

Pacific Reef Fisheries Pty Ltd

Alva Beach Prawn Farm - Environmental Impact Monitoring Program

March 2019



environmental
consultants

Document Control

Environmental Impact Monitoring Report – Spring 2018

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Approval for Issue

Name and position	Signature	Date
Nicholas Baker, Director		29/03/2019

Permits and approvals

Wild Environmental Consultants operate in accordance with the following permits and approvals:

Scientific Use Registration Certificate (*Animal Care and Protection Act 2001*) – Registration Number 600

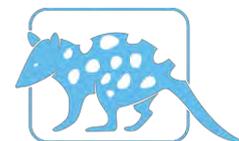
Scientific Purposes Permit (*Nature Conservation (Administration) Regulation 2006*) – Permit number WISP17791316

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Marine Parks Permit (*Great Barrier Reef Marine Park Regulations 1983* and *Marine Park Regulation 2006*) – G16/38539.1

Wildlife Authority (Rehabilitation Permit) (*Nature Conservation (Administration) Regulation 2017* – WA0002733

Wildlife Authority (Damage Mitigation Permit) (*Nature Conservation (Administration) Regulation 2017* – WA0005146



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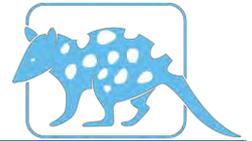


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1. Introduction

Wild Environmental Consultants (Wild Environmental) have been engaged by Pacific Reef Fisheries (Australia) Pty Ltd (PRF) to undertake and fulfil requirements of the revised Environmental Impact Monitoring Program (EIMP) at Alva Beach Aquaculture Farm (the Project), prepared by Gassman Development Perspectives in November 2013.

1.1 Aims and Objectives

The EIMP seeks to determine and understand the extent and concentration of potential impacts relating to the operation of the Project so as to ensure that impacts to receiving environmental values surrounding the Project are minimised. This EIMP report is prepared in fulfilment of Environmental Authority EPPR00864913, Condition SMR12, being:

“The holder of this environmental authority must develop and undertake an Environmental Impact Monitoring Program, in relevant creeks and along the western shoreline of the Pacific Ocean adjacent to the licensed premises, to determine:

- *presence of water quality disturbances; and*
- *any changes to representative natural biological communities, with an 80% certainty of detecting any such changes should any be present.”*

Condition SMR15 includes a condition requiring an annual return to be made to the administering authority. On that basis, this report summarises the findings of the EIMP for inclusion in the Annual Return.

1.1.1 Objectives of the EIMP Report

The objective of the EIMP design report is to document protocols for monitoring, identifying and describing potential impacts arising from aquaculture operations associated with the Project. Specifically, the objectives of the EIMP are to:

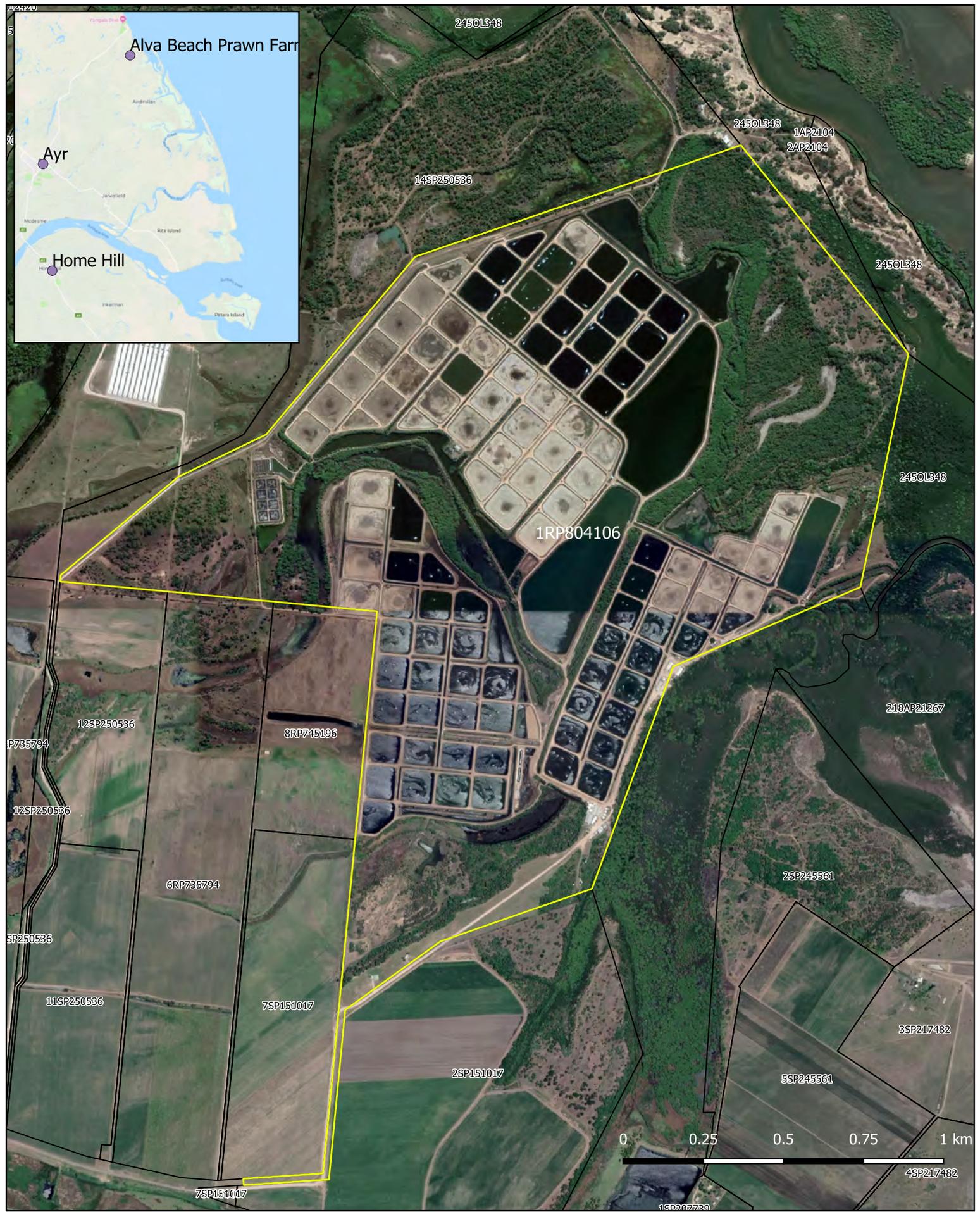
- identify environmental values of waterways within the receiving environments and determine the water quality objectives for the protection and enhancement of those Environmental Values (EVs); and
- understand potential impacts of the Project on:
 - benthos;
 - sediments; and
 - water quality.



Note: Monitoring of mangroves is undertaken biennially (every second year) and was completed in 2017. Monitoring of mangroves has not been included in this report.

1.2 Project description

The Alva Beach Aquaculture Farm is located on Trent Road, Alva Beach, approximately 15 km east of Ayr, Queensland. The Farm includes 105 operational aquaculture ponds covering approximately 98 ha. The farm produces both *Penaeus monodon* (Black tiger prawn) and *Rachycentron canadum* (Cobia). The farm includes a processing facility, settlement / treatment ponds and seven (7) hectares of constructed mangrove wetlands, designed to reduce contaminants prior to release from Release Point W1. Figure 2 details the Project layout.

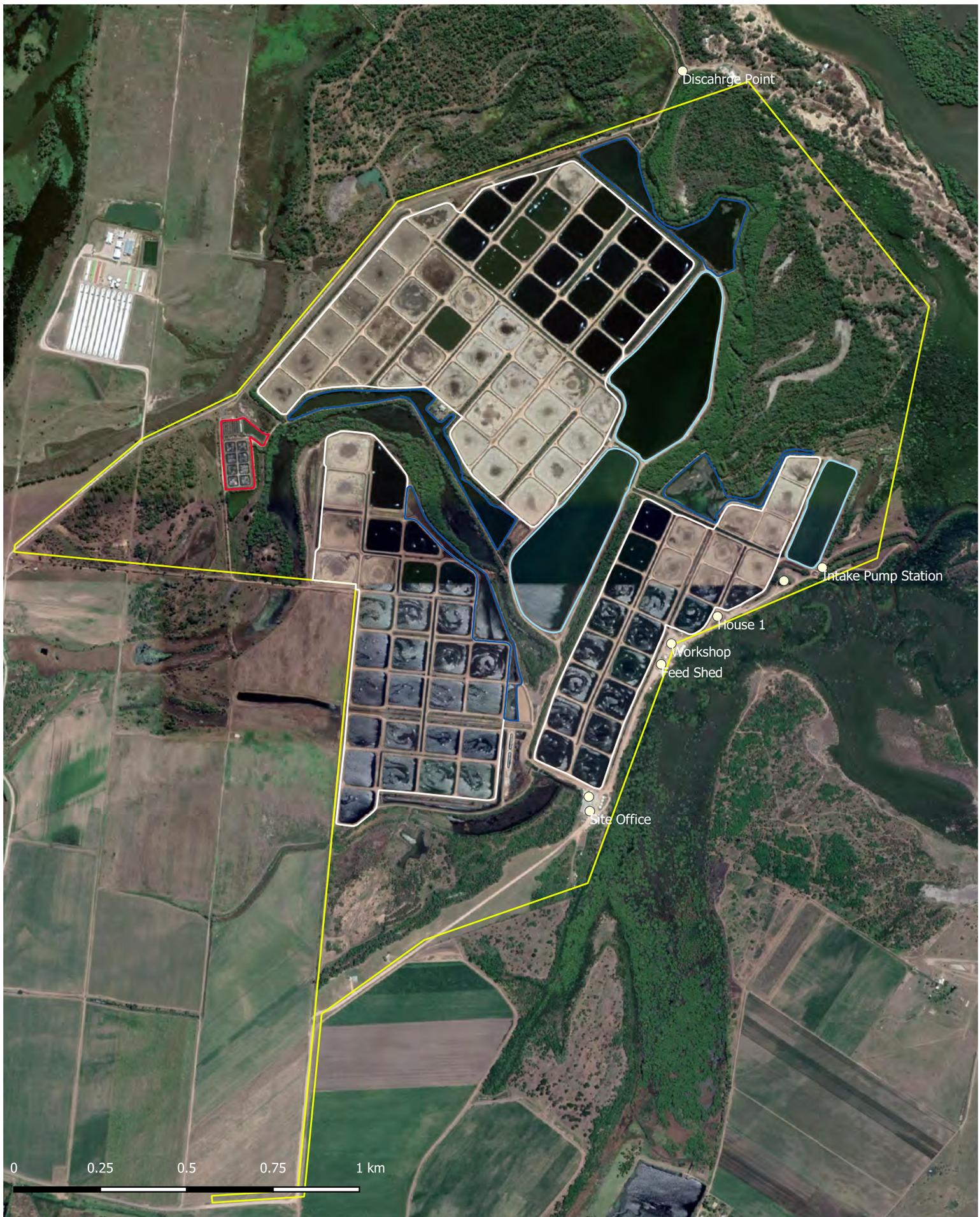


Pacific Reef Fisheries Pty Ltd
 Alva Beach - Environmental Impact Monitoring Program
 Figure 1: Project Location

