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Quarterly EM&A Report
August 2018 - October 2018

Client	:	Drainage Services Department
Project	:	Contract No. CM 14/2016 Environmental Team for Operational Environmental Monitoring and Audit for Siu Ho Wan Sewage Treatment Works
Report No.:	:	0041/17/ED/0388A

Prepared by: Andy K. H. Choi

Reviewed by: Cyrus C. Y. Lai

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沛然環境評估工程顧問有限公司

Our Ref: 1458/18-0190

24 December 2018

By Post and E-mail

Drainage Service Department
Projects and Development Branch
Consultants Management Division
42/F, Revenue Tower,
5 Gloucester Road
Wan Chai, Hong Kong

Attn: Mr. CHUNG Ching Hong, Romeo (E/CM9)

Dear Sir,

RE: CONTRACT NO. CM 13/2016
INDEPENDENT ENVIRONMENTAL CHECKER FOR OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT WORKS (SHWSTW)
QUARTERLY ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REPORT (AUGUST TO OCTOBER 2018)

Reference is made to the submission of Quarterly Environmental Monitoring and Audit (EM&A) Report (August to October 2018) (Report No.: 0041/17/ED/0388A) received from the Environmental Team (ET), Messrs. Fugro Technical Services Ltd., on 21 December 2018 via email.

We would like to inform you that we have no adverse comment on the captioned submission and hereby verify the same in accordance with Condition 4.3 of the Environmental Permit (EP) for the captioned Project (Permit No.: EP-076/2000).

Notwithstanding, please be reminded that the ET shall strictly follow Condition 4.3 of the EP to submit EM&A report within two weeks after the completion of each reporting period and the report shall be certified by the Independent Environmental Checker (IEC) before depositing with the Environmental Protection Department.

Should you have any queries, please feel free to contact the undersigned, or our Mr. Rodney IP at 2815 7028.

Yours faithfully,

For and on behalf of
Allied Environmental Consultants Ltd.

Grace M. H. KWOK
Independent Environmental Checker

GK/ri/rc

c.c. Fugro Technical Service (ET Leader) Attn: Mr. Colin YUNG (By E-mail)
AECOM Attn: Ms. Joanne TSOI (By E-mail)

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EXECUTIVE SUMMARY

The Drainage Services Department (DSD) of Hong Kong Special Administrative Region has appointed Fugro Technical Services Limited (FTS) to undertake the Environmental Team services for the Project and implement the EM&A works.

This is the fourth Quarterly EM&A Report presents the environmental monitoring and audit works for the period between 1 August 2018 and 31 October 2018. As informed by the Contractor, major activities in the reporting period included:

August 2018 - October 2018
▪ Perform comprehensive operation and maintenance services for the electrical, mechanical and electronic systems/equipment at Siu Ho Wan Sewage Treatment Works (SHWSTW).
▪ Alleviate as far as practicable the impact that the facilities and sewage systems imposed on the environment of Hong Kong.

Breaches of Action and Limit Levels

No exceedances of Action/Limit levels at Air Sensitive Receiver (ASR) were recorded and no non-compliance of odour monitoring at ASR were recorded in the reporting period.

Compliant Log

There was no complaint received in relation to the environmental impact during the report period.

Notifications of Summons and Successful Prosecutions

There were no notifications of summons or prosecutions received during the reporting period.

Summary of the Environmental Mitigations Measures

Mitigation measures specified in the EP and EIA Report such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment unit prior to stack exhaust was implemented during the reporting period.

1. INTRODUCTION

1.1 Background

1.1.1 The Project "Upgrading of Siu Ho Wan Sewage Treatment Works" is to upgrade Siu Ho Wan Sewage Treatment Works (SHWSTW) from the preliminary treatment level to Chemically Enhanced Primary Treatment (CEPT) level with Ultraviolet (UV) disinfection facilities. The Project is required to comply with the Environmental Permit (EP) in respect of the construction and operation phases of the Plant.

1.1.2 Under the Environmental Impact Assessment Ordinance (EIAO), the Project was classified as "Designated Project". The Environmental Impact Assessment (EIA) study was completed in September 1997 with the EIA Report of Register No. EIAR-124BC, Operational EM&A Plan and the EP of No. EP-076/2000 was issued in August 2000 to Drainage Services Department (DSD).

1.1.3 The CEPT part has been completed and was put into operation in March 2005. The UV disinfection works were substantially completed in December 2006. It is considered that the operation of the Project shall be deemed to start when the UV disinfection facilities have been completely installed and tested.

1.1.4 This Quarterly EM&A report is required under Section 8.5 of the OEM&A Plan. It is to report the results and findings of the EM&A programme required in the OEM&A Plan.

1.1.5 This is the fifth quarterly OEM&A Report which summaries the impact monitoring results and audit findings for the Project within the period between 1 August 2018 and 31 October 2018.

1.2 Project Description

1.2.1 The project proponent was DSD. AECOM was commissioned by DSD as the Engineer for the Project. Allied Environmental Consultants Limited (AEC) was commissioned by DSD as the Independent Environmental Checker (IEC) in the operation phase of the Project. FTS was appointed as the ET by DSD to implement the EM&A programme for the operation phase of the Project including air quality monitoring, water quality monitoring, sediment quality and benthic survey and Chinese white dolphin (CWD) monitoring.

1.3 Project Organization

1.3.1 The project organization for environmental works is shown in **Appendix A**. The contact person and telephone numbers of key personnel for the captioned project are shown in **Table 1.1**.

Table 1.1 Contact Persons and Telephone Numbers of Key Personnel

Organization	Role	Contact Person	Telephone No.	Fax No.
DSD	Project Proponent Representative	Mr. Romeo Chung	2594 7266	3104 6426
AECOM	Engineer Representative (ER)	Ms. Joanne Tsoi	3922 9423	3922 9797
AEC	Independent Environmental Checker (IEC)	Ms. Grace Kwok	2815 7028	2815 5399

FTS	ET Leader (ETL)	Mr. Colin Yung	3565 4114	2450 8032

1.4 Work Undertaken during the Report Period

1.4.1 During this reporting period, the principal work activities included:

August 2018 – October 2018
▪ Perform comprehensive operation and maintenance services for the electrical, mechanical and electronic systems/equipment at SHWSTW. ▪ Alleviate as far as practicable the impact that the facilities and sewage systems imposed on the environment of Hong Kong.

2. SUMMARY OF EM&A REQUIREMENTS AND MONITORING RESULTS

2.1 Monitoring Requirement

2.1.1 In accordance with the approved OEM&A Plan, air quality monitoring (odour patrol monitoring, H_2S measurement and olfactometry analysis), water quality monitoring (onsite measurement and laboratory analysis), sediment quality & benthic survey at the designated monitoring stations are required. Data interpretation for the distribution and abundance of Chinese white dolphin (CWD) from the survey undertaken by the Agriculture, Fisheries and Conservation Department (AFCD) is also required for CWD monitoring. Air quality monitoring (H_2S concentration monitoring and Odour patrol) should be conducted on a weekly basis for six months while the odour sampling for olfactometry analysis should be conducted on the first week of the odour patrol monitoring. For water quality monitoring, sediment quality & benthic survey and CWD monitoring should be carried out once per two months for a period of five years. The Action and Limit Levels of the air quality monitoring are given in **Appendix B**.

2.2 Monitoring Locations

2.2.1 According to the OEM&A Plan, one Air Sensitive Receiver (ASR) was identified and required to conduct air quality monitoring. The location (ASR) for air quality monitoring is shown in **Figure 1**.

2.2.2 In accordance with Section 5 of the EM&A Plan, water quality monitoring should be carried out at 8 designated monitoring locations (2 impact stations and 6 control stations). The monitoring locations shall be the same monitoring locations that were used for the baseline monitoring programme and have been approved by EPD. The coordinates of the monitoring location is shown in **Table 2.1**. The monitoring locations of water quality monitoring, Sediment Quality Monitoring and Benthic Survey are also shown in **Figure 2**.

Table 2.1 Location of Water Quality Monitoring, Sediment Quality Monitoring and Benthic Survey

Sampling Location		Easting	Northing
A	The Brothers, Control Station	816 100	822 500
B	The Brothers, Control Station	816 680	822 440
C	Siu Ho Wan Outfall, Impact Station	816 800	820 180
D	Siu Ho Wan Outfall, Impact Station	817 160	820 360
E	Cheung Sok, Control Station	819 817	821 655
F	Cheung Sok, Control Station	820 158	821 922
G	Tai Ching Chau, Control Station	822 214	822 692
H	Tai Ching Chau, Control Station	822 494	822 939

2.3 Monitoring Parameter

2.3.1 The durations and frequencies of H2S concentration measurement, odour patrolling and odour sampling are summarized in **Table 2.2** below.

Table 2.2 Durations and Frequencies of Air Quality Monitoring Programme

	Duration	Frequency
H_2S concentration monitoring	15 minutes	[1]Weekly basis for 6 months during the initial operation stage

Odour patrol		
Odour sampling for olfactometry analysis	[3]15 minutes	[2]First week of the odour patrol monitoring

Remark:
1) In case excessive odour nuisance was detected during the odour patrol monitoring or the standard of the 5 odour units cannot be complied with during the odour panel monitoring, the odour patrol monitoring and H_2S concentration monitoring shall be extended for a period of three months to cater for the warm-up period of the functioning of the additional mitigation measures.
2) In case the relationship between H_2S concentration (ppb) with the odour unit (OU/m3) cannot conclude from the correlation study carried out at the first week of the odour patrol monitoring due to invalid data, additional odour sampling for olfactometry analysis shall be carried out for the correlation study.
3) Sufficient air samples (approximate 60L) may be collected in less than 15 minutes during odour sampling.

2.3.2 The monitoring parameters for water quality monitoring are summarized in **Table 2.3**.

Table 2.3 Parameters for Water Quality Monitoring

Monitoring Parameters	
In-situ Measurement	**Laboratory Analysis**
Dissolved oxygen (mg/L)	*E. coli* (cfu/100ml)
Temperature (degree Celsius)	5-day BOD (mg/l)
pH value	Suspended Solids (mg/l)
Water depth (m)	Ammonia as N (mg/l)
Salinity (ppt)	Nitrate as N (mg/l)
Turbidity (NTU)	Nitrite as N (mg/l)
Current Speed (m/s)	Total inorganic nitrogen (mg/l)
Current Direction (degree magnetic)	Total phosphorus (soluble and particulate) (mg/l)

2.3.3 The monitoring parameters for sediment quality monitoring and benthic survey are summarized in **Table 2.4**.

Table 2.4 Parameters for Sediment Quality Monitoring and Benthic Survey

Monitoring Parameters	
Sediment Quality Monitoring	**Rinsate Blank for Benthic Survey**
Grain size profile* (i.e. Particle Size Distribution) (%)	Cadmium (µg/L)
Total organic carbon* (%)	Chromium (µg/L)
pH value	Copper (µg/L)
Ammonia as N (mg-N/kg)	Lead (µg/L)
Total nitrogen (mg-N/kg)	Mercury ((µg/L)
Total phosphorus (mg-N/kg)	Nickel (µg/L)
Cadmium (mg/kg)	Zinc (µg/L)
Chromium (mg/kg)	Arsenic (µg/L)
Copper (mg/kg)	Silver (µg/L)
Lead (mg/kg)	
Mercury (mg/kg)	
Nickel (mg/kg)	
Zinc (mg/kg)	

Monitoring Parameters	
Sediment Quality Monitoring	**Rinsate Blank for Benthic Survey**
Arsenic (mg/kg)	
Silver (mg/kg)	

*Grain size profile and total organic carbon is determined from the sediment sampled collected for benthic survey.

2.3.4 Apart from the parameters listed in the **Table 2.3** and **Table 2.4**, other relevant supplementary information such as monitoring location, time, weather conditions and any special phenomena shall be also recorded.

2.3.5 The tidal data will be obtained from the tide gauge installed in Ma Wan Marine Traffic Station, managed by the Hydrographic Office of Marine Department. Location of the tide gauge is shown in **Figure 3**. Tidal data obtained from Ma Wan Marine Traffic Station is present in **Appendix E**.

2.4 Results and Observations

2.4.1 Air quality monitoring (i.e. H2S concentration monitoring, odour patrol monitoring and olfactometry analysis), was temporary suspended and no monitoring was carried out in the reporting period.

2.4.2 No Action and Limit Level exceedance for air quality monitoring (odour patrol monitoring, H_2S measurement and olfactometry analysis) was recorded in the reporting period at ASR since no complaint on odour was received in the reporting period.

2.4.3 According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H_2S concentration (ppb) with the odour unit (OU/m^3). Due to non-ideal wind direction or domination of non-target smell during the measurements conducted between August 2017 and May 2018, inadequacy of representative data was result between August 2017 and May 2018. Current H_2S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H_2S concentration (ppb) with the odour unit (OU/m^3). In order to assess whether SHWSTW is the major H2S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H_2S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval. Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

2.4.4 Water quality monitoring, sediment quality monitoring and benthic survey were conducted on 21 August 2018 and 12 October to collect data for future reference in accordance with Section 5.5 and 6.5 of the Operational EM&A Plan. Heavy marine traffic and construction works from expansion of Hong Kong International Airport were observed nearby the Project site and its vicinity and may affect the water and sediment quality. The above conditions may affect monitoring results. The summaries of results collected of the monitoring were presented in the below tables. The graphical presentation of water quality monitoring results, sediment quality monitoring and benthic survey results are given in **Appendix D** and **Appendix F** respectively**.**

Table 2.5 Summary of In-situ Monitoring Results on 21 August 2018 (Depth – Average)

Monitoring Station		pH	Salinity (ppt)	Temperature (degree Celsius)	Dissolved oxygen (mg/L)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
A	E	8.18	25.53	28.65	3.52	3.7	0.29	195.3
	F	8.23	26.25	29.06	3.95	5.1	0.25	165.7
B	E	8.18	26.12	28.66	3.45	2.9	0.27	196.3
	F	8.20	27.83	28.55	3.38	6.6	0.23	168.1
C	E	8.19	25.15	28.97	3.48	3.2	0.21	210.9
	F	8.22	28.62	28.30	3.24	7.8	0.23	208.5
D	E	8.19	24.98	28.86	3.49	5.7	0.24	171.9
	F	8.21	28.55	28.34	3.56	9.3	0.34	233.0
E	E	8.20	23.48	29.84	3.90	5.9	0.22	198.9
	F	8.23	28.32	28.27	3.45	4.2	0.12	143.7
F	E	8.23	23.17	29.29	4.20	5.2	0.26	172.8
	F	8.36	28.49	28.26	3.44	4.3	0.37	224.1
G	E	8.23	24.86	29.15	3.93	5.4	0.34	211.6
	F	8.22	27.45	28.52	3.56	3.7	0.08	184.2
H	E	8.23	24.86	29.00	3.91	5.7	0.38	174.2
	F	8.22	26.05	28.81	3.99	9.1	0.17	194.5

Table 2.6 Summary of Laboratory Analysis Results on 21 August 2018 (Depth – Average)

Monitoring Station		TSS (mg/L)	NH_3 as N (mg/L)	NO_2^- as N (mg/L)	NO_3^- as N (mg/L)	TIN (mg/L)	E.coli (cfu/100mL)	Total P (mg/L)	BOD_5 (mg/L)
A	E	3.5	0.038	0.204	0.797	1.037	101.7	0.05	<1.0
	F	5.0	0.035	0.177	0.797	1.008	873.3	0.06	1.6
B	E	3.9	0.059	0.192	0.833	1.082	186.7	0.05	<1.0
	F	5.2	0.056	0.154	0.792	1.003	96.7	0.05	1.9
C	E	5.5	0.063	0.210	0.929	1.200	185.0	0.06	<1.0
	F	5.6	0.040	0.155	0.824	1.018	103.3	0.05	1.9
D	E	3.1	0.072	0.202	0.897	1.172	616.7	0.05	1.1
	F	7.1	0.029	0.155	0.785	0.969	58.3	0.04	1.6
E	E	2.2	0.038	0.174	0.808	1.020	105.0	0.04	1.2
	F	8.3	0.021	0.125	0.742	0.889	103.3	0.05	2.1
F	E	2.6	0.053	0.179	0.796	1.028	171.7	0.05	1.1
	F	9.0	0.044	0.133	0.702	0.878	323.3	0.05	1.3
G	E	2.3	0.047	0.185	0.811	1.042	191.7	0.04	1.1
	F	6.2	0.052	0.156	0.718	0.926	233.3	0.05	1.7
H	E	2.8	0.040	0.180	0.807	1.028	328.3	0.05	<1.0
	F	5.7	0.073	0.155	0.742	0.969	231.7	0.05	1.4

Table 2.7 Summary of In-situ Monitoring Results on 12 October 2018 (Depth – Average)

Monitoring Station		pH	Salinity (ppt)	Temperature (degree Celsius)	Dissolved oxygen (mg/L)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
A	E	8.35	32.30	26.88	7.10	5.6	0.34	181.4

Monitoring Station		pH	Salinity (ppt)	Temperature (degree Celsius)	Dissolved oxygen (mg/L)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
	F	8.41	32.22	27.22	7.06	7.1	0.15	167.4
B	E	8.39	32.73	26.92	7.04	6.1	0.17	145.0
	F	8.42	32.70	27.08	7.08	11.3	0.25	193.3
C	E	8.63	32.34	26.65	7.46	6.9	0.12	202.0
	F	8.40	32.00	26.96	7.18	8.3	0.16	136.7
D	E	8.44	32.47	26.76	7.24	6.1	0.13	158.6
	F	8.40	31.69	27.22	7.46	7.8	0.26	102.1
E	E	8.43	33.56	26.69	7.10	4.2	0.18	182.8
	F	8.40	32.68	26.84	7.04	7.8	0.17	166.0
F	E	8.43	33.29	26.70	7.05	4.1	0.19	147.7
	F	8.39	32.75	26.98	7.10	7.2	0.08	199.2
G	E	8.43	33.23	26.67	7.29	5.0	0.20	175.9
	F	8.37	32.39	26.83	6.92	8.4	0.35	172.3
H	E	8.44	33.09	26.73	7.32	4.7	0.16	163.9
	F	8.35	32.73	26.44	7.03	9.2	0.26	122.7

Table 2.8 Summary of Laboratory Analysis Results on 12 October 2018 (Depth – Average)

Monitoring Station		TSS (mg/L)	NH_3 as N (mg/L)	NO_2^- as N (mg/L)	NO_3^- as N (mg/L)	TIN (mg/L)	E.coli (cfu/100mL)	Total P (mg/L)	BOD_5 (mg/L)
A	E	8.5	0.026	0.094	0.298	0.418	ND	0.04	<1.0
	F	11.1	0.011	0.100	0.317	0.427	14.3	0.04	<1.0
B	E	11.0	0.024	0.085	0.267	0.376	ND	0.04	<1.0
	F	19.7	0.045	0.077	0.238	0.361	35.7	0.04	<1.0
C	E	10.6	0.012	0.084	0.309	0.403	ND	0.04	1.5
	F	8.0	0.038	0.096	0.302	0.436	12.0	0.04	<1.0
D	E	12.4	0.012	0.086	0.307	0.405	ND	0.04	2.7
	F	6.9	0.019	0.098	0.299	0.416	47.3	0.04	<1.0
E	E	12.5	0.042	0.081	0.246	0.370	245.0	0.04	<1.0
	F	11.5	0.045	0.094	0.298	0.437	39.2	0.04	<1.0
F	E	12.3	0.047	0.082	0.252	0.381	180.0	0.04	<1.0
	F	15.9	0.043	0.088	0.254	0.386	418.3	0.05	<1.0
G	E	13.5	0.036	0.076	0.236	0.348	147.8	0.04	<1.0
	F	17.2	0.028	0.092	0.271	0.389	97.8	0.05	<1.0
H	E	9.4	0.032	0.084	0.259	0.375	243.3	0.04	<1.0
	F	19.7	0.034	0.089	0.265	0.388	110.8	0.05	1.1

Table 2.9 Summary of laboratory analysis results for sediment monitoring on 21 August 2018

Monitoring Station	pH value	NH_3 as N (mg/L)	Total N (mg-N/kg)	Total P (mg-P/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	As (mg/kg)	Ag (mg/kg)
A	8.5	9.4	840	409	<0.10	31.9	23.7	30.1	0.06	18.1	85.6	11.2	0.21
B	8.4	3.2	960	504	0.15	51.8	69.6	50.7	0.15	28.7	123	15.9	0.46
C	8.4	11.6	1300	569	0.13	50.6	38.5	44.4	0.17	29.1	136	14.0	0.35

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Monitoring Station	pH value	NH_3 as N (mg/L)	Total N (mg-N/kg)	Total P (mg-P/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	As (mg/kg)	Ag (mg/kg)
D	8.4	9.8	1250	537	0.11	50.4	39.8	45.0	0.15	29.9	135	14.0	0.32
E	8.4	12.6	1060	445	<0.10	49.4	40.9	42.6	0.10	28.6	131	12.1	0.36
F	8.4	30.1	270	600	<0.10	50.4	41.9	45.0	0.14	30.1	136	12.9	0.51
G	8.6	4.5	50	107	<0.10	24.7	40.9	24.2	<0.05	13.7	77.5	6.9	0.18
H	8.4	11.0	<10	49	0.11	46.3	46.2	40.1	0.11	26.9	121	12.7	0.33

Table 2.10 Summary of laboratory analysis results for sediment monitoring on 12 October 2018

Monitoring Station	pH value	NH_3 as N (mg/L)	Total N (mg-N/kg)	Total P (mg-P/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	As (mg/kg)	Ag (mg/kg)
A	8.3	1.7	1240	602	<0.10	76.4	31.7	42.5	0.14	26.4	106	18.2	0.21
B	8.5	2.2	1280	576	<0.10	35.2	31.3	34.8	0.11	21.0	96.5	9.9	0.23
C	8.2	6.7	1520	671	0.12	47.0	37.9	42.5	0.12	28.5	121	13.9	0.26
D	8.2	6.8	1510	622	0.11	47.1	38.5	42.6	0.13	28.6	126	12.7	0.29
E	8.2	16.2	2240	734	0.11	50.7	44.0	45.0	0.15	30.6	135	12.3	0.34
F	8.3	14.6	1950	729	0.11	51.0	44.7	45.8	0.21	31.0	136	12.4	0.34
G	8.6	1.7	930	537	<0.10	14.2	15.0	18.8	<0.05	8.3	38.3	6.1	<0.10
H	8.3	2.2	1490	744	0.16	52.4	61.7	46.2	0.13	31.5	152	14.4	0.68

Table 2.11 Summary of laboratory analysis results for benthic survey

Monitoring Day	Monitoring Station	Total organic carbon (%)	Grain size profile (%)				Description
			Gravel	Sand	Silt	Clay	
21 August 2018	A	0.76	2	25	42	31	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
	B	0.86	1	18	49	32	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
	C	0.86	0	3	61	36	Dark grey, slightly sandy SILT/CLAY
	D	0.90	0	9	51	40	Dark grey, slightly sandy SILT/CLAY
	E	1.08	0	5	59	36	Dark grey, slightly sandy SILT/CLAY with shell fragments
	F	1.10	0	2	61	37	Dark grey, slightly sandy SILT/CLAY
	G	0.88	0	12	54	34	Dark grey, slightly sandy SILT/CLAY with shell fragments
	H	0.77	0	6	56	38	Dark grey, slightly sandy SILT/CLAY with shell fragments
12 October 2018	A	0.88	1	18	41	40	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
	B	0.80	5	22	42	31	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments

Monitoring Day	Monitoring Station	Total organic carbon (%)	Grain size profile (%)				Description
			Gravel	Sand	Silt	Clay	
	C	0.94	0	5	55	40	Dark grey, slightly sandy SILT/CLAY
	D	1.02	0	6	54	40	Dark grey, slightly sandy SILT/CLAY with shell fragments
	E	1.16	0	4	56	40	Dark grey, slightly sandy SILT/CLAY with shell fragments
	F	1.16	2	8	51	39	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
	G	0.96	2	12	46	40	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
	H	0.87	0	2	58	40	Dark grey, slightly sandy SILT/CLAY

2.4.5 The benthic survey results are analyzed and presented as below:

I. August 2018

II. Abundance

A total of 223 macrobenthic organisms were collected from the eight monitoring stations during the August 2018 monitoring period. Results of the current monitoring remained to be lower compared to the baseline data (August 2004) and showed a decrease in total abundance by 26 individuals (ind.) compared to the June 2018 monitoring results. Macrobenthic abundance showed decreasing trend since the wet season (August 2004) baseline monitoring albeit insignificant (p-value = 0.38 ; F crit = 2.94 ; α = 0.05). The decreasing trend might be attributed to weather disturbances (i.e. tropical storms) that hit Hong Kong week(s) before the sampling activities for June 2018 and August 2018 monitoring periods. Wave action brought about by these weather disturbances might have caused intermediate disturbances in the sampling stations, particularly that these stations are characteristically shallow waters (11m to 23m). Wave action may affect bottom sediments up to 50m in depth based on studies conducted by Coleman et al. (1997). Molluscs, particularly bivalves, were substantially affected by these disturbances as shown in their decreasing abundance since April 2018 monitoring period.

Across monitoring stations, the distribution of macrobenthic abundance is significantly variable (p-value = 0.03 ; F crit = 2.42 ; α = 0.05). As previously reported, the number of macrobenthic organisms might be correlated with the particle or grain size distribution as relatively higher abundances were recorded in stations with moderately sorted sediments and lower abundances in well-sorted sediments. Well-sorted sediments can only provide a smaller range of grain sizes and of interstitial spaces limiting the niches for benthic organisms (Gray 1974); thus, the lower abundances at stations with relatively homogenous grain size distribution. However, for the present monitoring period, no clear correlation between the abundances and sediment characteristics was observed which might due to the constant re-working of sediments brought about by the series of weather disturbances affecting the sampling stations.

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III. Biomass

The total wet biomass for all the eight monitoring stations during the August 2018 monitoring period was 63.99g, which is less than the biomass recorded during the previous monitoring periods. The decrease in total wet biomass (from April 2018 to August 2018) might be attributed to the parallel decline in the abundance of bivalves brought about by the series of weather disturbances that have impacted the sampling stations week(s) before the sampling activities.

The highest biomass continued to be observed in Station A (22.18g) and the lowest this present monitoring period is at the impact station, Station D (1.34g). Highest biomass remained at Station A because of the bivalves, *Ruditapes philippinarum* and *Paphia undulata*, remained to contribute significantly to the total wet biomass due to their larger sizes despite the decline in their abundance. Biomass generally decreased in all stations except at Station C and Station F due to the shift in the macrobenthic assemblage, which is currently dominated by smaller organisms (i.e. annelids).

IV. Taxonomic Composition

A total of seven phyla comprised of 37 families and 52 taxa were identified during the August 2018 monitoring period. With the previous increase in the number of annelid species and abundance and the decrease in the abundance of bivalves, annelids (i.e. polychaetes) remained to dominate the current benthic assemblages comprising about 65.02% of the sampled population. The intermediate disturbance in the form of wave action generated by the weather disturbances, as previously reported, might have cleared existing habitats providing opportunities for smaller benthic organisms such as polychaetes to colonize the area. A study shows that disturbance generated by episodic strong currents (“benthic storms”) was linked to high species dominance by polychaetes (58-64% ampharetids), bivalves, isopods and tanaids (Thistle et al.1985).

The current benthic assemblage is observed to be similar with the baseline data (August 2004) which were both dominated by polychaetes. However, during the baseline study capitellid and cirratulid were the dominant polychaetes which indicates unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000). For the present monitoring period capitellid and nepthyid were the most abundant group.

Station G remained to have the highest number of taxa (21) identified, followed by Station A and Station E both each have 20 taxa. The relatively higher number of taxa identified were mainly contributed by the species of polychaetes recorded at these stations. Station H had the lowest number (11) of taxa identified. Interestingly, the number of taxa in the impact stations (Station C and Station D) is increasing since April 2018 monitoring period.

V. Diversity

Diversity indices (H’) for the August 2018 monitoring period ranged from low (2.26 at Station H) to moderate (2.92 at Station A). Compared to the baseline and previous monitoring periods, increase in diversity in all stations (except at Station G) was observed. This increase might be due to the colonization of opportunistic species (i.e. annelids) of the new habitats made available by wave actions caused by weather disturbances. The increase in diversity consequently increase homogeneity of the benthic communities as showed by their high Evenness (J) Index.

Table 2.12 Summary of Benthic Survey Data on 21 August 2018

Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	28	22.18	20	2.92	0.97
B	20	3.16	16	2.72	0.98
C*	27	6.70	17	2.64	0.93
D*	25	1.34	13	2.40	0.93
E	39	12.11	20	2.74	0.91
F	27	9.31	14	2.44	0.92
G	40	4.97	21	2.76	0.91
H	17	4.22	11	2.26	0.94
TOTAL	223	63.99	52 **		

*Impact Sites, **Total count of different identified Taxa

VI. October 2018

VII. Abundance

A total of 202 macrobenthic organisms were collected from the eight stations during the October 2018 monitoring period. Results of the current monitoring remained to be lower compared to the baseline data (August 2004) and showed a decrease in total abundance by 21 individuals (ind.) compared to the August 2018 results. Macrobenthic abundance showed decreasing trend this wet season (April 2018 to October 2018) monitoring albeit insignificant (p-value = 0.30; F crit = 2.64; α = 0.05). The decreasing trend might be attributed to weather disturbances (i.e. tropical storms) that hit Hong Kong week(s) before the sampling activities for June 2018, August 2018, and October 2018 monitoring periods. Wave actions brought about by these weather disturbances might have caused intermediate disturbances in the sampling stations, particularly that these stations are characteristically shallow waters (11m to 23m). Wave action may affect bottom sediments up to 50m in depth based on studies conducted by Coleman et al. (1997). Molluscs, particularly bivalves, were significantly affected by these disturbances as shown in their decreasing abundance since April 2018 monitoring period.

Across monitoring stations, the distribution of macrobenthic abundance remained to be significantly variable (p-value = 0.03; F crit = 2.31; α = 0.05). Relatively higher abundances were recorded in the reference Stations E (30 ind.), F (28 ind.), G (46 ind.), and H (27 ind.) while lower abundances were recorded in the impact Stations C (16 ind.) and D (19 ind.) and reference Stations A and B, both have 18 ind. In correlation with particle grain size distribution, it can be observed that relatively higher abundances were noted in stations with slightly higher slit/clay percentages. Silt/clay substrates are preferred by annelids, the most abundant and ubiquitous groups during in this monitoring period.

VIII. Biomass

The total wet biomass for all the eight stations during the October 2018 monitoring period was 98.89g, which is relatively higher than the biomass recorded during the August 2018 monitoring period. The increase in total wet biomass from August 2018 to October 2018 might be attributed to the larger sizes of bivalves collected during this monitoring period despite their relatively lower and decreasing abundances.

The highest biomass was observed in Station E (27.92g) and A (19.44g) and the lowest remained to be at the impact station, Station D (0.05g). Highest biomass remained at Station E and A because of the bivalves, *Ruditapes philippinarum* and *Paphia undulata*, continued to contribute significantly to the total wet biomass due to their larger sizes despite the decline in their abundance. Biomass decreased in Station A, Station C and Station D compared to the August 2018 monitoring period, which may be due to the shift in the macrobenthic assemblage, which is currently dominated by smaller organisms (i.e. annelids).

