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Work Order : ES0818838
Client : C M JEWELL & ASSOC PTY LTD
Project : J1418

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER

Sub-Matrix: WATER				Method Blank (MB) Report		Laboratory Control Spike (LCS) Report			
Method/Compound				Unit	Result	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
CAS Number	LOR		Low					High	
ED037P: Alkalinity by PC Titrator (QCLot: 852600)									
ED037-P: Total Alkalinity as CaCO3	—	1	mg/L	—	—	200 mg/L	105	80.2	108
ED041: Sulfate (Turbidimetric) as SO4 2- (QCLot: 852609)									
ED041: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	20 mg/L	91.2	76.1	126
ED045G: Chloride Discrete analyser (QCLot: 850010)									
ED045G: Chloride	16887-00-6	1	mg/L	<1	<1	50 mg/L	98.4	83.7	124
ED093F: Dissolved Major Cations (QCLot: 852102)									
ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	50 mg/L	98.9	82.9	121
ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	50 mg/L	101	82.7	114
ED093F: Sodium	7440-23-5	1	mg/L	<1	<1	50 mg/L	97.3	77.4	113
ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	50 mg/L	99.8	84.3	118
EG020F: Dissolved Metals by ICP-MS (QCLot: 851138)									
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.1 mg/L	99.4	79.2	117
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.1 mg/L	100	85.1	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.1 mg/L	104	87	117
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.1 mg/L	103	80.6	115
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.1 mg/L	99.8	84.1	114
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.1 mg/L	102	84	116
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.1 mg/L	101	83	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.1 mg/L	102	81.1	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.5 mg/L	99.0	79.2	116
EG035F: Dissolved Mercury by FIMS (QCLot: 851274)									
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.010 mg/L	99.8	80.3	122
EK055G: Ammonia as N by Discrete Analyser (QCLot: 850006)									
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	1.00 mg/L	97.0	79.6	122
EK057G: Nitrite as N by Discrete Analyser (QCLot: 850225)									
EK057G: Nitrite as N	—	0.01	mg/L	0.01	0.01	0.96 mg/L	113	65.1	129
EK059G: NOx as N by Discrete Analyser (QCLot: 850004)									
EK059G: Nitrite + Nitrate as N	—	0.01	mg/L	<0.01	<0.01	0.96 mg/L	97.3	76.9	122
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 850224)									
EK071G: Reactive Phosphorus as P	—	0.01	mg/L	<0.01	<0.01	0.50 mg/L	101	83.8	122
EP002: Dissolved Organic Carbon (DOC) (QCLot: 852578)									
EP002: Dissolved Organic Carbon	—	1	mg/L	<1	<1	10 mg/L	110	90.8	121
EP074D: Fumigants (QCLot: 850557)									



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Client : C M JEWELL & ASSOC PTY LTD
Project : J1418

Sub-Matrix: WATER				Method Blank (MB) Report		Laboratory Control Spike (LCS) Report			
Method: Compound				Result	Spike Concentration	Spike Recovery (%)			
CAS Number	LOR	Unit	LCS			Low	High		
EP074D: Fumigants (QCLot: 850557) – continued									
EP074: 2,2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	92.3	72.7	124	
EP074: 1,2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	94.5	80.7	119	
EP074: cis-1,3-Dichloropropylene	10061-01-5	10	µg/L	<10	10 µg/L	92.3	80.4	119	
EP074: trans-1,3-Dichloropropylene	10061-02-6	10	µg/L	<10	10 µg/L	90.4	79.3	120	
EP074: 1,2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	99.5	79.1	123	
EP074E: Halogenated Aliphatic Compounds (QCLot: 850557)									
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	126	60.6	138	
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	115	67.4	130	
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	96.8	69.4	129	
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	100	88.9	131	
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	106	73.9	126	
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	101	71.6	128	
EP074: 1,1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	96.0	72.5	128	
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	94.3	70.2	128	
EP074: trans-1,2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	96.6	77.4	122	
EP074: 1,1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	95.2	79.3	121	
EP074: cis-1,2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	93.1	79.5	121	
EP074: 1,1,1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	92.0	75.8	124	
EP074: 1,1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	93.2	77.8	121	
EP074: Carbon Tetrachloride	58-23-5	5	µg/L	<5	10 µg/L	91.9	73.8	126	
EP074: 1,2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	97.2	75.5	126	
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	89.5	76.7	123	
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	99.9	76.1	126	
EP074: 1,1,2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	101	79.6	122	
EP074: 1,3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	96.1	78.9	122	
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	94.8	75	124	
EP074: 1,1,1,2-Tetrachloroethane	630-20-6	5	µg/L	<5	10 µg/L	93.1	78.9	121	
EP074: trans-1,4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	86.5	61.4	136	
EP074: cis-1,4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	97.6	70.6	128	
EP074: 1,1,2,2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	99.6	77.8	126	
EP074: 1,2,3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	94.9	74.1	128	
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	91.9	71.8	126	
EP074: 1,2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	96.9	66.4	136	
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	93.3	67.2	129	
EP074F: Halogenated Aromatic Compounds (QCLot: 850557)									
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	96.0	80.8	119	
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	92.5	79.3	119	
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	90.6	78.2	120	
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	90.1	79	119	