- Legend**
- Localities
 - Project Boundary
 - Property Boundaries

Job number: JW181167
 Coordinate reference system: GDA 94
 Date 13 March 2019





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Alva Beach - Environmental
Impact Monitoring Program
Figure 2: Project Layout

Legend

- Aquiculture Ponds
- Treatment Pond
- Nursery
- Project Boundary
- Reservoir

Job number: JW181167
Coordinate reference system: GDA 94
Date 14 March 2019





2. Methodology

2.1 Sampling Locations

Eight (8) sampling locations are specified for the Project as detailed in Table 1 and Figure 3. Monitoring locations accessed correspond to sediment and macroinvertebrate sampling.

Table 1. Sampling locations and descriptions.

Site			Description
A	147.4899	-19.4662	Discharge point into Little Alva Creek.
	147.4898	-19.4662	
	147.4897	-19.4661	
B	147.4916	-19.4651	500m downstream in Little Alva Creek.
	147.4915	-19.4651	
	147.4914	-19.4647	
E	147.487	-19.4637	Location in Alva Creek corresponding with B.
	147.4869	-19.4636	
	147.4868	-19.4634	
H	147.49	-19.4616	Location in Alva Creek corresponding with A.
	147.4902	-19.4613	
	147.4906	-19.4611	

2.2 Sample Collection

All samples were collected in accordance with the Department of Environment and Science (DES) Monitoring and Sampling Manual 2018¹ and. Sediment samples collected were submitted to National Association of Testing Authorities (NATA) accredited laboratory ALS Environmental for analysis. Benthos samples (i.e. macro-invertebrates) were preserved in ethanol and placed in sample storage for identification.

¹ Department of Environment and Science. 2018. Monitoring and Sampling Manual: Environmental Protection (Water) Policy. Brisbane: Department of Environment and Science Government.



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Alva Beach - Environmental Impact
Monitoring Program
Figure 3: Monitoring Locations

Legend

- Monitoring Locations
- Project boundary

Job number: JW181167
Coordinate reference system: GDA 94
Date 13 March 2019





2.3 Water Quality

Water quality monitoring is conducted by Pacific Reef Fisheries on a monthly basis in accordance with Schedule 2 – Monitoring, Table 1 of the EA. Monitoring locations sampled during the reporting period include locations A, B, E and H. Water quality parameters monitored under this EIMP include:

- temperature;
- pH;
- dissolved oxygen;
- salinity (referred to as electrical conductivity);
- total suspended solids;
- turbidity;
- total nitrogen; and
- total phosphorus.

Results of monitoring are summarised in Section 3.1.

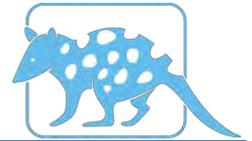
2.4 Sediments

Sediment monitoring is conducted on an annual basis at sites B, C, E and F to determine macroinvertebrate species composition and abundance, total organic carbon and particle size. Three subsamples were acquired across the stream channel at monitoring locations B, C, E and F (see Figure 3).

2.4.1 Sediment and macroinvertebrate sampling

Analysis of sediments relates to physical and chemical characteristics of the sediments, as well as the presence of any macroinvertebrate species. The approach taken is generally in accordance with the Approved EIMP prepared by Gassman Development Prospectives. The method of selecting sampling locations was identified within the approved EIMP.

Sampling is undertaken using a stainless steel Ponar grab dredge, or a handheld corer, depending on the anticipated depth of material and practical consideration of achieving core penetration, retention, and depth of water overlying the sediments to be sampled.



The sediment sampling is led by a suitably qualified environmental professional. The vessel used as the platform for the sampling is provided by PRF and is suitable for accessing the sampling locations. All working areas of the vessel were thoroughly checked, cleaned and prepared for sediment sampling activities prior to each day's sampling. Photographs are taken of grabs from each of the sampling locations.

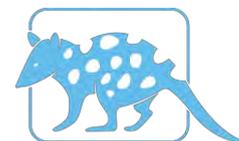
Once samples are logged and photographed, they are placed/extruded into large stainless steel mixing bowls and homogenised using gloved hands (powderless latex gloves) or small stainless steel sample scoop.

Samples are stored in specific containers, supplied by the laboratory for the required analyses. A table of specific sampling containers to be used to contain samples is provided in Table 2. Sample containers are appropriately labelled using indelible ink to write the sample location number and date on both the label and lid of the container and immediately stored in refrigerators or eskies with ice packs. Samples remain in refrigerated condition until dispatched to the analytical testing laboratory, where they are maintained at 4°C.

All sample material held at the analytical laboratory is typically retained for one month (or longer by request in the case of hold material) from the date of submission for repeat/verification testing if required.

Table 2: Sample containers

Analyte	Containers per sample
TOC, Trace metals, nutrients, hydrocarbons and organics	1 x 250 ml solvent washed, acid rinsed glass jar with a Teflon lined lid
Particle size	1 x plastic bag to hold a minimum of 500 g sample
Hold samples	1 to 3 x 250 ml solvent washed, acid rinsed glass jar with a Teflon lined lid



3. Results and Discussion

3.1 Water Quality

Three sub samples were collected at EIMP monitoring locations A, B, E, and H with laboratory analytes selected in accordance with Section 2.3. Results for the EIMP reporting period are summarised in Table 3 and detailed in Figure 4 to Figure 17.

Table 3: Water Quality Results

	Temp	pH	DO	Sal	TSS(mg/L)	Turbidity	TN(mg/L)	TP(mg/L)
A								
Min	18.8	7.07	2.23	25.25	7.00	5.10	0.17	0.02
Max	29.16	7.95	6.14	39.56	30.00	20.5	2.00	0.27
Mean	24.63	7.62	4.56	35.70	14.58	10.23	0.75	0.11
Median	25.40	7.67	4.96	36.67	13.50	7.75	0.55	0.105
B								
Min	18.90	7.56	5.60	26.17	1.00	2.20	0.10	0.02
Max	29.40	8.18	7.79	36.82	45.00	23.80	0.52	0.10
Mean	24.91	7.89	6.39	35.15	15.67	8.99	0.21	0.07
Median	25.85	7.95	6.48	36.38	13.50	6.20	0.20	0.08
E								
Min	18.8	7.39	5.83	26.79	1	2.7	0.1	0.02
Max	30.1	8.22	7.05	36.73	52	35.5	0.31	0.1
Mean	26.23	7.917667	6.495	34.97433	16.66667	10.63333	0.161818	0.054444
Median	27.2	7.96	6.755	36.365	13	5.8	0.15	0.04
H								
Min	18.3	6.64	1.83	15.86	8	3.8	0.16	0.02
Max	30.3	7.83	6.39	42.02	25	15.4	1.1	0.32
Mean	25.52	7.295	4.044667	34.911	15.4	9.9	0.539167	0.131
Median	26.05	7.29	3.945	38.715	14	9.75	0.48	0.1



Monitoring locations B and E are located at the mouth of tributaries with which flow into Kaliama / Little Alva Creek. Water monitoring at these two locations indicate that for the majority of monitoring events, the physical and chemical parameter results are similar. The exception to this was during July 2018, when Suspended Solids and Turbidity became elevated. Physical and chemical parameters at location H are not similar to locations A, B or E. In particular, between January and June 2018, nutrient concentrations were elevated when compared to other monitoring locations.

It is noted that monitoring location A is the discharge point for the aquaculture facility. Electrical conductivity, turbidity, and suspended solids concentrations were similar to monitoring locations B and E. The majority of parameters were varied in comparison to other monitoring locations. In particular, concentrations of nutrients became elevated during October – November 2018.