IX. Taxonomic Composition

A total of five phyla comprised of 36 families and 50 taxa were identified in the eight stations during the October 2018 monitoring period. With the previous increase in the number of annelid species and abundance and the decrease in the abundance of bivalves, annelids (i.e. polychaetes) remained to dominate the current benthic assemblages comprising about 65.35% of the sampled population. The shift in benthic assemblage from the April 2018 monitoring period might be attributed to wave actions generated by the series of typhoons which cleared existing habitats providing opportunities for smaller benthic organisms such as polychaetes to colonize the area. A study shows that disturbance generated by episodic strong currents (“benthic storms”) was linked to high species dominance by polychaetes (58-64% ampharetids), bivalves, isopods and tanaids (Thistle et al.1985).

The current benthic assemblage is observed to be similar with the wet season baseline data (August 2004) which were both dominated by polychaetes. However, during the baseline study capitellid and cirratulid were the dominant polychaetes which indicates unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000). For the present monitoring period capitellid and nepthyid were the most abundant group.

Same as with abundance distribution, relatively higher numbers of taxa identified were recorded in the reference Stations E (18), F (13), G (22), and H (19) while lower abundances were recorded in reference Stations A (12) and B (10) and impact Stations C and D, both have 9 ind. The relatively higher number of taxa identified were mainly contributed by the species of polychaetes recorded at these stations.

X. Diversity

Diversity indices (H’) for the October 2018 monitoring period ranged from very low (1.76 at Station D and 1.98 at Station C) to moderate (2.83 at Station G). Compared to the August 2018 monitoring periods, decrease in diversity in majority of stations (except station G and H) was observed. This decrease might be due to the dominance of the annelids in the new habitats made available by wave actions caused by weather disturbances. The decrease in diversity consequently lowered the heterogeneity of the benthic communities as showed by their decreased Evenness (J) Index.

Table 2.13 Summary of Benthic Survey Data on 12 October 2018

Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	18	19.44	12	2.37	0.95
B	18	4.72	10	2.25	0.98
C*	16	4.84	9	1.98	0.90
D*	19	0.05	9	1.76	0.80

E	30	27.92	18	2.73	0.94
F	28	18.91	13	2.15	0.84
G	46	7.79	22	2.83	0.91
H	27	15.22	19	2.78	0.96
TOTAL	202	98.89	50 **		

*Impact Sites, **Total count of different identified Taxa

2.4.6 The latest AFCD's report dated 10 July 2018, "*Monitoring of Marine Mammals in Hong Kong Waters (2017-18)*" in terms of the distribution and abundance of CWDs was reviewed in the Monthly EM&A report in July 2018. According to the advice from AFCD, the data of distribution and abundance of CWDs would only be available in the annual reports for Monitoring of Marine Mammals In Hong Kong Waters which cover monitoring data from 1 April to 31 March (next year). The updated status of the distribution and abundance of CWDs will be provided once the annual report (2018-19) is uploaded to AFCD"s webpage.

3. ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITGATION MEASURES

3.1 Implementation Status

3.1.1 Although no site inspection is prescribed during the operation of the Plant in accordance with the approved EM&A Plan, SHWSTW is reminded to fully and properly implement mitigation measures specified in the EP and EIA Report. Mitigation measures such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment prior to stack exhaust was implemented in the reporting period. A summary of mitigation measures implementation schedule is provided in **Appendix G**.

4. ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS

4.1.1 SHWSTW is reminded to fully comply with EP conditions. All measures and recommendations in the EP, EIA Report and approved waste management plan shall be fully and properly implemented. During the reporting period, following measures in related to solid and liquid waste management was implemented:

- The influent of waste water shall be treated by CEPT with UV disinfection;
- Trip-ticket system shall be implemented for sludge and sediment;
- The acceptance criteria for Landfill disposal should be followed;
- Chemical waste should be properly handled and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.

4.1.2 A summary of mitigation measures implementation schedule is provided in **Appendix G**.

5. SUMMARY OF EXCEEDANCE OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMITS

5.1.1 Air quality monitoring (i.e. H2S concentration monitoring, odour patrol monitoring and olfactometry analysis), was temporary suspended and no monitoring was carried out in the reporting period. No exceedances of Action/Limit levels at ASRs were recorded.

5.1.2 Water quality monitoring, sediment quality monitoring and benthic survey were carried out on 21 August 2018 and 12 October 2018. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

6. SUMMARY OF ENVIRONMENTAL COMPLAINTS

6.1.1 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to the environmental impact during the report period. Summaries of complaints, notification of summons and successful prosecutions are presented in **Table 9.1** and **Table 9.2**.

Table 9.1 Cumulative Statistics on Complaints

Environmental Parameters	Cumulative No. Brought Forward	No. of Complaints This Month	Cumulative Project-to-Date
Air	0	0	0
Noise	0	0	0
Water	0	0	0
Waste	0	0	0
Others	0	0	0
Total	0	0	0

Table 9.2 Cumulative Statistics on Notification of Summons and Successful Prosecutions

Environmental Parameters	Cumulative No. Brought Forward	No. of Notification of Summons and Prosecutions This Month	Cumulative Project-to-Date
Air	0	0	0
Noise	0	0	0
Water	0	0	0
Waste	0	0	0
Others	0	0	0
Total	0	0	0

7. CONCLUSION

7.1.1 Air quality monitoring i.e. H_2S concentration monitoring, odour patrol monitoring and olfactometry analysis, was temporary suspended and no monitoring was carried out in the reporting period. No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period.

7.1.2 According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H_2S concentration (ppb) with the odour unit (OU/m^3). Due to non-ideal wind direction or domination of non-target smell during the measurements conducted between August 2017 and May 2018, inadequacy of representative data was result between August 2017 and May 2018. Current H_2S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H_2S concentration (ppb) with the odour unit (OU/m^3). In order to assess whether SHWSTW is the major H2S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H_2S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval. Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

7.1.3 Water quality monitoring, sediment quality monitoring and benthic survey were conducted on 21 August 2018 and 12 October to collect data for future reference in accordance with Section 5.5 and 6.5 of the Operational EM&A Plan. The details of methodology and results collected of the monitoring were presented in Section 2. Heavy marine traffic and construction works from expansion of Hong Kong International Airport were observed nearby the Project site and its vicinity and may affect the water and sediment quality. The above conditions may affect monitoring results.

7.1.4 The latest AFCD's report dated 10 July 2018, "*Monitoring of Marine Mammals in Hong Kong Waters (2017-18)*" in terms of the distribution and abundance of CWDs was reviewed. Only one sighting of CWD was made in NEL in 2018. CWD occurence in NEL has plummeted starting from 2013 to the lowest point in 2015-17 when no dolphin was sighted. Even the marine works of HZMB has been mostly completed in 2017, it is reported that there is still no sign of recovery. The potential impact of increased effluent discharged from SHWSTW on CWDs is not mentioned in this AFCD report. However, anthropogenic disturbances such as increasing level of vessel traffic, construction of HZMB and expansion of Hong Kong International Airport are perceived as causes of decline in local abundance of CWDs. Continued systematic dolphin surveying in Lantau Island is necessary to further study this issue.

7.1.5 SHWSTW is reminded to fully *comply with EP conditions. All environmental mitigation m*easures and recommendations in the EP, EIA Report and approved waste management plan shall be fully and properly implemented.

7.1.6 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to the environmental impact during the report period.

7.2 Comment and Recommendations

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7.2.1 The recommended environmental mitigation measures, as proposed in the EIA reports and OEM&A Plan were effectively and efficiently minimize the potential environmental impacts from the Project. Therefore, no complaint or non-compliance of monitoring were recorded during the reporting period. As inadequacy of representative data was result between August 2017 and May 2018, current H_2S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H_2S concentration (ppb) with the odour unit (OU/m^3). Alternative methods shall be proposed and submitted for EPD's approval to ensure that EM&A programme could effectively monitor the environmental impacts generated from the site and ensure the proper implementation of mitigation measure.

7.2.2 According to the environmental monitoring performed in the reporting period, the following recommendations were made:

Air Quality Monitoring

- In order to assess whether SHWSTW is the major H2S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H_2S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

Water Quality Monitoring

- No specific observation was identified in the reporting period.

Sediment Quality Monitoring and Benthic Survey

- No specific observation was identified in the reporting period.

Chinese White Dolphin Monitoring

- No specific observation was identified in the reporting period.

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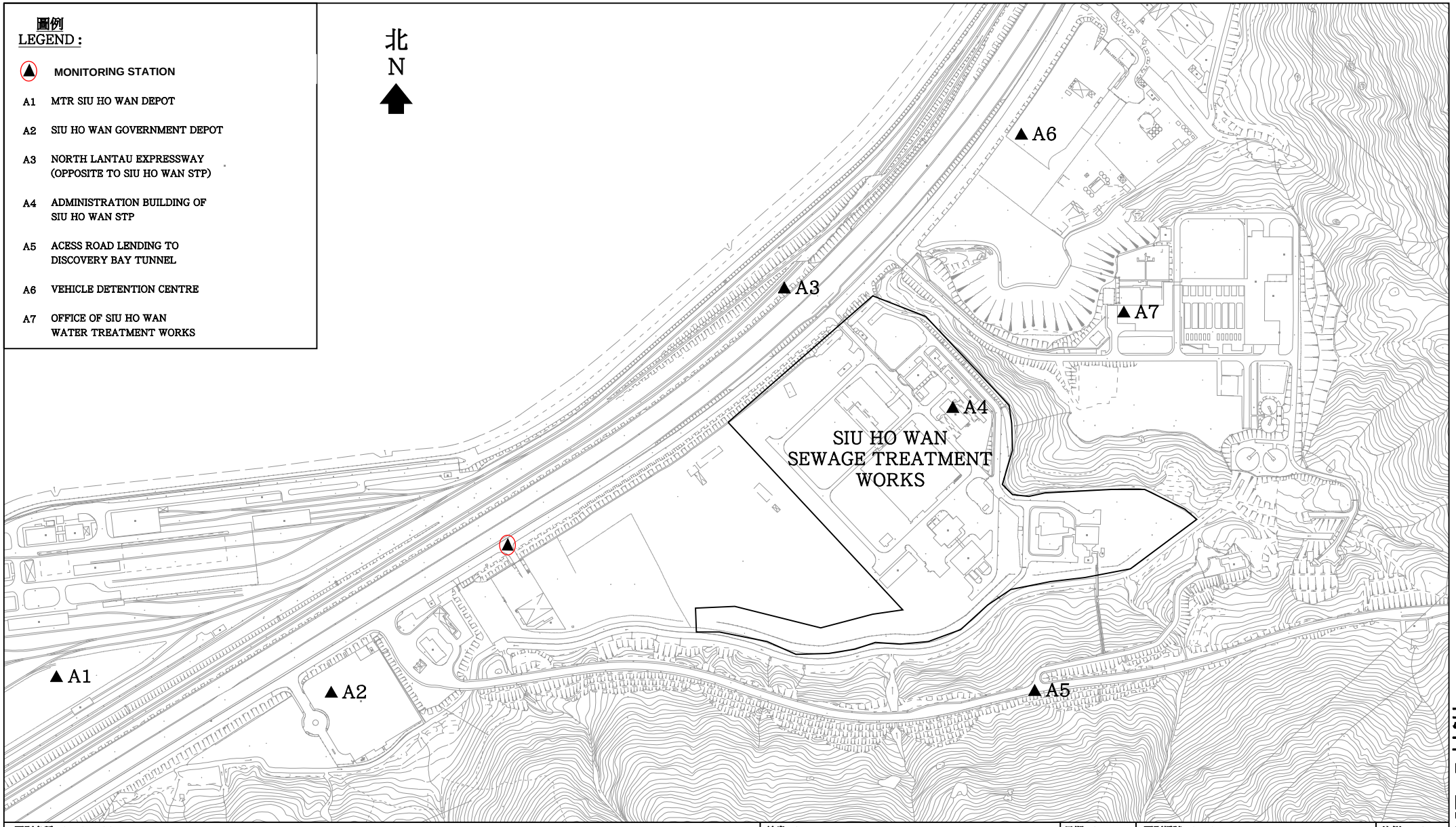
Figure 1

Monitoring Location of Air Sensitive Receiver



圖則名稱 drawing title

UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT
OPTIONAL ENVIRONMENTAL MONITORING AND AUDIT PLAN
ODOUR PATROL MONITORING STATIONS

繪畫 drawn	C.W. CHAN	日期 date 16-08-2006
核對 checked	C.K. LAM	日期 date 16-08-2006
批核 approved	S.K. WONG	日期 date 16-08-2006
部門 office	顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION	

圖則編號 drawing no. DCM/2006/063

比例 scale N.T.S.

香港特別行政區政府渠務署
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

附件1 ENCLOSURE 1

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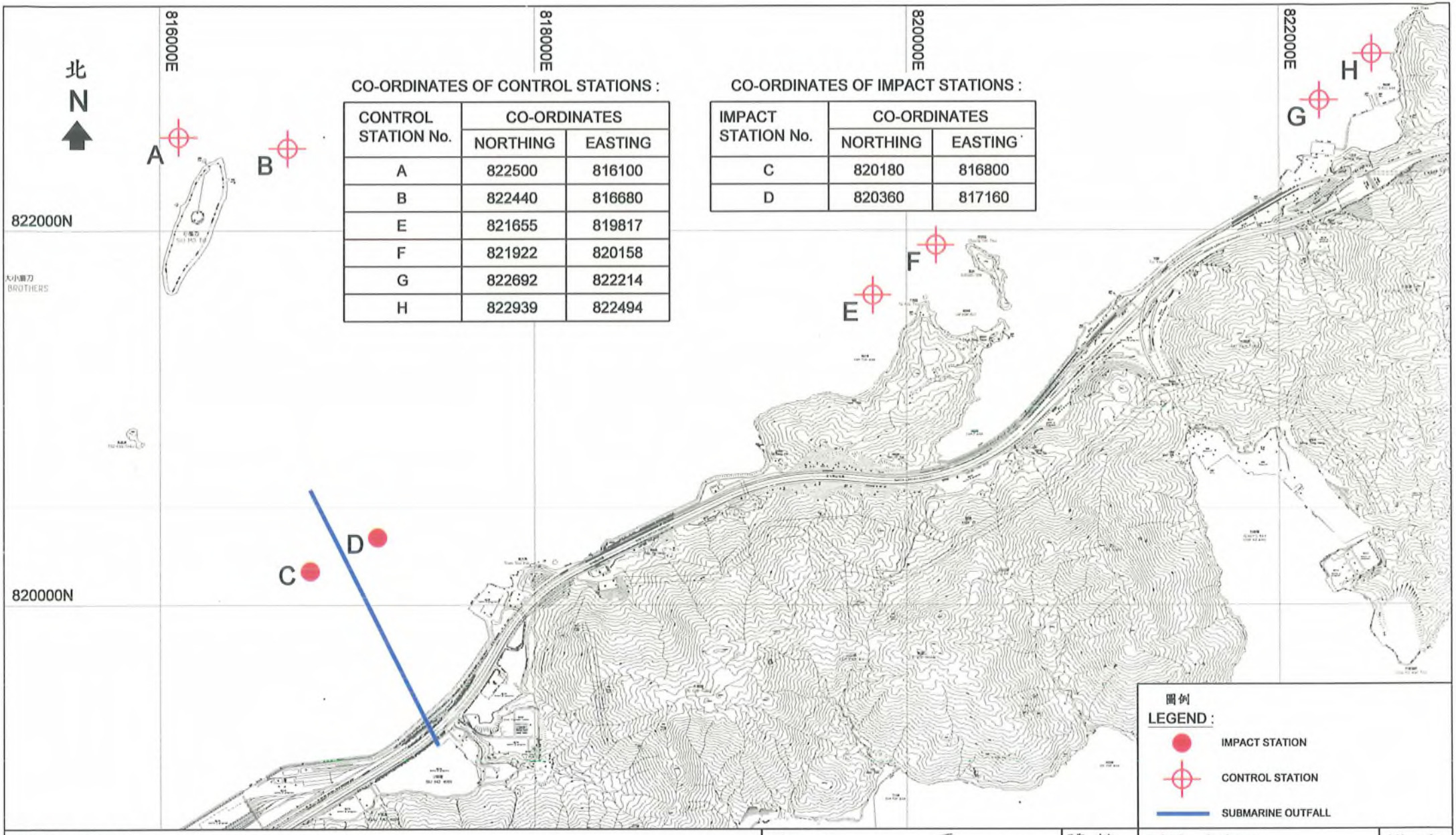
Figure 2

Monitoring Location of Water Quality Monitoring, Sediment Quality Monitoring and Benthic Survey



CO-ORDINATES OF CONTROL STATIONS :

CONTROL STATION No.	CO-ORDINATES	
	NORTHING	EASTING
A	822500	816100
B	822440	816680
E	821655	819817
F	821922	820158
G	822692	822214
H	822939	822494

CO-ORDINATES OF IMPACT STATIONS :

IMPACT STATION No.	CO-ORDINATES	
	NORTHING	EASTING
C	820180	816800
D	820360	817160

圖例
LEGEND :

- IMPACT STATION
- CONTROL STATION
- SUBMARINE OUTFALL

圖則名稱 drawing title

UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT
BASELINE MONITORING - LOCATION OF MONITORING STATIONS

繪畫 drawn	H.K. LAI	日期 date	06-02-2004
核對 checked	C.K. LAM	日期 date	04-03-2004
批核 approved	S.K. WONG	日期 date	04-03-2004
部門 office	顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION		

圖則編號 drawing no. DCM/2004/002

比例 scale N.T.S.

香港特別行政區政府渠務署
DRAINAGE SERVICES DEPARTMENT
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Figure 3

Location of the Tide Gauge

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Location of the Tide Gauge

Source: Google Maps

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Figure 4

Location of Survey Areas of Chinese White Dolphins

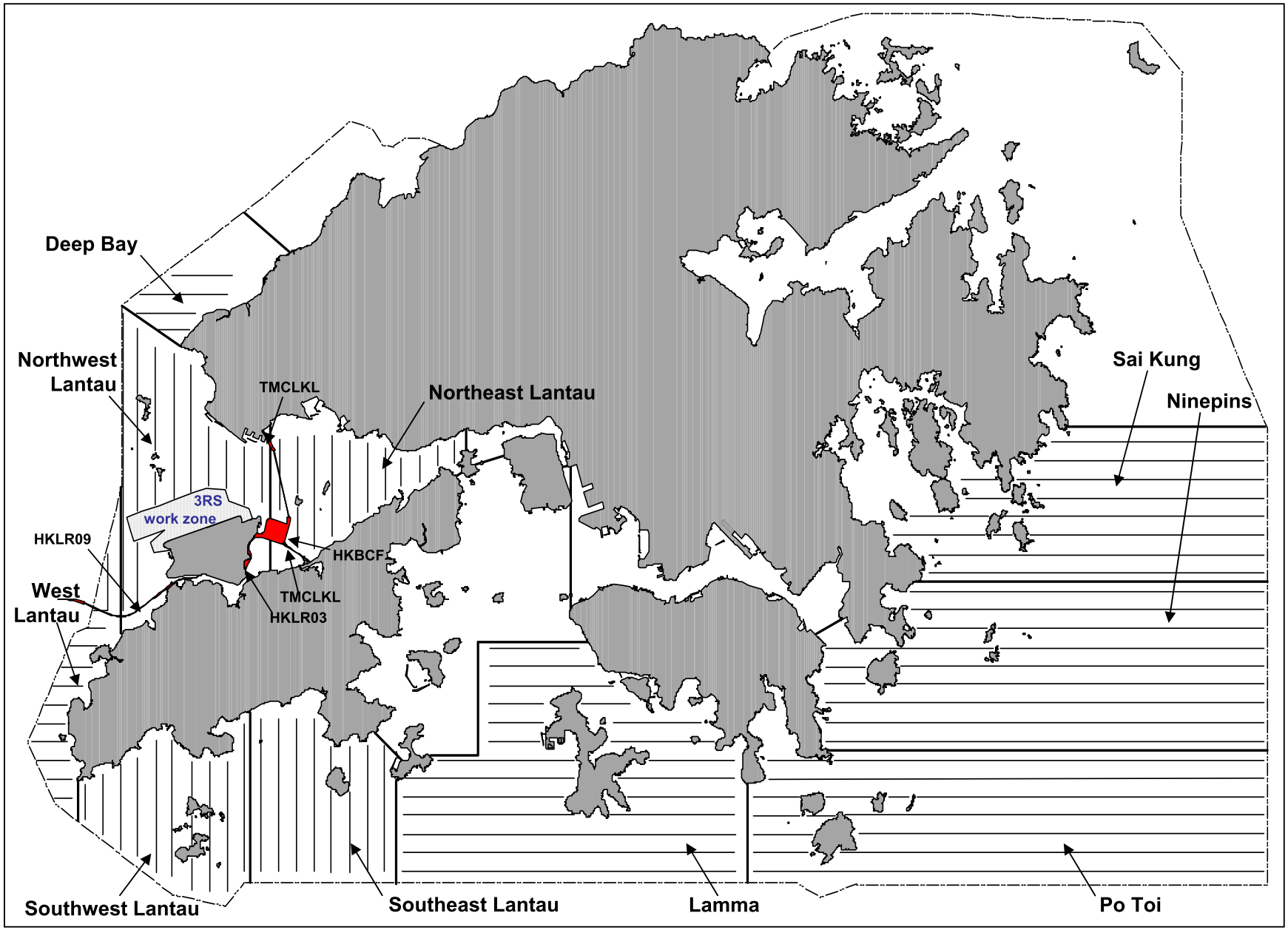

Figure 4. Ten Line-Transect Survey Areas within the Study Area for the 2017-18 Monitoring Study

Source: Monitoring of Marine Mammals in Hong Kong Waters (2017-18), AFCD

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Appendix A

Project Organization Chart

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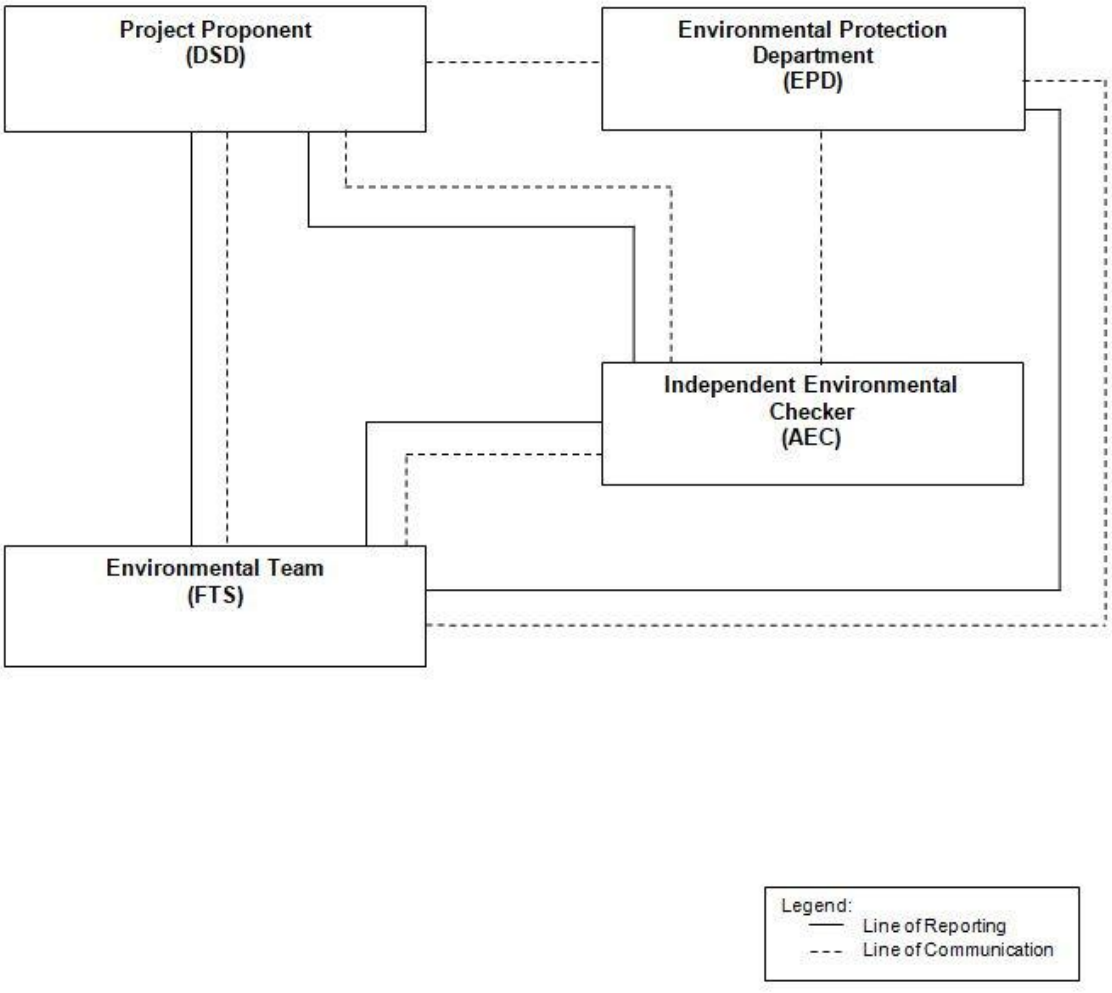

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Appendix B

Action and Limit Levels for Air Quality Monitoring

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Report No.: 0041/17/ED/0388A

Action and Limit Levels for Air Quality Monitoring

Parameter	Action	Limit
Odour	One complaint received for specific odour event	Two or more independent complaints receive for specific odour event

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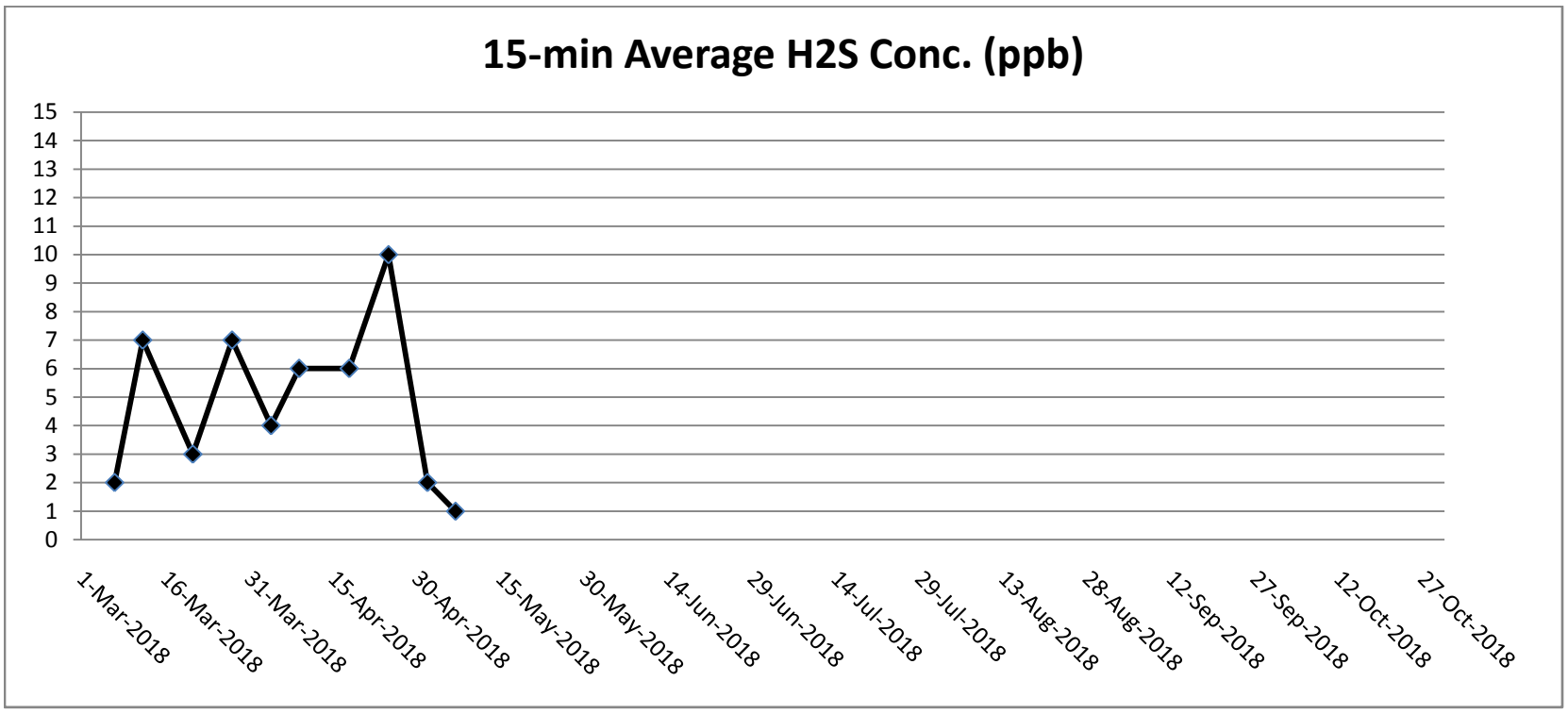
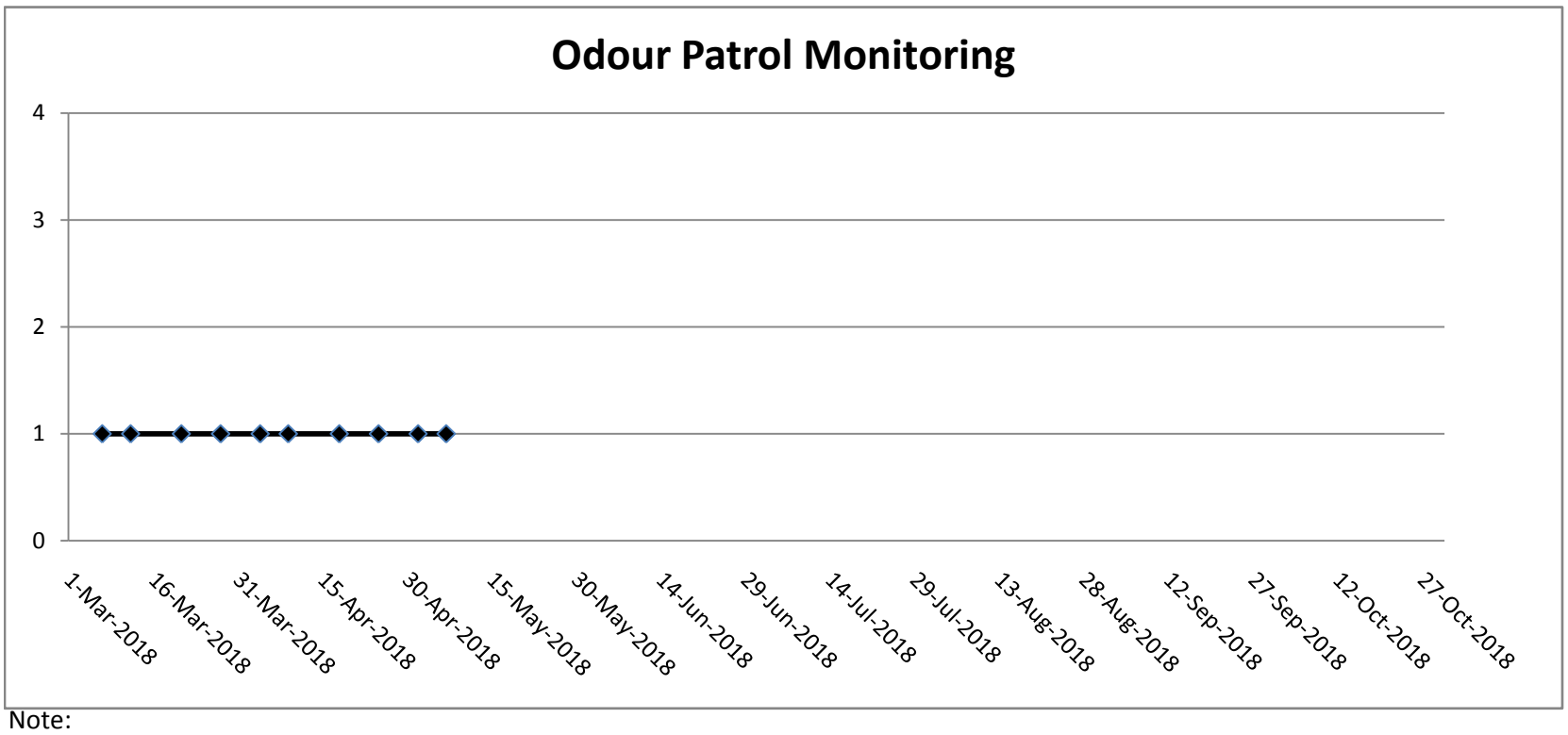
Appendix C

