.10823	1.62182	0.109896	6.776	0.0129	1.9330	1.3680	284
Ni-oe3iS	AQC 0910 MET NV	29.3673	1.48515	29.93996	0.909249	3.037	0.5727	32.1208	28.1288	29
Ni-oe3iS	AQC 0910 MET 005	30.5569	0.88747	29.62940	1.309798	4.421	-0.9275	33.0272	25.6559	278
Pb-oe3iS	AQC 0910 MET NV	33.9494	2.11518	33.77975	2.342167	6.934	-0.1697	38.5694	30.4610	29
Pb-oe3iS	AQC 0910 MET 005	35.8592	1.85598	35.22324	2.011715	5.711	-0.6360	41.0354	29.6238	280
Se-oe3iS	AQC 0910 MET NV	44.7737	2.29912	43.87601	1.871222	4.265	-0.8977	47.7370	39.5915	30
Se-oe3iS	AQC 0910 MET 005	41.7153	1.84282	43.83552	2.571532	5.866	2.1202	49.6807	37.9097	279
Zn-oe3iS	AQC 0910 MET NV	91.4933	3.69153	92.03094	3.587019	3.898	0.5376	102.4480	85.6100	30
Zn-oe3iS	AQC 0910 MET 005	96.3399	3.05920	92.46249	4.635938	5.014	-3.8774	101.4440	79.3443	282

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12/06/2014

Analytical Quality Control Summary

Page

1

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
BENZ-3iS	AQC ORG 016	1.7909	0.14119	1.79040	0.135392	7.562	-0.0005	1.9800	1.3600	75
BENZ-3iS	AQC ECOS8083	1.7652	0.11378	1.73102	0.112606	6.505	-0.0342	1.9400	1.4400	155
ETHBEN3iS	AQC ECOS8083	1.7590	0.10778	1.71794	0.108279	6.303	-0.0411	1.9200	1.4700	155
ETHBEN3iS	AQC ORG 016	1.7659	0.13414	1.76547	0.128118	7.257	-0.0004	1.9600	1.4000	75
S-FREE3iS	AQC SULPHUR 0513	127.1881	11.24286	129.23355	15.766993	12.200	2.0455	167.4174	96.0050	52
TOLU3iS	AQC ORG 016	1.7796	0.14256	1.77947	0.136806	7.688	-0.0001	2.0000	1.3400	75
TOLU3iS	AQC ECOS8083	1.7703	0.11278	1.71942	0.111537	6.487	-0.0509	1.9400	1.4800	155
TPH-T3iS	AQC ORG 034	1079.7368	89.28977	1080.48798	93.687840	8.671	0.7512	1285.6760	799.5310	80
TPH-T3iS	AQC ORG 027	1113.8562	111.73050	1127.92101	82.600951	7.323	14.0648	1335.6330	917.5420	92
XYLEN3iS	AQC ECOS8083	5.1730	0.31870	5.09706	0.331176	6.497	-0.0759	5.7400	4.4000	153
XYLEN3iS	AQC ORG 016	5.2674	0.38180	5.24397	0.390010	7.437	-0.0234	5.8500	4.1600	73