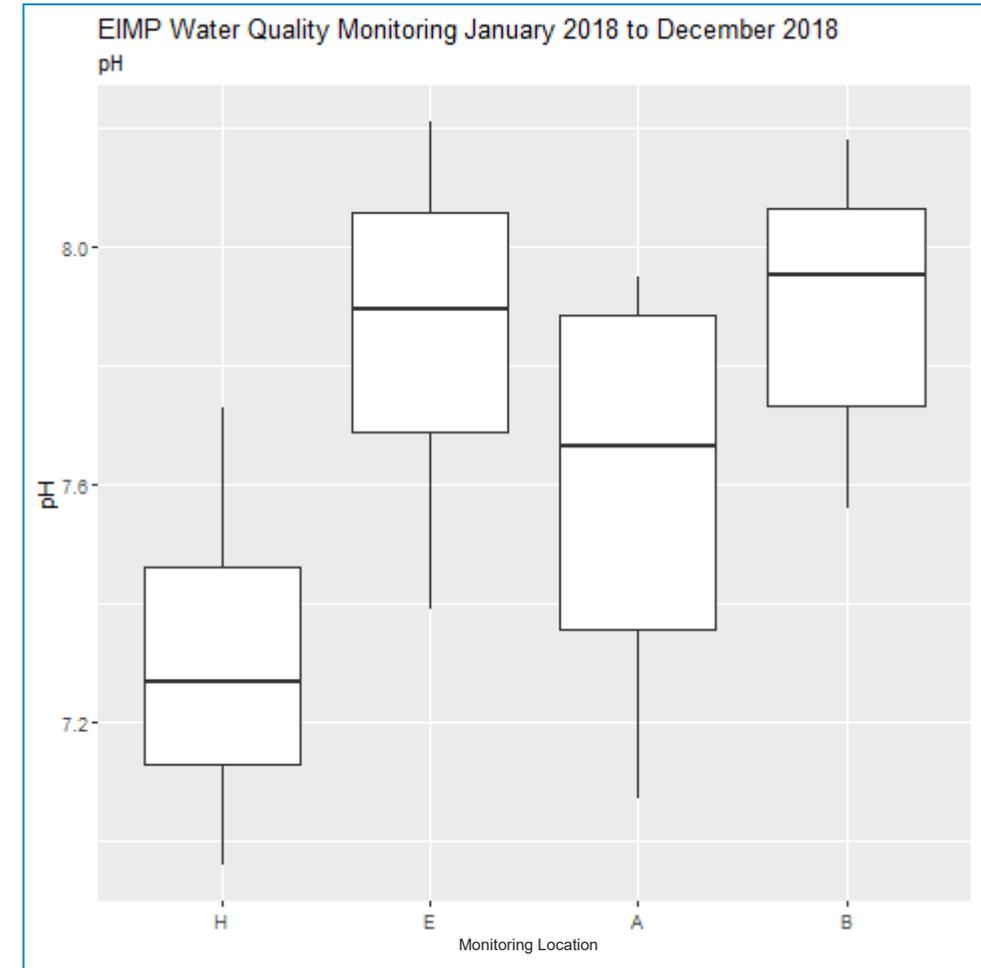
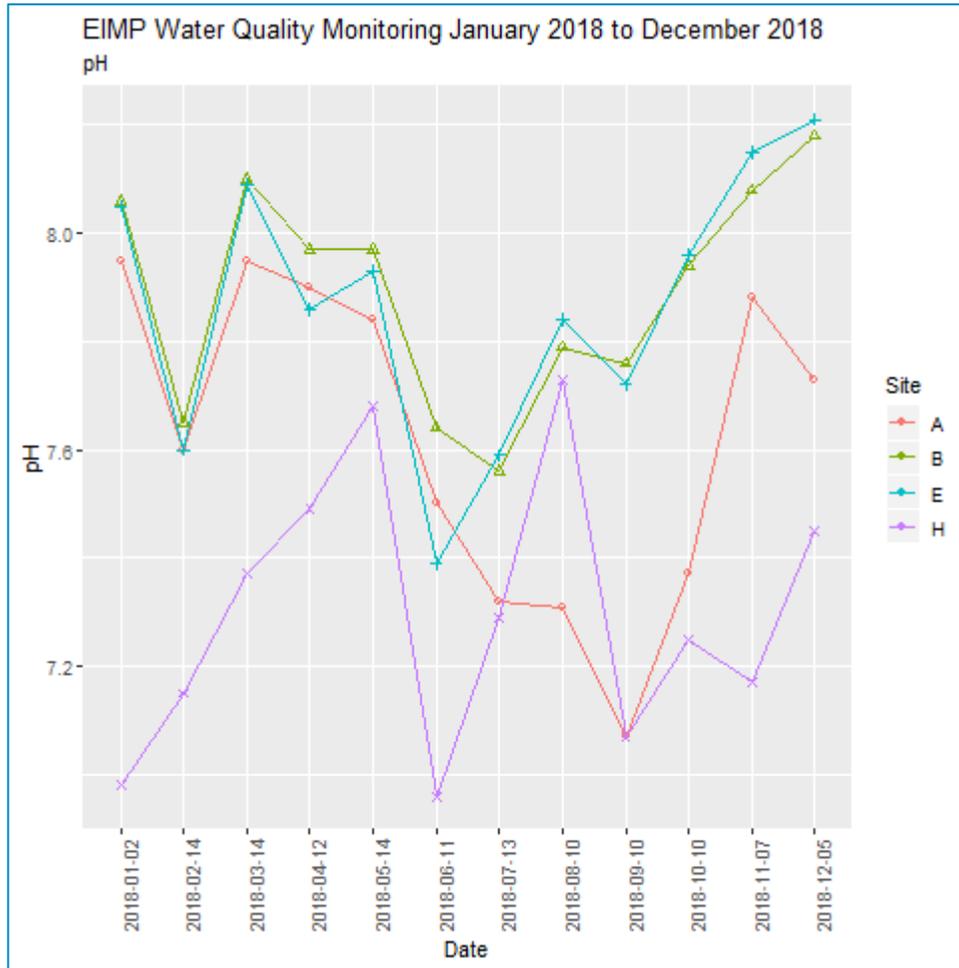
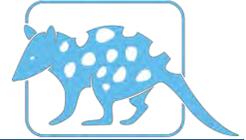


Figure 4. Time series plot of pH at EIMP monitoring sites for January to December 2018.

Figure 5. Boxplot of pH at EIMP monitoring sites for January to December 2018.

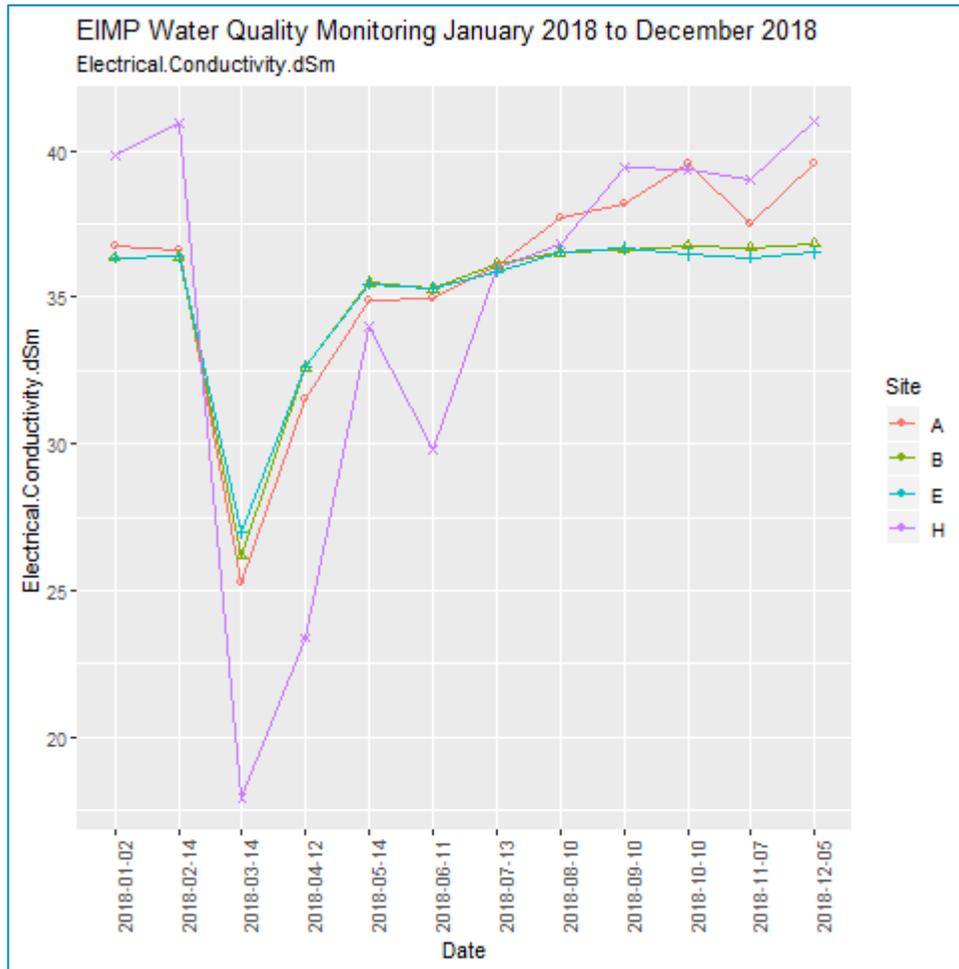
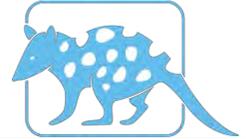


Figure 6. Time series plot of EC at EIMP monitoring sites for January to December 2018.

