

CLIENT DETAILS

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Project **217500- Lithgow SWF**
 Order Number **217500**
 Samples **1**

LABORATORY DETAILS

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SGS Reference **SE258588 R0**
 Date Received **22 Dec 2023**
 Date Reported **10 Jan 2024**


COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES



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 Chemist



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 Metals/Inorganics Team Leader



Ly Kim HA
 Organic Section Head

Sample Number	SE258588.001	
Sample Matrix	Water	
Sample Date	21 Dec 2023	
Sample Name	SW1	
Parameter	Units	LOR

Volatile Petroleum Hydrocarbons in Water Method: AN433 Tested: 27/12/2023

TRH C6-C10	µg/L	50	<50
TRH C6-C9	µg/L	40	<40

Surrogates

d4-1,2-dichloroethane (Surrogate)	%	-	95
d8-toluene (Surrogate)	%	-	92
Bromofluorobenzene (Surrogate)	%	-	104

VPH F Bands

Benzene (F0)	µg/L	0.5	<0.5
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403 Tested: 3/1/2024

TRH C10-C14	µg/L	50	<50
TRH C15-C28	µg/L	200	250
TRH C29-C36	µg/L	200	<200
TRH C37-C40	µg/L	200	<200
TRH C10-C40	µg/L	320	<320

TRH F Bands

TRH >C10-C16	µg/L	60	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60
TRH >C16-C34 (F3)	µg/L	500	<500
TRH >C34-C40 (F4)	µg/L	500	<500

OC Pesticides in Water Method: AN420 Tested: 3/1/2024

Alpha BHC	µg/L	0.1	<0.1
Hexachlorobenzene (HCB)	µg/L	0.1	<0.1
Beta BHC	µg/L	0.1	<0.1
Lindane (gamma BHC)	µg/L	0.1	<0.1
Delta BHC	µg/L	0.1	<0.1
Heptachlor	µg/L	0.1	<0.1
Aldrin	µg/L	0.1	<0.1
Isodrin	µg/L	0.1	<0.1
Heptachlor epoxide	µg/L	0.1	<0.1
Gamma Chlordane	µg/L	0.1	<0.1
Alpha Chlordane	µg/L	0.1	<0.1
Alpha Endosulfan	µg/L	0.1	<0.1
o,p'-DDE	µg/L	0.1	<0.1
p,p'-DDE	µg/L	0.1	<0.1
Dieldrin	µg/L	0.1	<0.1
Endrin	µg/L	0.1	<0.1
Beta Endosulfan	µg/L	0.1	<0.1
o,p'-DDD	µg/L	0.1	<0.1
p,p'-DDD	µg/L	0.1	<0.1
Endrin aldehyde	µg/L	0.1	<0.1
Endosulfan sulphate	µg/L	0.1	<0.1
o,p'-DDT	µg/L	0.1	<0.1
p,p'-DDT	µg/L	0.1	<0.1
Endrin ketone	µg/L	0.1	<0.1
Methoxychlor	µg/L	0.1	<0.1
Mirex	µg/L	0.1	<0.1
trans-Nonachlor	µg/L	0.1	<0.1
Total OC	µg/L	1	<1
Total OC	µg/L	1	<1

Sample Number	SE258588.001
Sample Matrix	Water
Sample Date	21 Dec 2023
Sample Name	SW1

Parameter	Units	LOR
OC Pesticides in Water Method: AN420 Tested: 3/1/2024 (continued)		
Surrogates		
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	- 70

Parameter	Units	LOR
OP Pesticides in Water Method: AN420 Tested: 3/1/2024		
Azinphos-methyl	µg/L	0.2 <0.2
Bromophos Ethyl	µg/L	0.2 <0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.2 <0.2
Diazinon (Dimpylate)	µg/L	0.5 <0.5
Dichlorvos	µg/L	0.5 <0.5
Dimethoate	µg/L	0.5 <0.5
Ethion	µg/L	0.2 <0.2
Fenitrothion	µg/L	0.2 <0.2
Malathion	µg/L	0.2 <0.2
Methidathion	µg/L	0.5 <0.5
Parathion-ethyl (Parathion)	µg/L	0.2 <0.2

Parameter	Units	LOR
Surrogates		
2-fluorobiphenyl (Surrogate)	%	- 37
d14-p-terphenyl (Surrogate)	%	- 45