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12/06/2014

Analytical Quality Control Summary

Page 1

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
ANAPT-3iS	AQC ORG 025F 0810	20.8094	1.40593	20.97717	1.329284	6.337	0.1678	22.9460	17.8276	59
ANAPT-3iS	AQC ORG 062B 0114	21.5779	1.66674	22.38075	0.690631	3.086	0.8028	22.8691	21.8924	2
ANAPT-3iS	AQC ORG 032F 0211	21.1532	1.25743	20.36942	1.595880	7.835	-0.7838	23.1842	17.3293	92
ANAPT-3iS	AQC ORG 032M 0211	21.2506	1.20773	20.63378	1.492535	7.233	-0.6168	22.9916	17.2822	88
ANAPT-3iS	AQC ORG 062F 0114	21.2060	1.25202	20.21383	1.571796	7.776	-0.9922	21.8090	18.6665	3
ANAPT-3iS	AQC ORG 025M 0810	20.5027	1.24028	20.19720	1.483933	7.347	-0.3055	21.8518	17.7724	7
ANAPY-3iS	AQC ORG 025M 0810	20.0611	1.31272	20.98767	0.982008	4.679	0.9266	22.4425	19.6917	7
ANAPY-3iS	AQC ORG 062F 0114	21.0963	1.23890	20.38700	1.521387	7.463	-0.7093	21.9290	18.8871	3
ANAPY-3iS	AQC ORG 032M 0211	21.0266	1.26840	20.59884	1.480877	7.189	-0.4278	23.0856	16.9590	88
ANAPY-3iS	AQC ORG 032F 0211	20.7819	1.33583	20.37220	1.543196	7.575	-0.4097	22.8500	17.3910	92
ANAPY-3iS	AQC ORG 062B 0114	21.7903	1.68664	22.57060	0.709794	3.145	0.7803	23.0725	22.0687	2
ANAPY-3iS	AQC ORG 025F 0810	20.4098	1.38768	20.58678	1.502875	7.300	0.1770	23.0752	17.4776	59
ANTHR-3iS	AQC ORG 025M 0810	20.0402	1.39330	20.44703	0.991137	4.847	0.4068	21.8914	18.9873	7
ANTHR-3iS	AQC ORG 062F 0114	20.8402	1.14781	20.42157	2.216968	10.856	-0.4186	22.7960	18.4058	3
ANTHR-3iS	AQC ORG 032M 0211	20.7646	1.30030	20.61447	1.411350	6.846	-0.1501	22.7599	17.6634	88
ANTHR-3iS	AQC ORG 032F 0211	20.9144	1.18730	20.12701	1.476819	7.337	-0.7874	22.6275	17.0872	92
ANTHR-3iS	AQC ORG 062B 0114	22.7872	2.03628	23.79820	0.837922	3.521	1.0110	24.3907	23.2057	2
ANTHR-3iS	AQC ORG 025F 0810	20.6258	1.26488	21.01050	1.223852	5.825	0.3847	23.1396	18.0260	59
BENAA-3iS	AQC ORG 025F 0810	19.7696	1.85331	19.37881	1.926354	9.941	-0.3908	23.0732	15.9041	59
BENAA-3iS	AQC ORG 025M 0810	19.0655	1.63405	19.70519	0.844912	4.288	0.6397	21.0857	18.4902	7
BENAA-3iS	AQC ORG 062F 0114	21.1692	1.13099	20.54810	1.220843	5.941	-0.6211	21.7920	19.3517	3
BENAA-3iS	AQC ORG 032M 0211	19.8833	2.00400	19.78307	1.880898	9.508	-0.1002	23.2899	15.5364	88
BENAA-3iS	AQC ORG 032F 0211	20.3725	1.35013	19.12668	1.632649	8.536	-1.2458	22.2431	16.0156	92