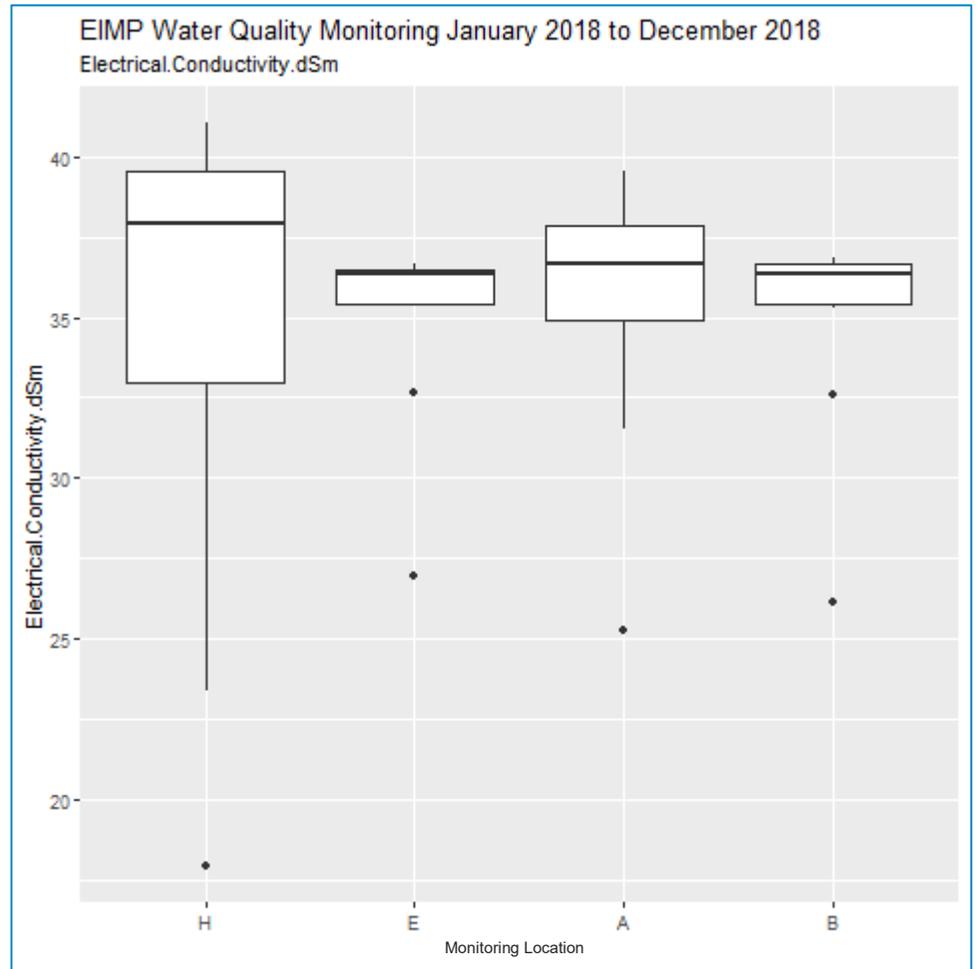


Figure 7. Boxplot of EC at EIMP monitoring sites for January to December 2018.

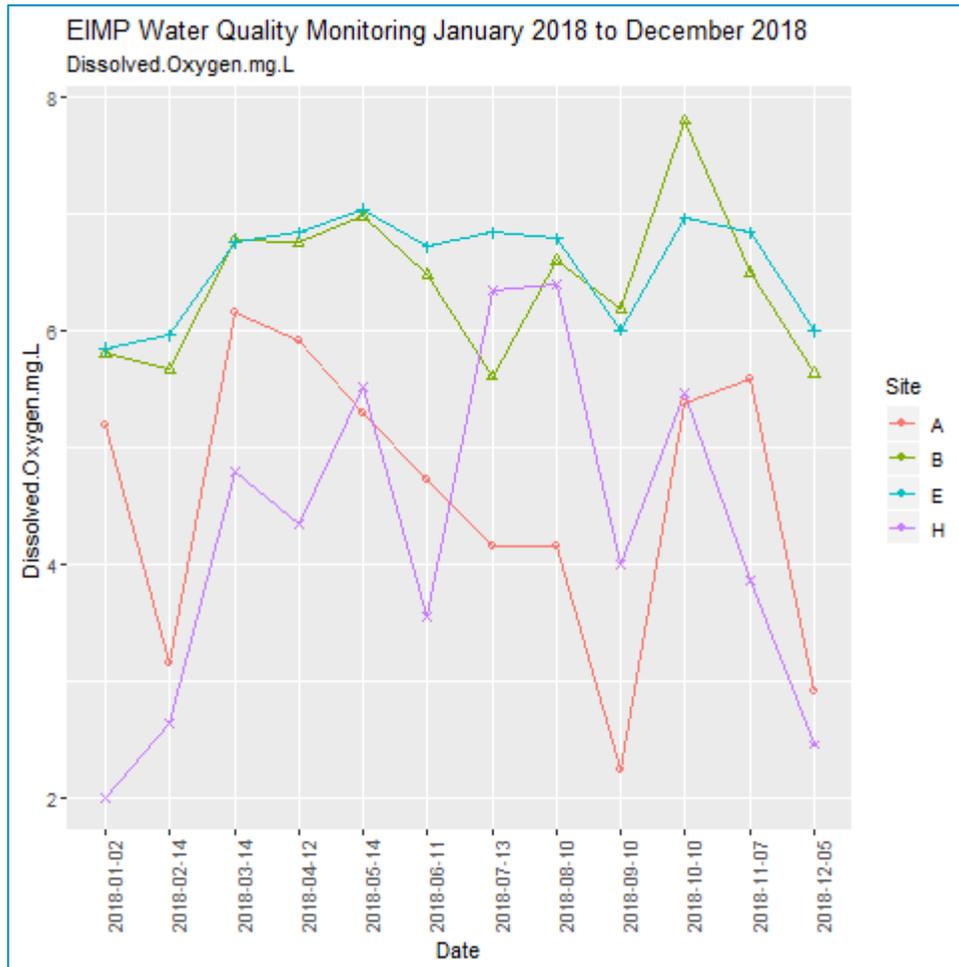
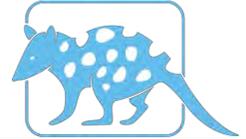


Figure 8. Time series plot of DO at EIMP monitoring sites for January to December 2018.

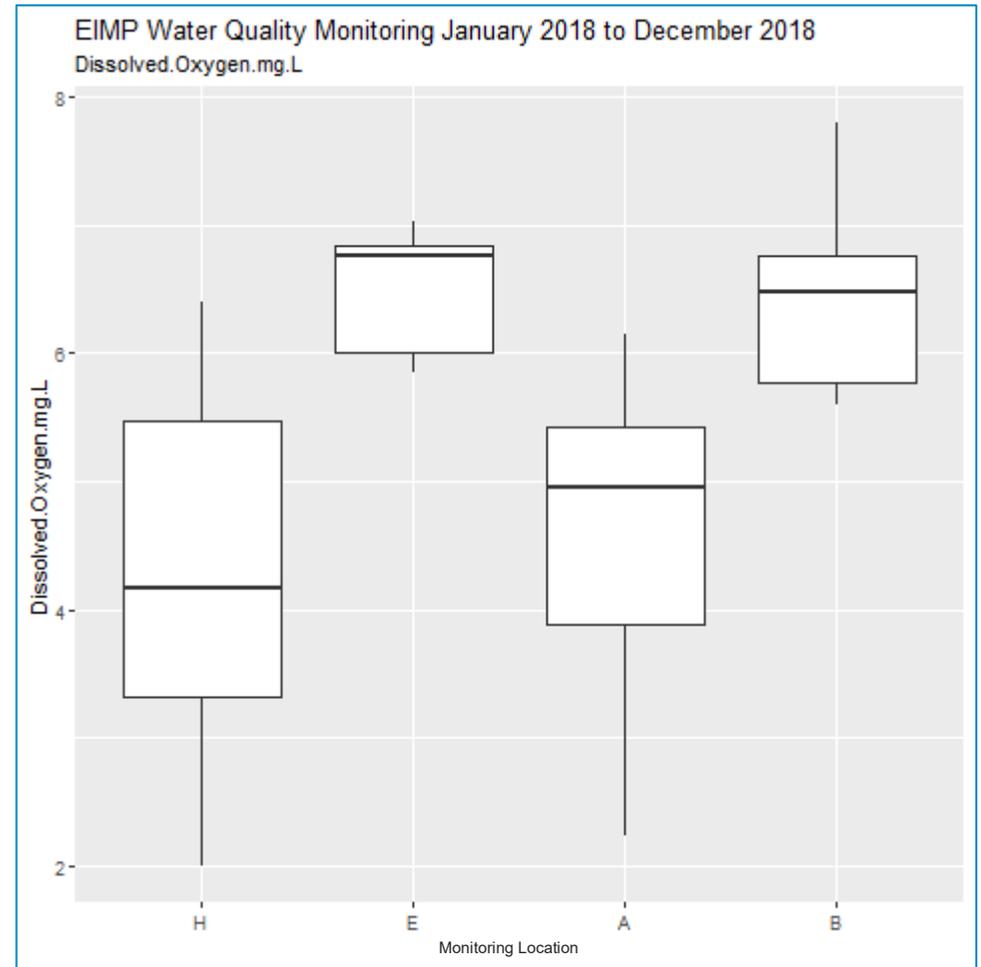


Figure 9. Boxplot of DO at EIMP monitoring sites for January to December 2018.

