ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2125413**	Page	: 1 of 14
Client	: **Dept for Environment & Water**	Laboratory	: Environmental Division Melbourne
Contact	: Mr FRANK MANGERUCA	Telephone	: +61881625130
Project	: HCHB - Phase 1	Date Samples Received	: 16-Dec-2021
Site	: ----	Issue Date	: 24-Dec-2021
Sampler	: ----	No. of samples received	: 22
Order number	: ----	No. of samples analysed	: 22

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

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
Duplicate (DUP) RPDs							
ED037P: Alkalinity by PC Titrator	EM2125413--019	Tilley Swamp Drain D/S Nth Ou	**Carbonate Alkalinity as CaCO3**	3812-32-6	91.2 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EK055G-SW: Ammonia as N by Discrete Analyser in Sa	EM2125413--002	3.2km south of Salt Creek (lanc	**Ammonia as N**	7664-41-7	41.7 %	70.0-130%	**Recovery less than lower data quality objective**
EK055G-SW: Ammonia as N by Discrete Analyser in Sa	EM2125413--022	Villa de Yumpa	**Ammonia as N**	7664-41-7	56.6 %	70.0-130%	**Recovery less than lower data quality objective**
ED045G: Chloride by Discrete Analyser	EM2125413--019	Tilley Swamp Drain D/S Nth Ou	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG052G: Silica by Discrete Analyser	EM2125413--022	Villa de Yumpa	**Reactive Silica**	----	74.3 %	80.0-120%	**Recovery less than lower data quality objective**
EK071G: Reactive Phosphorus as P by discrete analyse	EM2125167--002	Anonymous	**Reactive Phosphorus as P**	14265-44-2	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP002: Dissolved Organic Carbon (DOC)	EM2125413--022	Villa de Yumpa	**Dissolved Organic Carbon**	----	123 %	75.0-117%	**Recovery greater than upper data quality objective**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA045: Turbidity							
Clear Plastic Bottle - Natural							
Bonneys,	Long Point,	----	----	----	19-Dec-2021	15-Dec-2021	**4**
Mark Point,	McGrath Flat North,						
Murray Mouth,	Noonameena,						
Tauwitchere D/S,	Tauwitchere U/S						
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural							
Bonneys,	Long Point,	----	----	----	16-Dec-2021	15-Dec-2021	**1**
Mark Point,	McGrath Flat North,						
Murray Mouth,	Noonameena,						
Tauwitchere D/S,	Tauwitchere U/S						
EK071G: Reactive Phosphorus as P by discrete analyser							

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EK071G: Reactive Phosphorus as P by discrete analyser - Analysis Holding Time Compliance							
Clear Plastic Bottle - Natural							
Bonneys,	Long Point,	----	----	----	16-Dec-2021	15-Dec-2021	**1**
Mark Point,	McGrath Flat North,						
Murray Mouth,	Noonameena,						
Tauwitchere D/S,	Tauwitchere U/S						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Chlorophyll a, b and c	1	22	4.55	10.00	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)					
Chlorophyll a, b and c	0	22	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
Bonneys,	Long Point,	**13-Dec-2021**	**----**	----	----	**19-Dec-2021**	20-Dec-2021	✓
Mark Point,	McGrath Flat North,							
Murray Mouth,	Noonameena,							
Tauwitchere D/S,	Tauwitchere U/S							
Clear Plastic Bottle - Natural (EA015H)								
1.8km west of Salt Creek,	3.2km south of Salt Creek (land),	**14-Dec-2021**	**----**	----	----	**19-Dec-2021**	21-Dec-2021	✓
Morella Basin @ outlet regulator,	Morella Creek @ gauge,							
North Jacks Point,	Parnka Point,							
Salt Creek Outlet,	Snipe Point,							
South Policeman Point / Seagull Island,	Stoney Well,							
Villa de Yumpa,								
Tilley Swamp Drain D/S Nth Outlet,	Tilley Swamp Drain U/S Morella,							
Tilley Swamp Drain Watercourse Outlet								