12/06/2014

Analytical Quality Control Summary

Page

2

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
BENAA-3iS	AQC ORG 062B 0114	21.4187	1.84535	21.61850	0.623385	2.884	0.1998	22.0593	21.1777	2
FANTH-3iS	AQC ORG 025M 0810	20.3961	1.29120	20.76894	0.594491	2.862	0.3728	21.5611	20.0178	7
FANTH-3iS	AQC ORG 062F 0114	21.3969	1.18752	20.48180	1.772818	8.656	-0.9151	22.3550	18.8302	3
FANTH-3iS	AQC ORG 032M 0211	20.7300	1.59684	20.41259	1.672777	8.195	-0.3174	23.1080	16.0657	88
FANTH-3iS	AQC ORG 025F 0810	20.1706	1.58993	20.79197	1.546471	7.438	0.6214	23.1438	17.0901	59
FANTH-3iS	AQC ORG 062B 0114	21.5995	1.78115	22.22540	0.715168	3.218	0.6259	22.7311	21.7197	2
FANTH-3iS	AQC ORG 032F 0211	21.0625	1.25716	19.77538	1.720374	8.700	-1.2871	22.7303	16.9784	92
FLOUR-3iS	AQC ORG 062F 0114	20.8676	1.22015	19.74517	1.766916	8.949	-1.1224	21.5630	18.0340	3
FLOUR-3iS	AQC ORG 032M 0211	20.1947	1.40633	19.80753	1.537600	7.763	-0.3872	22.3585	16.3338	88
FLOUR-3iS	AQC ORG 032F 0211	20.3206	1.26715	19.56733	1.601936	8.187	-0.7533	22.6497	16.5416	92
FLOUR-3iS	AQC ORG 062B 0114	21.2070	1.70252	22.02225	0.712976	3.238	0.8152	22.5264	21.5181	2
FLOUR-3iS	AQC ORG 025F 0810	19.9818	1.44715	19.99831	1.691555	8.458	0.0165	22.7412	17.0042	59
FLOUR-3iS	AQC ORG 025M 0810	19.6957	1.64405	20.21446	1.256383	6.215	0.5188	22.5823	18.4875	7
NAPH-3iS	AQC ORG 062F 0114	21.1963	1.09501	20.14057	1.055890	5.243	-1.0557	21.1670	19.0575	3
NAPH-3iS	AQC ORG 032M 0211	20.9237	1.16978	20.31901	1.414182	6.960	-0.6047	23.0243	16.6944	88
NAPH-3iS	AQC ORG 032F 0211	20.1839	1.37033	19.72125	1.451770	7.361	-0.4627	22.1962	16.8265	92
NAPH-3iS	AQC ORG 062B 0114	20.9552	1.41482	21.50475	0.576221	2.680	0.5496	21.9122	21.0973	2
NAPH-3iS	AQC ORG 025F 0810	19.8159	1.47304	19.77699	1.466364	7.414	-0.0389	22.7534	17.1704	59
NAPH-3iS	AQC ORG 025M 0810	19.7588	1.53604	20.02577	0.758291	3.787	0.2670	21.0774	18.6870	7
PHENA-3iS	AQC ORG 025F 0810	19.5857	1.87048	19.45559	2.007849	10.320	-0.1301	23.0307	15.0727	59
PHENA-3iS	AQC ORG 025M 0810	19.8303	1.36516	20.60657	1.153693	5.599	0.7763	22.5215	19.3104	7
PHENA-3iS	AQC ORG 062F 0114	21.4644	1.24440	20.84393	1.499385	7.193	-0.6205	22.2950	19.3005	3
PHENA-3iS	AQC ORG 062B 0114	21.5412	1.76945	22.32770	0.717148	3.212	0.7865	22.8348	21.8206	2

12/06/2014

Analytical Quality Control Summary

Page

3

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
PHENA-3iS	AQC ORG 032F 0211	20.6190	1.48026	19.51863	1.811948	9.283	-1.1004	22.9209	15.9796	92
PHENA-3iS	AQC ORG 032M 0211	19.8255	1.92158	19.83088	1.975733	9.963	0.0054	22.7489	15.0044	88
PYRE-3iS	AQC ORG 032F 0211	21.0757	1.17115	19.64333	1.689667	8.602	-1.4324	22.9241	16.9278	92
PYRE-3iS	AQC ORG 062B 0114	20.3756	1.65594	20.93745	0.656973	3.138	0.5618	21.4020	20.4729	2
PYRE-3iS	AQC ORG 025F 0810	20.4820	1.52747	20.64222	1.475392	7.147	0.1602	23.5082	17.1552	59
PYRE-3iS	AQC ORG 032M 0211	20.6878	1.48189	20.22306	1.578177	7.804	-0.4647	23.0474	16.0621	88
PYRE-3iS	AQC ORG 062F 0114	20.8862	1.08326	19.99420	1.705958	8.532	-0.8920	21.8140	18.4312	3
PYRE-3iS	AQC ORG 025M 0810	20.6192	1.23339	20.71576	0.819150	3.954	0.0966	22.1545	20.0018	7

The above data is the AQC Summary from 2nd December 2013 – 11th February 2014.