Parameter	Units	LOR
Total Phenolics in Water Method: AN295 Tested: 27/12/2023		
Total Phenols	mg/L	0.05 <0.05

Parameter	Units	LOR
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293(Sydney only) Tested: 22/12/2023		
Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02 0.62

Sample Number	SE258588.001
Sample Matrix	Water
Sample Date	21 Dec 2023
Sample Name	SW1

Parameter	Units	LOR	
Ammonia Nitrogen by Discrete Analyser Method: AN291 Tested: 22/12/2023			
Ammonia Nitrogen, NH ₃ as N	mg/L	0.01	0.29

COD in Water Method: AN179/AN181 Tested: 28/12/2023			
Chemical Oxygen Demand	mg/L	10	56

Forms of Carbon Method: AN190 Tested: 27/12/2023			
Total Organic Carbon as NPOC	mg/L	0.2	21

Anions by Ion Chromatography in Water Method: AN245 Tested: 28/12/2023			
Chloride	mg/L	1	40
Sulfate, SO ₄	mg/L	1	46
Nitrate Nitrogen, NO ₃ -N	mg/L	0.005	2.3
Fluoride	mg/L	0.1	0.16

Alkalinity Method: AN135 Tested: 27/12/2023			
Total Alkalinity as CaCO ₃	mg/L	5	62

pH in water Method: AN101 Tested: 22/12/2023			
pH**	No unit	-	8.2

Sample Number	SE258588.001	
Sample Matrix	Water	
Sample Date	21 Dec 2023	
Sample Name	SW1	
Parameter	Units	LOR

Conductivity and TDS by Calculation - Water Method: AN106 Tested: 22/12/2023

Conductivity @ 25 C	µS/cm	2	300
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Total and Volatile Suspended Solids (TSS / VSS) Method: AN114 Tested: 27/12/2023

Total Suspended Solids Dried at 103-105°C	mg/L	5	1100
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Hexavalent Chromium in water by Discrete Analyser Method: AN283 Tested: 22/12/2023

Hexavalent Chromium, Cr6+	mg/L	0.004	<0.004
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Metals in Water (Dissolved) by ICPOES Method: AN320 Tested: 27/12/2023

Calcium, Ca	mg/L	0.1	26
Magnesium, Mg	mg/L	0.1	7.0
Potassium, K	mg/L	0.2	13
Sodium, Na	mg/L	0.5	14

Trace Metals (Dissolved) in Water by ICPMS Method: AN318 Tested: 28/12/2023

Aluminium	mg/L	0.005	0.027
Iron	mg/L	0.005	0.083
Manganese	mg/L	0.001	0.002

Trace Metals (Total) in Water by ICPMS Method: AN022/AN318 Tested: 28/12/2023

Total Chromium	mg/L	0.001	0.008
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MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB300484	mg/L	5	<5	1%	102%

Ammonia Nitrogen by Discrete Analyser Method: ME-(AU)-[ENV]AN291

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Ammonia Nitrogen, NH ₃ as N	LB300452	mg/L	0.01	<0.01	0%	99%	92%

Anions by Ion Chromatography in Water Method: ME-(AU)-[ENV]AN245

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB300646	mg/L	1	<0.05	3%	92%
Sulfate, SO ₄	LB300646	mg/L	1	<1.0	1 - 2%	91%
Nitrate Nitrogen, NO ₃ -N	LB300646	mg/L	0.005	<0.005	0%	96%
Fluoride	LB300646	mg/L	0.1	<0.10	1%	99%

COD in Water Method: ME-(AU)-[ENV]AN179/AN181

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chemical Oxygen Demand	LB300636	mg/L	10	<10	0 - 15%	81%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Conductivity @ 25 C	LB300444	µS/cm	2	<2	0%	102%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Forms of Carbon Method: ME-(AU)-[ENV]AN190

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Organic Carbon as NPOC	LB300501	mg/L	0.2	<0.2	3 - 8%	89%	88%

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Hexavalent Chromium, Cr6+	LB300207	mg/L	0.004	<0.004	0%	106%	112%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB300495	mg/L	0.1	<0.1	1 - 4%	104%	106%
Magnesium, Mg	LB300495	mg/L	0.1	<0.1	3%	104%	109%
Potassium, K	LB300495	mg/L	0.2	<0.2	5%	101%	113%
Sodium, Na	LB300495	mg/L	0.5	<0.5	4%	108%	112%