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C - Continued							
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
Bonneys, Long Point, Mark Point, McGrath Flat North, Murray Mouth, Noonameena, Tauwitchere D/S, Tauwitchere U/S	**13-Dec-2021**	**----**	----	----	**19-Dec-2021**	15-Dec-2021	×
Clear Plastic Bottle - Natural (EA045)							
1.8km west of Salt Creek, 3.2km south of Salt Creek (land), Morella Basin @ outlet regulator, Morella Creek @ gauge, North Jacks Point, Parnka Point, Salt Creek Outlet, Snipe Point, South Policeman Point / Seagull Island, Stoney Well, Villa de Yumpa, Tilley Swamp Drain D/S Nth Outlet, Tilley Swamp Drain U/S Morella, Tilley Swamp Drain Watercourse Outlet	**14-Dec-2021**	**----**	----	----	**16-Dec-2021**	16-Dec-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
Bonneys, Long Point, Mark Point, McGrath Flat North, Murray Mouth, Noonameena, Tauwitchere D/S, Tauwitchere U/S	**13-Dec-2021**	**----**	----	----	**17-Dec-2021**	27-Dec-2021	✓
Clear Plastic Bottle - Natural (ED037-P)							
1.8km west of Salt Creek, 3.2km south of Salt Creek (land), Morella Basin @ outlet regulator, Morella Creek @ gauge, North Jacks Point, Parnka Point, Salt Creek Outlet, Snipe Point, South Policeman Point / Seagull Island, Stoney Well, Villa de Yumpa, Tilley Swamp Drain D/S Nth Outlet, Tilley Swamp Drain U/S Morella, Tilley Swamp Drain Watercourse Outlet	**14-Dec-2021**	**----**	----	----	**17-Dec-2021**	28-Dec-2021	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
Bonneys, Long Point, Mark Point, McGrath Flat North, Murray Mouth, Noonameena, Tauwitchere D/S, Tauwitchere U/S	**13-Dec-2021**	**----**	----	----	**17-Dec-2021**	10-Jan-2022	✓
Clear Plastic Bottle - Natural (ED045G)							
1.8km west of Salt Creek, 3.2km south of Salt Creek (land), Morella Basin @ outlet regulator, Morella Creek @ gauge, North Jacks Point, Parnka Point, Salt Creek Outlet, Snipe Point, South Policeman Point / Seagull Island, Stoney Well, Villa de Yumpa, Tilley Swamp Drain D/S Nth Outlet, Tilley Swamp Drain U/S Morella, Tilley Swamp Drain Watercourse Outlet	**14-Dec-2021**	**----**	----	----	**17-Dec-2021**	11-Jan-2022	✓
EG052G: Silica by Discrete Analyser							
Clear Plastic Bottle - Natural (EG052G)							
Bonneys, Long Point, Mark Point, McGrath Flat North, Murray Mouth, Noonameena, Tauwitchere D/S, Tauwitchere U/S	**13-Dec-2021**	**----**	----	----	**17-Dec-2021**	10-Jan-2022	✓
Clear Plastic Bottle - Natural (EG052G)							
1.8km west of Salt Creek, 3.2km south of Salt Creek (land), Morella Basin @ outlet regulator, Morella Creek @ gauge, North Jacks Point, Parnka Point, Salt Creek Outlet, Snipe Point, South Policeman Point / Seagull Island, Stoney Well, Villa de Yumpa, Tilley Swamp Drain D/S Nth Outlet, Tilley Swamp Drain U/S Morella, Tilley Swamp Drain Watercourse Outlet	**14-Dec-2021**	**----**	----	----	**17-Dec-2021**	11-Jan-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK055G-SW: Ammonia as N by Discrete Analyser in Saline Water							
Clear Plastic Bottle - Sulfuric Acid (EK055G-SW)							
Bonneys,	**13-Dec-2021**	**----**	----	----	**23-Dec-2021**	10-Jan-2022	✓
Mark Point,							
Murray Mouth,							
Tauwitchere D/S,							
Clear Plastic Bottle - Sulfuric Acid (EK055G-SW)							
1.8km west of Salt Creek,	**14-Dec-2021**	**----**	----	----	**23-Dec-2021**	11-Jan-2022	✓
Morella Basin @ outlet regulator,							
North Jacks Point,							
Salt Creek Outlet,							
South Policeman Point / Seagull Island,							
Villa de Yumpa,							
Tilley Swamp Drain D/S Nth Outlet,							
Tilley Swamp Drain Watercourse Outlet							
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
Bonneys,	**13-Dec-2021**	**----**	----	----	**16-Dec-2021**	15-Dec-2021	×
Mark Point,							
Murray Mouth,							
Tauwitchere D/S,							
Clear Plastic Bottle - Natural (EK057G)							
1.8km west of Salt Creek,	**14-Dec-2021**	**----**	----	----	**16-Dec-2021**	16-Dec-2021	✓
Morella Basin @ outlet regulator,							
North Jacks Point,							
Salt Creek Outlet,							
South Policeman Point / Seagull Island,							
Villa de Yumpa,							
Tilley Swamp Drain D/S Nth Outlet,							
Tilley Swamp Drain Watercourse Outlet							