12/06/2014

Analytical Quality Control Summary

Page 1

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
BAPYR-3iS	AQC ORG 025F 0810	19.8051	1.76246	20.31016	1.530013	7.533	0.5051	23.2827	16.5458	59
BAPYR-3iS	AQC ORG 062B 0114	20.7504	1.59558	21.03130	0.530896	2.524	0.2809	21.4067	20.6559	2
BAPYR-3iS	AQC ORG 032F 0211	19.8658	1.55791	19.12943	1.651731	8.635	-0.7364	22.3617	15.5971	92
BAPYR-3iS	AQC ORG 032M 0211	20.2886	1.56248	20.20885	1.672615	8.277	-0.0798	22.7538	16.6803	88
BAPYR-3iS	AQC ORG 062F 0114	20.6251	1.02386	20.46953	0.699093	3.415	-0.1556	21.0690	19.7016	3
BAPYR-3iS	AQC ORG 025M 0810	20.0495	1.48286	20.72863	1.112743	5.368	0.6791	22.2672	19.5107	7
BENBF-3iS	AQC ORG 025M 0810	19.6969	1.84029	19.78140	1.591955	8.048	0.0845	22.1744	17.9648	7
BENBF-3iS	AQC ORG 062F 0114	20.5854	0.99492	20.36737	0.593251	2.913	-0.2180	21.0445	19.9390	3
BENBF-3iS	AQC ORG 032M 0211	19.4946	1.94267	19.46059	1.858711	9.551	-0.0340	22.8342	15.9386	88
BENBF-3iS	AQC ORG 032F 0211	20.2083	1.69436	18.94190	1.841985	9.724	-1.2664	23.0051	15.4914	92
BENBF-3iS	AQC ORG 062B 0114	19.7499	1.52723	19.97235	0.471852	2.363	0.2224	20.3060	19.6387	2
BENBF-3iS	AQC ORG 025F 0810	19.5603	1.96539	19.07961	1.977193	10.363	-0.4807	22.1257	14.3588	59
BKFLO-3iS	AQC ORG 025M 0810	20.4014	1.38176	20.68616	1.580422	7.640	0.2848	22.7748	18.0247	7
BKFLO-3iS	AQC ORG 062F 0114	20.2283	0.78239	19.92407	0.846874	4.251	-0.3042	20.7200	19.0341	3
BKFLO-3iS	AQC ORG 032M 0211	21.0529	1.34676	20.76023	1.522339	7.333	-0.2927	23.0657	17.3470	88
BKFLO-3iS	AQC ORG 032F 0211	20.0738	1.45815	19.28481	1.703019	8.831	-0.7890	22.9096	16.3594	92
BKFLO-3iS	AQC ORG 062B 0114	21.2037	1.64128	21.30215	0.546523	2.566	0.0984	21.6886	20.9157	2
BKFLO-3iS	AQC ORG 025F 0810	20.8249	1.66828	21.43495	1.395208	6.509	0.6101	23.7368	17.5267	59
BPERY-3iS	AQC ORG 025F 0810	19.8279	1.63697	20.37031	1.402942	6.887	0.5424	22.8282	16.7823	59
BPERY-3iS	AQC ORG 025M 0810	20.2610	1.40392	20.28170	1.408209	6.943	0.0207	22.4850	18.4056	7
BPERY-3iS	AQC ORG 062F 0114	20.3757	0.73962	20.42407	0.340134	1.665	0.0484	20.7389	20.0633	3
BPERY-3iS	AQC ORG 062B 0114	20.1822	1.48848	20.30160	0.476731	2.348	0.1194	20.6387	19.9645	2
BPERY-3iS	AQC ORG 032F 0211	20.0455	1.37444	19.39128	1.543567	7.960	-0.6542	22.7310	16.7575	92