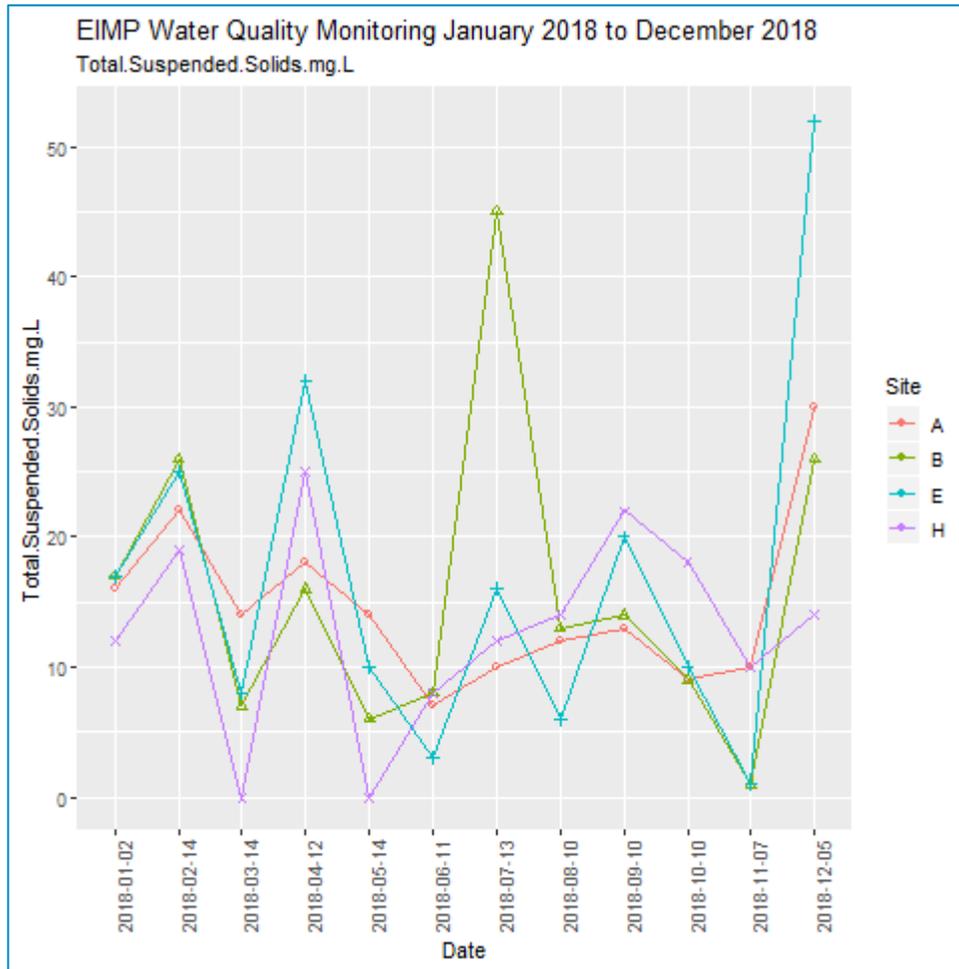
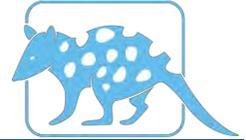


Figure 10. Time series plot of TSS at EIMP monitoring sites for January to Dec 2018.

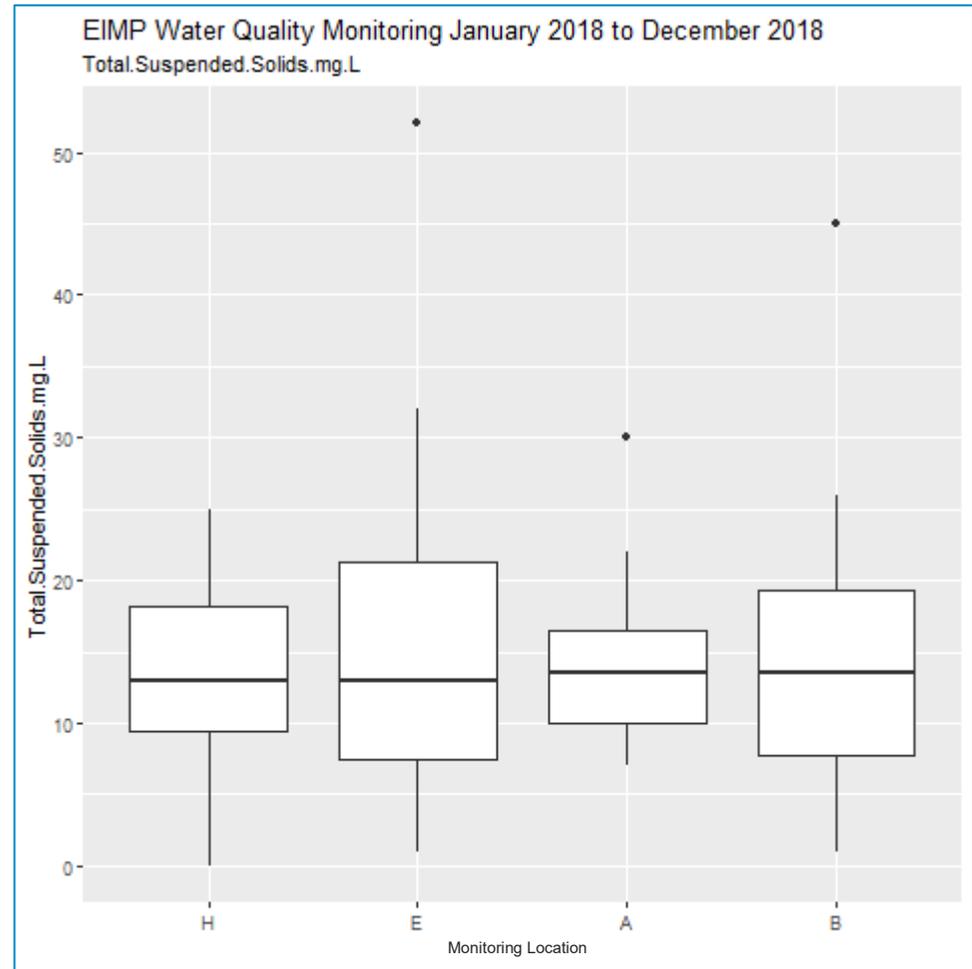


Figure 11. Boxplot of TSS at EIMP monitoring sites for January to December 2018.

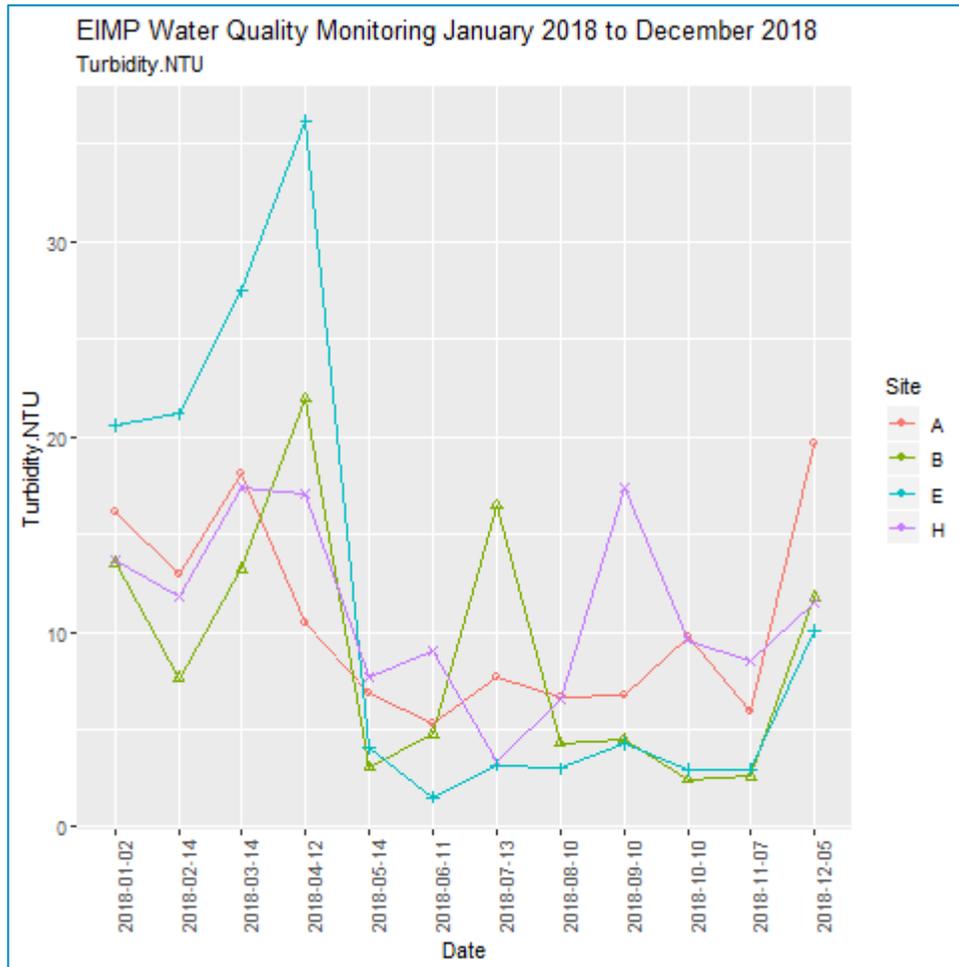
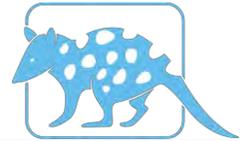


Figure 12. Time series plot of Turbidity at EIMP monitoring sites for Jan – Dec 2018.