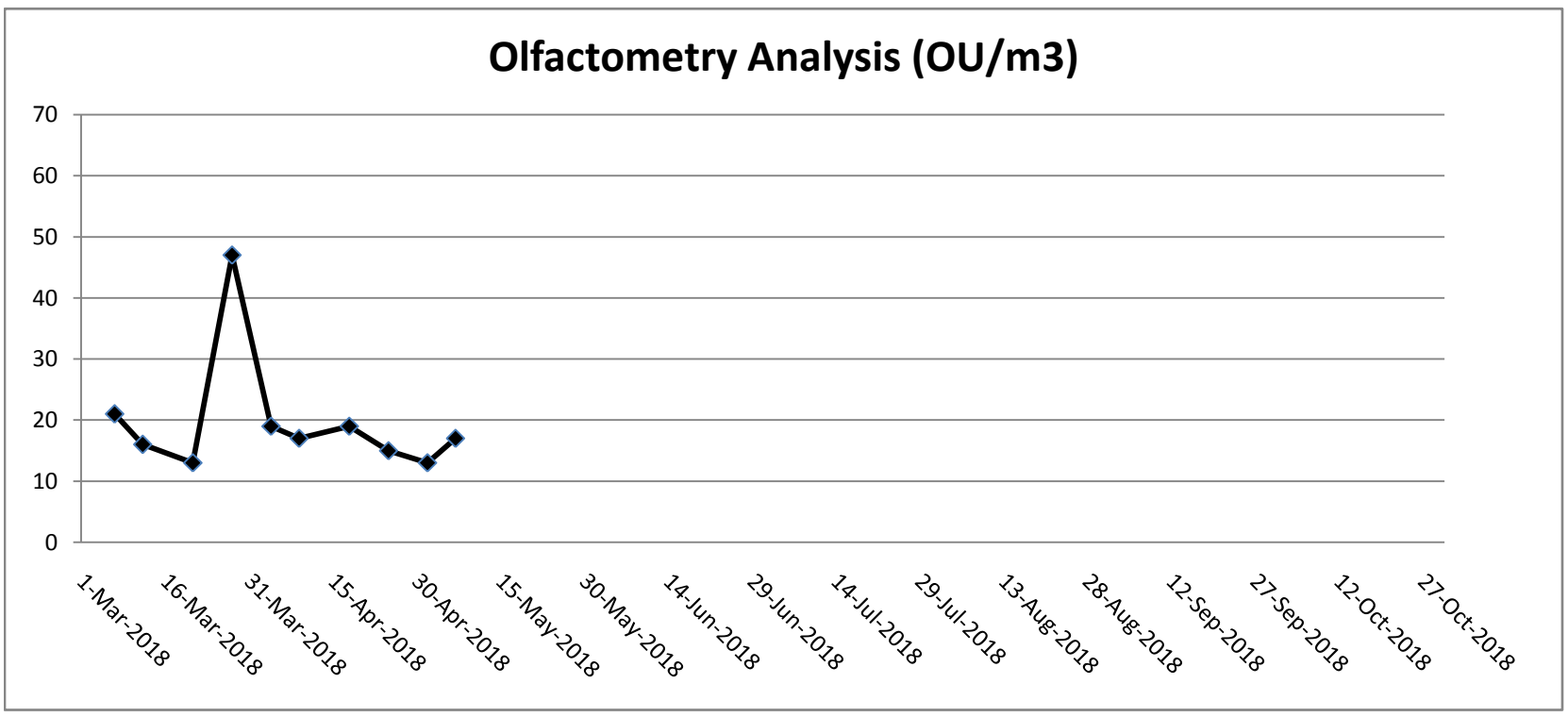
Graphical Presentation of Air Quality Monitoring





Note:

Y-axis refers to the Odour Level: 0 - Not Detected; 1- Slight; 2 - Moderate; 3 - Strong; 4 - Extreme



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E-mail : matlab@fugro.com
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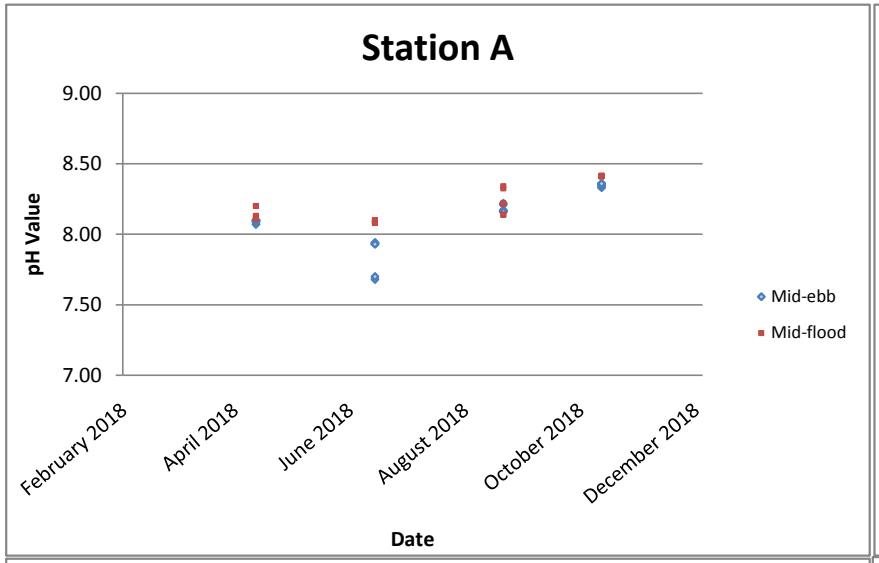
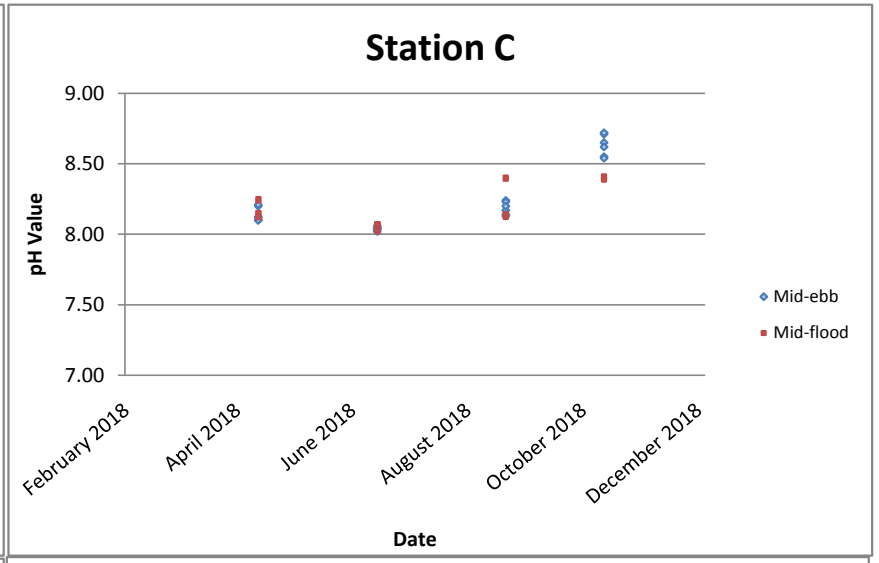
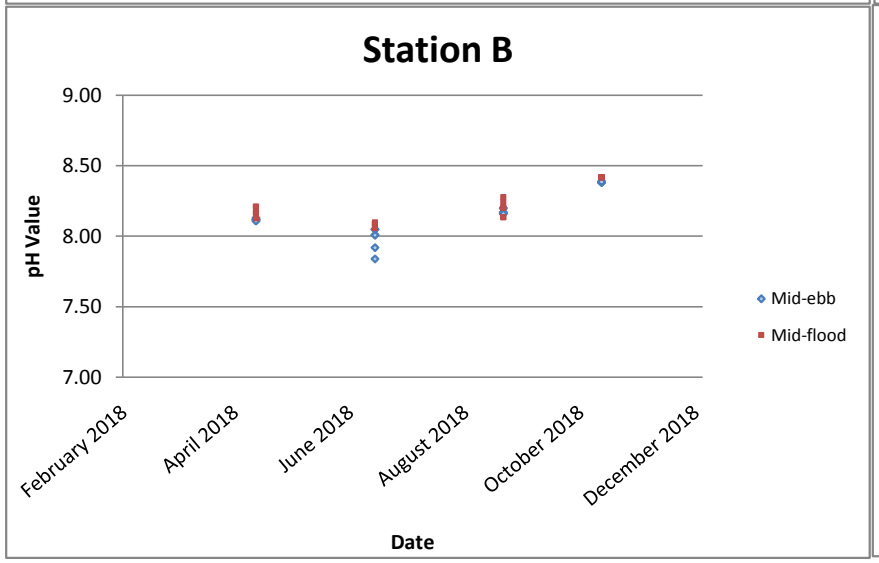
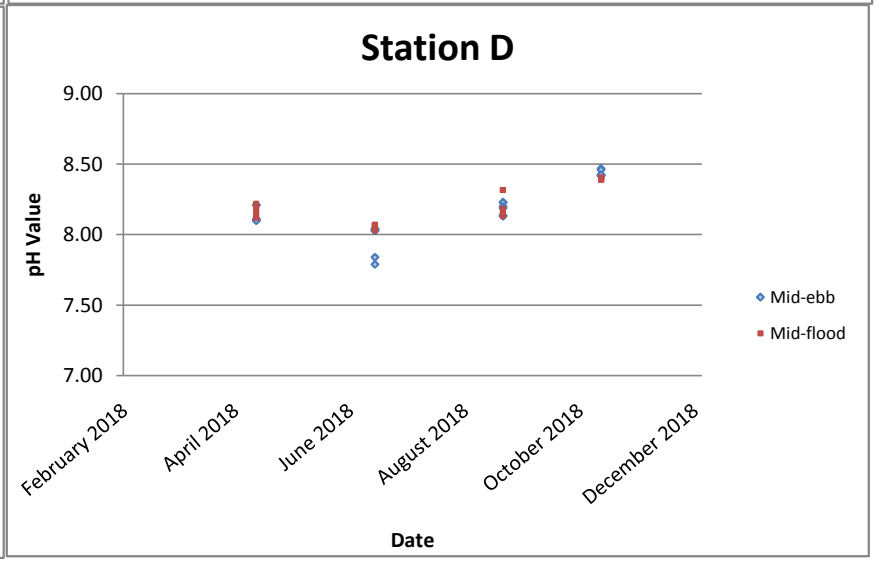
Appendix D

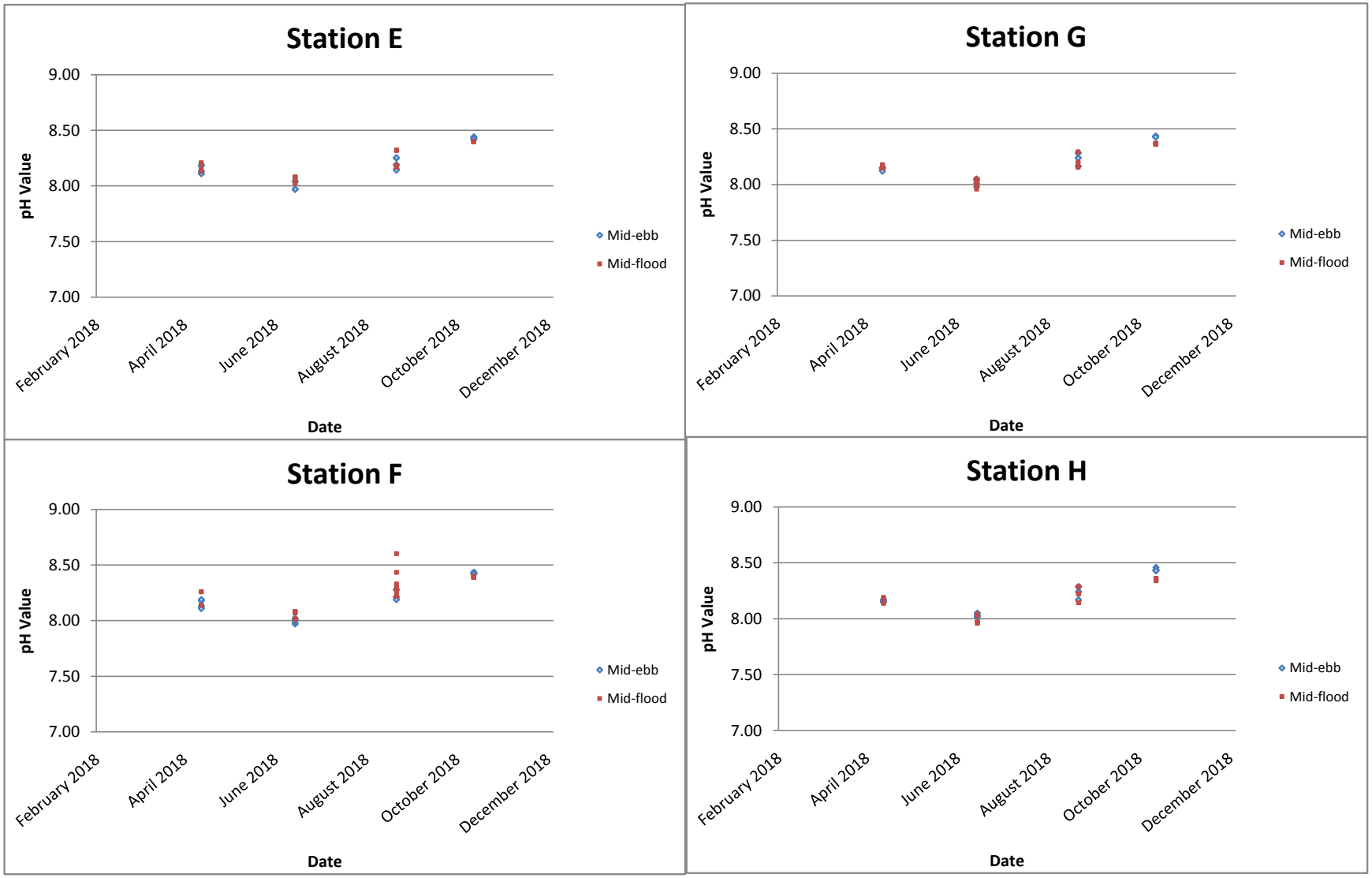
Graphical Presentation of Water Quality Monitoring


Station A
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

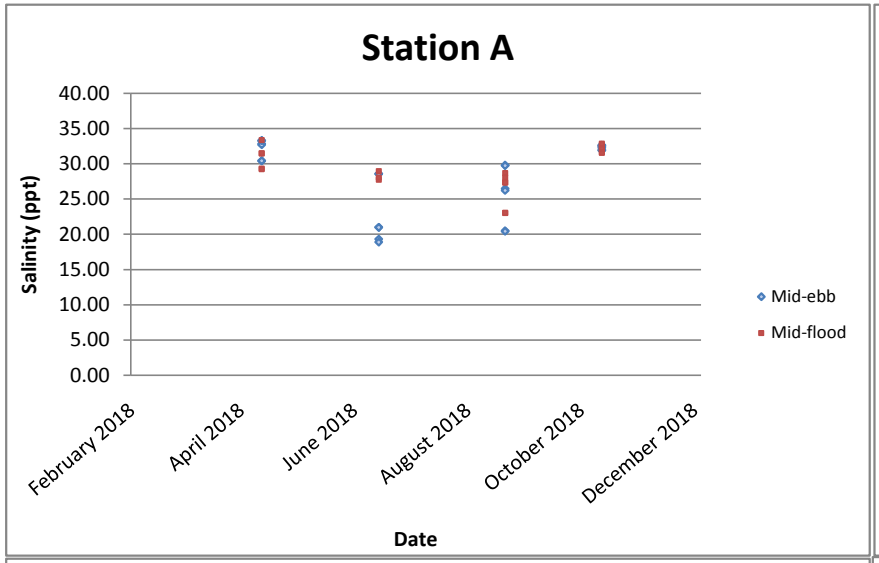

Station C
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

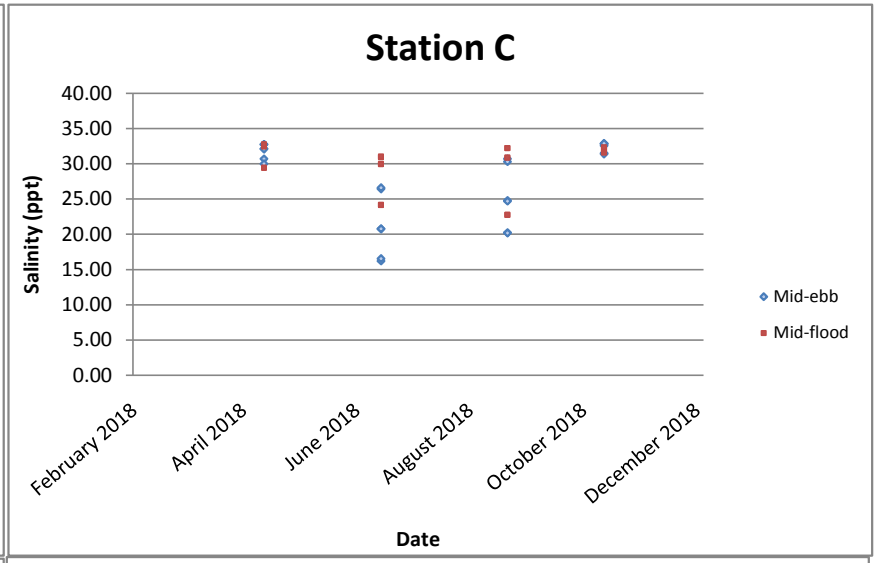

Station B
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

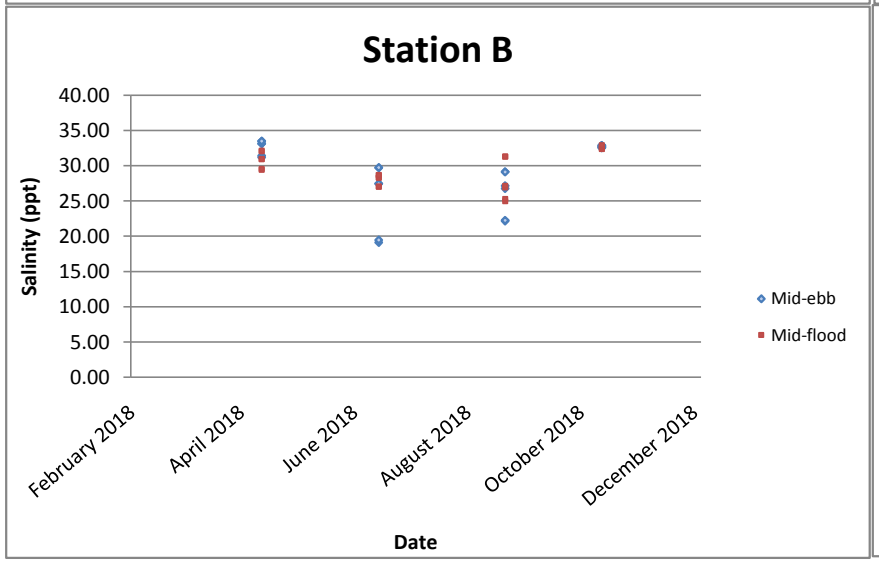

Station D
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

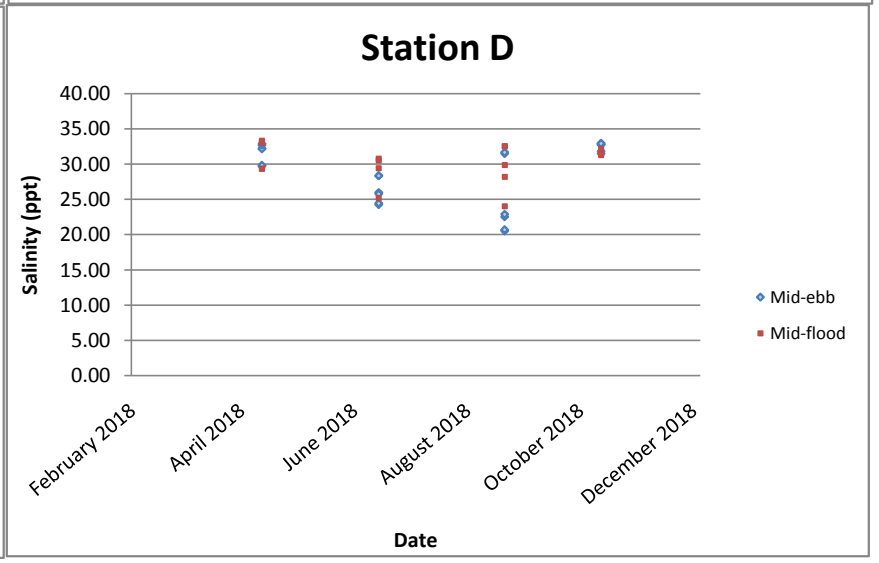

Station E
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station G
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station F
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station H
9.00
8.50
8.00
7.50
7.00
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

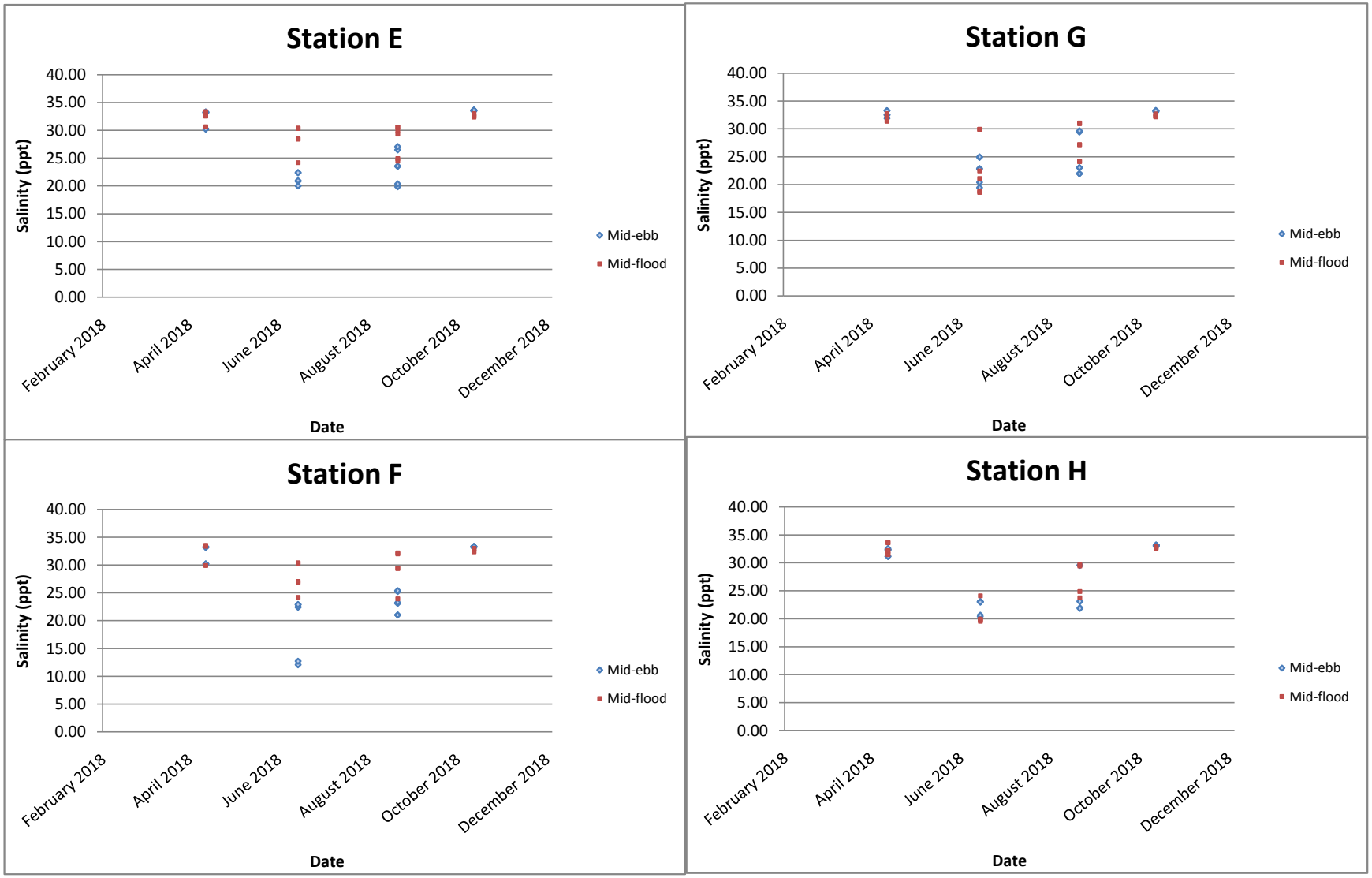
Salinity (ppt)



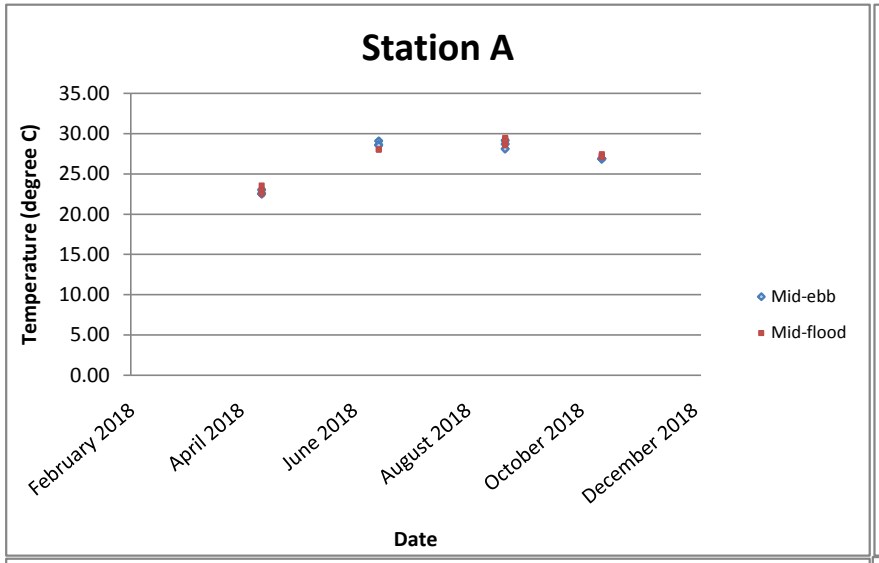


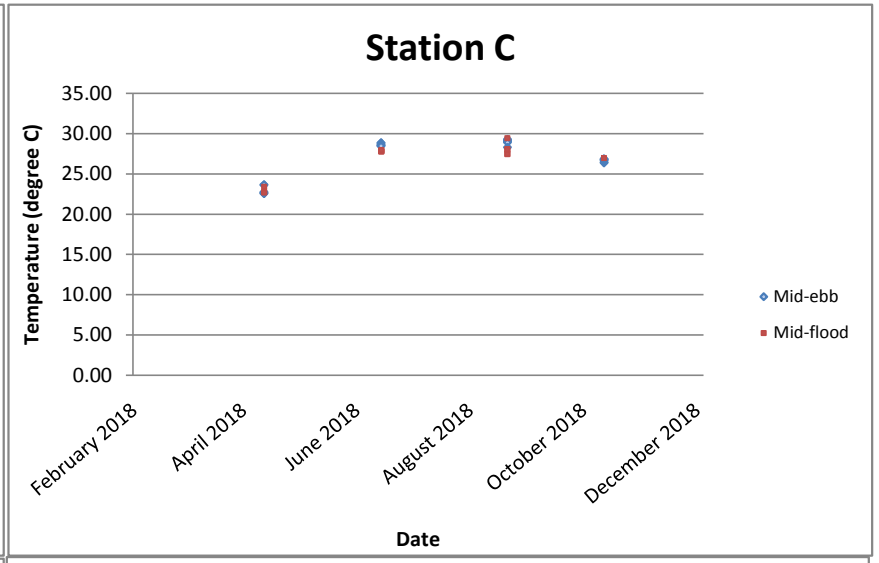


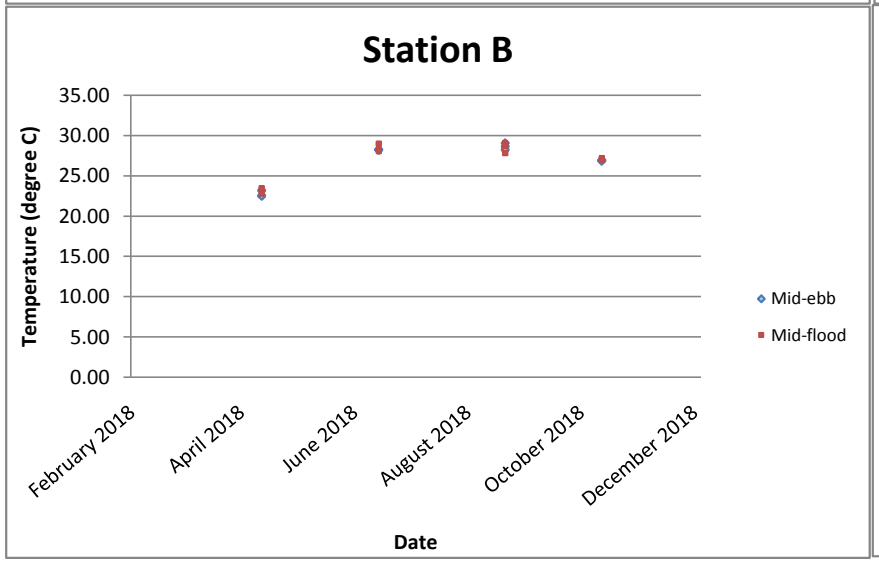


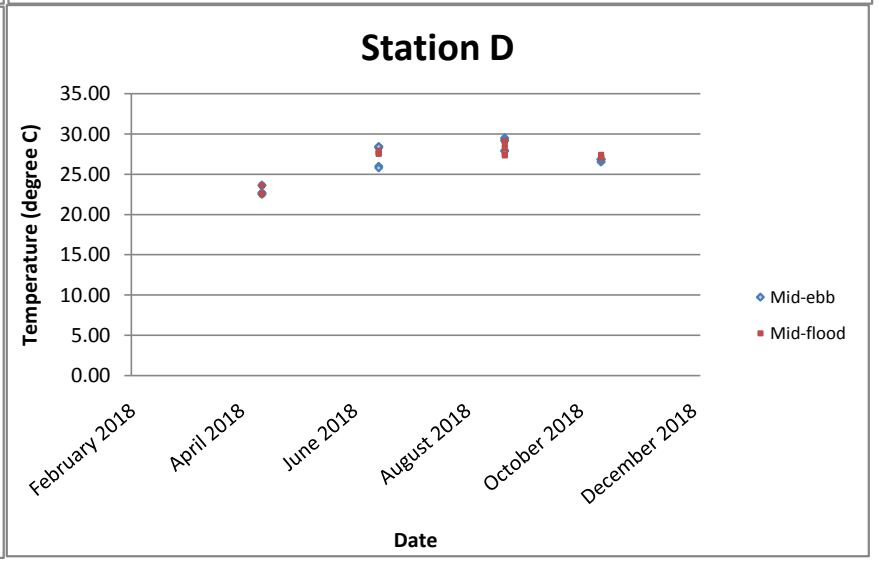

Station E
Salinity (ppt)
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station G
Salinity (ppt)
Date
Mid-ebb
Mid-flood
Station F
Salinity (ppt)
Date
Mid-ebb
Mid-flood
Station H
Salinity (ppt)
Date
Mid-ebb
Mid-flood