12/06/2014

Analytical Quality Control Summary

Page

2

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
BPERY-3iS	AQC ORG 032M 0211	20.5642	1.45039	20.50618	1.485762	7.245	-0.0580	23.5659	17.3386	88
CHRY5-3iS	AQC ORG 032M 0211	20.4669	1.47276	20.27454	1.682421	8.298	-0.1924	22.9645	15.9490	88
CHRY5-3iS	AQC ORG 062F 0114	20.8600	0.89060	20.63533	1.095658	5.310	-0.2247	21.7170	19.5262	3
CHRY5-3iS	AQC ORG 025M 0810	20.0222	1.49112	20.64813	1.185197	5.740	0.6259	22.2959	19.2258	7
CHRY5-3iS	AQC ORG 032F 0211	20.1699	1.31287	19.28142	1.576670	8.177	-0.8885	22.3114	16.4566	92
CHRY5-3iS	AQC ORG 062B 0114	21.2519	1.69486	21.62215	0.591353	2.735	0.3702	22.0403	21.2040	2
CHRY5-3iS	AQC ORG 025F 0810	20.1832	1.59665	20.59530	1.494407	7.256	0.4121	22.8465	17.2919	59
DIBEN-3iS	AQC ORG 025M 0810	20.1382	1.63579	20.20747	1.491551	7.381	0.0693	22.5946	18.5256	7
DIBEN-3iS	AQC ORG 062F 0114	20.5447	0.84561	20.76087	0.449499	2.165	0.2162	21.0487	20.2429	3
DIBEN-3iS	AQC ORG 032M 0211	20.7344	1.66991	20.62121	1.641759	7.962	-0.1132	23.2098	15.4430	88
DIBEN-3iS	AQC ORG 032F 0211	19.1496	1.49404	19.01003	1.456611	7.662	-0.1396	22.2411	16.0917	92
DIBEN-3iS	AQC ORG 062B 0114	20.5466	1.52053	20.63945	0.505369	2.449	0.0928	20.9968	20.2821	2
DIBEN-3iS	AQC ORG 025F 0810	20.3688	1.59188	20.73085	1.428022	6.888	0.3620	23.1240	17.2338	59
INDE-3iS	AQC ORG 062B 0114	20.5535	1.41443	20.55440	0.457922	2.228	0.0009	20.8782	20.2306	2
INDE-3iS	AQC ORG 032F 0211	20.3621	1.71187	19.45562	1.740017	8.944	-0.9065	23.2362	16.3325	92
INDE-3iS	AQC ORG 032M 0211	19.9902	1.96732	20.40376	1.823176	8.935	0.4136	23.1223	16.1004	88
INDE-3iS	AQC ORG 062F 0114	20.6784	0.75547	20.87247	0.354371	1.698	0.1941	21.1933	20.4921	3
INDE-3iS	AQC ORG 025M 0810	19.3680	1.68294	20.18754	1.548639	7.671	0.8195	22.3357	18.6618	7
INDE-3iS	AQC ORG 025F 0810	19.6499	2.01593	19.64800	2.057521	10.472	-0.0019	23.0225	14.5474	59
PAH-3iS	AQC ORG 025M 0810	320.7619	15.40243	318.99275	24.350065	7.633	-1.7691	347.6348	268.6147	8
PAH-3iS	AQC ORG 062F 0114	334.0524	14.23418	326.23040	17.627972	5.404	-7.8220	343.3600	308.1431	3
PAH-3iS	AQC ORG 032M 0211	327.8786	19.52922	324.45858	22.782545	7.022	-3.4200	359.8817	278.1349	88
PAH-3iS	AQC ORG 032F 0211	326.2814	14.56591	312.71570	21.319719	6.818	-13.5657	352.2371	276.6247	92

12/06/2014

Analytical Quality Control Summary

Page 3

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
PAH-3iS	AQC ORG 062B 0114	337.4908	25.80922	344.80900	9.821006	2.848	7.3182	351.7535	337.8645	2
PAH-3iS	AQC ORG 025F 0810	323.8939	20.00574	324.78753	21.358263	6.576	0.8936	363.8142	278.9905	59

The above data is the AQC Summary from 2nd December 2013 – 11th February 2014.