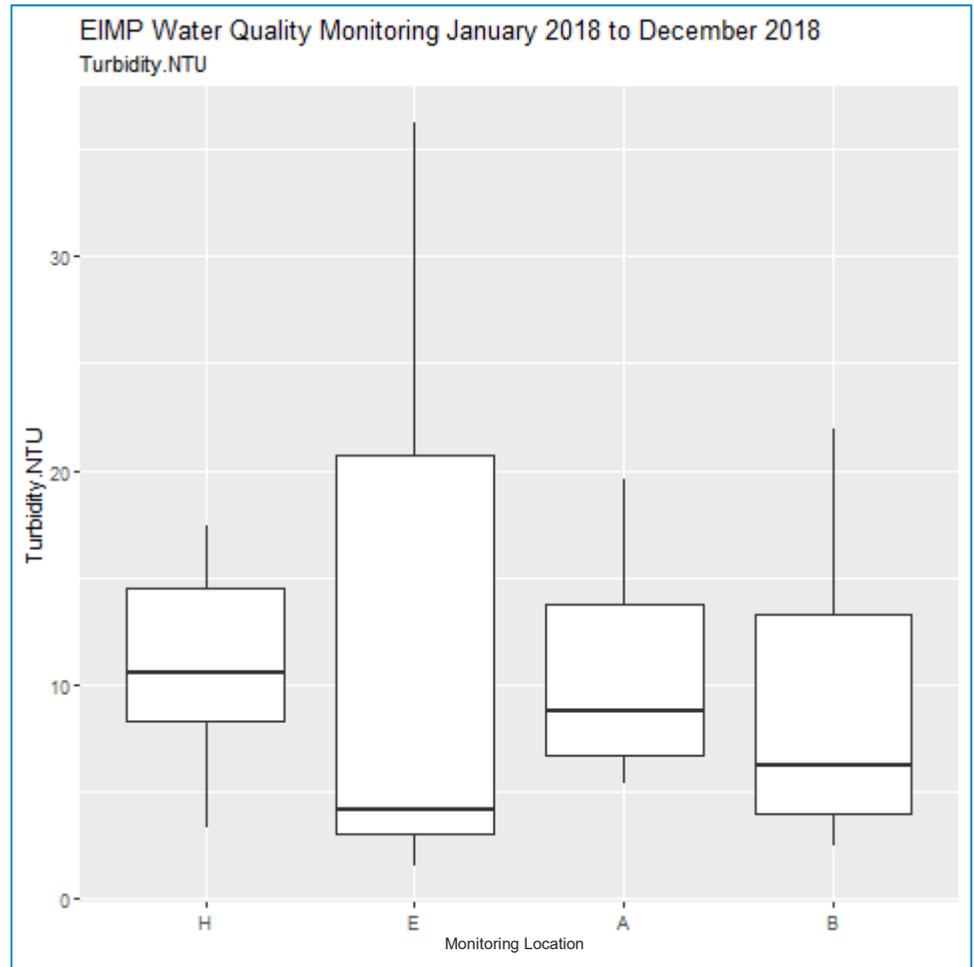


Figure 13. Boxplot of Turbidity at EIMP monitoring sites for January to December 2018.

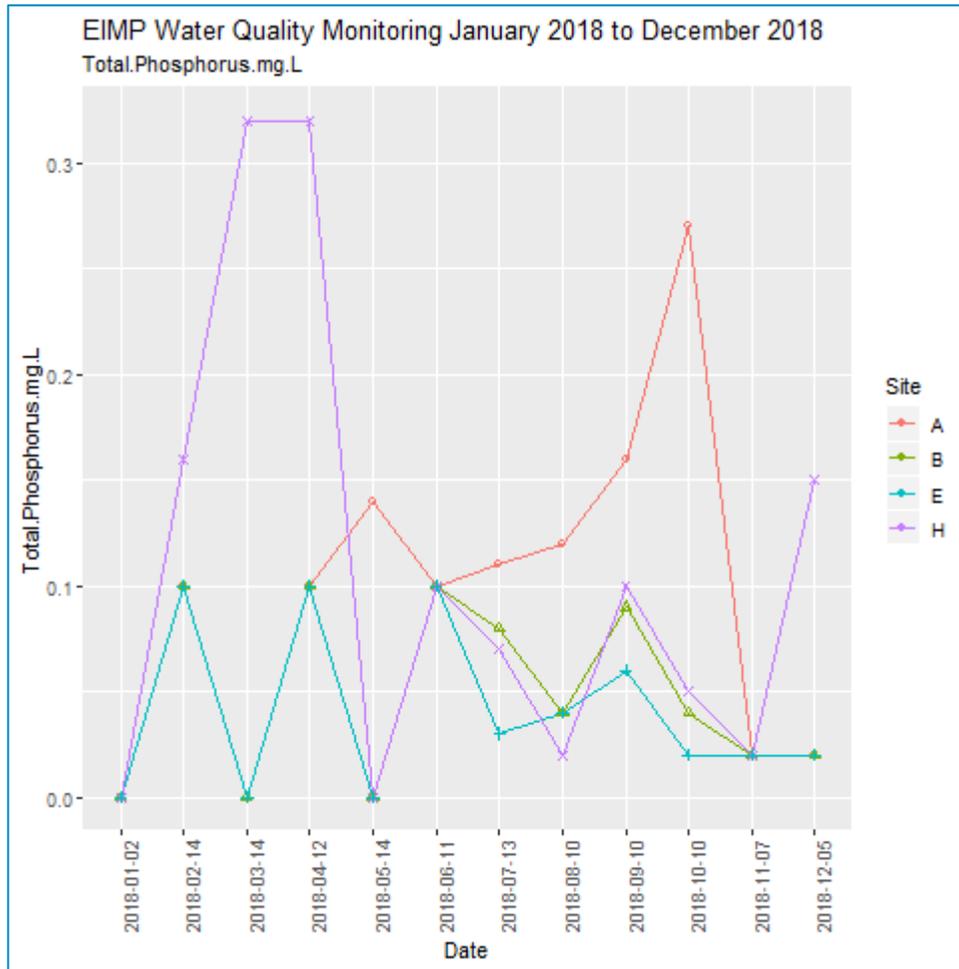
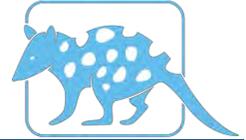


Figure 14. Time series plot - TP at EIMP monitoring sites for Jan- Dec 2018.

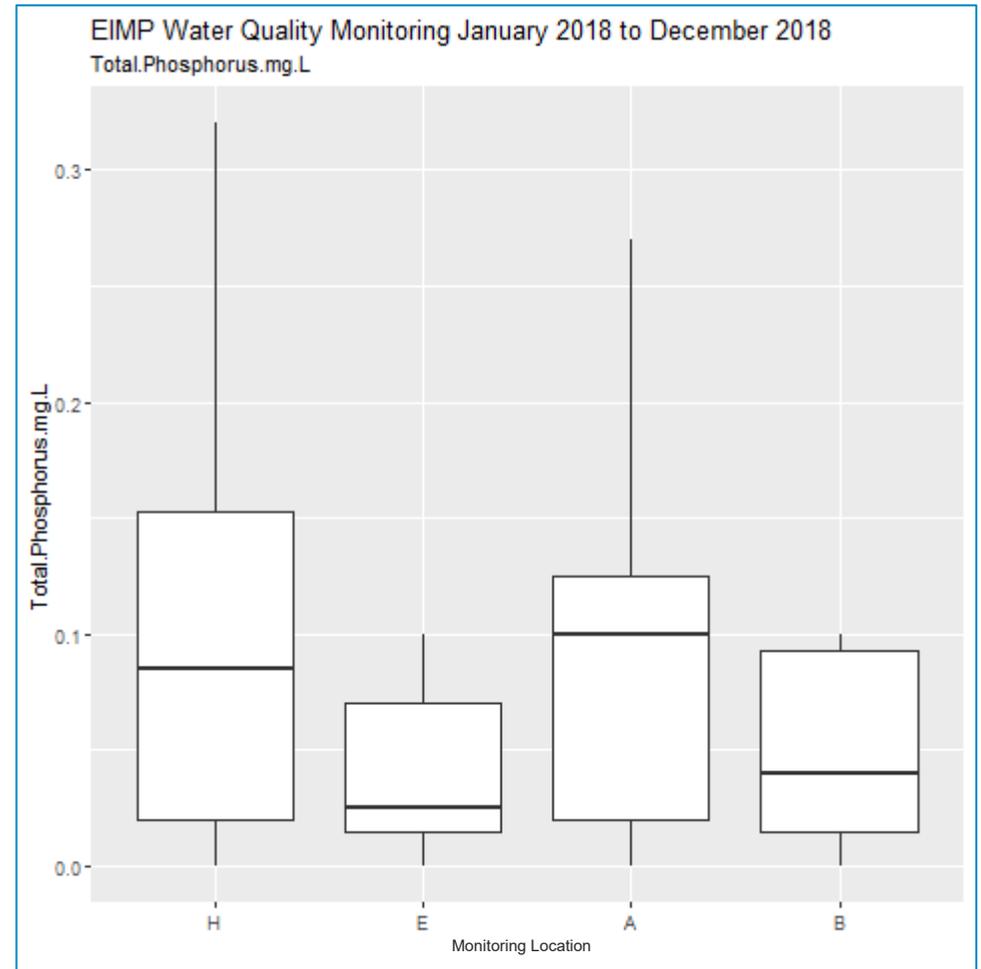


Figure 15. Boxplot of Total Phosphorus at EIMP monitoring sites for Jan - Dec 2018.

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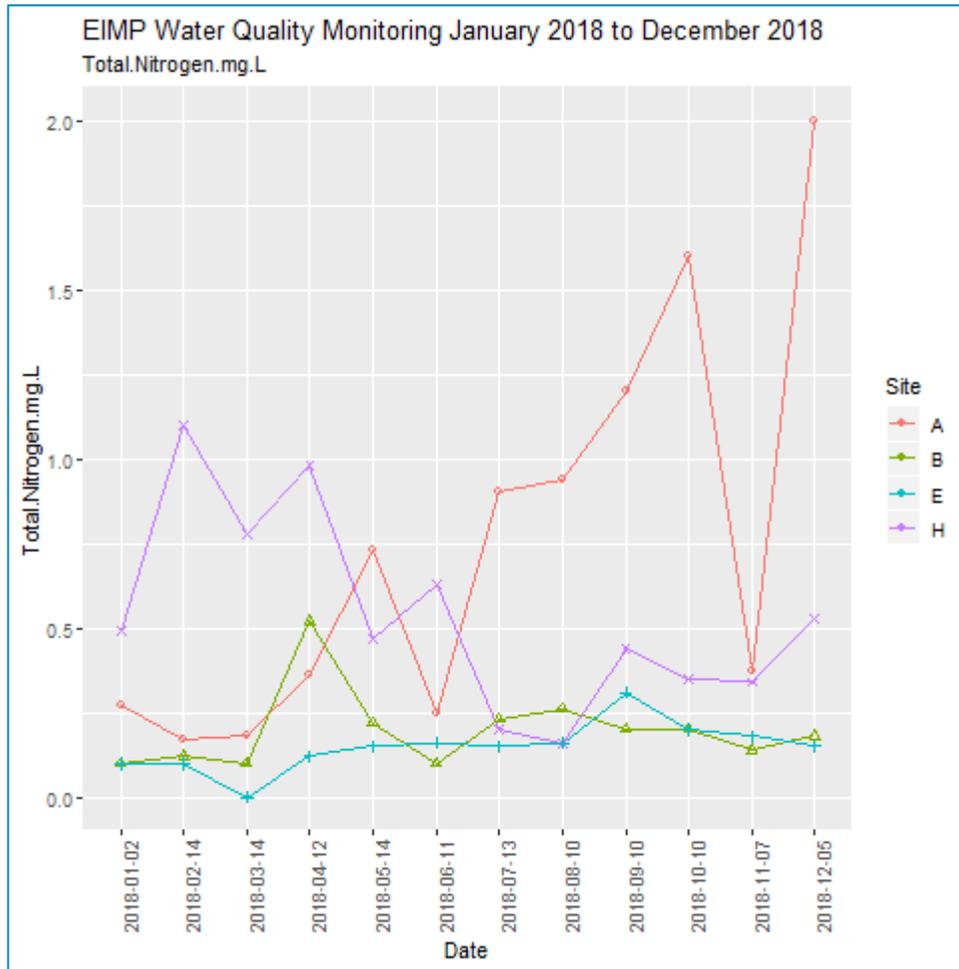
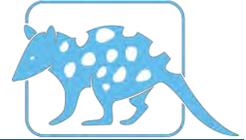