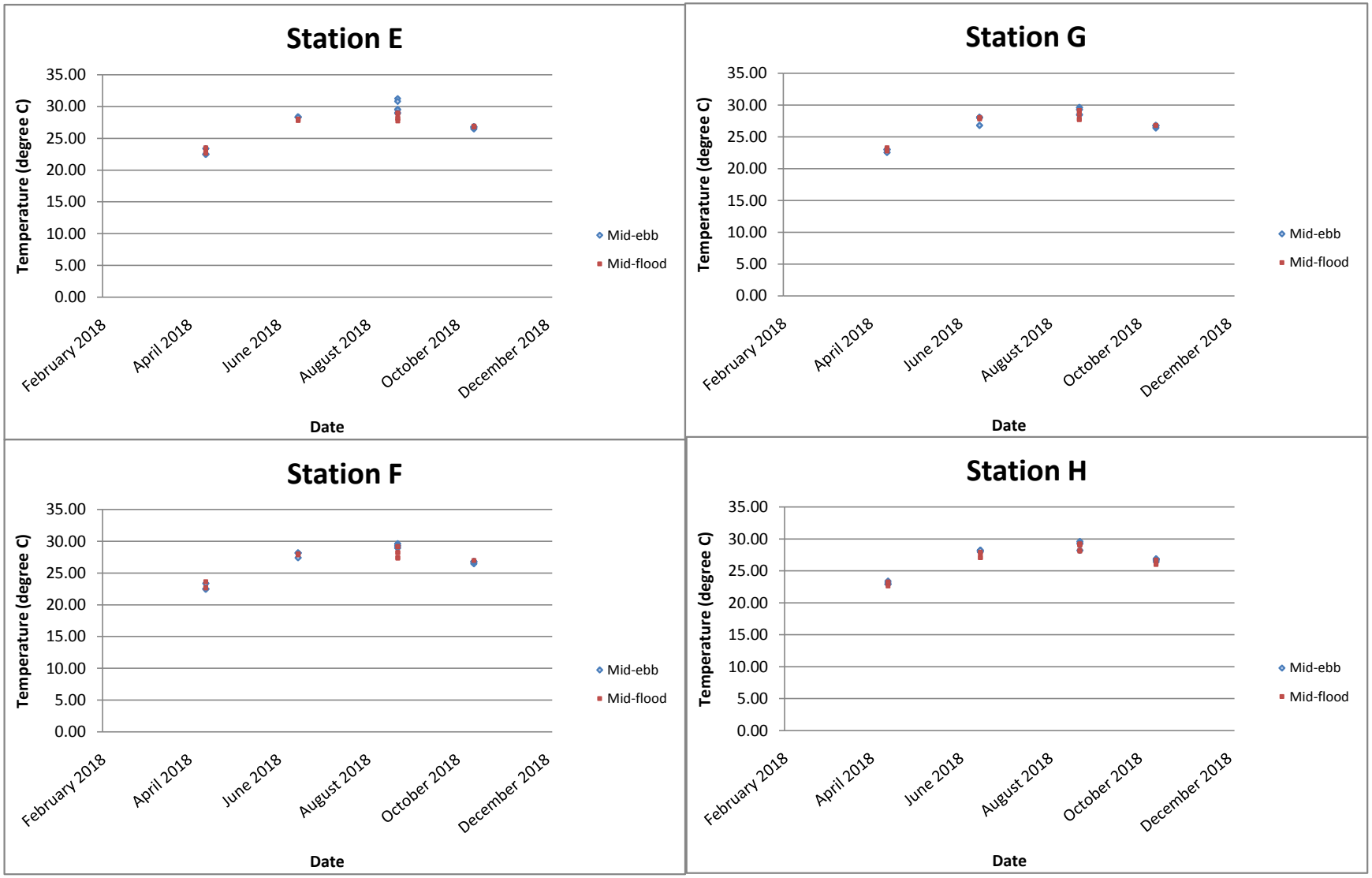
Temperature (degree C)

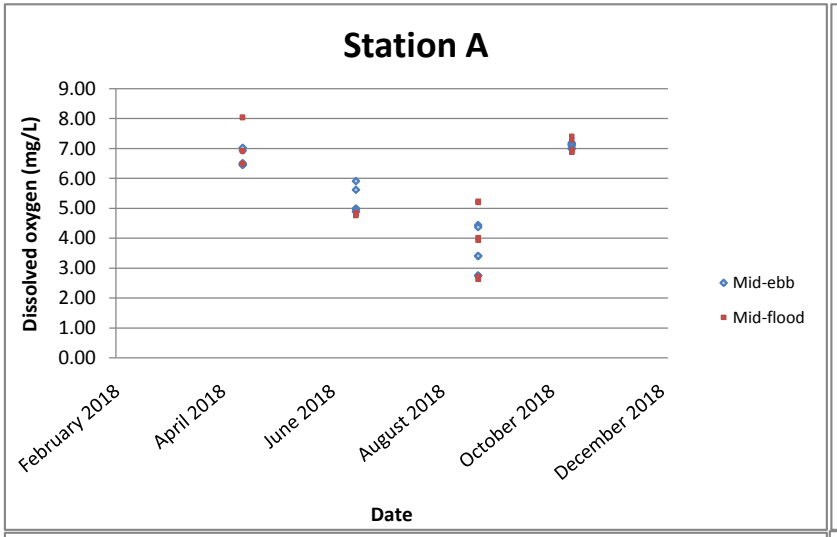


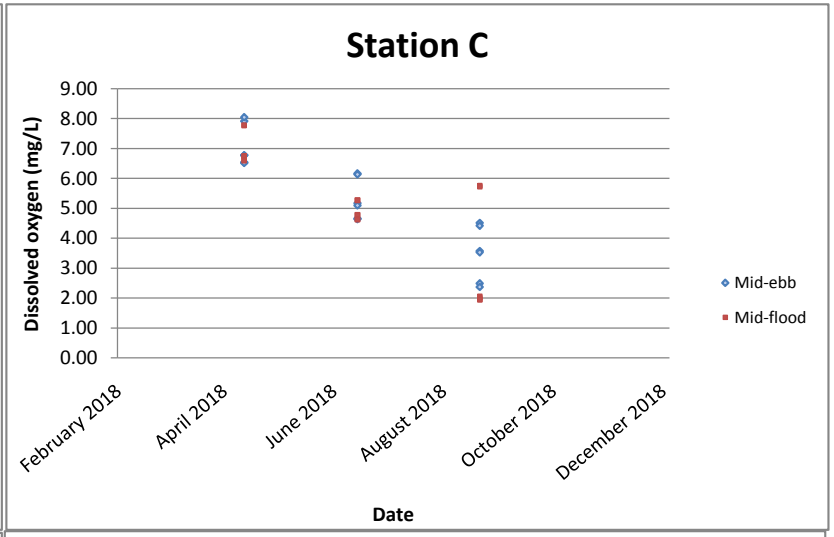


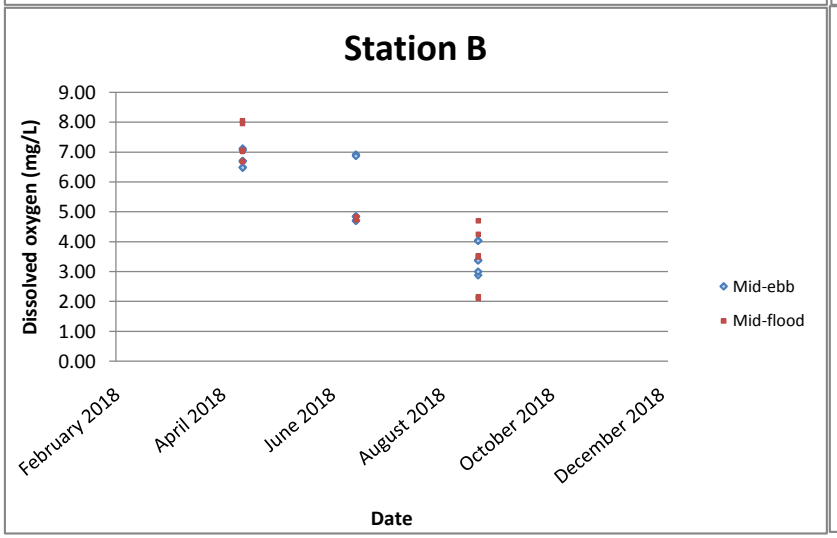


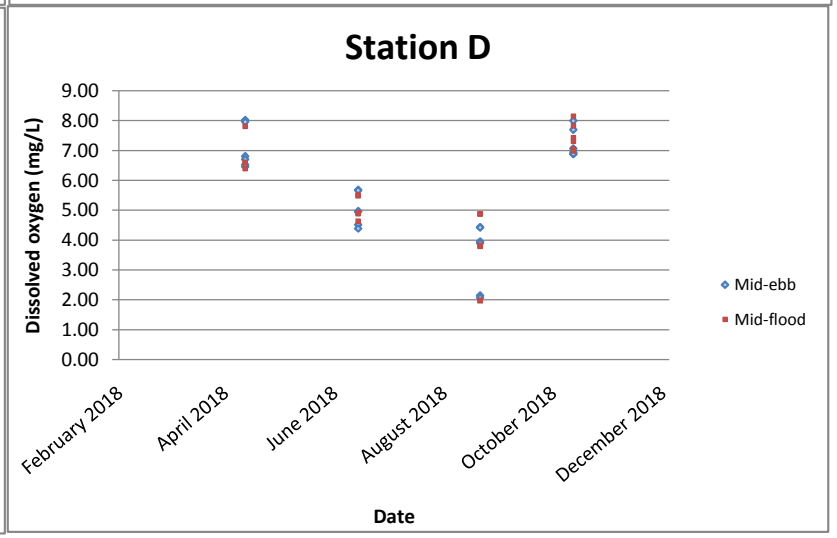


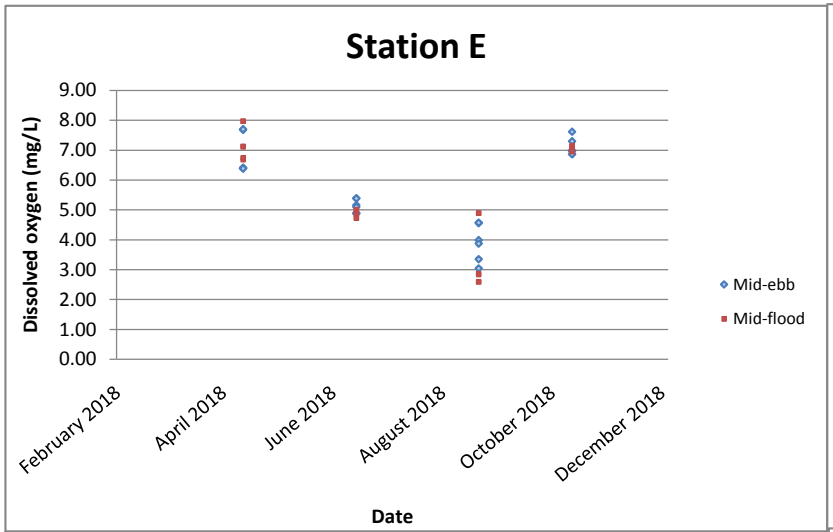

Station E
Temperature (degree C)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station G
Temperature (degree C)
Date
Mid-ebb
Mid-flood
Station F
Temperature (degree C)
Date
Mid-ebb
Mid-flood
Station H
Temperature (degree C)
Date
Mid-ebb
Mid-flood

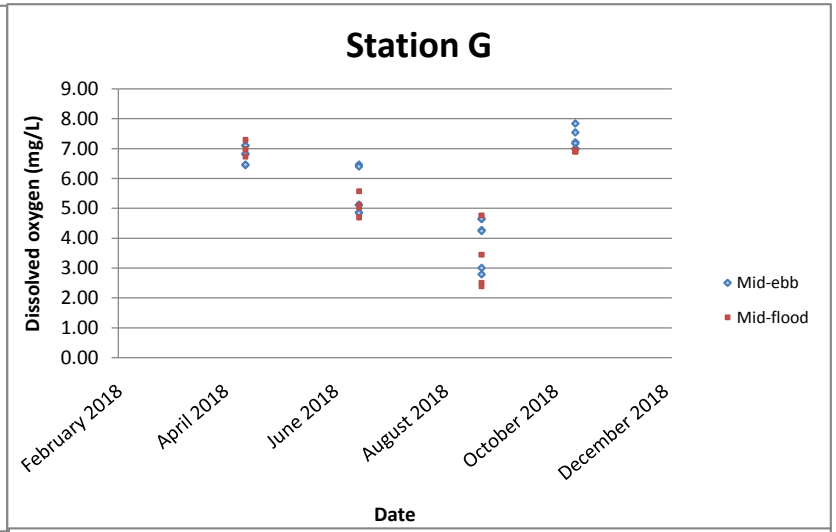

Station A
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

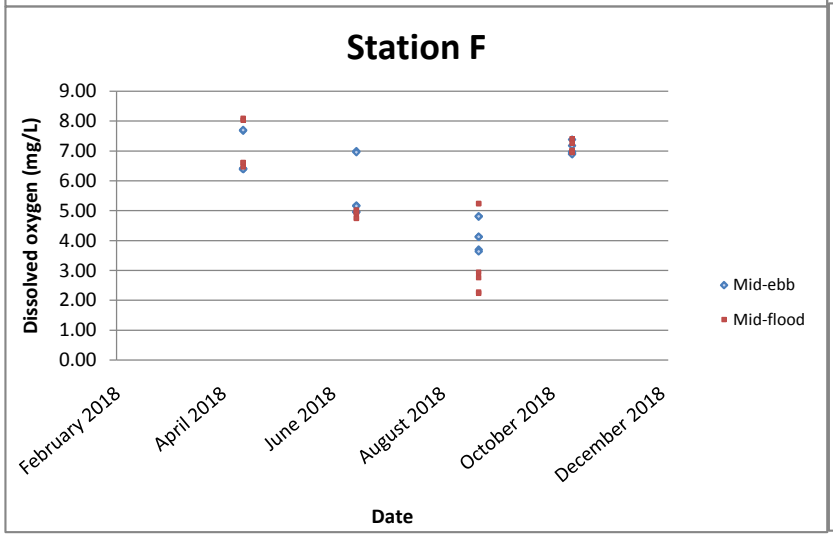

Station C
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

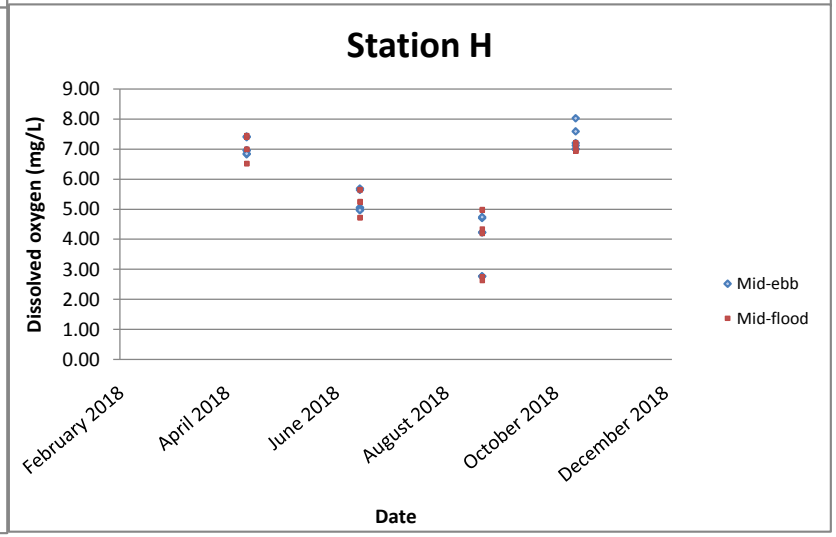

Station B
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station D
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

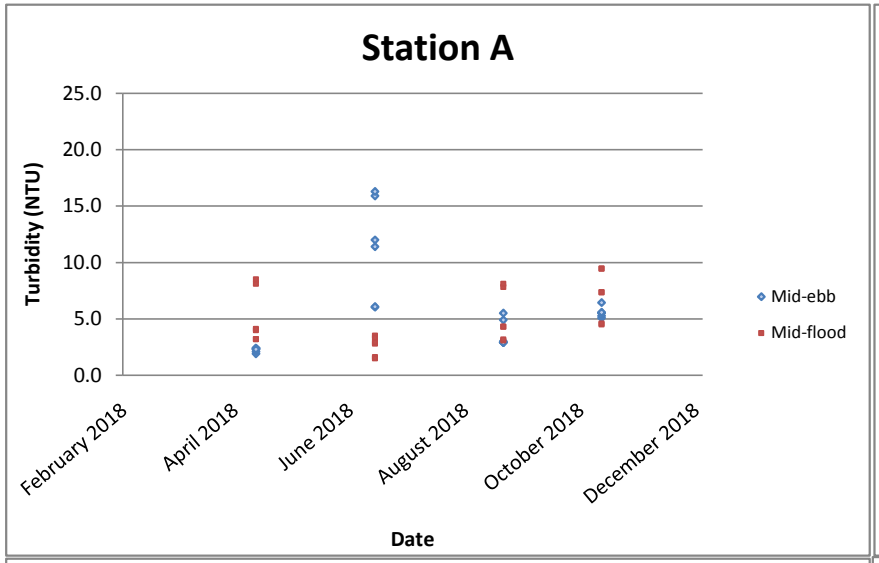

Station E
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

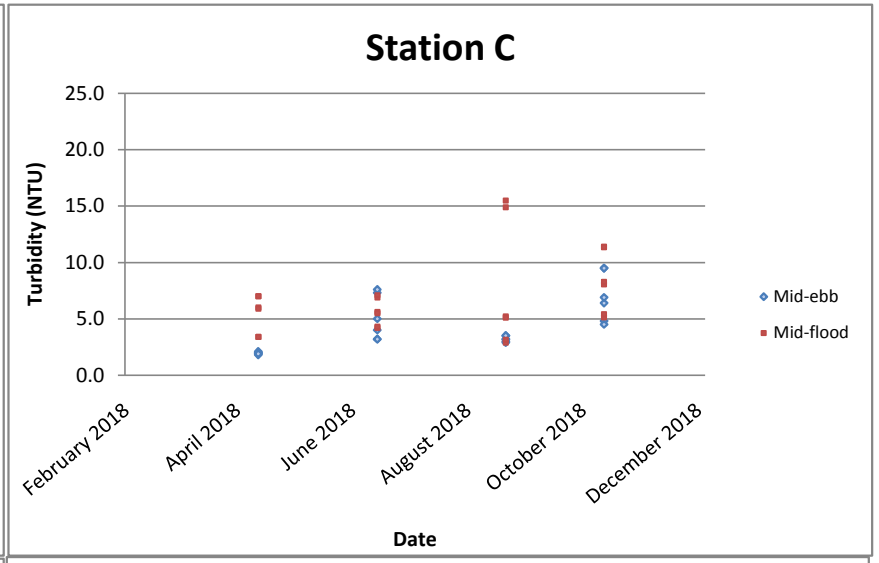

Station G
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

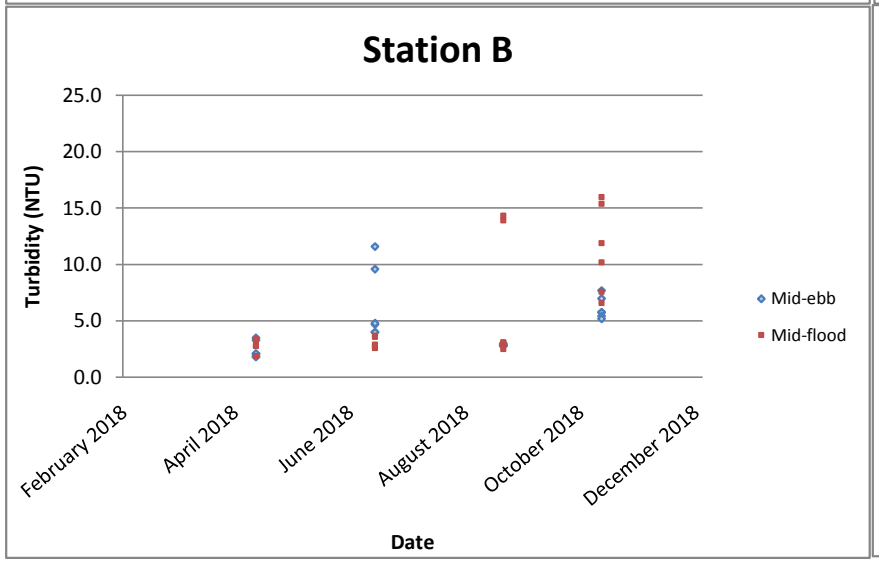

Station F
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

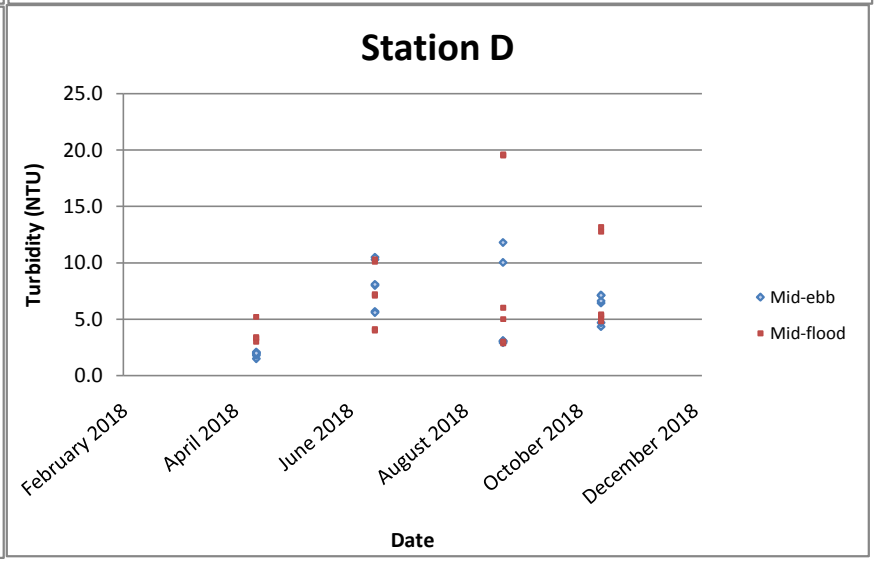

Station H
Dissolved oxygen (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

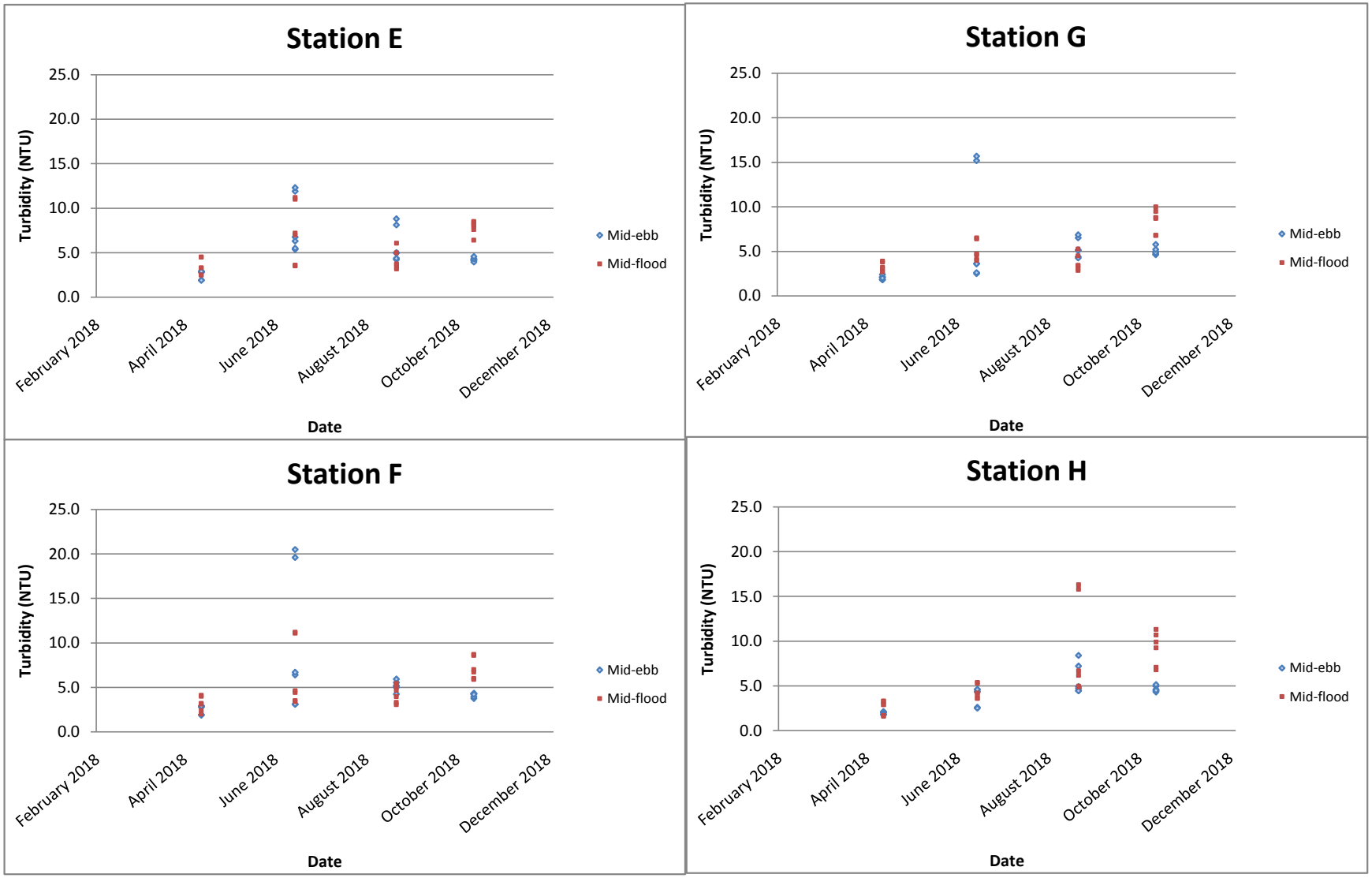
Turbidity (NTU)