12/06/2014

Analytical Quality Control Summary

Page

1

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
ANTHR-4iL	AQC ANTHR-L	57.8643	3.38105	57.61451	3.699034	6.420	-0.2498	65.6329	49.7386	78
As-msS4iL	AQC ICPMS 0712	4.3046	0.24086	4.25177	0.299922	7.054	-0.0528	4.9059	3.4803	219
BENZ-4iL	AQC ORG 051	105.2233	8.78100	104.47500	6.631950	6.348	-0.7483	114.1800	99.2200	4
BENZ-4iL	AQC ORG 016	99.6642	7.72069	101.62309	7.477063	7.358	1.9589	118.8600	82.7000	55
BPERY-4iL	AQC BENZO-GHI-L	60.9425	5.32769	60.72197	5.026386	8.278	-0.2205	70.9404	47.2859	78
Cd-msS4iL	AQC ICPMS 0712	2.1356	0.12796	2.13235	0.128100	6.007	-0.0033	2.4363	1.7983	224
CHRY-4iL	AQC CHRY-4iL	61.5430	3.85593	61.20750	3.429353	5.603	-0.3355	68.1827	50.2390	78
Cl-an3iL	AQC 8192	5.0286	0.22599	5.28109	0.267047	5.057	0.2525	5.8775	4.5627	82
Cl-an3iL	AQC INO 021	5.1065	0.30754	5.06071	0.352271	6.961	-0.0458	5.9600	4.2400	42
Cl-an3iL	AQC 8193	5.2330	0.23926	5.28276	0.242747	4.595	0.0498	5.8677	4.6170	135
CN-FREE4iL	AQC FREECN SKALAR2-L	492.2330	31.45565	466.08493	15.119114	3.244	-26.1481	493.6500	445.5800	14
CN-FREE4iL	AQC FREE CN-L	489.3230	19.08834	476.77463	17.725540	3.718	-12.5484	515.4700	436.9300	89
CN-TOT4iL	AQC TOTAL CYANIDE-L	522.6868	19.42369	494.21245	21.632317	4.377	-28.4743	549.6100	449.9000	99
CN-TOT4iL	AQC TOT CN SKALAR2-L	503.9980	26.30497	487.66627	18.880971	3.872	-16.3317	531.7900	464.8660	15
COND-iL	AQC EC 12.91	12.8955	0.01245	12.89218	0.012121	0.094	-0.0033	12.9200	12.8700	206
COND-iL	AQC EC 1413	1411.2642	1.68561	1411.58937	1.637095	0.116	0.3252	1414.0000	1407.0000	207
COND-iL	AQC EC 147	147.4677	1.06429	147.33043	1.084843	0.736	-0.1373	149.1000	144.9000	207
Cr-msS4iL	AQC ICPMS 0712	20.4101	1.01402	20.35549	1.133105	5.567	-0.0546	22.9470	17.4320	226
Cu-msS4iL	AQC ICPMS 0712	20.0938	1.08473	19.32867	1.160852	6.006	-0.7651	21.8510	16.5400	225
ETHBEN-4iL	AQC ORG 051	104.9933	7.93539	106.02750	6.106048	5.759	1.0342	113.7900	99.0200	4
ETHBEN-4iL	AQC ORG 016	101.7409	7.60253	101.19236	7.336566	7.250	-0.5485	118.3300	84.4100	55
Fe-msS4iL	AQC ICPMS 0712	383.2431	24.92675	382.51206	23.232028	6.074	-0.7310	449.0900	324.2500	160
Hg-msS4iL	AQC ICPMS 0712	0.1193	0.01054	0.11977	0.010846	9.056	0.0005	0.1443	0.0898	208