OC Pesticides in Water Method: ME-(AU)-[ENV]AN420

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Alpha BHC	LB300791	µg/L	0.1	<0.1	NA
Hexachlorobenzene (HCB)	LB300791	µg/L	0.1	<0.1	NA
Beta BHC	LB300791	µg/L	0.1	<0.1	NA
Lindane (gamma BHC)	LB300791	µg/L	0.1	<0.1	NA
Delta BHC	LB300791	µg/L	0.1	<0.1	102%
Heptachlor	LB300791	µg/L	0.1	<0.1	103%
Aldrin	LB300791	µg/L	0.1	<0.1	102%
Isodrin	LB300791	µg/L	0.1	<0.1	NA
Heptachlor epoxide	LB300791	µg/L	0.1	<0.1	NA
Gamma Chlordane	LB300791	µg/L	0.1	<0.1	NA
Alpha Chlordane	LB300791	µg/L	0.1	<0.1	NA
Alpha Endosulfan	LB300791	µg/L	0.1	<0.1	NA
o,p'-DDE	LB300791	µg/L	0.1	<0.1	NA
p,p'-DDE	LB300791	µg/L	0.1	<0.1	NA
Dieldrin	LB300791	µg/L	0.1	<0.1	102%
Endrin	LB300791	µg/L	0.1	<0.1	118%
Beta Endosulfan	LB300791	µg/L	0.1	<0.1	NA
o,p'-DDD	LB300791	µg/L	0.1	<0.1	NA
p,p'-DDD	LB300791	µg/L	0.1	<0.1	NA
Endrin aldehyde	LB300791	µg/L	0.1	<0.1	NA
Endosulfan sulphate	LB300791	µg/L	0.1	<0.1	NA
o,p'-DDT	LB300791	µg/L	0.1	<0.1	NA
p,p'-DDT	LB300791	µg/L	0.1	<0.1	117%
Endrin ketone	LB300791	µg/L	0.1	<0.1	NA
Methoxychlor	LB300791	µg/L	0.1	<0.1	NA
Mirex	LB300791	µg/L	0.1	<0.1	NA
trans-Nonachlor	LB300791	µg/L	0.1	<0.1	NA
Total OC	LB300791	µg/L	1	<1	
Total OC	LB300791	µg/L	1	<1	

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Tetrachloro-m-xylene (TCMX) (Surrogate)	LB300791	%	-	103%	106%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

OP Pesticides in Water Method: ME-(AU)-[ENV]AN420

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Azinphos-methyl	LB300791	µg/L	0.2	<0.2	NA
Bromophos Ethyl	LB300791	µg/L	0.2	<0.2	NA
Chlorpyrifos (Chlorpyrifos Ethyl)	LB300791	µg/L	0.2	<0.2	109%
Diazinon (Dimpylate)	LB300791	µg/L	0.5	<0.5	120%
Dichlorvos	LB300791	µg/L	0.5	<0.5	79%
Dimethoate	LB300791	µg/L	0.5	<0.5	NA
Ethion	LB300791	µg/L	0.2	<0.2	133%
Fenitrothion	LB300791	µg/L	0.2	<0.2	NA
Malathion	LB300791	µg/L	0.2	<0.2	NA
Methidathion	LB300791	µg/L	0.5	<0.5	NA
Parathion-ethyl (Parathion)	LB300791	µg/L	0.2	<0.2	NA

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
2-fluorobiphenyl (Surrogate)	LB300791	%	-	84%	72%
d14-p-terphenyl (Surrogate)	LB300791	%	-	86%	70%

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
pH**	LB300444	No unit	-	0 - 2%	100%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB300487	mg/L	5	<5	0 - 2%	97%

Total Phenolics in Water Method: ME-(AU)-[ENV]AN295

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phenols	LB300470	mg/L	0.05	<0.05	0 - 7%	104%	104%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phosphorus (Kjeldahl Digestion) as P	LB300434	mg/L	0.02	<0.02	2 - 13%	108%	104%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium	LB300632	mg/L	0.005	<0.005	2%	110%	110%
Iron	LB300632	mg/L	0.005	<0.005	3%	112%	104%
Manganese	LB300632	mg/L	0.001	<0.001	1 - 2%	107%	102%