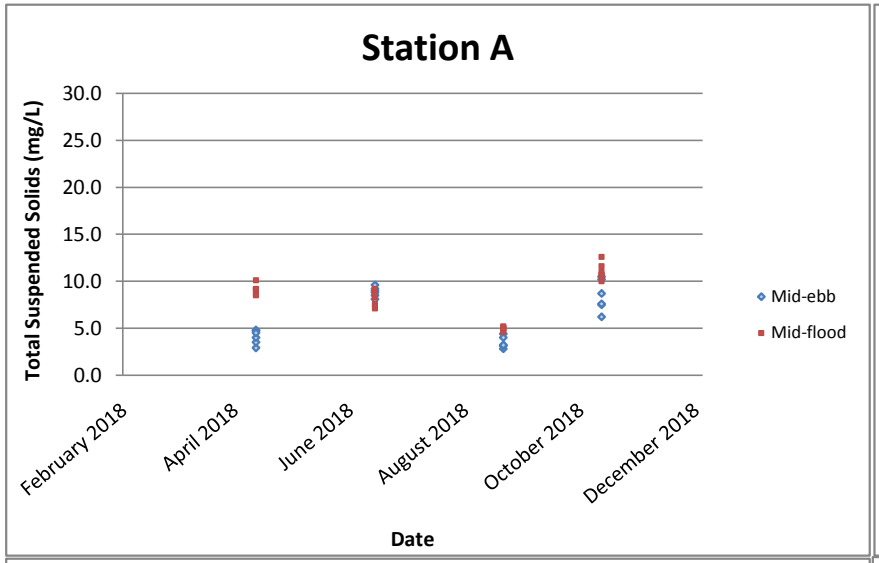


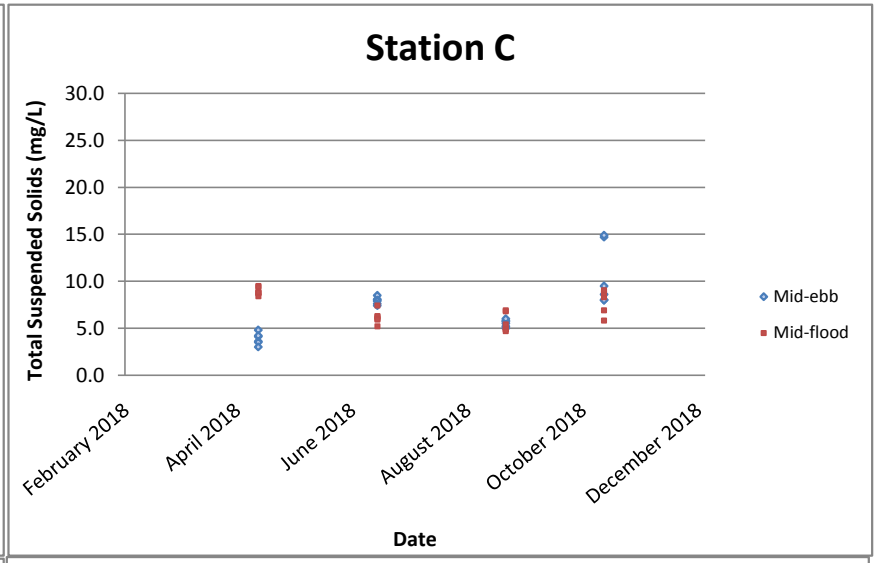


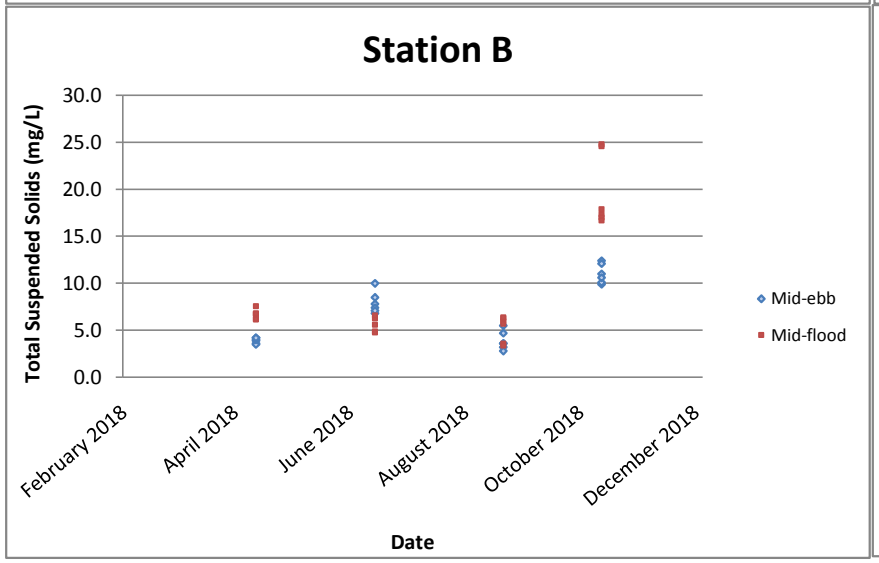


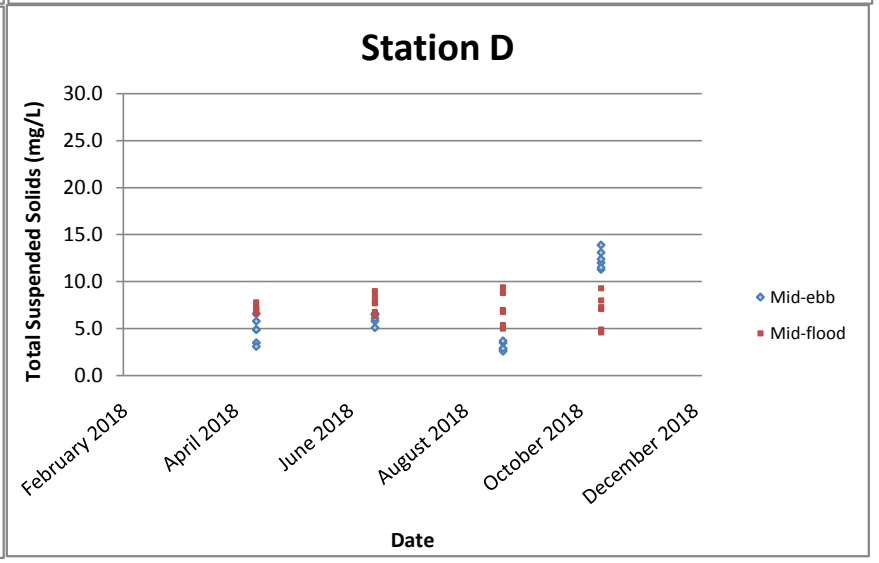


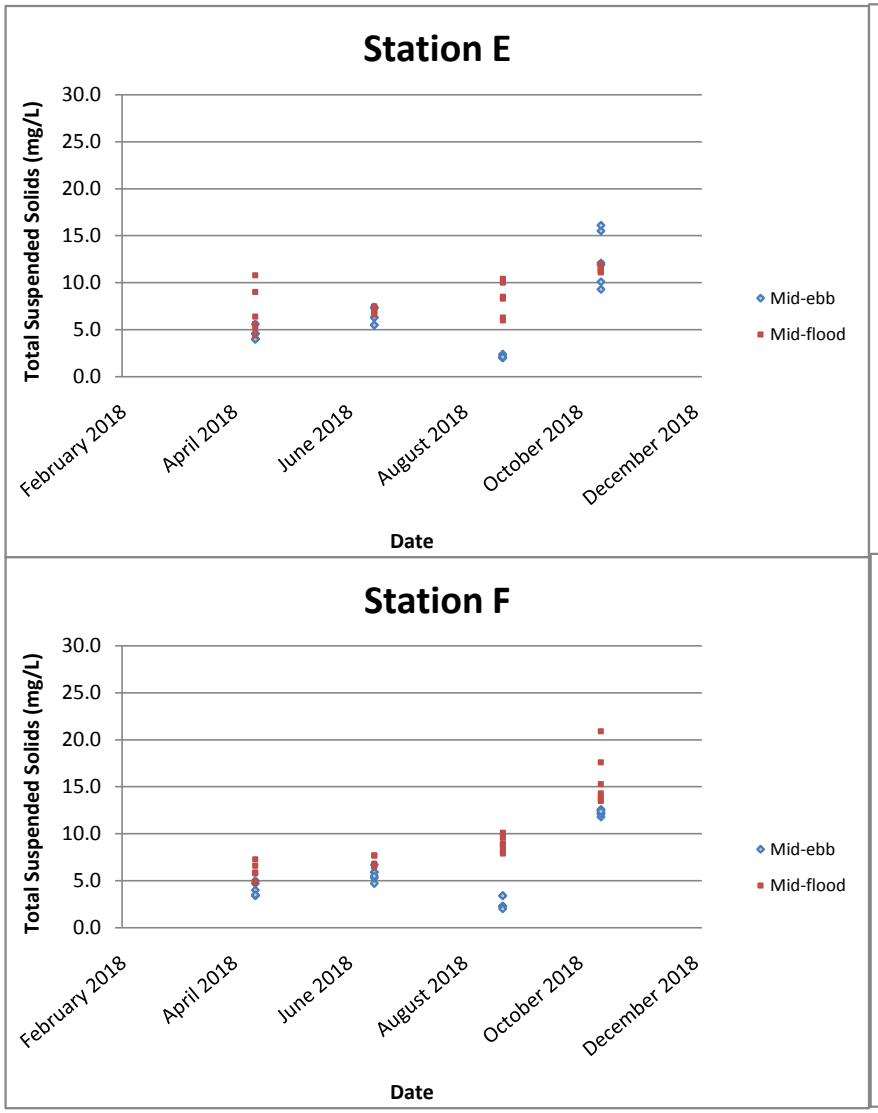

Station E
Turbidity (NTU)
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station G
Turbidity (NTU)
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station F
Turbidity (NTU)
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station H
Turbidity (NTU)
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

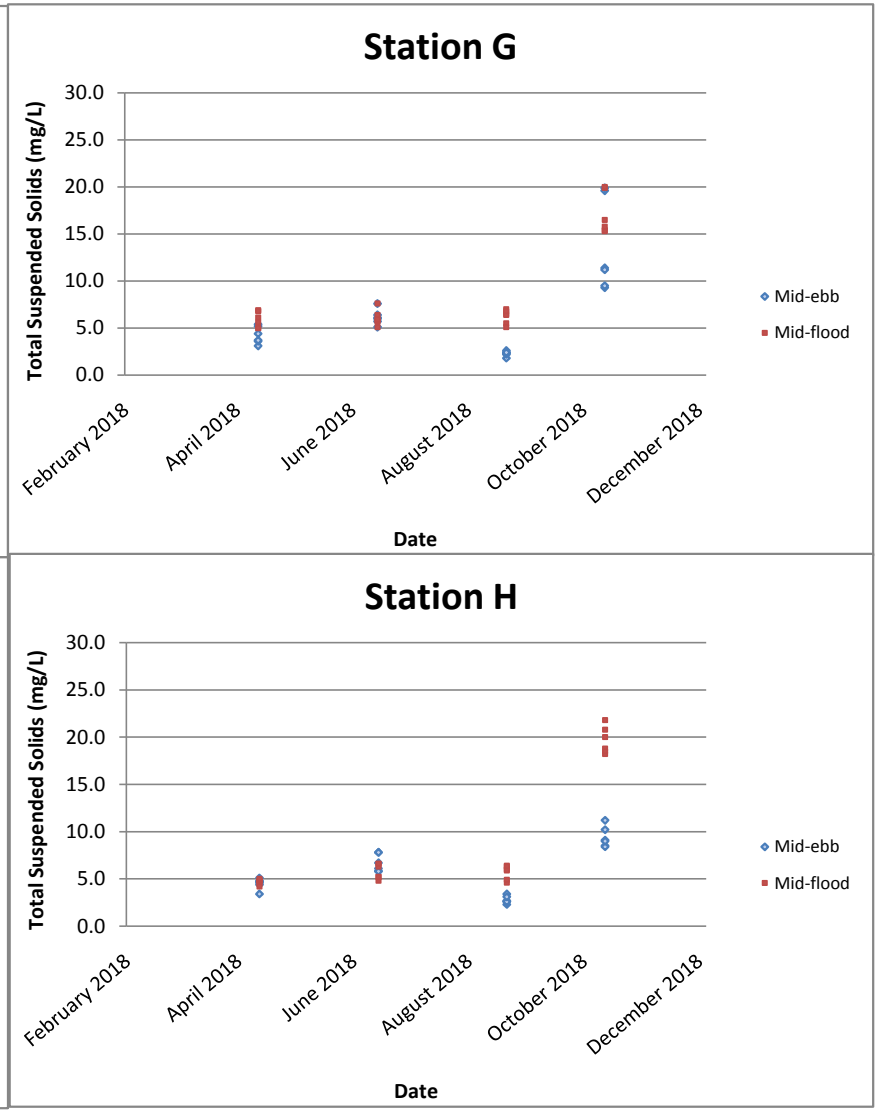

Station A
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station C
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station B
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

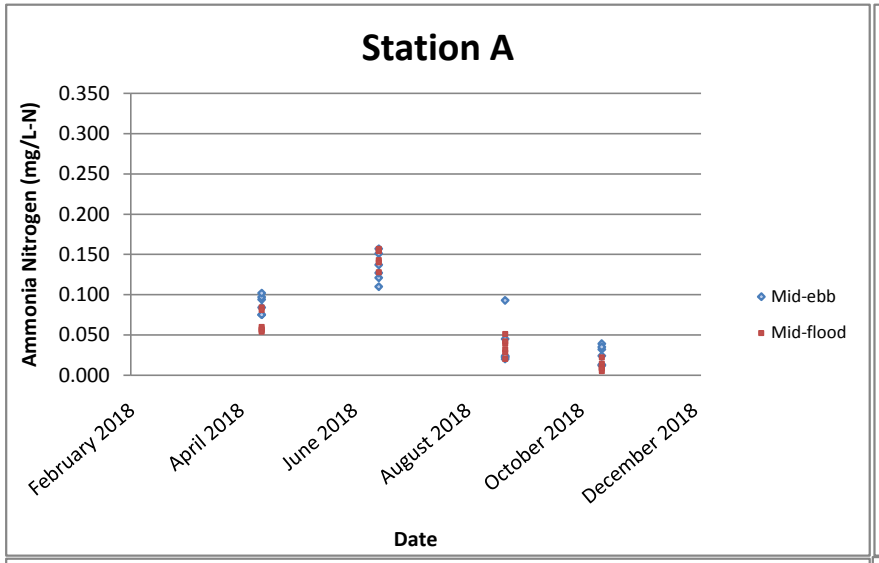

Station D
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

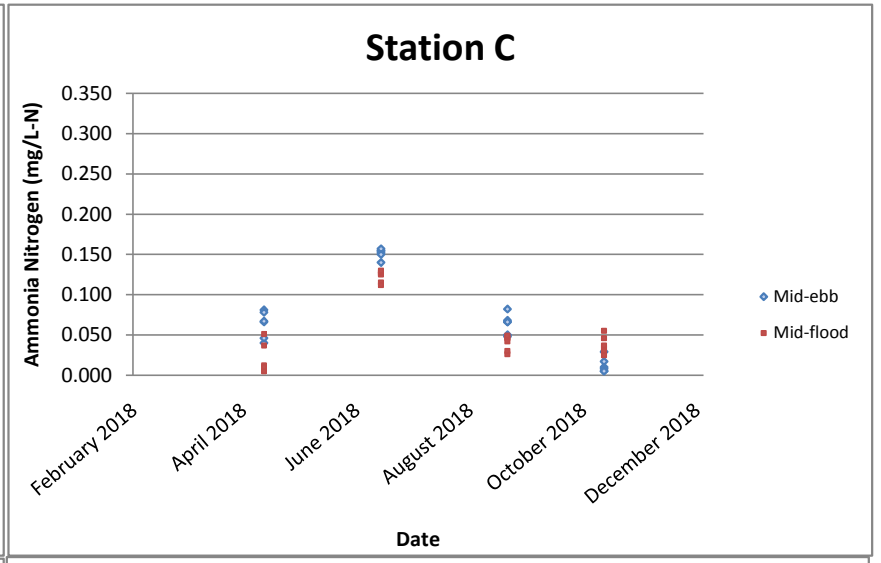

Station E
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

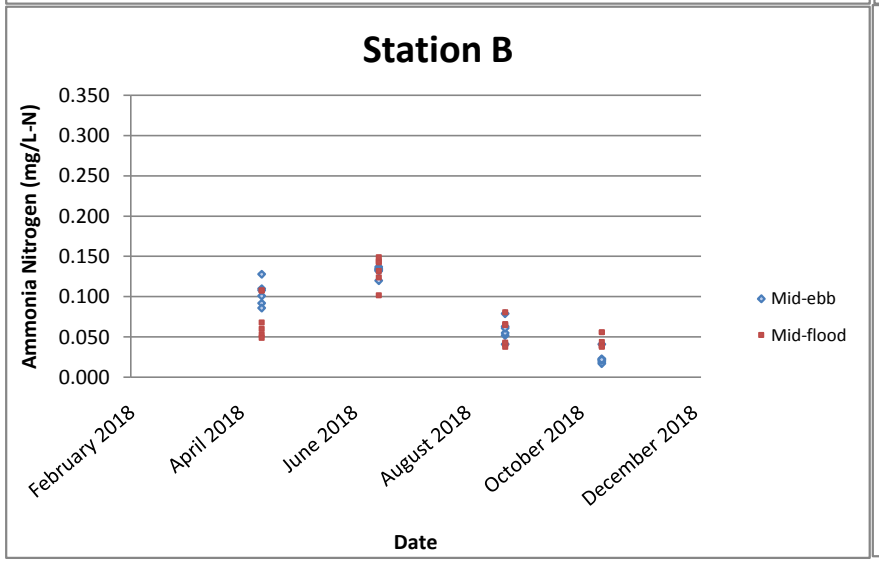

Station G
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

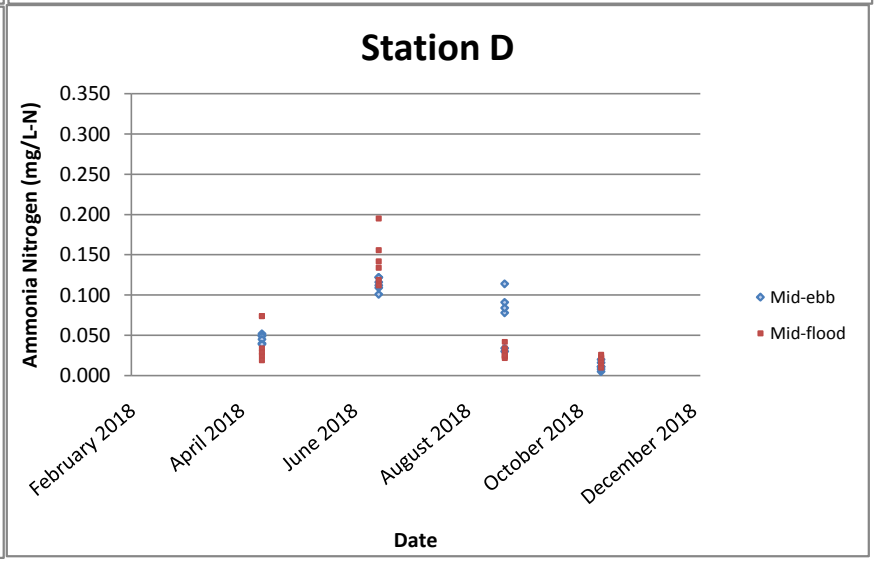
Station F
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

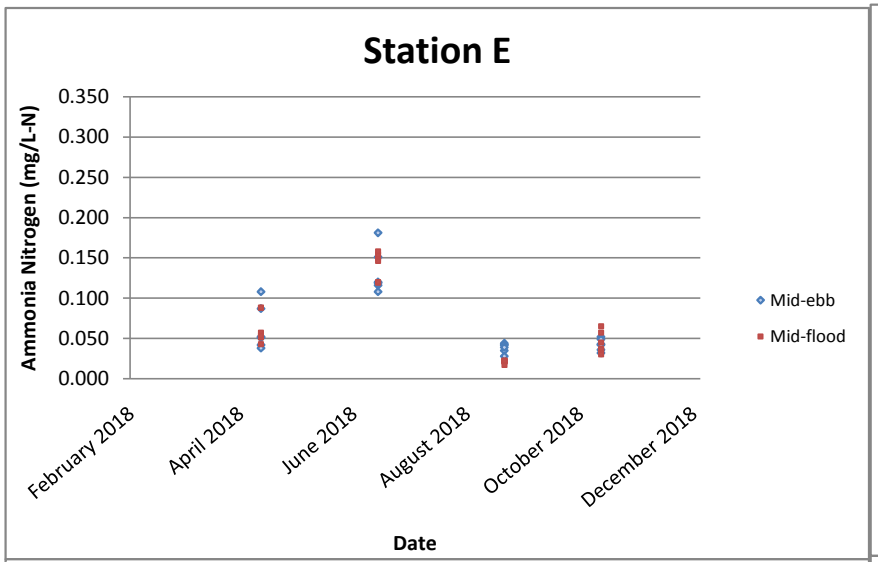
Station H
Total Suspended Solids (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