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Sub-Matrix: WATER				Method Blank (MB) Report		Laboratory Control Spike (LCS) Report		
Method Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	High
Method: Compound								
EP074F: Halogenated Aromatic Compounds (QCLot: 850557) - continued								
EP074: 1,3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	94.7	78.9	120
EP074: 1,4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	91.3	79.9	119
EP074: 1,2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	94.6	82.3	116
EP074: 1,2,4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	95.6	67.8	129
EP074: 1,2,3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	92.2	68.6	128
EP074G: Trihalomethanes (QCLot: 850557)								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	93.5	78.2	122
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	91.6	76.9	123
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	95.6	78.5	124
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	96.4	73.5	126
EP080/074: Total Petroleum Hydrocarbons (QCLot: 850556)								
EP080: C6 - C8 Fraction	—	20	µg/L	<20	260 µg/L	96.0	75	127
EP080/074: Total Petroleum Hydrocarbons (QCLot: 854216)								
EP071: C10 - C14 Fraction	—	50	µg/L	<50	200 µg/L	89.5	58.9	131
EP071: C15 - C28 Fraction	—	100	µg/L	<100	200 µg/L	80.5	73.9	138
EP071: C29 - C36 Fraction	—	50	µg/L	<50	200 µg/L	77.5	62.7	131
EP080: BTEX (QCLot: 850556)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	99.3	76.2	124
EP080: Toluene	108-88-3	2	µg/L	<5	10 µg/L	93.2	74.4	124
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	98.7	76.1	122
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	97.9	75.7	123
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	100	77.9	121



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Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER

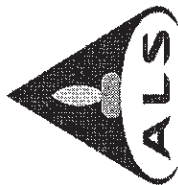
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Matrix Spike (MS) Report		
					Spike Recovery (%)	MS	Recovery Limits (%)
ED045G: Chloride-Discrete analyser (QCLot: 850010)							
ES0818838-001	GW:1	ED045G: Chloride	16887-00-6	250 mg/L	120	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 851138)							
ES0818837-001	Anonymous						
EG020A-F: Arsenic		7440-38-2		0.2 mg/L	102	70	130
EG020A-F: Cadmium		7440-43-9		0.05 mg/L	102	70	130
EG020A-F: Chromium		7440-47-3		0.2 mg/L	102	70	130
EG020A-F: Copper		7440-50-8		0.2 mg/L	101	70	130
EG020A-F: Lead		7439-92-1		0.2 mg/L	102	70	130
EG020A-F: Manganese		7439-96-5		0.2 mg/L	98.3	70	130
EG020A-F: Nickel		7440-02-0		0.2 mg/L	100	70	130
EG020A-F: Zinc		7440-66-6		0.2 mg/L	104	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 851274)							
ES0818809-002	Anonymous	EG035F: Mercury	7439-97-6	0.0100 mg/L	88.0	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 850005)							
ES0818812-001	Anonymous	EK055G: Ammonia as N	7664-41-7	.400 mg/L	# Not Determined	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 850225)							
ES0818825-020	Anonymous	EK057G: Nitrite as N	—	0.60 mg/L	87.5	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 850004)							
ES0818825-020	Anonymous	EK059G: Nitrite + Nitrate as N	—	0.60 mg/L	# Not Determined	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 850224)							
ES0818838-001	GW:1	EK071G: Reactive Phosphorus as P	—	0.50 mg/L	94.0	70	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 852578)							
ES0818784-004	Anonymous	EP002: Dissolved Organic Carbon	—	100 mg/L	111	70	130
EP074E: Halogenated Aliphatic Compounds (QCLot: 850557)							
ES0818863-005	Anonymous	EP074: 1,1-Dichloroethene	75-35-4	25 µg/L	120	70	130
		EP074: Trichloroethene	79-01-6	25 µg/L	114	70	130
EP074F: Halogenated Aromatic Compounds (QCLot: 850557)							
ES0818863-005	Anonymous	EP074: Chlorobenzene	108-90-7	25 µg/L	105	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 850556)							
ES0818863-005	Anonymous	EP080: C6 - C9 Fraction	—	250 µg/L	128	70	130
EP080: BTEX (QCLot: 850556)							
ES0818863-005	Anonymous	EP080: Benzene	71-43-2	25 µg/L	102	70	130
		EP080: Toluene	108-88-3	25 µg/L	104	70	130