Trace Metals (Total) in Water by ICPMS Method: ME-(AU)-[ENV]AN022/AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Chromium	LB300631	mg/L	0.001	<0.001	5%	96%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C10-C14	LB300791	µg/L	50	<50	111%
TRH C15-C28	LB300791	µg/L	200	<200	116%
TRH C29-C36	LB300791	µg/L	200	<200	120%
TRH C37-C40	LB300791	µg/L	200	<200	NA
TRH C10-C40	LB300791	µg/L	320	<320	NA

TRH F Bands

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH >C10-C16	LB300791	µg/L	60	<60	113%
TRH >C10-C16 - Naphthalene (F2)	LB300791	µg/L	60	<60	NA
TRH >C16-C34 (F3)	LB300791	µg/L	500	<500	114%
TRH >C34-C40 (F4)	LB300791	µg/L	500	<500	131%

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
TRH C6-C10	LB300607	µg/L	50	<50	0%	80%	99%
TRH C6-C9	LB300607	µg/L	40	<40	0%	80%	100%

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
d4-1,2-dichloroethane (Surrogate)	LB300607	%	-	94%	0 - 1%	106%	101%
d8-toluene (Surrogate)	LB300607	%	-	77%	12 - 13%	101%	93%
Bromofluorobenzene (Surrogate)	LB300607	%	-	93%	6 - 12%	95%	97%

VPH F Bands

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Benzene (F0)	LB300607	µg/L	0.5		0%	NA	NA
TRH C6-C10 minus BTEX (F1)	LB300607	µg/L	50	<50	0%	71%	91%

METHOD

METHODOLOGY SUMMARY

AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN022	The water sample is digested with Nitric Acid and made up to the original volume similar to APHA3030E.
AN022/AN318	Following acid digestion of un filtered sample, determination of elements at trace level in waters by ICP-MS technique, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN181	Analysis of COD by Semi Closed Reflux: The sample is refluxed with strong acid and a known excess of oxidant. After digestion the unreduced oxidant is back titrated to determine the amount of oxidant consumed. The chemically oxidised matter is calculated in terms of oxygen equivalents. Reference APHA 5220 B.
AN190	TOC and DOC in Water: A homogenised micro portion of sample is injected into a heated reaction chamber packed with an oxidative catalyst that converts organic carbon to carbon dioxide. The CO ₂ is measured using a non-dispersive infrared detector. The process is fully automated in a commercially available analyser. If required a sugar value can be calculated from the TOC result. Reference APHA 5310 B.
AN190	Chemical oxygen demand can be calculated/estimated based on the O ₂ /C relation as 2.67*NPOC (TOC). This is an estimate only and the factor will vary with sample matrix so results should be interpreted with caution.
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO ₂ , NO ₃ and SO ₄ are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

METHOD

METHODOLOGY SUMMARY

AN279/AN293(Sydney)	The sample is digested with Sulphuric acid, K ₂ SO ₄ and CuSO ₄ . All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN283	Hexavalent Chromium via DA: Soluble hexavalent chromium forms a red/violet colour with diphenylcarbazide in acidic solution. This procedure is very sensitive and nearly specific for Cr ⁶⁺ . If total chromium is also measured the trivalent form of chromium Cr ³⁺ can be calculated from the difference (Total Cr - Cr ⁶⁺). Reference APHA3500CrB.
AN291	Ammonia in solution reacts with hypochlorite ions from Sodium Dichloroisocyanate, and salicylate in the presence of Sodium Nitroprusside to form indophenol blue and measured at 660 nm by Discrete Analyser.
AN295	The water sample or extract of sample is distilled in a phosphoric acid stream. Phenolic compounds in the distillate react with a reagent stream of potassium hexacyanoferrate(III) and 4-Amino-2,3-dimethyl-3-pyrazolin-5-one in an alkaline medium to form a coloured complex which is analysed spectrophotometrically onboard a continuous flow analyser.
AN318	Determination of elements at trace level in waters by ICP-MS technique,, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). Where F2 is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).

METHOD

METHODOLOGY SUMMARY

AN433

VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

Calculation

Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
***	Indicates that both * and ** apply.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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