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
Bonneys, Long Point, Mark Point, McGrath Flat North, Murray Mouth, Noonameena, Tauwitchere D/S, Tauwitchere U/S	**13-Dec-2021**	**----**	----	----	**23-Dec-2021**	10-Jan-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
1.8km west of Salt Creek, 3.2km south of Salt Creek (land), Morella Basin @ outlet regulator, Morella Creek @ gauge, North Jacks Point, Parnka Point, Salt Creek Outlet, Snipe Point, South Policeman Point / Seagull Island, Stoney Well, Villa de Yumpa, Tilley Swamp Drain D/S Nth Outlet, Tilley Swamp Drain U/S Morella, Tilley Swamp Drain Watercourse Outlet	**14-Dec-2021**	**----**	----	----	**23-Dec-2021**	11-Jan-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
Bonneys, Long Point, Mark Point, McGrath Flat North, Murray Mouth, Noonameena, Tauwitchere D/S, Tauwitchere U/S	**13-Dec-2021**	**22-Dec-2021**	10-Jan-2022	✓	**22-Dec-2021**	10-Jan-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
1.8km west of Salt Creek, 3.2km south of Salt Creek (land), Morella Basin @ outlet regulator, Morella Creek @ gauge, North Jacks Point, Parnka Point, Salt Creek Outlet, Snipe Point, South Policeman Point / Seagull Island, Stoney Well, Villa de Yumpa, Tilley Swamp Drain D/S Nth Outlet, Tilley Swamp Drain U/S Morella, Tilley Swamp Drain Watercourse Outlet	**14-Dec-2021**	**22-Dec-2021**	11-Jan-2022	✓	**22-Dec-2021**	11-Jan-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
Bonneys,	**13-Dec-2021**	**22-Dec-2021**	10-Jan-2022	✓	**22-Dec-2021**	10-Jan-2022	✓
Mark Point,							
Murray Mouth,							
Tauwitchere D/S,							
Long Point,							
McGrath Flat North,							
Noonameena,							
Tauwitchere U/S							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
1.8km west of Salt Creek,	**14-Dec-2021**	**22-Dec-2021**	11-Jan-2022	✓	**22-Dec-2021**	11-Jan-2022	✓
Morella Basin @ outlet regulator,							
North Jacks Point,							
Salt Creek Outlet,							
South Policeman Point / Seagull Island,							
Villa de Yumpa,							
Tilley Swamp Drain D/S Nth Outlet,							
Tilley Swamp Drain Watercourse Outlet							
3.2km south of Salt Creek (land),							
Morella Creek @ gauge,							
Parnka Point,							
Snipe Point,							
Stoney Well,							
Tilley Swamp Drain U/S Morella,							
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G)							
Bonneys,	**13-Dec-2021**	**----**	----	----	**16-Dec-2021**	15-Dec-2021	×
Mark Point,							
Murray Mouth,							
Tauwitchere D/S,							
Long Point,							
McGrath Flat North,							
Noonameena,							
Tauwitchere U/S							
Clear Plastic Bottle - Natural (EK071G)							
1.8km west of Salt Creek,	**14-Dec-2021**	**----**	----	----	**16-Dec-2021**	16-Dec-2021	✓
Morella Basin @ outlet regulator,							
North Jacks Point,							
Salt Creek Outlet,							
South Policeman Point / Seagull Island,							
Villa de Yumpa,							
Tilley Swamp Drain D/S Nth Outlet,							
Tilley Swamp Drain Watercourse Outlet							
3.2km south of Salt Creek (land),							
Morella Creek @ gauge,							
Parnka Point,							
Snipe Point,							
Stoney Well,							
Tilley Swamp Drain U/S Morella,							