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Sub-Matrix: WATER

Sub-Matrix: WATER		Matrix Spike (MS) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)			Recovery Limits (%)	
					MS	Low	High		
EP080: BTEX (QCLot: 850556) - continued ES0818883-005	Anonymous								
		EP080: Ethylbenzene	100-41-4	25 µg/L	100	70	130		
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	99.5	70	130		
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70	130		



Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES0818838	Page	: 1 of 10
Client	: C M JEWELL & ASSOC PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR CRAIG WICENCIAK	Contact	: Charlie Pierce
Address	: P O BOX 10 WENTWORTH FALLS NSW, AUSTRALIA 2782	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: craig@cm-jewell.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 47593251	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 47593257	Facsimile	: +61-2-8784 8500
Project	: J1418	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: KIRRAWEE BRICK PIT	Date Samples Received	: 19-DEC-2008
C-O-C number	: —	Issue Date	: 05-JAN-2009
Sampler	: DVE/CBW	Nc. of samples received	: 6
Order number	: —	Nc. of samples analysed	: 6
Quote number	: SY/H00/08		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



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Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analysis holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: WATER

Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation		Analysis	
Container / Client Sample ID(s)		Date extracted	Due for extraction	Date analysed	Due for analysis
ED037P: Alkalinity by PC Titrator					
Clear Plastic Bottle - Natural					
GW:1,	19-DEC-2008	---	---	29-DEC-2008	02-JAN-2009
GW:3,					
GW:4,					
BH01					
ED041: Sulfate (Turbidimetric) as SO4 2-					
Clear Plastic Bottle - Natural					
GW:1,	19-DEC-2008	---	---	24-DEC-2008	16-JAN-2009
GW:3,					
GW:4,					
BH01					
ED045G: Chloride Discrete analyser					
Clear Plastic Bottle - Natural					
GW:1,	19-DEC-2008	---	---	22-DEC-2008	16-JAN-2009
GW:3,					
GW:4,					
BH01					
ED053F: Dissolved Major Cations					
Clear Plastic Bottle - Natural					
GW:1,	19-DEC-2008	---	---	24-DEC-2008	16-JAN-2009
GW:3,					
GW:4,					
BH01					
EG020F: Dissolved Metals by ICP-MS					
Clear Plastic Bottle - Nitric Acid; Filtered					
GW:1,	19-DEC-2008	---	---	23-DEC-2008	17-JUN-2009
GW:3,					
GW:4,					
BH01					
EG035F: Dissolved Mercury by FIMS					
Clear Plastic Bottle - Nitric Acid; Filtered					
GW:1,	19-DEC-2008	---	---	24-DEC-2008	16-JAN-2009
GW:3,					
GW:4,					
BH01					