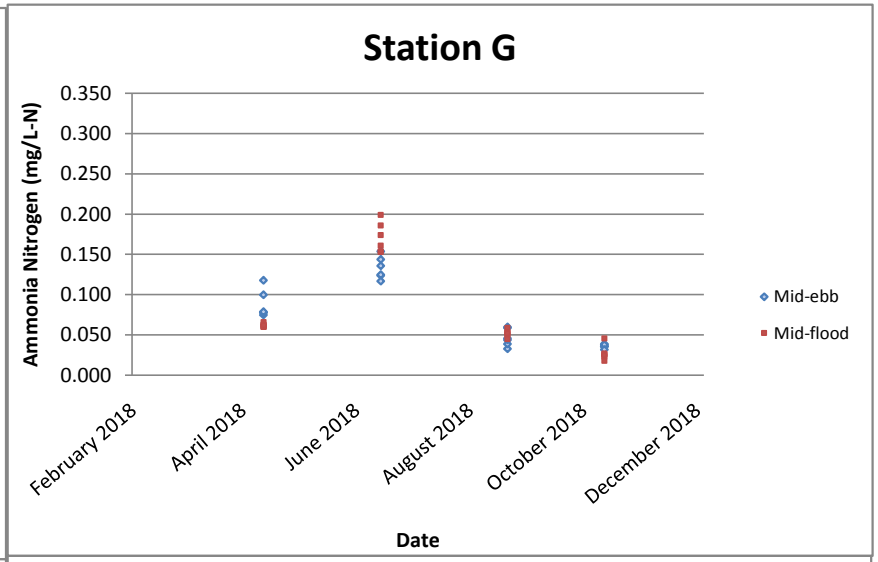

Station A
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

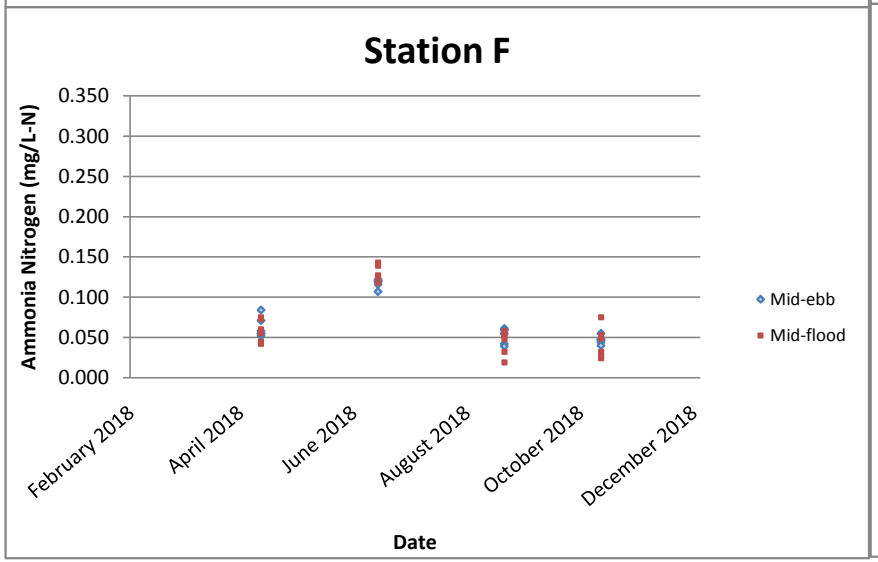

Station C
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

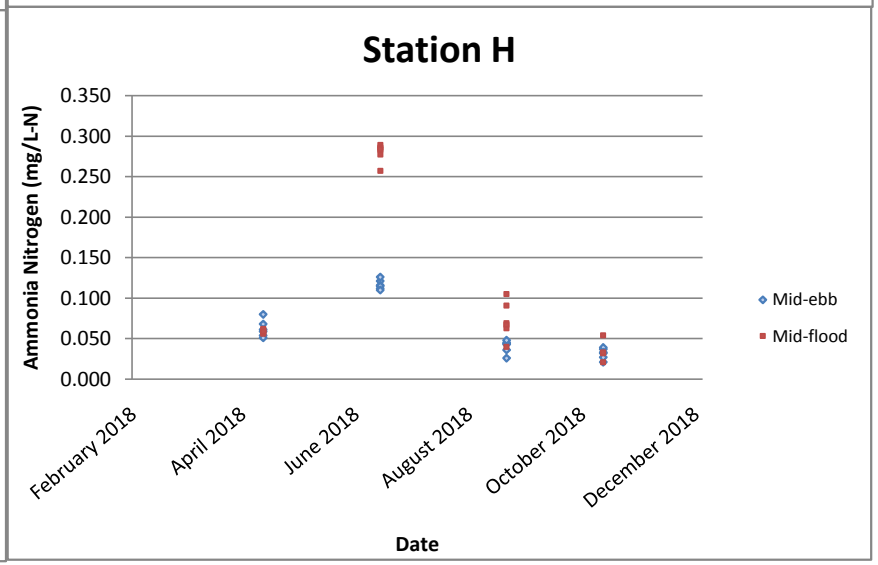

Station B
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

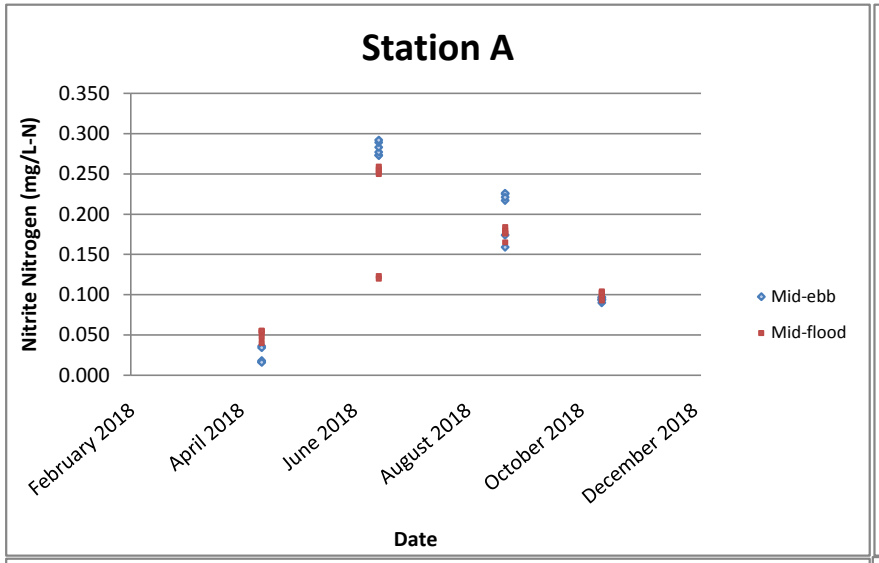

Station D
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

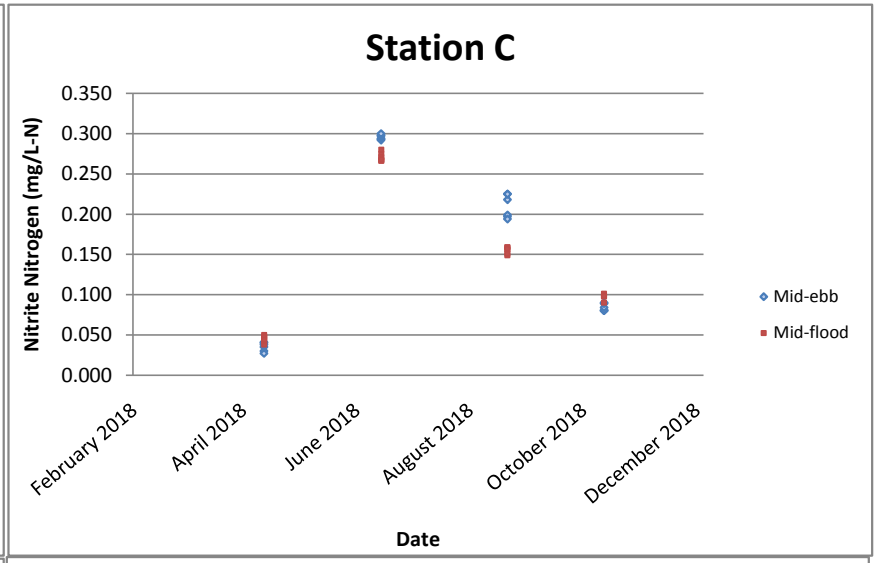

Station E
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

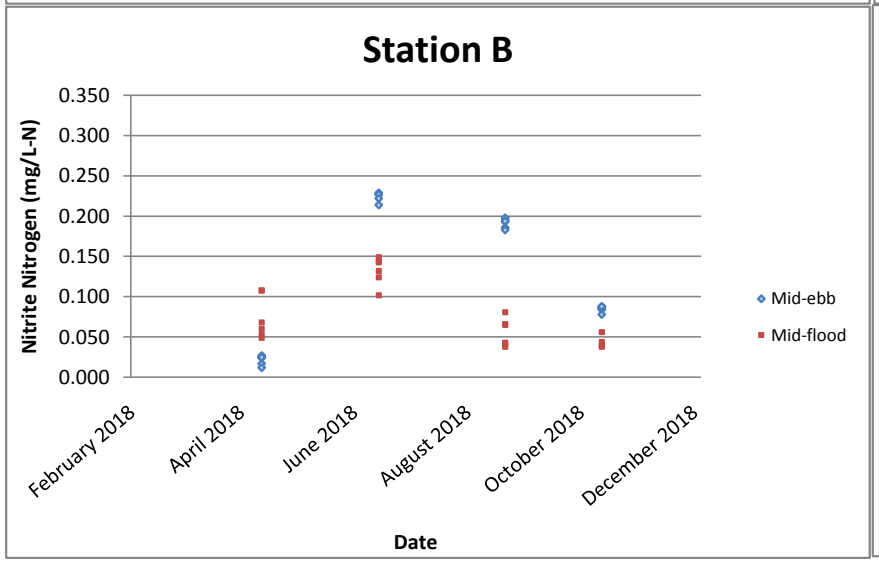

Station G
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

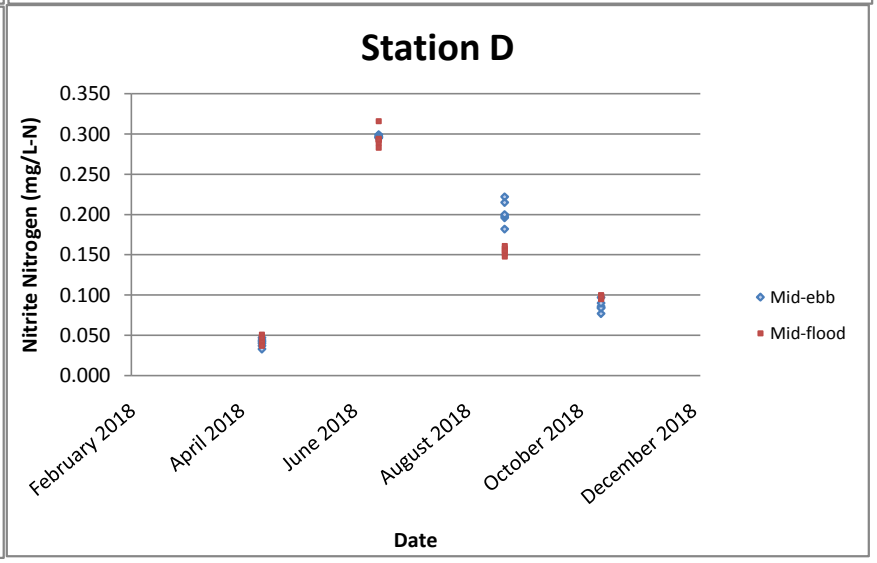

Station F
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

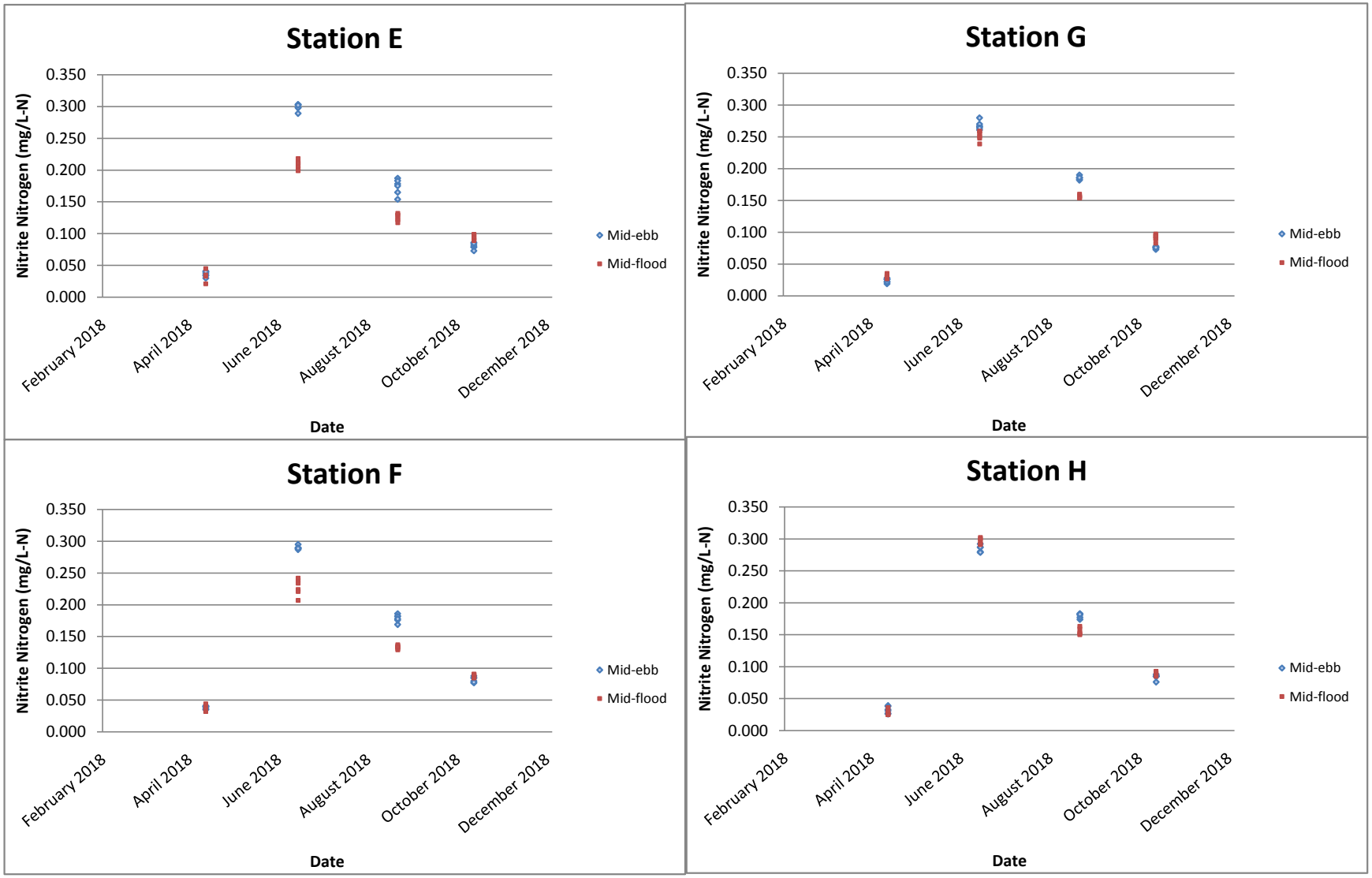

Station H
Ammonia Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

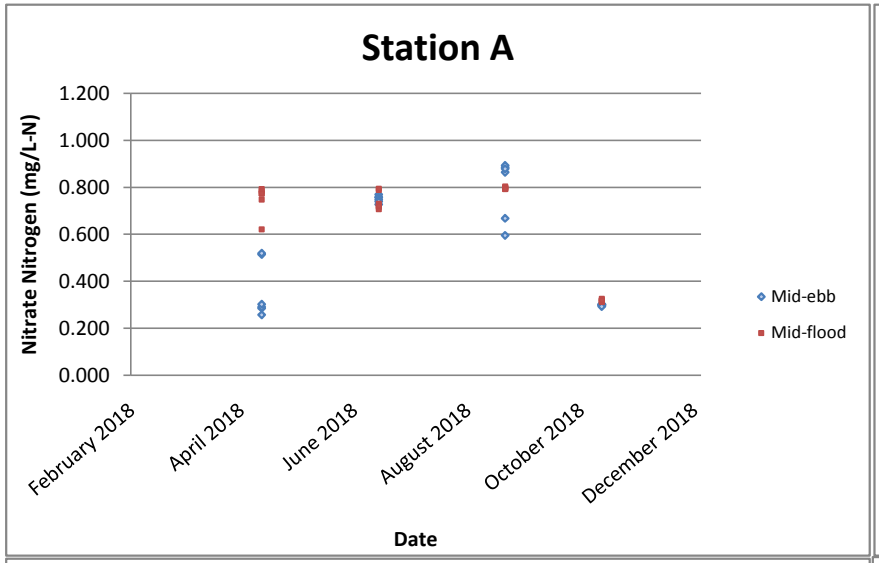

Station A
Nitrite Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

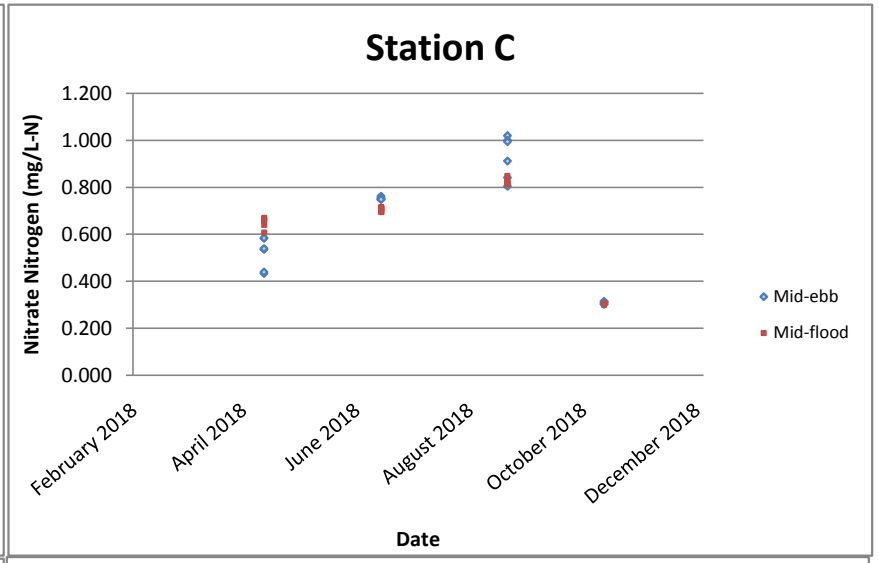

Station C
Nitrite Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

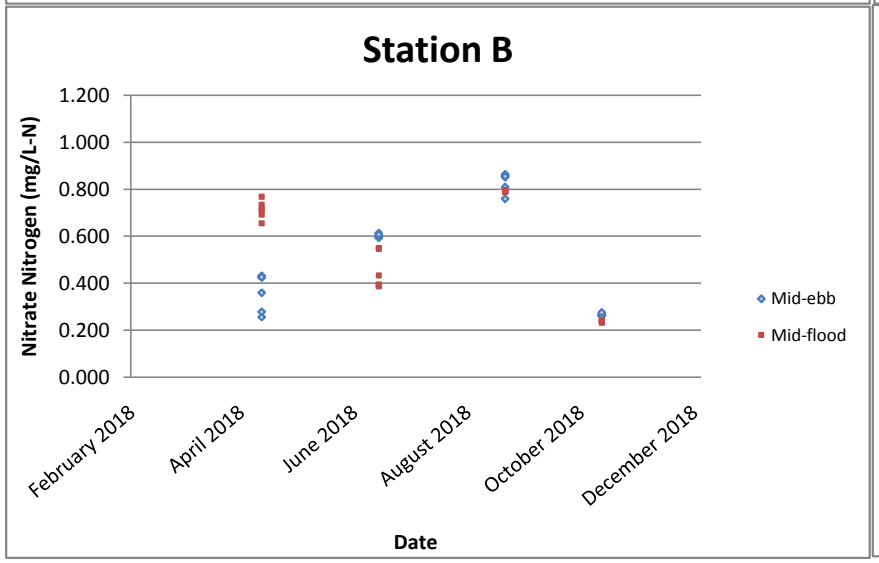

Station B
Nitrite Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

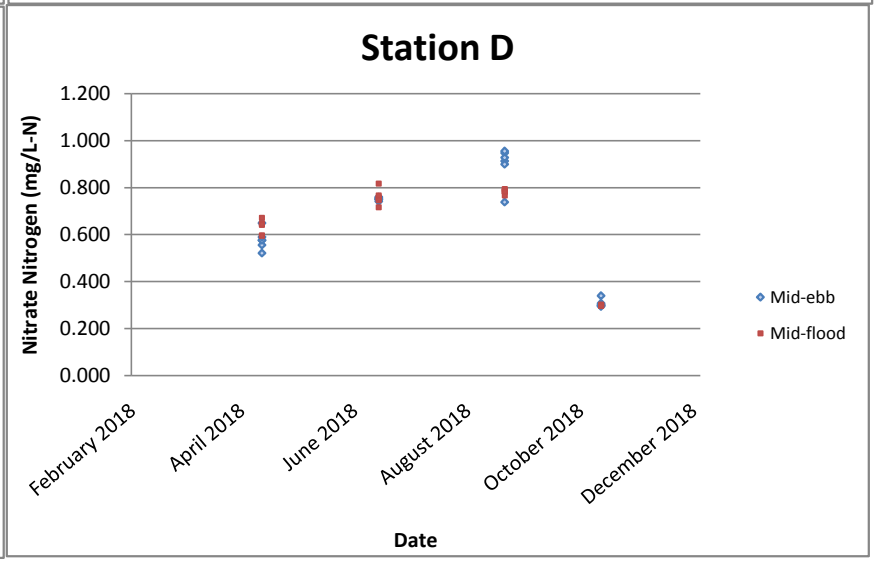

Station D
Nitrite Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

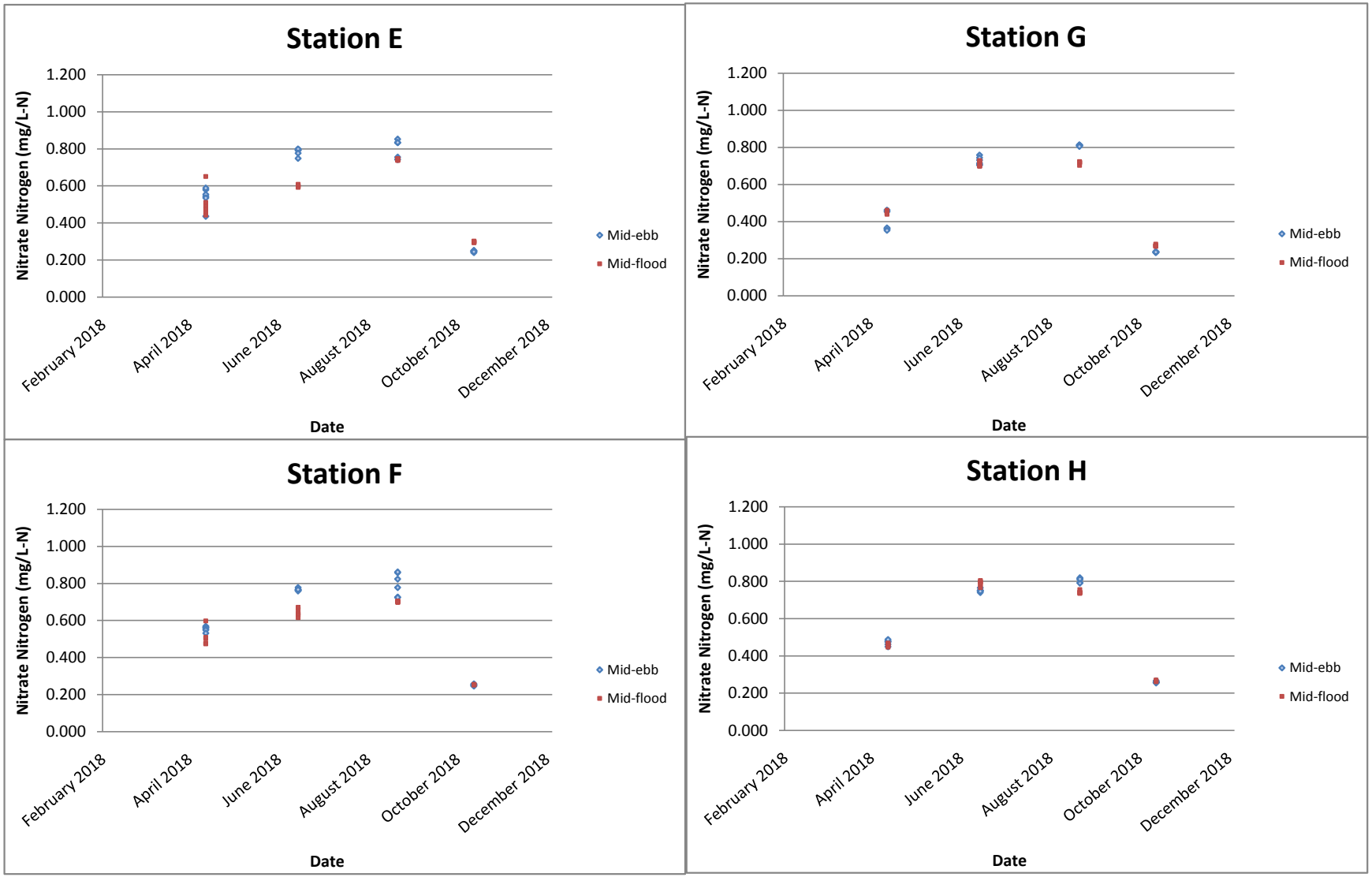

Station E
Nitrite Nitrogen (mg/L-N)
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station G
Nitrite Nitrogen (mg/L-N)
Date
Mid-ebb
Mid-flood
Station F
Nitrite Nitrogen (mg/L-N)
Date
Mid-ebb
Mid-flood
Station H
Nitrite Nitrogen (mg/L-N)
Date
Mid-ebb
Mid-flood

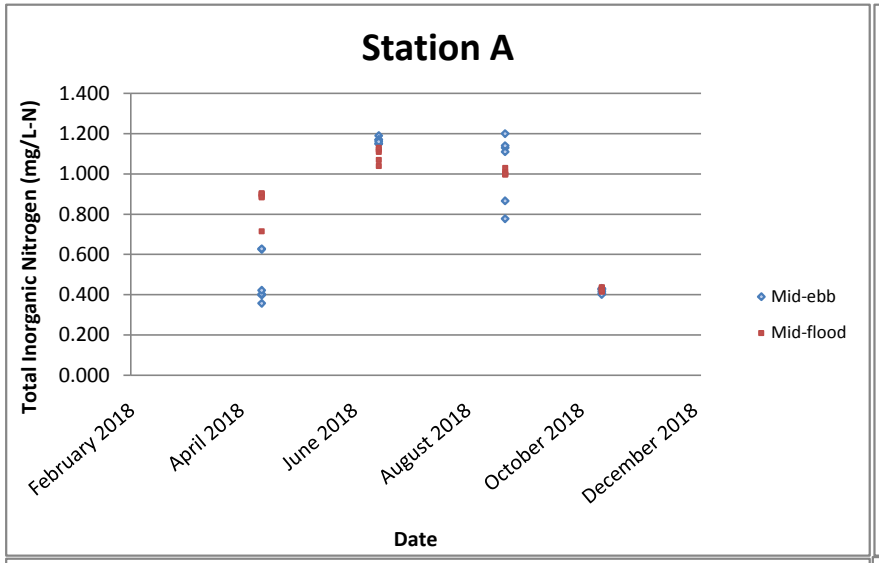

Station A
Nitrate Nitrogen (mg/L-N)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

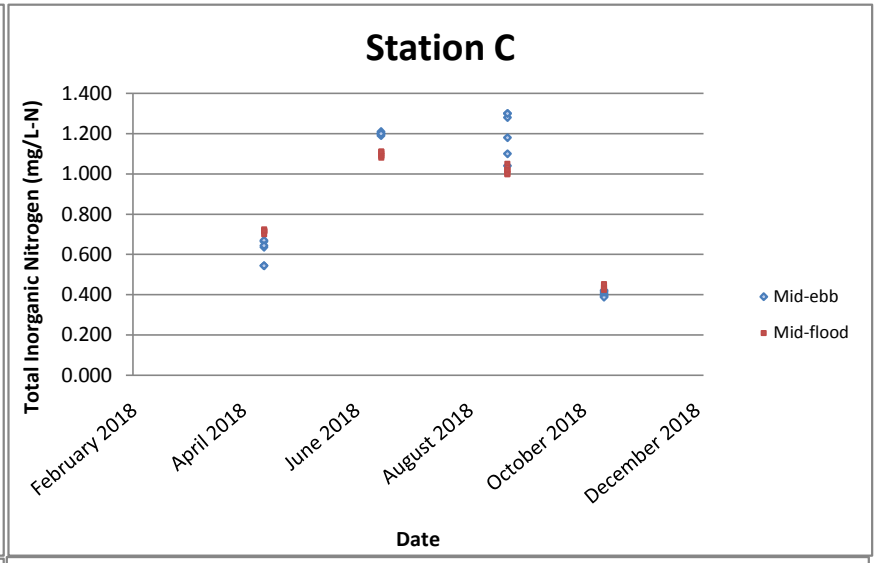

Station C
Nitrate Nitrogen (mg/L-N)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

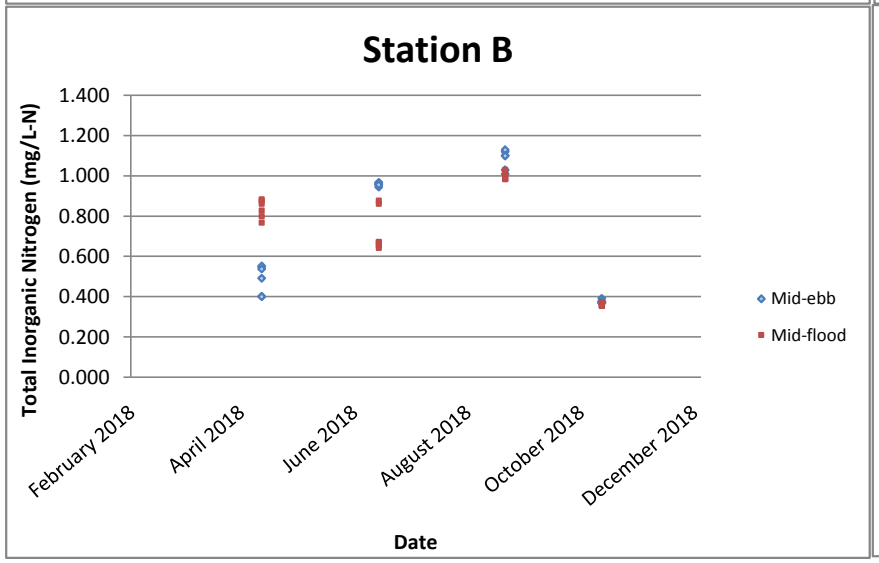

Station B
Nitrate Nitrogen (mg/L-N)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

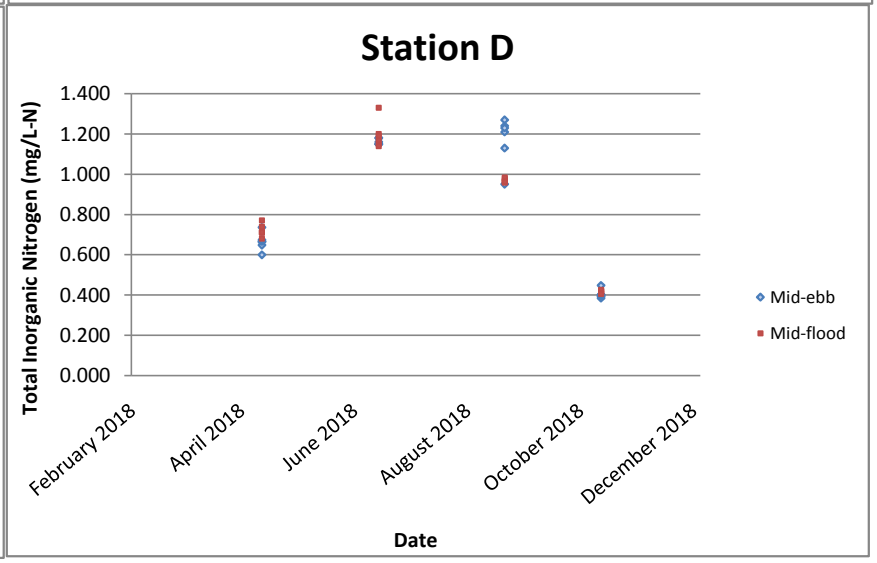

Station D
Nitrate Nitrogen (mg/L-N)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

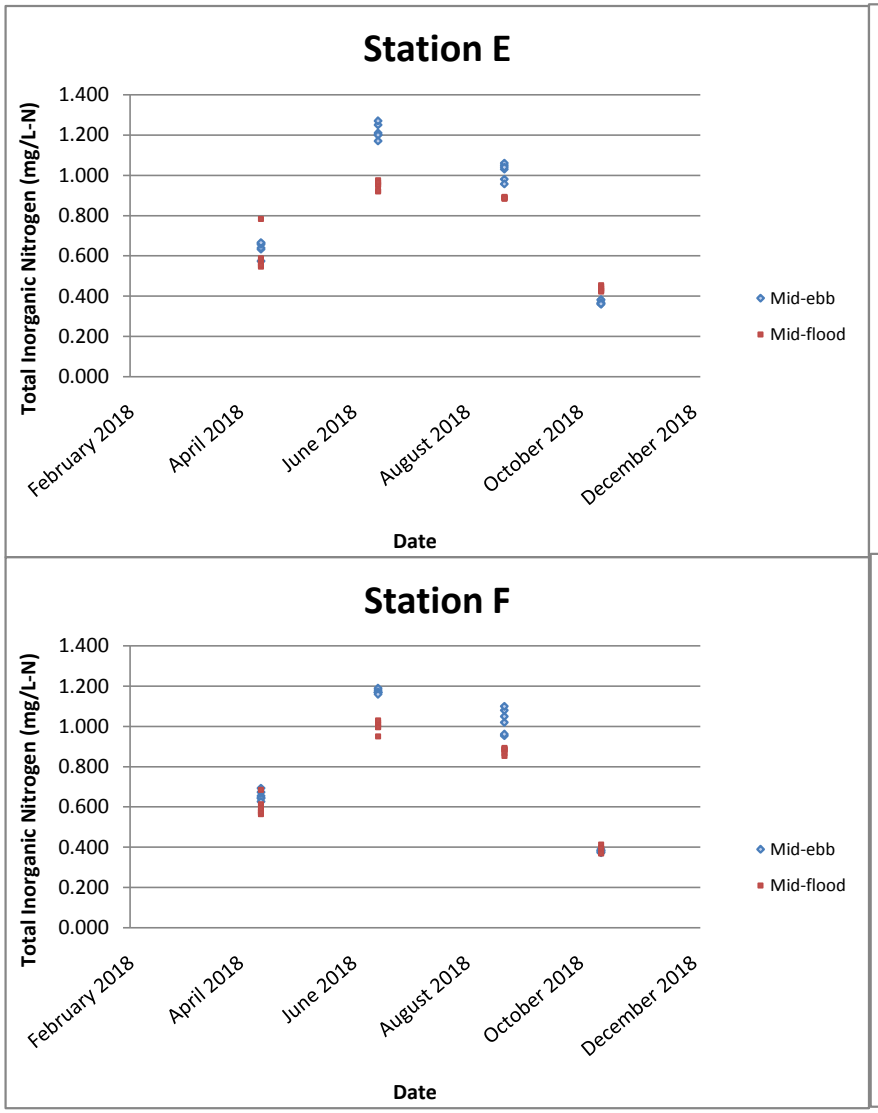

Station E
Nitrate Nitrogen (mg/L-N)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station G
Nitrate Nitrogen (mg/L-N)
Date
Mid-ebb
Mid-flood
Station F
Nitrate Nitrogen (mg/L-N)
Date
Mid-ebb
Mid-flood
Station H
Nitrate Nitrogen (mg/L-N)
Date
Mid-ebb
Mid-flood

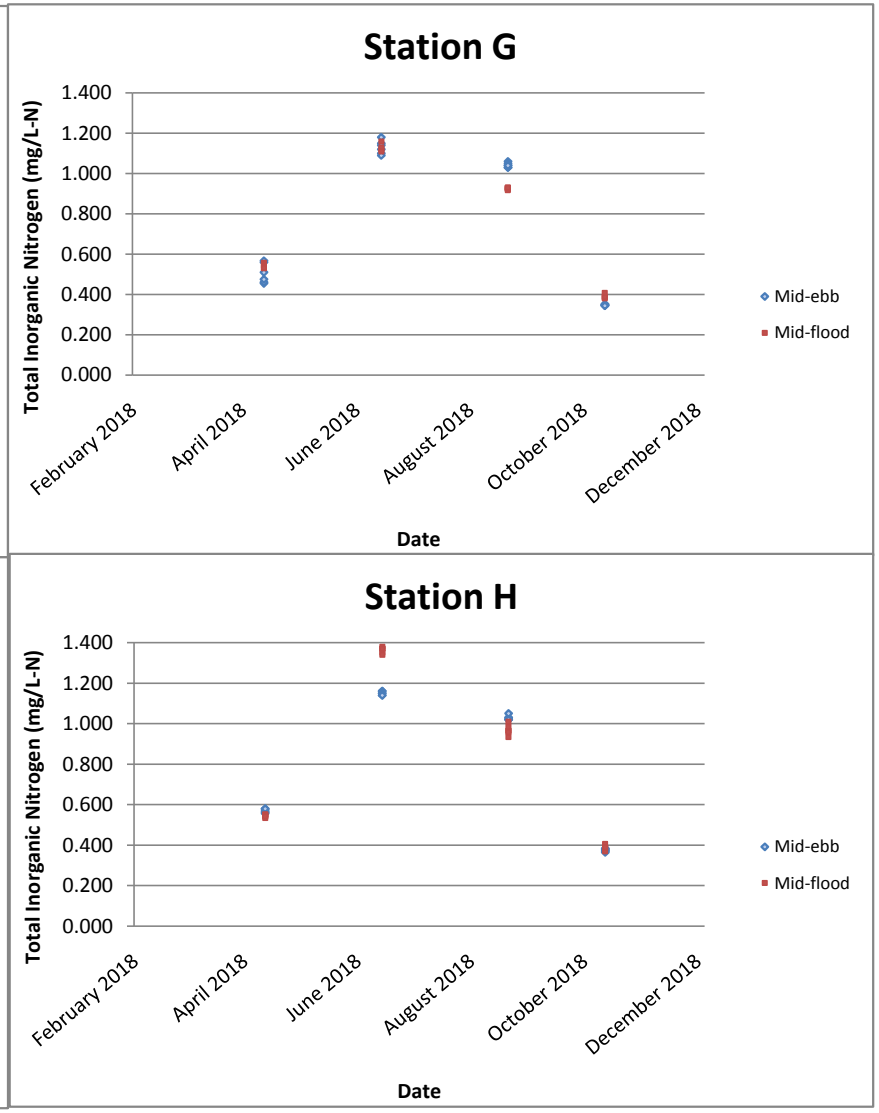

Station A
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station C
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station B
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station D
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

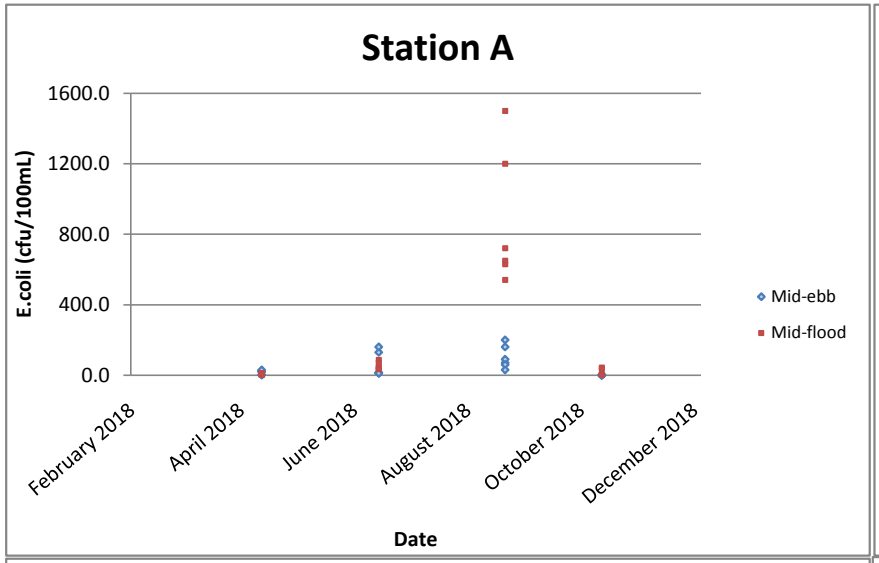

Station E
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

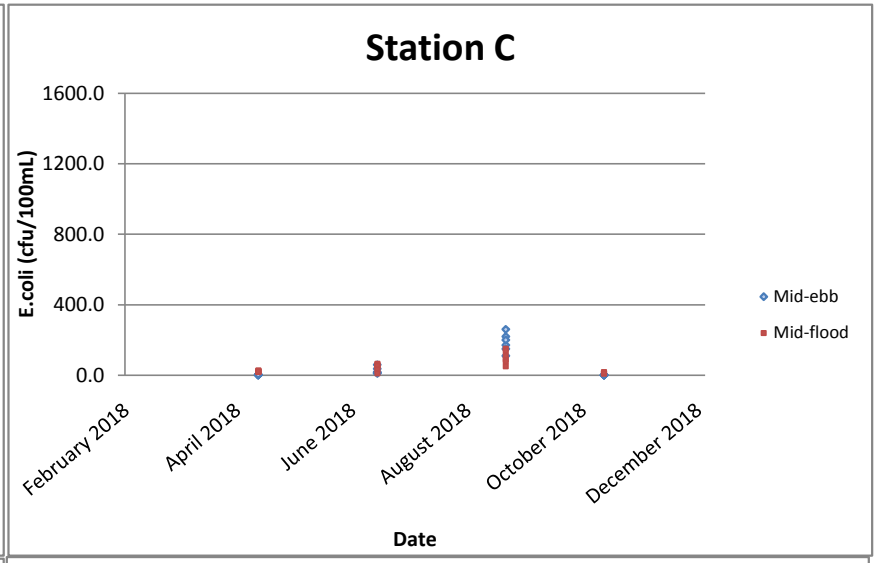

Station G
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

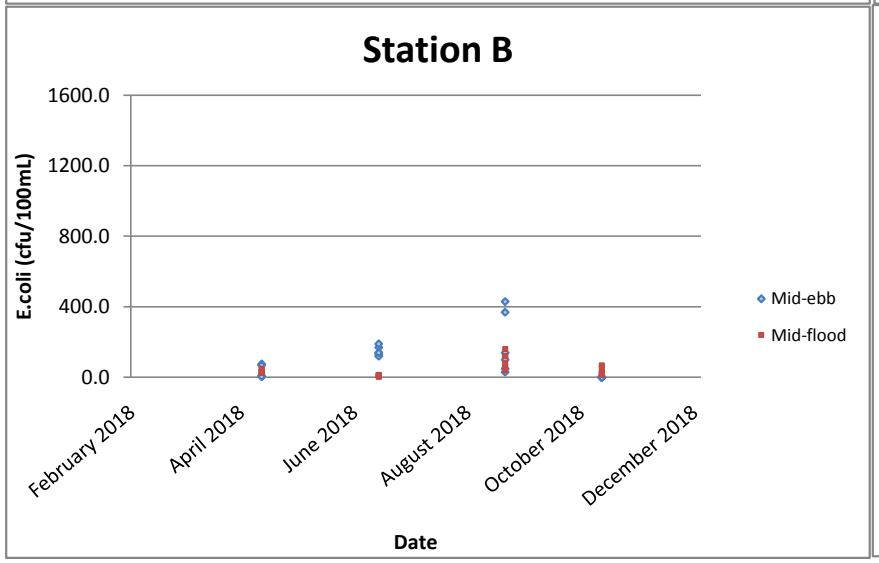
Station F
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