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
Bonneys,	**13-Dec-2021**	**----**	----	----	**17-Dec-2021**	10-Jan-2022	✓
Mark Point,							
Murray Mouth,							
Tauwitchere D/S,							
Long Point,							
McGrath Flat North,							
Noonameena,							
Tauwitchere U/S							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
1.8km west of Salt Creek,	**14-Dec-2021**	**----**	----	----	**17-Dec-2021**	11-Jan-2022	✓
Morella Basin @ outlet regulator,							
North Jacks Point,							
Salt Creek Outlet,							
South Policeman Point / Seagull Island,							
Villa de Yumpa,							
Tilley Swamp Drain D/S Nth Outlet,							
Tilley Swamp Drain Watercourse Outlet							
3.2km south of Salt Creek (land),							
Morella Creek @ gauge,							
Parnka Point,							
Snipe Point,							
Stoney Well,							
Tilley Swamp Drain U/S Morella,							
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
Bonneys,	**13-Dec-2021**	**----**	----	----	**17-Dec-2021**	10-Jan-2022	✓
Mark Point,							
Murray Mouth,							
Tauwitchere D/S,							
Long Point,							
McGrath Flat North,							
Noonameena,							
Tauwitchere U/S							
Amber TOC Vial - Sulfuric Acid (EP005)							
1.8km west of Salt Creek,	**14-Dec-2021**	**----**	----	----	**17-Dec-2021**	11-Jan-2022	✓
Morella Basin @ outlet regulator,							
North Jacks Point,							
Salt Creek Outlet,							
South Policeman Point / Seagull Island,							
Villa de Yumpa,							
Tilley Swamp Drain D/S Nth Outlet,							
Tilley Swamp Drain Watercourse Outlet							
3.2km south of Salt Creek (land),							
Morella Creek @ gauge,							
Parnka Point,							
Snipe Point,							
Stoney Well,							
Tilley Swamp Drain U/S Morella,							

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP008: Chlorophyll							
Glass Fibre Filter Paper (Chlorophyll) (EP008B)							
Bonneys,	**13-Dec-2021**	**----**	----	----	**21-Dec-2021**	03-Jan-2022	✓
Long Point,							
Mark Point,							
McGrath Flat North,							
Murray Mouth,							
Noonameena,							
Tauwitchere D/S,							
Tauwitchere U/S							
Glass Fibre Filter Paper (Chlorophyll) (EP008B)							
1.8km west of Salt Creek,	**14-Dec-2021**	**----**	----	----	**21-Dec-2021**	04-Jan-2022	✓
3.2km south of Salt Creek (land),							
Morella Basin @ outlet regulator,							
Morella Creek @ gauge,							
North Jacks Point,							
Parnka Point,							
Salt Creek Outlet,							
Snipe Point,							
South Policeman Point / Seagull Island,							
Stoney Well,							
Villa de Yumpa,							
Tilley Swamp Drain D/S Nth Outlet,							
Tilley Swamp Drain U/S Morella,							
Tilley Swamp Drain Watercourse Outlet							

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	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N (Saline Water)	EK055G-SW	3	24	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chlorophyll a, b and c	EP008B	1	22	**4.55**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	24	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	4	25	**16.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	3	25	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	8	70	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N (Saline Water)	EK055G-SW	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chlorophyll a and Pheophytin a	EP008	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chlorophyll a, b and c	EP008B	0	22	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	40	**7.50**	**7.50**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	4	70	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N (Saline Water)	EK055G-SW	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chlorophyll a and Pheophytin a	EP008	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chlorophyll a, b and c	EP008B	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	4	70	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N (Saline Water)	EK055G-SW	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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
Algal Count	BM010	WATER	Specialist microbiological analysis subcontracted to ALS Scoresby (NATA Accredited Laboratory No. 992).
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.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 librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Silica (Reactive) by Discrete Analyser	EG052G	WATER	In house: Referenced to APHA 4500-SiO2 D: Under Acdic conditions reactive silicon combines with ammonium molybdate to form a yellow molybdosilicic acid complex. This is reduced by 1-amino-2-naphthol-4-sulfonic acid to a silicomolybdenum blue complex which is measured by discrete analyser at 670 nm. This method is compliant with NEPM Schedule B(3).
Ammonia as N (Saline Water)	EK055G-SW	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate 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 Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)
Chlorophyll a and Pheophytin a	EP008	WATER	In house: Referenced to APHA 10200 H. The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Chlorophyll a, b and c	EP008B	WATER	In house: Referenced to APHA 10200 H. The pigments are extracted into aqueous acetone. The trichromatic method is used by determining the optical density of the extract at 664 nm, 647nm and 630 nm spectrometrically.

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)