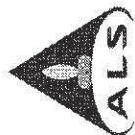
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Matrix: WATER							Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.			
Method		Sample Date		Extraction / Preparation		Analysis				
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation			
EK055G: Ammonia as N by Discrete Analyser										
Clear Plastic Bottle - Natural										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	22-DEC-2008	20-DEC-2008	✖			
EK057G: Nitrite as N by Discrete Analyser										
Clear Plastic Bottle - Natural										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	19-DEC-2008	21-DEC-2008	✔			
EK059G: NOx as N by Discrete Analyser										
Clear Plastic Bottle - Natural										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	22-DEC-2008	21-DEC-2008	✖			
EK071G: Reactive Phosphorus as P by discrete analyser										
Clear Plastic Bottle - Natural										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	19-DEC-2008	21-DEC-2008	✔			
EP002: Dissolved Organic Carbon (DOC)										
DOC filtered- sulphuric preserved										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	24-DEC-2008	16-JAN-2009	✔			
EP074D: Fumigants										
Amber VOC Vial - HCl or NaHSO4										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	23-DEC-2008	02-JAN-2009	✔			
EP074E: Halogenated Aliphatic Compounds										
Amber VOC Vial - HCl or NaHSO4										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	23-DEC-2008	02-JAN-2009	✔			
EP074F: Halogenated Aromatic Compounds										
Amber VOC Vial - HCl or NaHSO4										
GW:2, GW:D, BH01	19-DEC-2008	—	—	—	23-DEC-2008	02-JAN-2009	✔			



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Matrix: WATER		Evaluation: * = Holding time breach ; ✓ = Within holding time.					
Method	Sample Date	Extraction / Preparation		Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP074G: Trihalomethanes							
Amber VOC Vial - HCl or NaHSO4							
GW:1,	19-DEC-2008	—	—	—	23-DEC-2008	02-JAN-2009	✓
GW:3,							
GW:4,							
EP080/074: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved							
GW:4,	19-DEC-2008	24-DEC-2008	26-DEC-2008	✓	31-DEC-2008	09-FEB-2009	✓
Amber VOC Vial - HCl or NaHSO4							
GW:4,	19-DEC-2008	—	—	—	23-DEC-2008	02-JAN-2009	✓
EP080: BTEX							
Amber VOC Vial - HCl or NaHSO4							
GW:4,	19-DEC-2008	—	—	—	23-DEC-2008	02-JAN-2009	✓



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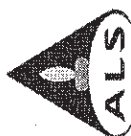
Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: WATER

Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods		QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator Ammonia as N by Discrete analyser Chloride by Discrete Analyser Dissolved Mercury by FIMS Dissolved Metals by ICP-MS - Suite A Dissolved Organic Carbon Major Cations - Filtered Nitrite and Nitrate as N (NOx) by Discrete Analyser Nitrite as N by Discrete Analyser Reactive Phosphorus as P-By Discrete Analyser Sulfate (Turbidimetric) as SO4 2- TPH Volatiles/BTEX Volatile Organic Compounds	ED037-P	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK055G	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED045G	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EG035F	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EG020A-F	2	16	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP002	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED093F	1	20	5.0	10.0	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK059G	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK057G	2	17	11.8	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK071G	1	6	16.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED041	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP080	2	16	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP074	2	11	18.2	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	Laboratory Control Samples (LCS)						
Alkalinity by PC Titrator Ammonia as N by Discrete analyser Chloride by Discrete Analyser Dissolved Mercury by FIMS Dissolved Metals by ICP-MS - Suite A Dissolved Organic Carbon Major Cations - Filtered Nitrite and Nitrate as N (NOx) by Discrete Analyser Nitrite as N by Discrete Analyser Reactive Phosphorus as P-By Discrete Analyser Sulfate (Turbidimetric) as SO4 2- TPH - Semivolatile Fraction TPH Volatiles/BTEX Volatile Organic Compounds	ED037-P	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK055G	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED045G	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EG035F	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EG020A-F	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP002	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED093F	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK059G	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK057G	1	17	5.9	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EK071G	1	6	16.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED041	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP071	1	8	12.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP080	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP074	1	11	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser Chloride by Discrete Analyser Dissolved Mercury by FIMS Dissolved Metals by ICP-MS - Suite A Dissolved Organic Carbon Major Cations - Filtered	EK055G	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED045G	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EG035F	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EG020A-F	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	EP002	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
	ED093F	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