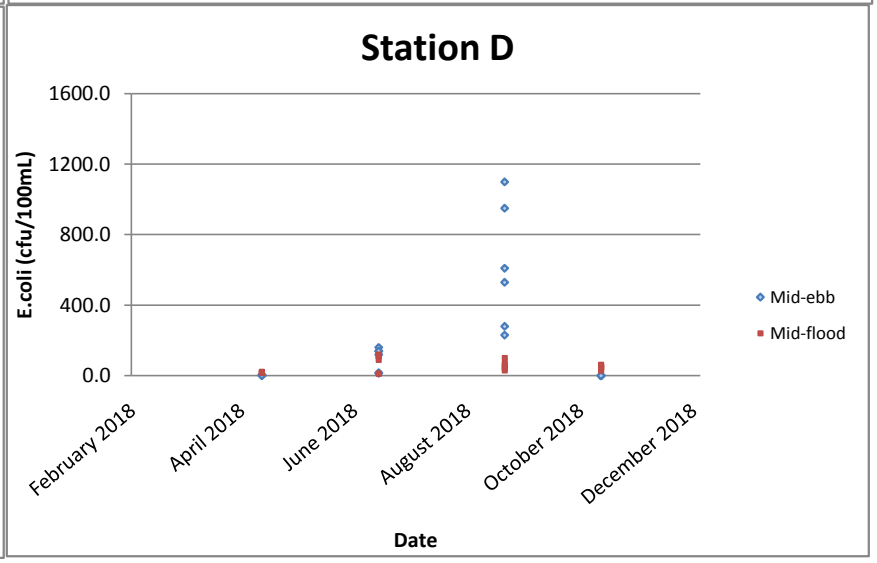
Station H
Total Inorganic Nitrogen (mg/L-N)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

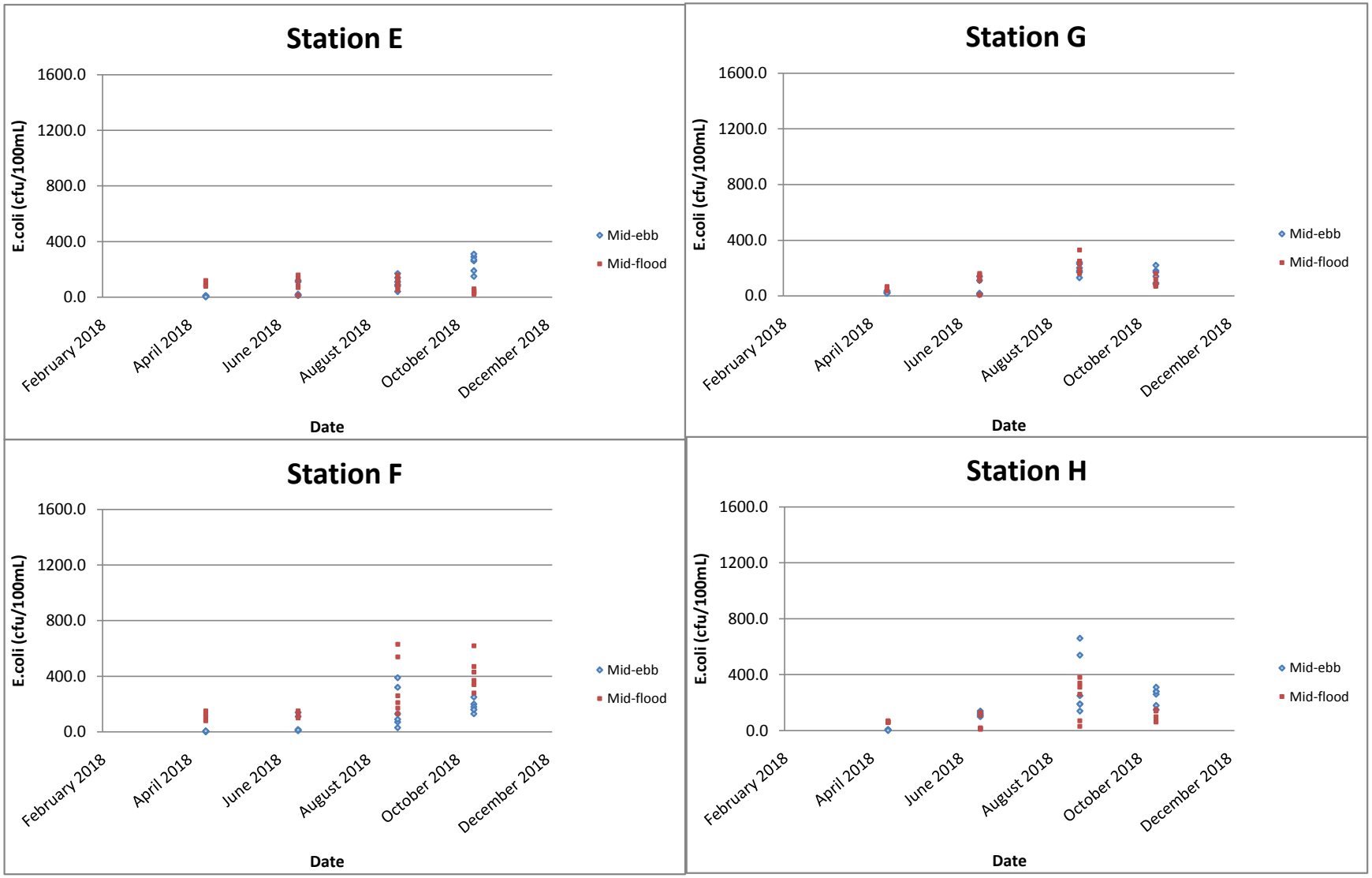
E.coli (cfu/100mL)



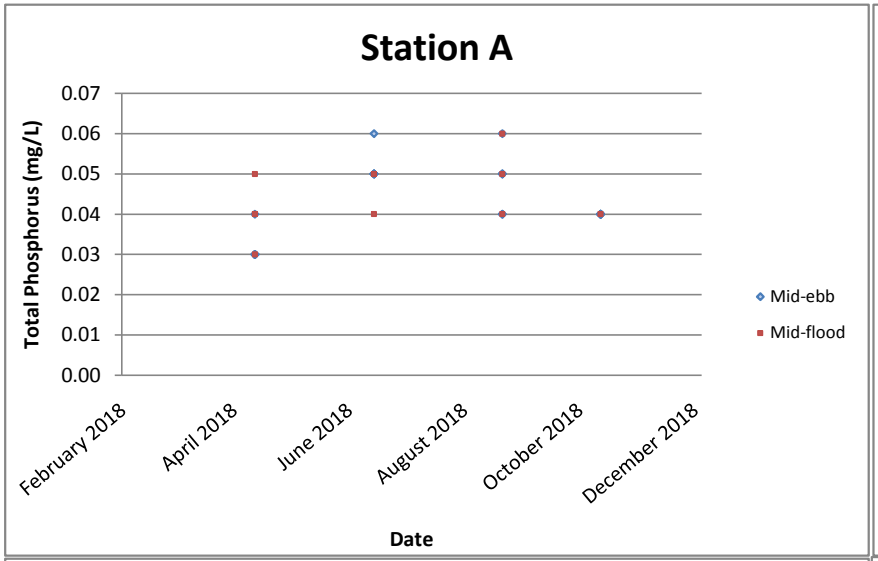


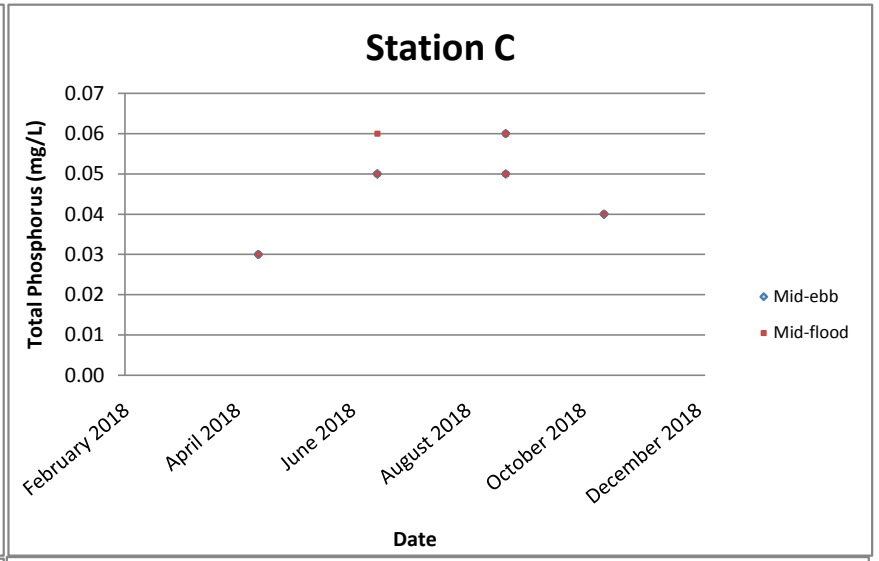


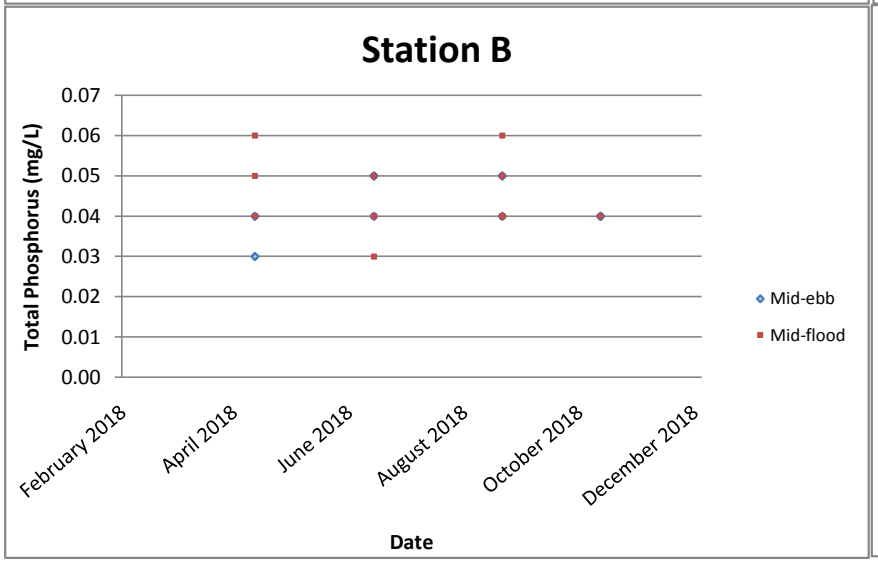


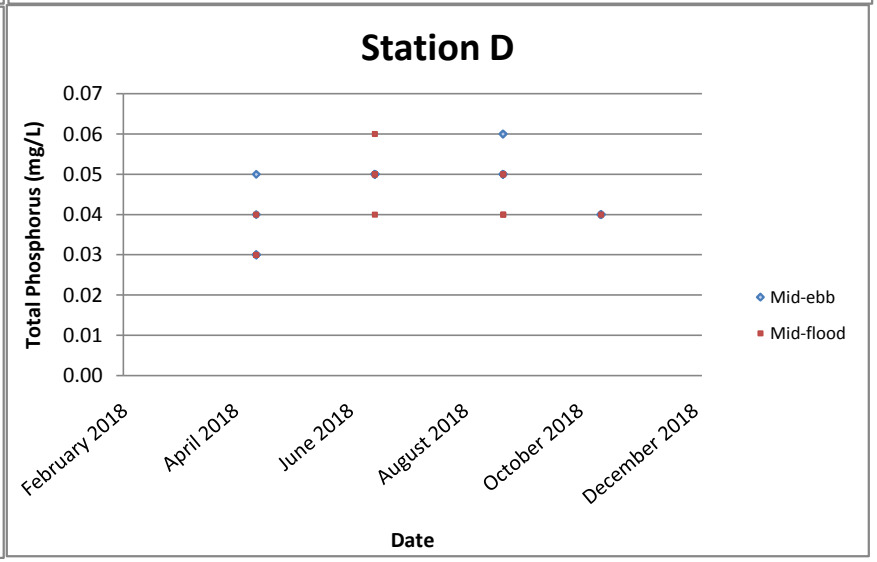

Station E
1600.0
1200.0
800.0
400.0
0.0
E.coli (cfu/100mL)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station G
1600.0
1200.0
800.0
400.0
0.0
E.coli (cfu/100mL)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station F
1600.0
1200.0
800.0
400.0
0.0
E.coli (cfu/100mL)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood
Station H
1600.0
1200.0
800.0
400.0
0.0
E.coli (cfu/100mL)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

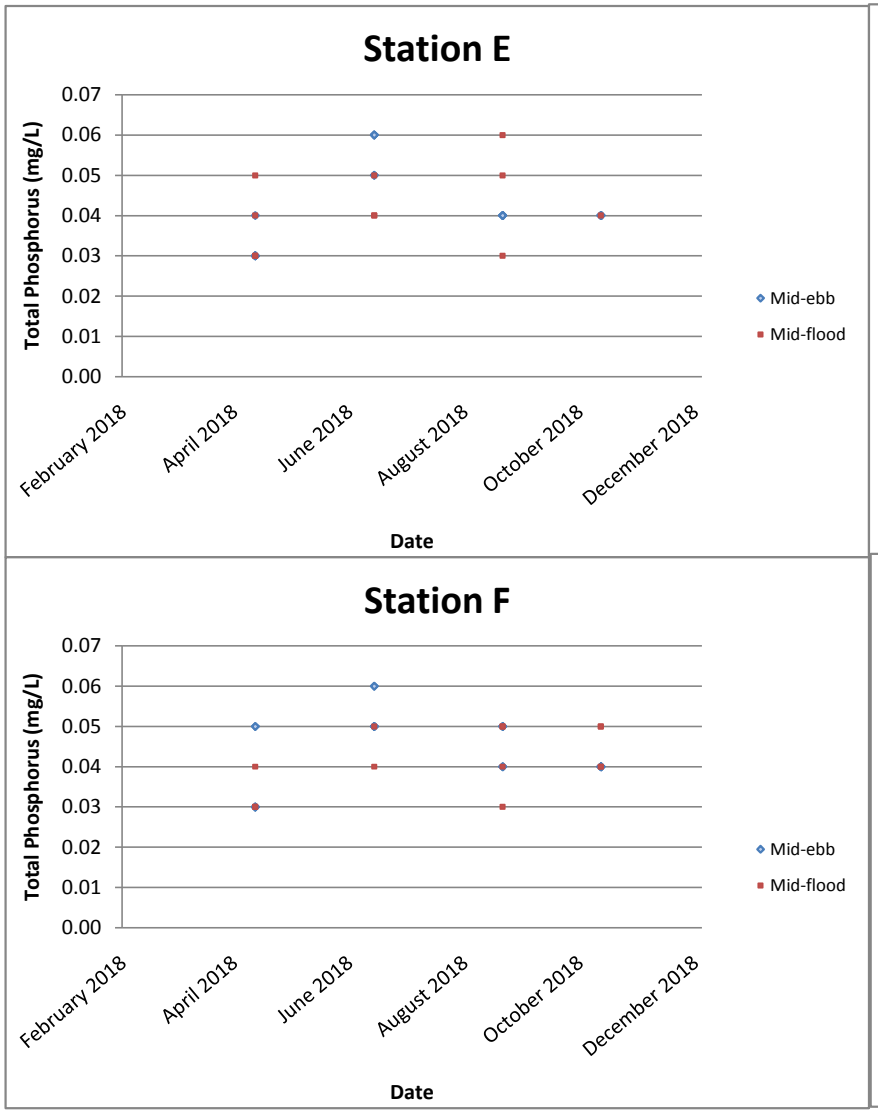
Total Phosphorus (soluble and particulate) (mg/L)

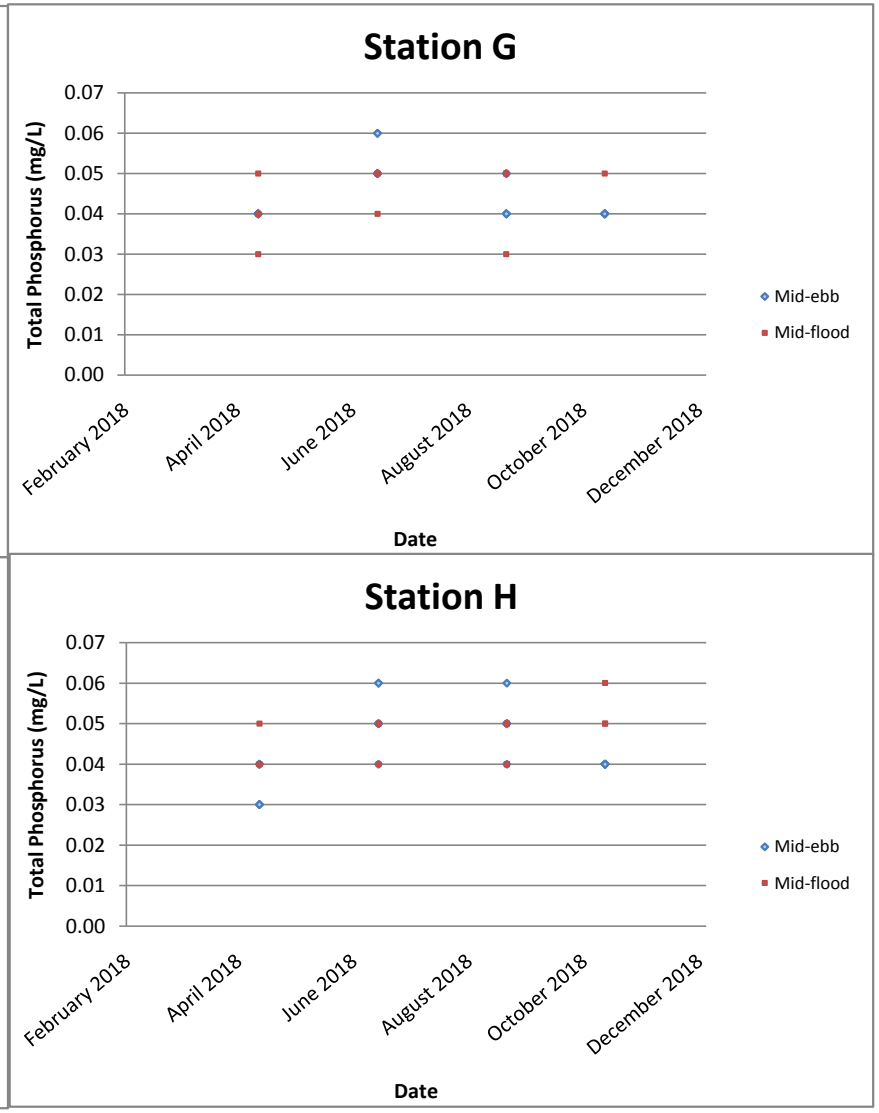








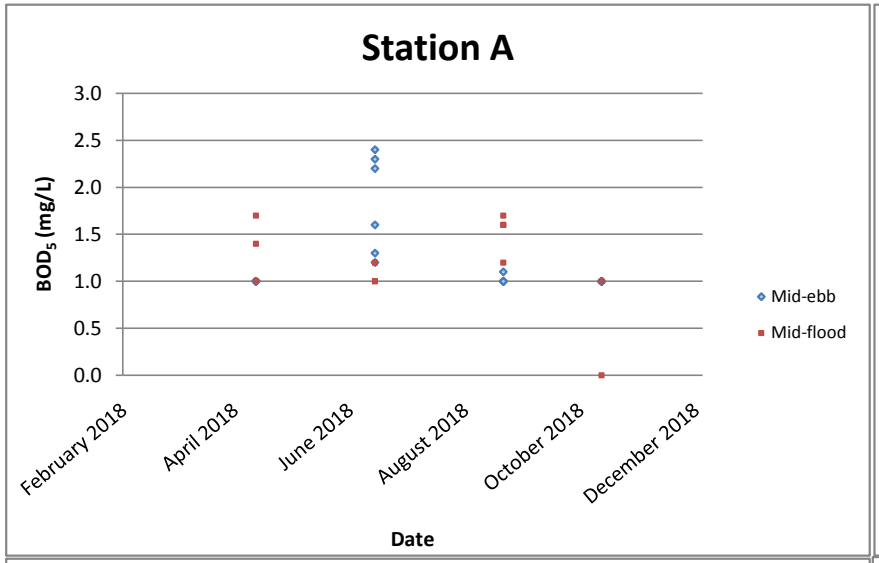

Station E
Total Phosphorus (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

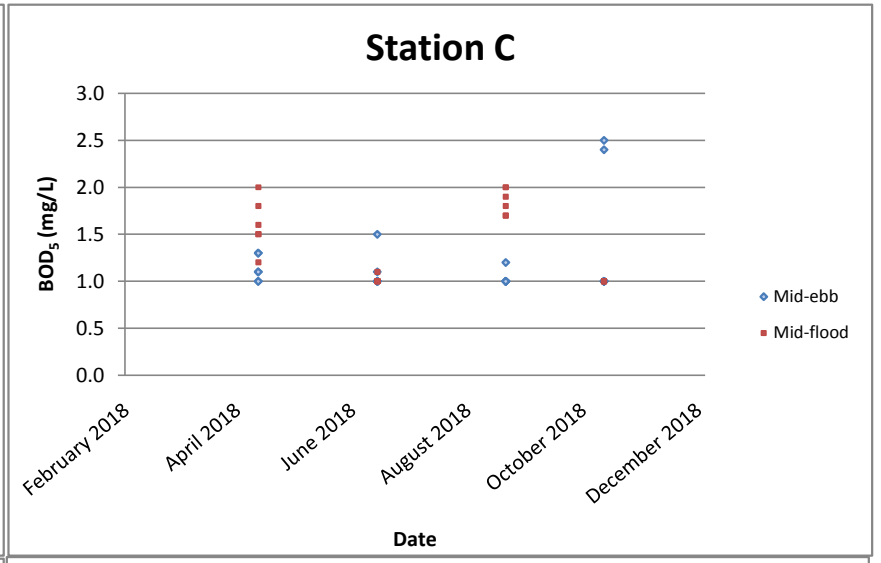

Station G
Total Phosphorus (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

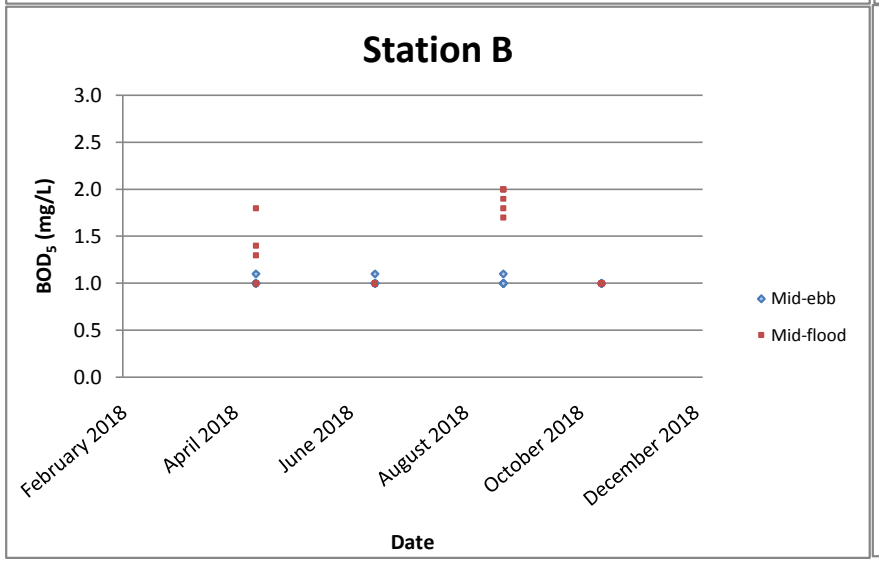
Station F
Total Phosphorus (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

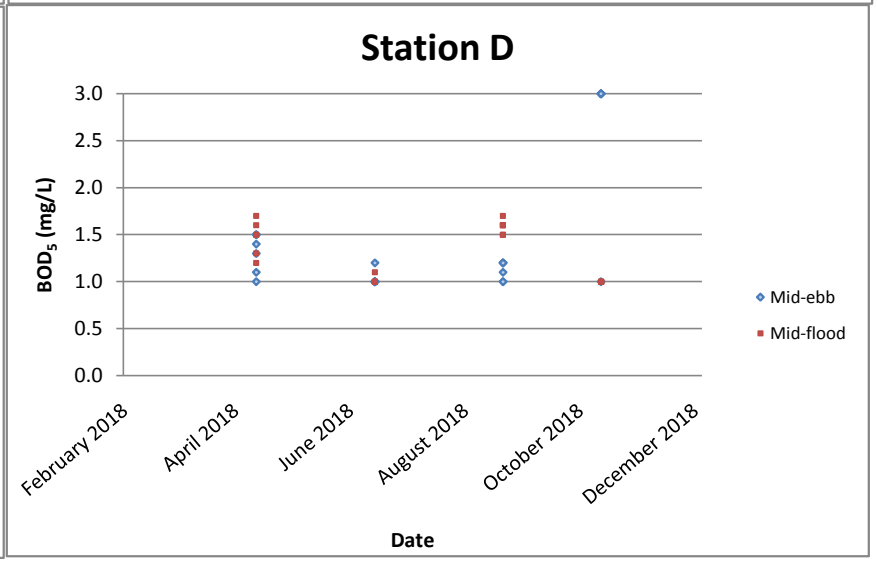
Station H
Total Phosphorus (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

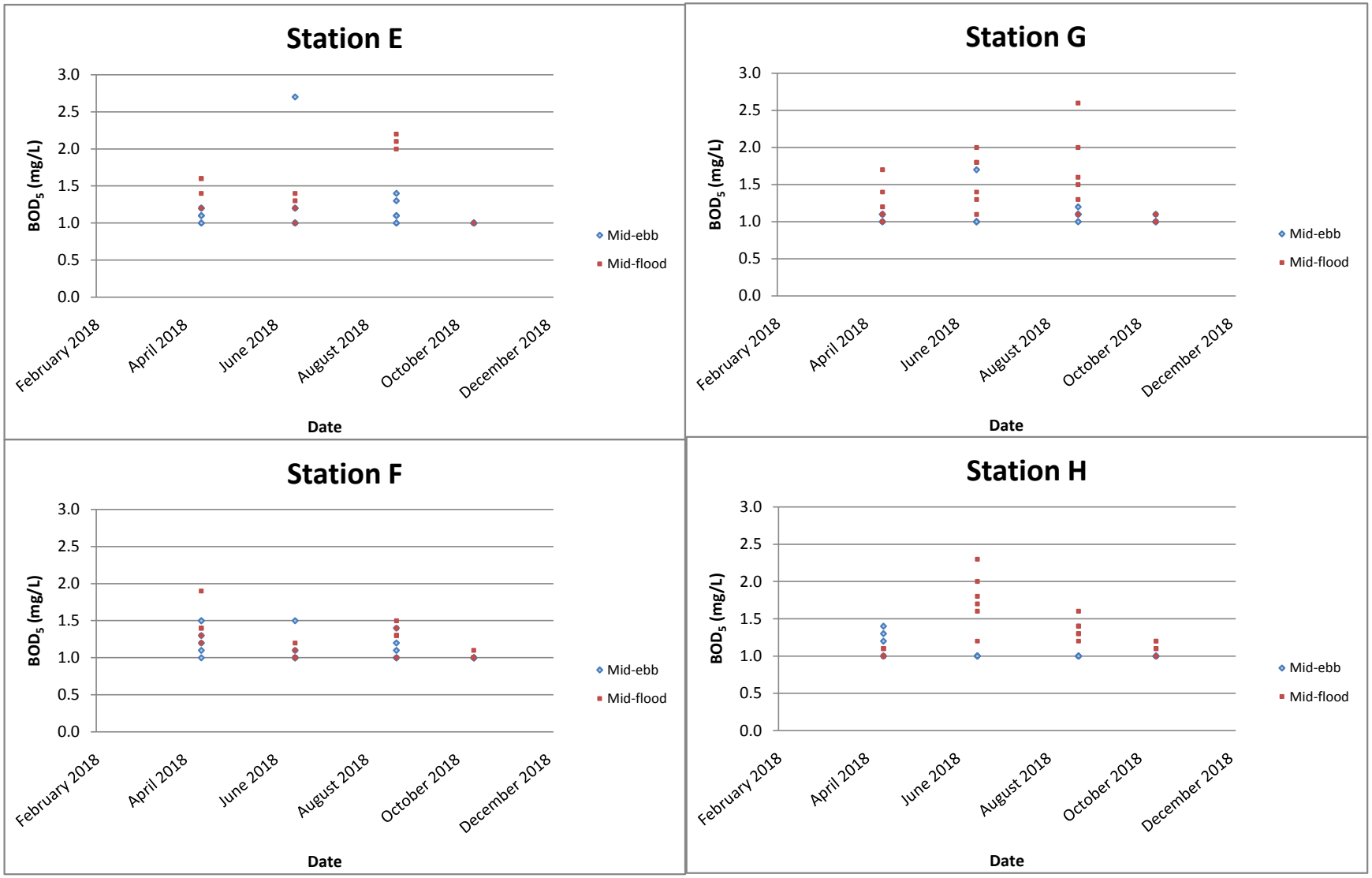
BOD_5 (mg/L)


Station A
3.0
2.5
2.0
1.5
1.0
0.5
0.0
BOD5 (mg/L)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station C
3.0
2.5
2.0
1.5
1.0
0.5
0.0
BOD5 (mg/L)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station B
3.0
2.5
2.0
1.5
1.0
0.5
0.0
BOD5 (mg/L)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station D
3.0
2.5
2.0
1.5
1.0
0.5
0.0
BOD5 (mg/L)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood


Station E
Station G
Station F
Station H
BOD5 (mg/L)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Mid-ebb
Mid-flood