Figure 16. Time series plot of Total Nitrogen at EIMP monitoring sites for Jan- Dec 2018.

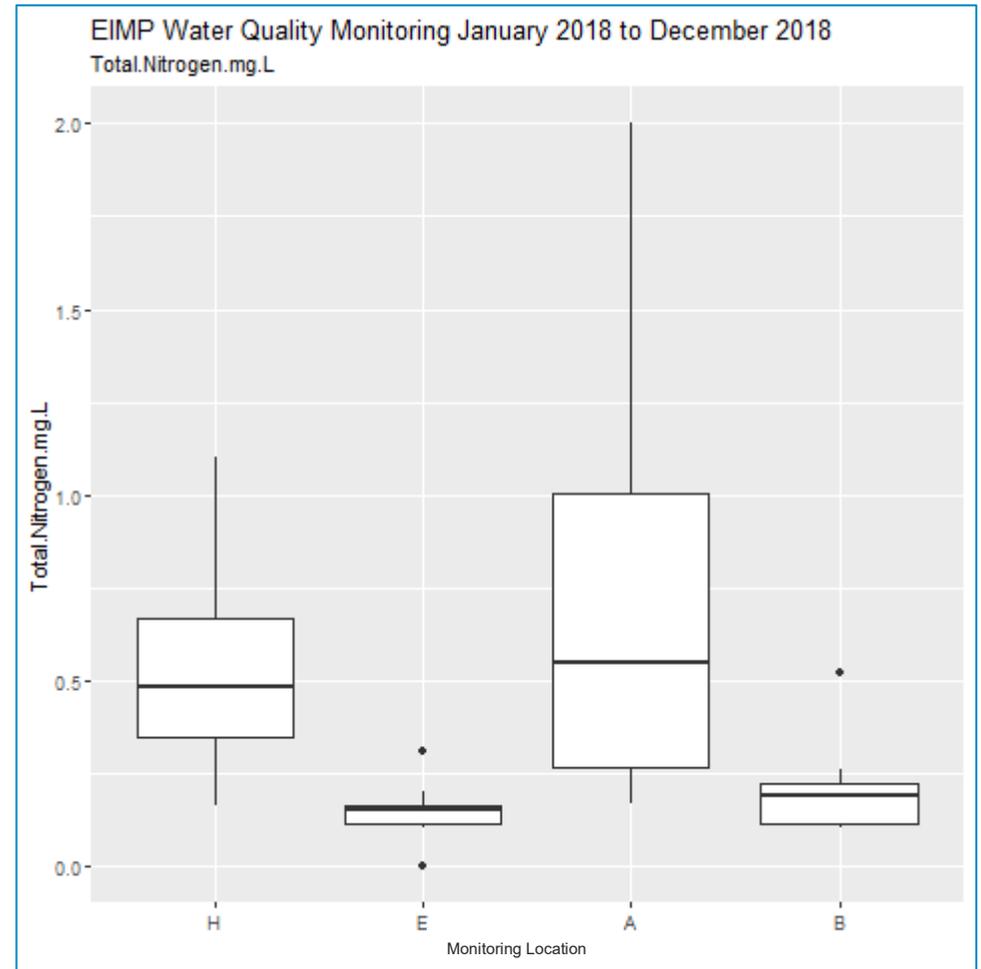


Figure 17. Boxplot of Total Nitrogen at EIMP monitoring sites for Jan-Dec 2018.



3.2 Sediments

3.2.1 Particle Size Distribution

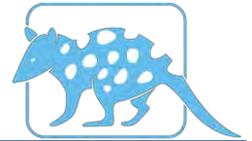
Three sub samples were collected at EIMP monitoring locations B, C, E and F with laboratory analytes selected in accordance with Section 2.3. Locations of sub-samples are provided in Table 4 and particle distribution results are provided in Table 5. Laboratory analysis is expressed as the percentage of material retained at each size fraction. Sediments sampled were dominated by sand to clay sand.

Table 4. Locations of sediment sub-sampling.

Site ID	Latitude	Longitude
B-1	147.4899	-19.4662
B-2	147.4898	-19.4662
B-3	147.4897	-19.4661
C-1	147.4916	-19.4651
C-2	147.4915	-19.4651
C-3	147.4914	-19.4647
E-1	147.487	-19.4637
E-2	147.4869	-19.4636
E-3	147.4868	-19.4634
F-1	147.49	-19.4616
F-2	147.4902	-19.4613
F-3	147.4906	-19.4611

Table 5. Particle size distribution results for sediment subsamples.

Particle Size (%)												
Site ID	SB-1	SB-2	SB-3	SC-1	SC-2	SC-3	SE – 1	SE-2	SE-3	SF-1	SF-2	SF-3
+75µm	94	92	54	99	98	95	98	97	55	99	96	94
+150µm	93	89	46	98	98	92	98	96	40	99	94	88
+300µm	76	69	28	76	86	76	76	65	13	82	70	56
+425µm	46	41	14	35	49	46	40	30	6	40	35	29
+600µm	18	16	5	8	16	17	15	10	2	12	12	11
+1180µm	<1	1	<1	<1	<1	2	2	1	<1	<1	4	4
+2.36mm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3	2
+4.75mm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
+9.5mm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
+19.0mm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
+37.5mm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
+75.0mm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Description	Sand	Sand	Clayey Sand	Sand	Sand	Sand	Sand	Sand	Clayey Sand	Sand	Sand	Sand



3.3 Total Organic Carbon

Three Total Organic Carbon (TOC) sub samples were collected at monitoring locations B, C, E and F (See Table 4). Results are provided in Table 6.

Table 6: Total Organic Carbon Results

Site ID	TOC %
B-1	0.14
B-2	0.16
B-3	0.67
C-1	0.03
C-2	0.05
C-3	0.09
E-1	0.06
E-2	0.10
E-3	1.04
F-1	0.03
F-2	0.10
F-3	0.11

Across all monitoring locations, the TOC concentrations were similar. The exception to this was subsamples B-3 and E-3, which indicated elevated TOC results compared to the corresponding duplicates.



3.4 Macroinvertebrates

The sampling of macroinvertebrates was conducted at monitoring locations B, C, D and F. The result of Macroinvertebrate sampling and analysis is outlined in Table 7. In summary, analyses indicated the presence of 541 individual specimens from 27 taxa where identified across all monitoring locations.

Environmental Impact Monitoring Program – Spring 2018

Pacific Reef Fisheries Pty Ltd – Alva Beach



	SBM_1	SBM_2	SBM_3	SBM_4	SBM_5	SBM_6	SCM_1	SCM_2	SCM_3	SCM_4	SCM_5	SCM_6	SEM_1	SEM_2	SEM_3	SEM_4	SEM_5	SEM_6	SFM_1	SFM_2	SFM_3	SFM_4	SFM_5	SFM_6	Grand Total
Annelida	1	2	5		3	1		2			2	1		2		6	2	1			4	11	7	17	67
Polychaeta	1	1	5		3	1		2			2	1		1		6	2	1			4	11	7	16	64
Capitellidae		1	5														2					5	7	9	29
DAMAGED																						0		0	0
Nephtyidae												1				2					1	2		2	8
Nereididae	1							1										1				2		2	7
Orbiniidae											1													3	4
Oweniidae					3	1					1			1		4					3	2			15
Polychaeta_damage d								1																	1
Sipunculiformes		1												1										1	3
Sipunculidae		1												1										1	3
Arthropoda					1						1														2
Aracnida					1																				1
Acarina					1																				1
Pycnogonida											1														1
Pycnogonidae											1														1
Brachiopoda																						2	1	4	7
Lingulata																						2	1	4	7
Lingulidae																						2	1	4	7
Crustacea			0			2	3	3		1	2	1		2	1	4		1	1	3	4	4	3	17	52
Amphipoda									1													1	3	2	7
Aoridae																					1	3		2	6
DAMAGED								1																	1
DAMAGED			0																						0
DAMAGED			0																						0
Decapoda						1	1									4						1			7
Alpheidae																1									1
Diogenidae							1															1			2
Ocypodidae						1										3									4
Isopoda							2	2		1								1	1	3					10
Cirolanidae							2	2		1								1	1	3					10
Tanaidacea						1					2	1		2	1							2	1	3	15
Apseudidae						1					2	1		2	1							2	1	3	15
Echinodermata																						2			2
Ophiuroidea																						2			2
Ophiuroidea																						2			2
Insecta							1														1				2
Diptera							1														1				2
NA							1														1				2
Mollusca	4	9	19	10	2	3	26	6	16	7	30	14	7	4	5	25	45	2	10	8	18	42	47	43	402
Bivalvia	3	8	13	3	2	3	22	6	16	6	30	13	7	4	4	3	3	2	10	7	14	38	46	40	303
DAMAGED			0	0		0		0			0			0	0			0			0		0	0	0