12/06/2014

Analytical Quality Control Summary

Page

2

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
NH4N-k3iL	AQC KONE NH3 HIGH L	30.6200	0.69647	31.05846	0.711950	2.292	0.4385	32.0689	28.9000	18
NH4N-k3iL	AQC NH3 LOW INO 098	1.5651	0.03501	1.56906	0.029910	1.906	0.0040	1.6399	1.5077	69
NH4N-k3iL	AQC NH3 HIGH INO 098	30.7362	0.97165	30.69577	0.999064	3.255	-0.0404	32.8830	28.7400	84
NH4N-k3iL	AQC KONE NH3 LOW L	1.5464	0.07076	1.52537	0.101080	6.627	-0.0210	1.7035	1.3593	20
Ni-msS4iL	AQC ICPMS 0712	20.3334	1.06221	19.98288	1.261336	6.312	-0.3505	23.5380	16.6700	225
PAH-4iL	AQC PAH-L	924.2935	60.54595	915.00757	61.239701	6.693	-9.2859	1011.2201	777.6477	46
Pb-msS4iL	AQC ICPMS 0712	20.3292	1.28331	19.82231	1.287273	6.494	-0.5069	22.7240	16.9860	232
pH-iL	AQC PH-L 0409 MANUAL	7.9923	0.01457	7.99447	0.015046	0.188	0.0022	8.0400	7.9500	255
pH-iL	AQC PH-L 0409 ROBOT	8.0096	0.05046	0.00000			-8.0096	7.9500	7.9500	1
S-FREE4iL	AQC SULPHUR-L 0510	1078.2843	125.95434	988.79964	139.899981	14.148	-89.4847	1218.7678	727.2326	19
S2-kl4iL	AQC S2 INO 098	242.3294	10.65647	245.00408	12.107510	4.942	2.6747	265.9300	231.7700	10
S2-kl4iL	AQC KONE S2 LIQUID	236.3240	11.48327	232.72727	10.213727	4.389	-3.5967	255.4600	209.5600	44
SCN-4iL	AQC THIOCN-L	2401.7200	104.90834	2391.64154	110.366948	4.615	-10.0785	2573.4800	2224.1200	26
SCN-4iL	AQC THIOCN SKALAR2-L	2473.5998	170.06111	2470.37380	116.642507	4.722	-3.2260	2589.3650	2304.8880	5
Se-msS4iL	AQC ICPMS 0712	4.3006	0.31177	3.98705	0.300064	7.526	-0.3135	4.6800	3.1796	206
SO4-an3iL	AQC INO 021	5.0884	0.20930	5.24178	0.276375	5.273	0.1534	5.7100	4.5700	45
SO4-an3iL	AQC 8192	5.1187	0.19956	5.27275	0.236188	4.479	0.1540	6.0859	4.6962	93
SO4-an3iL	AQC 8193	5.1308	0.25097	5.13318	0.274232	5.342	0.0024	6.1258	4.4264	138
SS-SUS-3iL	AQC SUSPENDED SOLIDS	196.5752	3.20583	195.93962	2.826206	1.442	-0.6356	204.5000	191.0000	53
TOC-man3iL	AQC TOC-L HIGH RANGE	98.7750	1.19173	98.76200	1.361105	1.378	-0.0130	101.0000	96.0000	50
TOC-man3iL	AQC TOC-L	10.0090	0.29747	9.95791	0.299350	3.006	-0.0511	10.5000	9.4200	67
TOLU-4iL	AQC ORG 051	105.0767	7.96986	108.09750	8.655027	8.007	3.0208	116.1100	98.3000	4
TOLU-4iL	AQC ORG 016	100.3183	7.80097	101.17127	7.599992	7.512	0.8530	118.0800	84.3900	55

12/06/2014

Analytical Quality Control Summary

Page

3

Det	Aqc name	Target	Target sd	Mean	Sd	% Rsd	Bias	Max	Min	Count
TPH-T4iL	AQC ORG 027	100.2546	6.85912	104.97053	7.867952	7.495	4.7159	117.3840	91.3030	19
TPH-T4iL	AQC ORG 034	99.7784	5.67145	101.35522	5.557938	5.484	1.5768	109.4660	90.2940	27
Zn-msS4iL	AQC ICPMS 0712	20.3726	1.37242	22.31502	1.734529	7.773	1.9424	27.2600	17.8020	247

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