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Matrix: WATER						
Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.						
Quality Control Specification						
Quality Control Sample Type	Method	QC	Count	Regular	Actual	Expected
Analytical Methods						
Method Blanks (MB) - Continued						
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	20	5.0	5.0
Nitrite as N by Discrete Analyser	EK057G	1	17	17	5.9	5.0
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	6	6	16.7	5.0
Sulfate (Turbidimetric) as SO4 2-	ED041	1	20	20	5.0	5.0
TPH - Semivolatle Fraction	EP071	1	8	8	12.5	5.0
TPH Volatiles/BTEX	EP080	1	16	16	6.3	5.0
Volatile Organic Compounds	EP074	1	11	11	9.1	5.0
Matrix Spikes (MS)						
Ammonia as N by Discrete analyser	EK055G	1	20	20	5.0	5.0
Chloride by Discrete Analyser	ED045G	1	20	20	5.0	5.0
Dissolved Mercury by FIMS	EG035F	1	20	20	5.0	5.0
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	16	16	6.3	5.0
Dissolved Organic Carbon	EP002	1	20	20	5.0	5.0
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	20	5.0	5.0
Nitrite as N by Discrete Analyser	EK057G	1	17	17	5.9	5.0
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	6	6	16.7	5.0
TPH Volatiles/BTEX	EP080	1	16	16	6.3	5.0
Volatile Organic Compounds	EP074	1	11	11	9.1	5.0
Quality Control Frequency						
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	20	5.0	5.0
Nitrite as N by Discrete Analyser	EK057G	1	17	17	5.9	5.0
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	6	6	16.7	5.0
Sulfate (Turbidimetric) as SO4 2-	ED041	1	20	20	5.0	5.0
TPH - Semivolatle Fraction	EP071	1	8	8	12.5	5.0
TPH Volatiles/BTEX	EP080	1	16	16	6.3	5.0
Volatile Organic Compounds	EP074	1	11	11	9.1	5.0



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Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by both manual measurement and automated measurement (e.g. PC Titrator) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2-	ED041	WATER	APHA 21st ed., 4500-SO4 Sulfate ions are precipitated in an acetic acid medium with barium chloride to form barium sulfate crystals. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride in the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Filtered	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QM1-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500 NH3+-G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500 NO3-B. Nitrite is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500 NO3--F. Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colorimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500 NO3-F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500 P-F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



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Analytical Methods		Method	Matrix	Method Descriptions
Ionic Balance by PCT DA Turbidimetric and ICPAES Dissolved Organic Carbon TPH - Semivolatile Fraction	EN055 - TS	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)	
	EP002	WATER	APHA 21st ed., 5310 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)	
	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)	
	EP074	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)	
Volatile Organic Compounds	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)	
TPH Volatiles/BTEX				
Preparation Methods		Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.	



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Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWW/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: WATER

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK055C: Ammonia as N by Discrete Analyser	ES08188172-001	Anonymous	Ammonia as N	7664-41-7	Not Determined	—	MS recovery not determined, background level greater than or equal to 4x spike level.
EK059C: NOX as N by Discrete Analyser	ES0818825-020	Anonymous	Nitrite + Nitrate as N	—	Not Determined	—	MS recovery not determined, background level greater than or equal to 4x spike level.

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.

Regular Sample Surrogates

Sub-Matrix: WATER

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP074S: VOC Surrogates	ES0818838-002	GW/2	1,2-Dichloroethane-D4	17060-07-0	120 %	80-120 %	Recovery greater than upper data quality objective
EP074S: VOC Surrogates	ES0818838-004	GW/D	1,2-Dichloroethane-D4	17060-07-0	120 %	80-120 %	Recovery greater than upper data quality objective
EP074S: VOC Surrogates	ES0818838-001	GW/1	1,2-Dichloroethane-D4	17060-07-0	121 %	80-120 %	Recovery greater than upper data quality objective
EP074S: VOC Surrogates	ES0818838-002	GW/2	Toluene-D8	2037-26-5	86.6 %	88-110 %	Recovery less than lower data quality objective
EP074S: VOC Surrogates	ES0818838-004	GW/D	Toluene-D8	2037-26-5	87.7 %	88-110 %	Recovery less than lower data quality objective
EP074S: VOC Surrogates	ES0818838-003	GW/3	Toluene-D8	2037-26-5	86.0 %	88-110 %	Recovery less than lower data quality objective

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: WATER

Method	Extraction / Preparation	Analysis
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