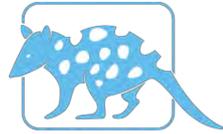
Environmental Impact Monitoring Program – Spring 2018

Pacific Reef Fisheries Pty Ltd – Alva Beach



Mactridae	2	4	4	1	2	1	15	4	8	4	16	9	3	2	1	1	1	1	4	5	13	35	38	31	205	
Mytilidae			1			1				1	2												3	2	10	
Pharidae							2																	1	3	
Tellinidae	1	4	8	2		1	5	2	8	1	12	4	4	2	3	2	2	1	6	2	1	3	5	6	85	
DAMAGED					0																				0	
DAMAGED					0																				0	
Gastropoda	1	1	6	7		0	4			1	1				1	22	42			1	4	4	1	3	99	
Cerithiidae		1	6	6			1								1	12	37					1		2	67	
DAMAGED						0											0								0	
Gastropod_juvenile																									1	
Littorinidae										1							1						1	1	1	5
Nassariidae							2					1					1				3	2			9	
Naticidae							1										10				1				12	
Neritidae	1																								3	
Potamididae				1																					2	
Nemertea								1			2	3												1	2	9
Nemertinea								1			2	3												1	2	9
Nemertinea								1			2	3												1	2	9
Grand Total	5	11	24	10	6	6	30	12	16	8	37	19	7	8	6	35	47	4	11	12	28	59	59	83	543	

Table 7: Macroinvertebrate Monitoring Results



4. Conclusions and Recommendations

Monitoring during this EIMP monitoring campaign included the sampling of water, sediments and macroinvertebrates. At monitoring location A the majority of water parameters were varied in comparison to the other monitoring locations (B, E and H). In particular, concentrations of nutrients became elevated during October – November 2018. Sediment sampling indicated that stream substrate was dominated by sand, with clayey sand existing adjacent to stream banks. TOC Concentrations were similar between sampling locations, with the exception of subsamples B-3 and E-3. Macroinvertebrate analysis identified a total of 541 individual macroinvertebrates from 27 Taxa.

Environmental Authority EPPR00864913 Condition SMR12, specifies that an Environmental Impact Monitoring Program was to be developed to determine:

- the presence of water quality disturbance in relation to aquaculture activities; and
- any changes to representative natural biological communities, with an 80% certainty of detecting any such changes should be present.

Determination of water quality disturbance and impact to biological communities with 80% confidence, cannot currently be achieved under the current EIMP design. It is recommended that the EIMP design be updated.

The updated EIMP should:

- outline the environmental values;
- provide further detail into monitoring methodologies;
- provide further data interpretations;
- determine potential for impact against receiving environments and environmental values; and
- provide recommendations of further actions to rectify impacts to the environment (if any).



5. Appendix A – Particle Size Distribution Analysis

CERTIFICATE OF ANALYSIS

Work Order : **EB1824478**
Client : **WILD ENVIRONMENTAL**
Contact : Matthew Ayre
Address : Suite 3, 175 Sturt Street PO Box 55
 TOWNSVILLE QLD 4810
Telephone : 0744109000
Project : ----
Order number :
C-O-C number : ----
Sampler : Matthew Ayre, NICHOLAS BAKER
Site : ----
Quote number : EN/222/18
No. of samples received : 7
No. of samples analysed : 7

Page : 1 of 4
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61-7-3243 7222
Date Samples Received : 10-Oct-2018 08:45
Date Analysis Commenced : 17-Oct-2018
Issue Date : 13-Nov-2018 09:52



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SE - 1	SE - 2	SE - 3	SF - 1	SF - 2 DUP
Client sampling date / time				08-Oct-2018 00:00					
Compound	CAS Number	LOR	Unit	EB1824478-001	EB1824478-002	EB1824478-003	EB1824478-004	EB1824478-005	
				Result	Result	Result	Result	Result	
EA150: Particle Sizing									
+75µm	----	1	%	98	97	55	99	96	
+150µm	----	1	%	98	96	40	99	94	
+300µm	----	1	%	76	65	13	82	70	
+425µm	----	1	%	40	30	6	40	35	
+600µm	----	1	%	15	10	2	12	12	
+1180µm	----	1	%	2	1	<1	<1	4	
+2.36mm	----	1	%	<1	<1	<1	<1	3	
+4.75mm	----	1	%	<1	<1	<1	<1	<1	
+9.5mm	----	1	%	<1	<1	<1	<1	<1	
+19.0mm	----	1	%	<1	<1	<1	<1	<1	
+37.5mm	----	1	%	<1	<1	<1	<1	<1	
+75.0mm	----	1	%	<1	<1	<1	<1	<1	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	1	2	39	1	4	
Silt (2-60 µm)	----	1	%	1	<1	6	<1	<1	
Sand (0.06-2.00 mm)	----	1	%	97	98	55	99	93	
Gravel (>2mm)	----	1	%	1	<1	<1	<1	3	
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1	
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.63	2.62	2.43	2.77	2.62	
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.06	0.10	1.04	0.03	0.06	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			SF - 2	SF - 3	----	----	----
		Client sampling date / time			08-Oct-2018 00:00	08-Oct-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1824478-006	EB1824478-007	-----	-----	-----	
				Result	Result	----	----	----	
EA150: Particle Sizing									
+75µm	----	1	%	93	94	----	----	----	
+150µm	----	1	%	90	88	----	----	----	
+300µm	----	1	%	70	56	----	----	----	
+425µm	----	1	%	34	29	----	----	----	
+600µm	----	1	%	10	11	----	----	----	
+1180µm	----	1	%	2	4	----	----	----	
+2.36mm	----	1	%	<1	2	----	----	----	
+4.75mm	----	1	%	<1	<1	----	----	----	
+9.5mm	----	1	%	<1	<1	----	----	----	
+19.0mm	----	1	%	<1	<1	----	----	----	
+37.5mm	----	1	%	<1	<1	----	----	----	
+75.0mm	----	1	%	<1	<1	----	----	----	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	5	5	----	----	----	
Silt (2-60 µm)	----	1	%	1	<1	----	----	----	
Sand (0.06-2.00 mm)	----	1	%	93	92	----	----	----	
Gravel (>2mm)	----	1	%	1	3	----	----	----	
Cobbles (>6cm)	----	1	%	<1	<1	----	----	----	
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.61	2.59	----	----	----	
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.10	0.11	----	----	----	

CERTIFICATE OF ANALYSIS

Work Order : **EB1824517**
Client : **WILD ENVIRONMENTAL**
Contact : **MR NICHOLAS BAKER**
Address : **Suite 3, 175 Sturt Street PO Box 55**
TOWNSVILLE QLD 4810
Telephone : ----
Project : ----
Order number : ----
C-O-C number : ----
Sampler : **Matthew Ayre, NICHOLAS BAKER**
Site : ----
Quote number : **EN/222/18**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 4
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 11-Oct-2018 09:30
Date Analysis Commenced : 17-Oct-2018
Issue Date : 13-Nov-2018 09:52



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

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When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Client sample ID

				SB - 1	SB - 2	SB - 3	SC - 1	SC - 2
Client sampling date / time				09-Oct-2018 00:00				
Compound	CAS Number	LOR	Unit	EB1824517-001	EB1824517-002	EB1824517-003	EB1824517-004	EB1824517-005
				Result	Result	Result	Result	Result
EA150: Particle Sizing								
+75µm	----	1	%	94	92	54	99	98
+150µm	----	1	%	93	89	46	98	98
+300µm	----	1	%	76	69	28	76	86
+425µm	----	1	%	46	41	14	35	49
+600µm	----	1	%	18	16	5	8	16
+1180µm	----	1	%	<1	1	<1	<1	<1
+2.36mm	----	1	%	<1	<1	<1	<1	<1
+4.75mm	----	1	%	<1	<1	<1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Fines (<75 µm)	----	1	%	6	8	46	1	2
Sand (>75 µm)	----	1	%	94	92	54	99	98
Gravel (>2mm)	----	1	%	<1	<1	<1	<1	<1
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.14	0.16	0.67	0.03	0.05



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)		Client sample ID			SC - 3	----	----	----	----
		Client sampling date / time			09-Oct-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1824517-006	-----	-----	-----	-----	
				Result	----	----	----	----	
EA150: Particle Sizing									
+75µm	----	1	%	95	----	----	----	----	
+150µm	----	1	%	92	----	----	----	----	
+300µm	----	1	%	76	----	----	----	----	
+425µm	----	1	%	46	----	----	----	----	
+600µm	----	1	%	17	----	----	----	----	
+1180µm	----	1	%	2	----	----	----	----	
+2.36mm	----	1	%	<1	----	----	----	----	
+4.75mm	----	1	%	<1	----	----	----	----	
+9.5mm	----	1	%	<1	----	----	----	----	
+19.0mm	----	1	%	<1	----	----	----	----	
+37.5mm	----	1	%	<1	----	----	----	----	
+75.0mm	----	1	%	<1	----	----	----	----	
EA150: Soil Classification based on Particle Size									
Fines (<75 µm)	----	1	%	5	----	----	----	----	
Sand (>75 µm)	----	1	%	95	----	----	----	----	
Gravel (>2mm)	----	1	%	<1	----	----	----	----	
Cobbles (>6cm)	----	1	%	<1	----	----	----	----	
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.09	----	----	----	----	