FUGRO TECHNICAL SERVICES LIMITED

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Appendix E

Tidal Data obtained from Ma Wan Marine Tradffic Station

FUGRO TECHNICAL SERVICES LIMITED

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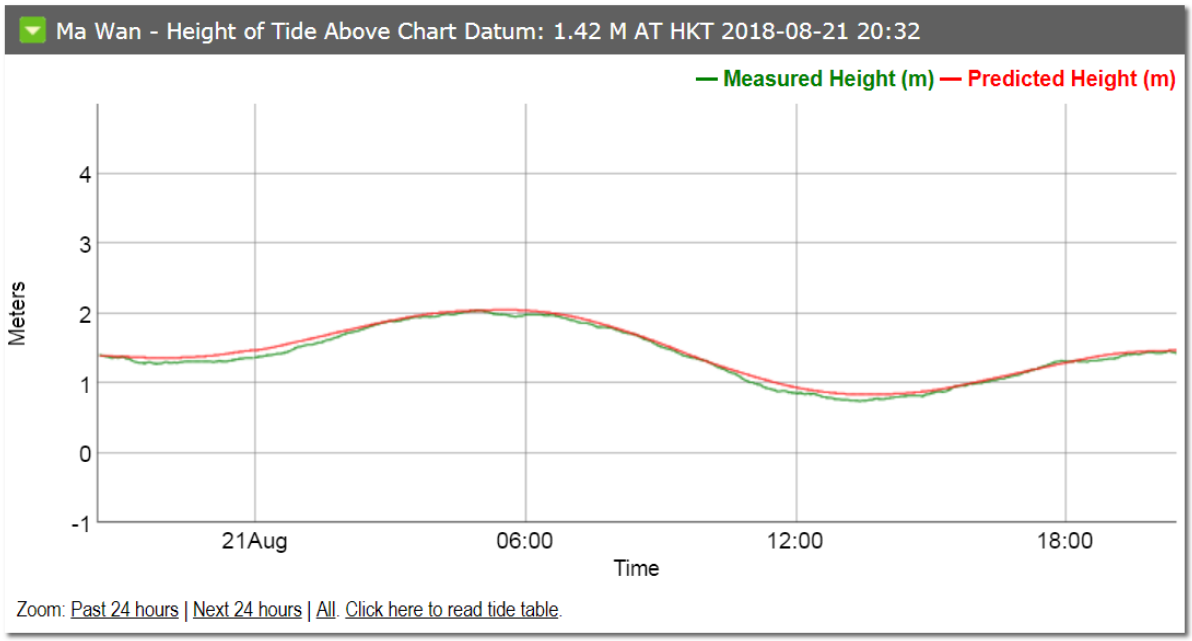
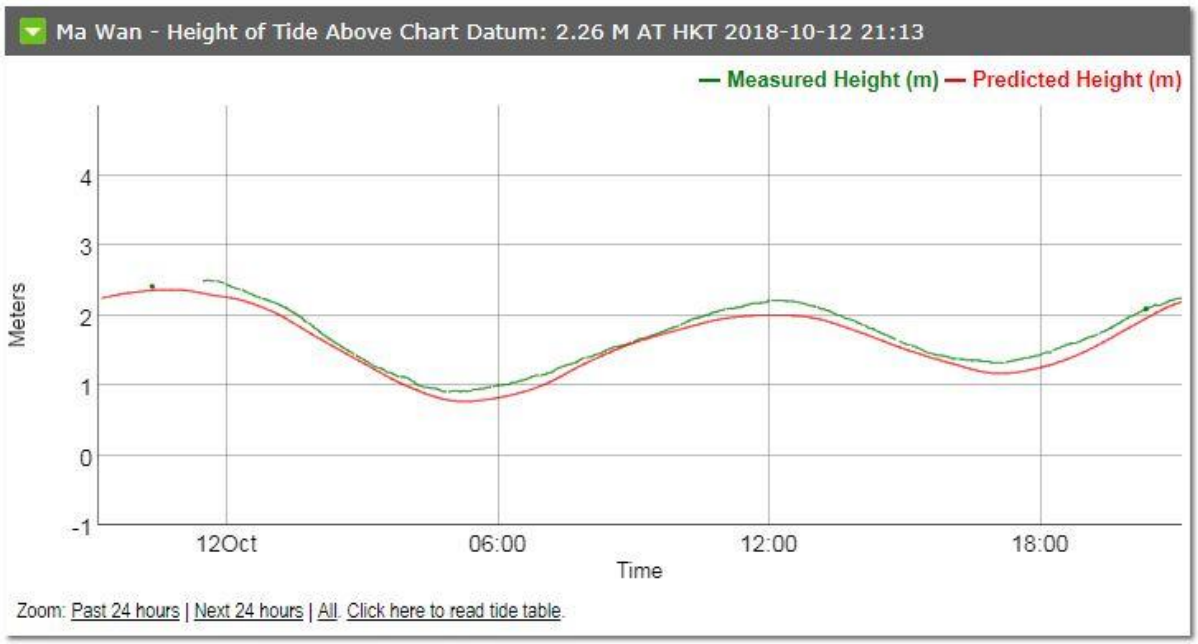
Website : www.fugro.com

Report No.: 0041/17/ED/0388A





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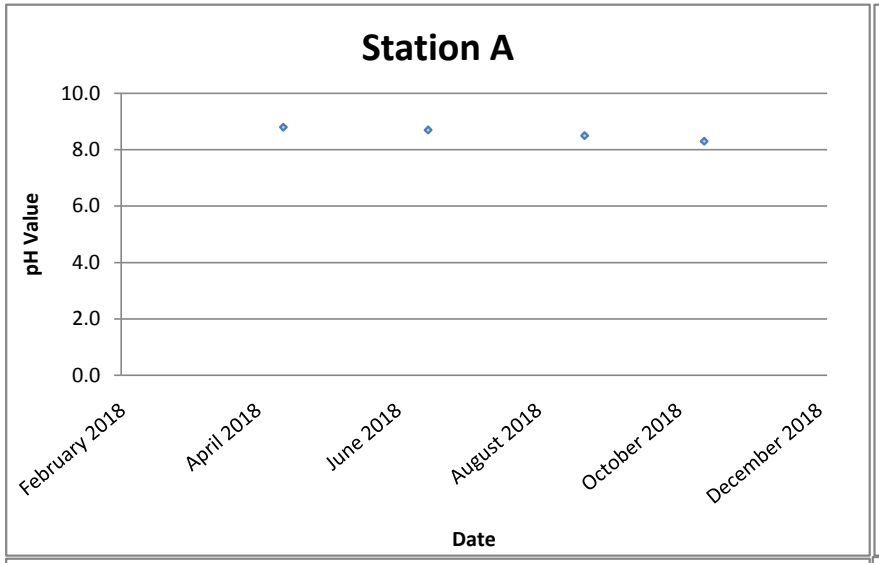
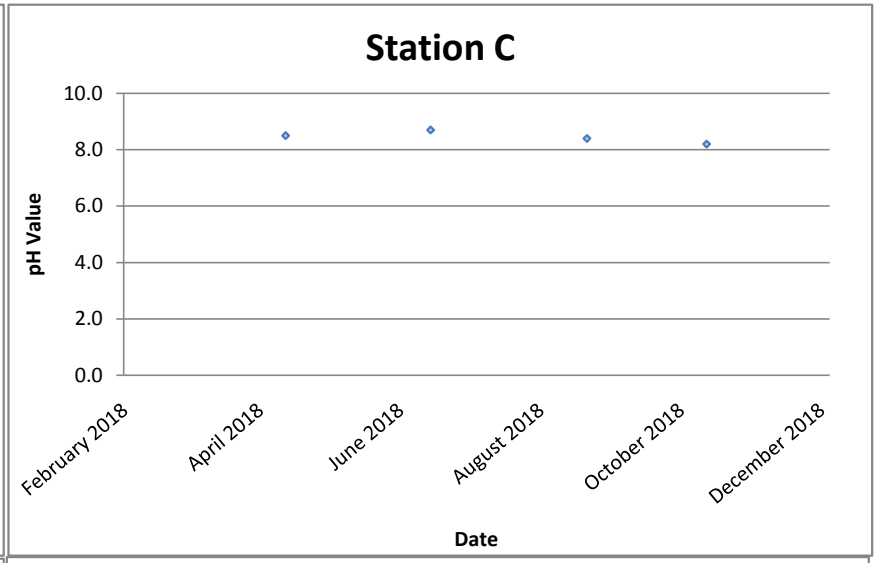
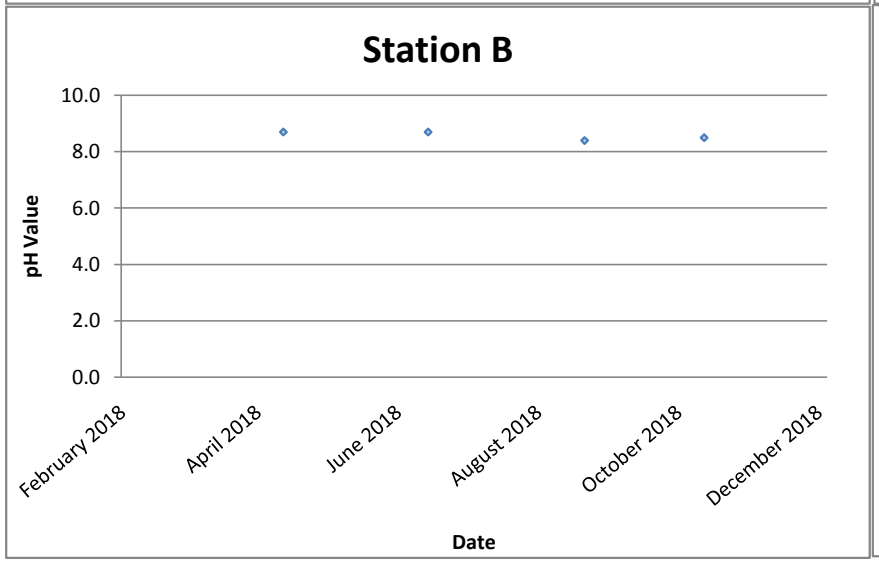
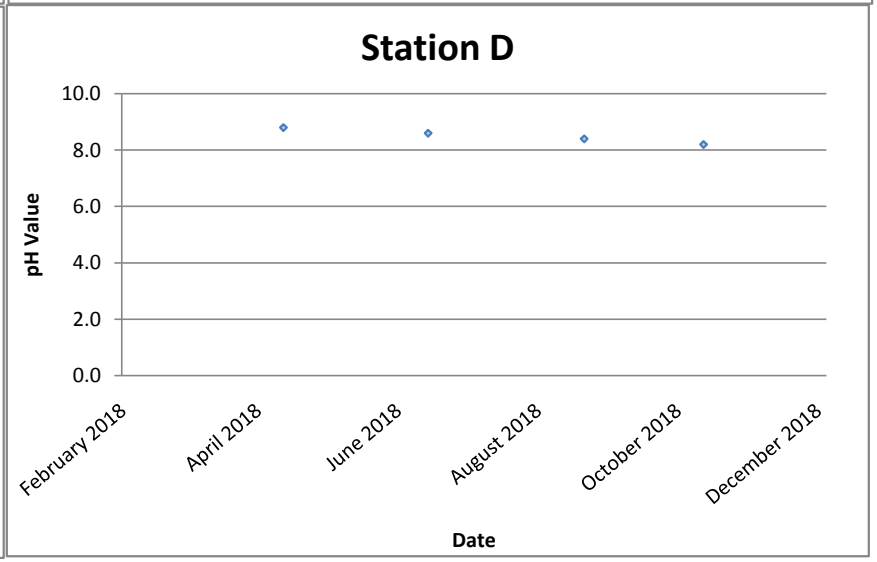
Appendix F

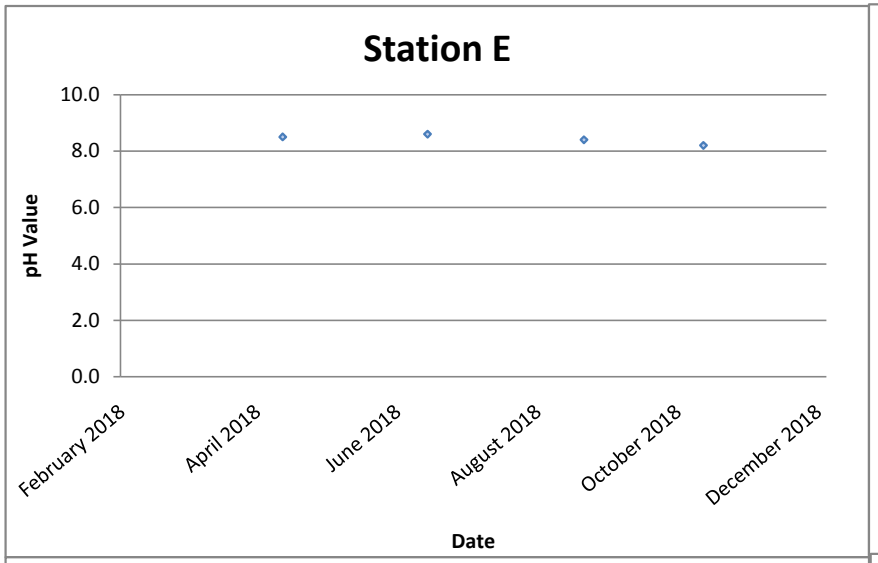
Graphical Presentation of Sediment Quality Monitoring and Benthic Survey

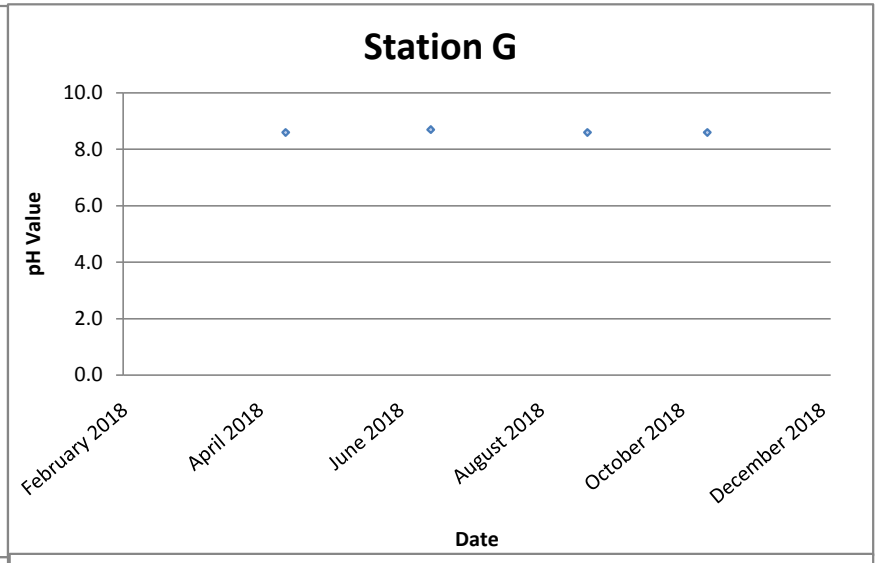

Station A
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

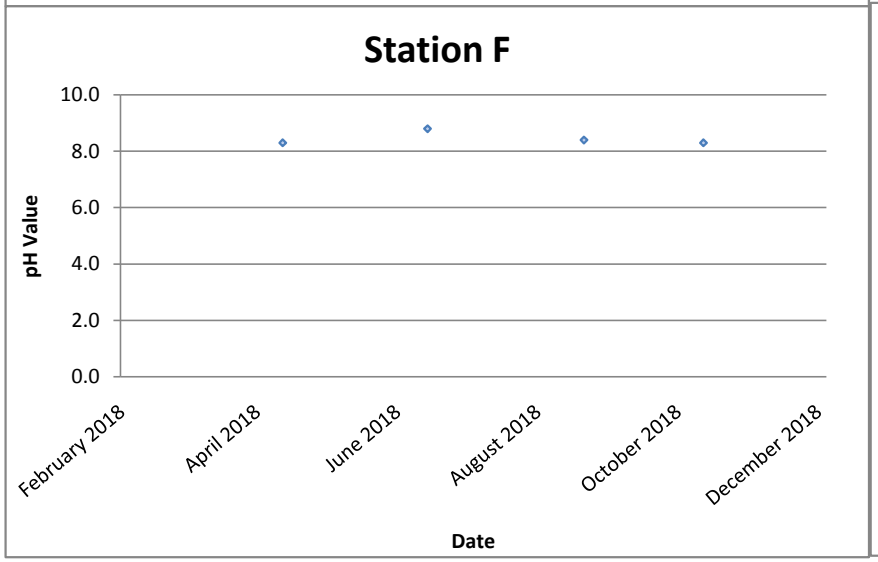

Station C
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

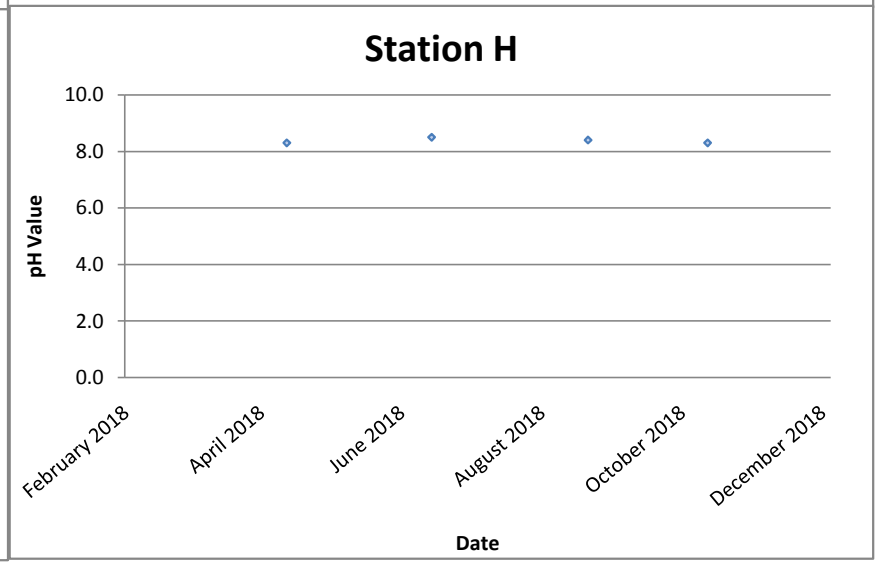

Station B
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

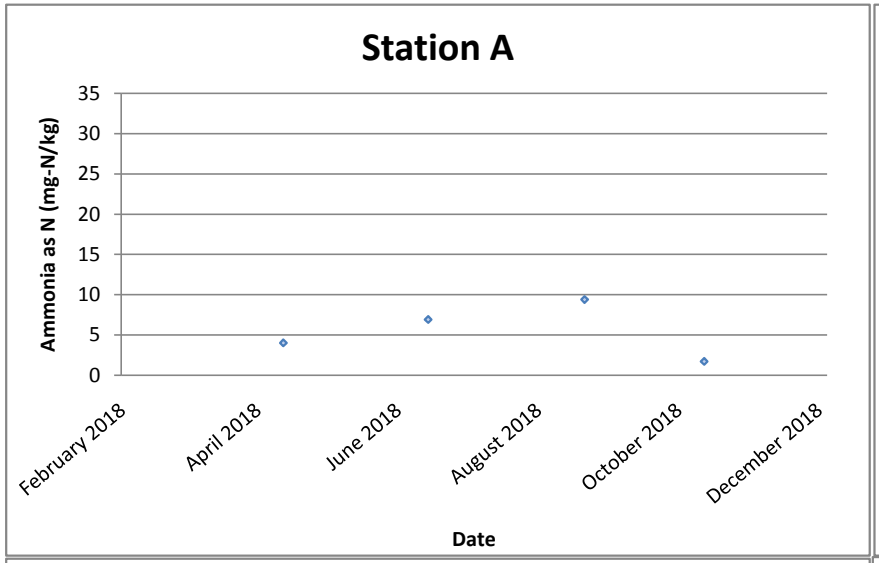

Station D
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

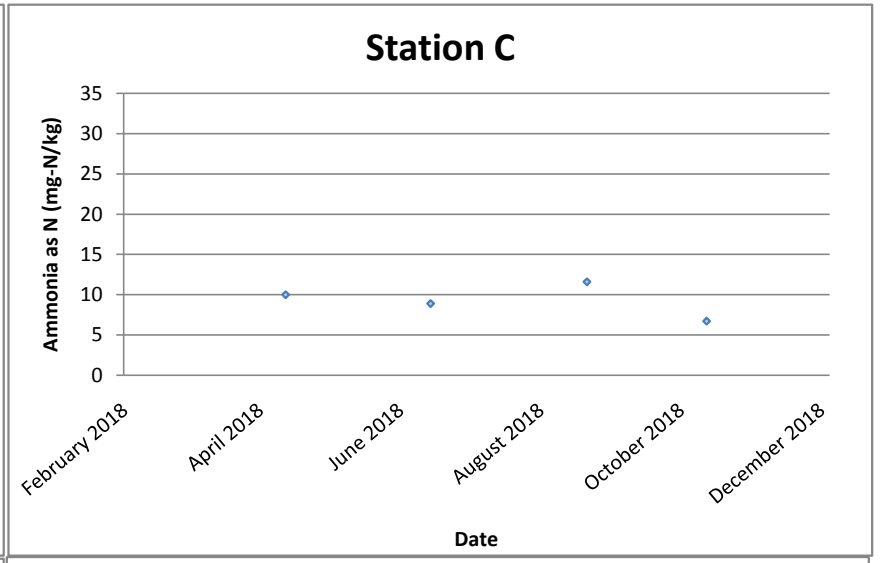

Station E
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

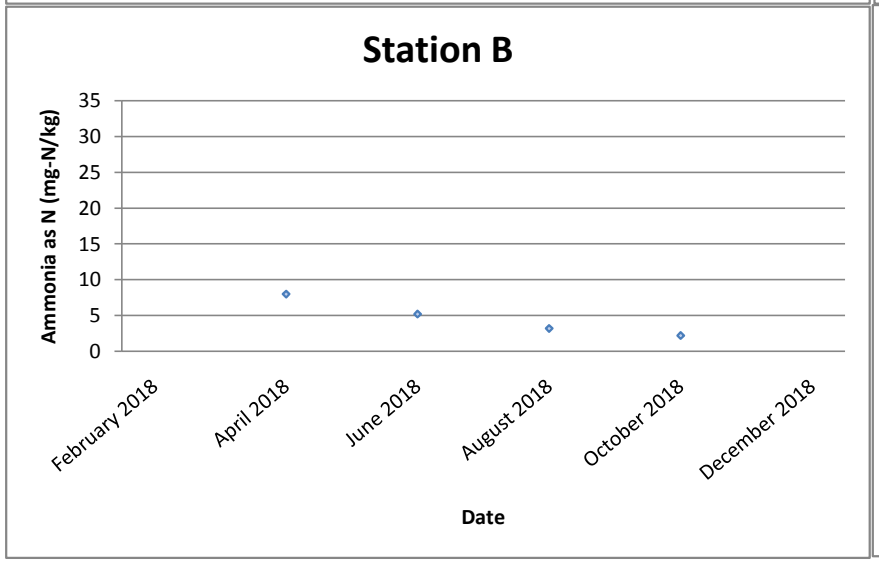

Station G
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

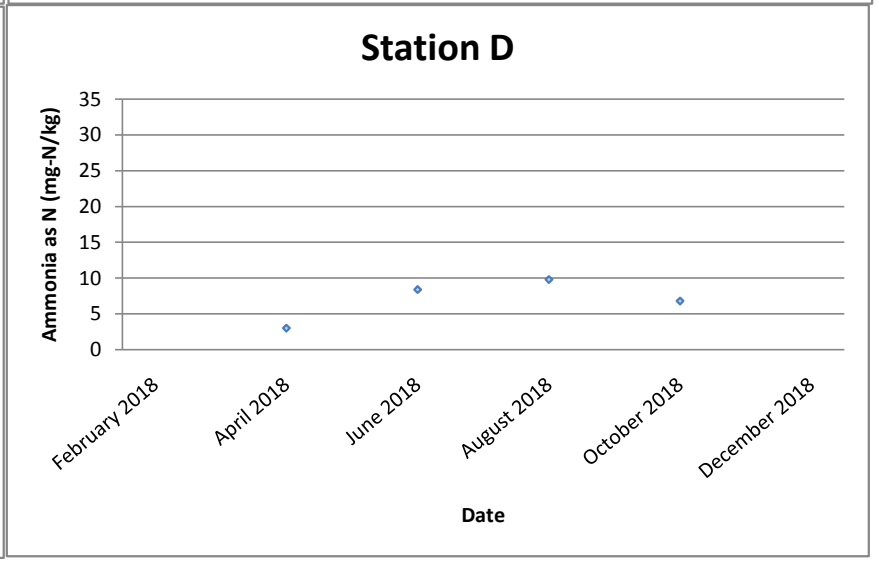

Station F
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

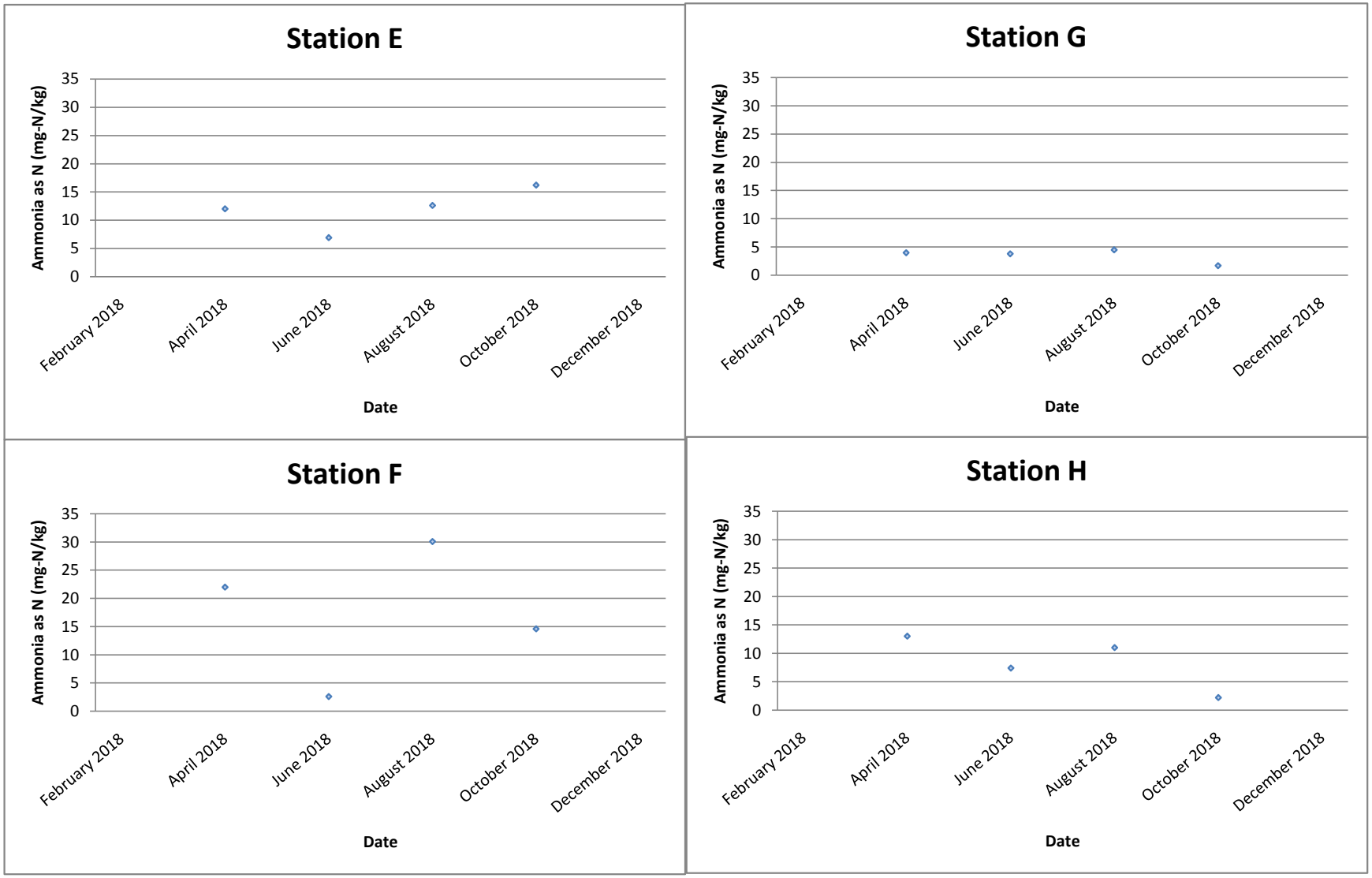

Station H
10.0
8.0
6.0
4.0
2.0
0.0
pH Value
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

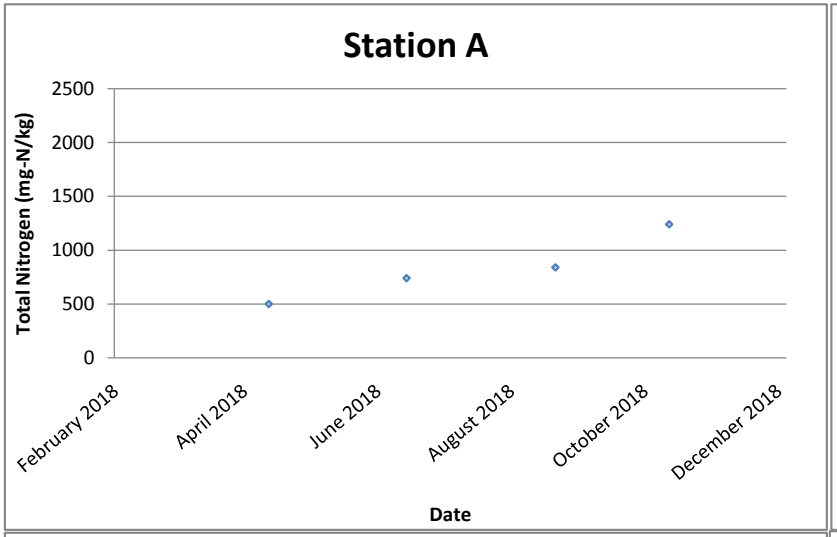

Station A
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

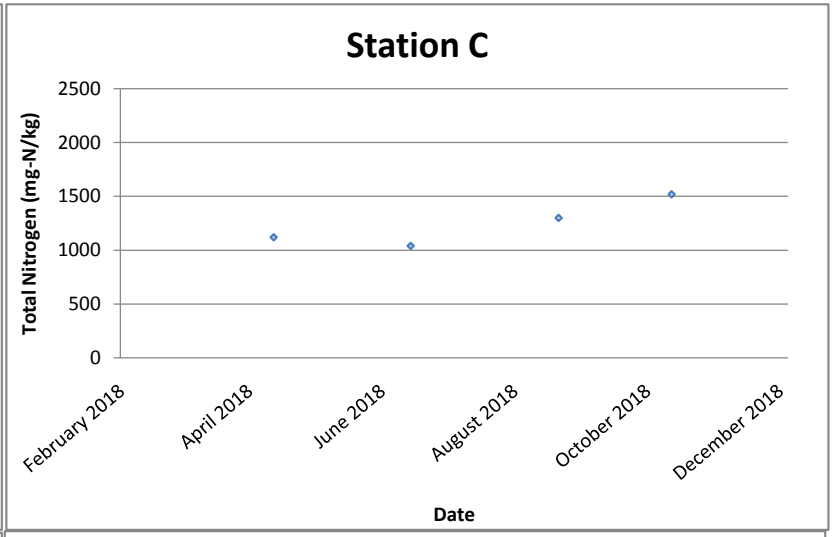

Station C
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

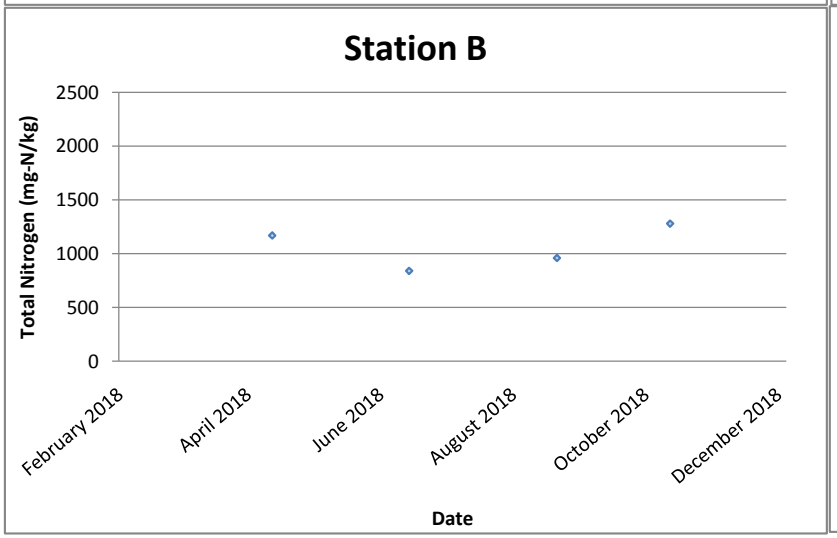

Station B
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

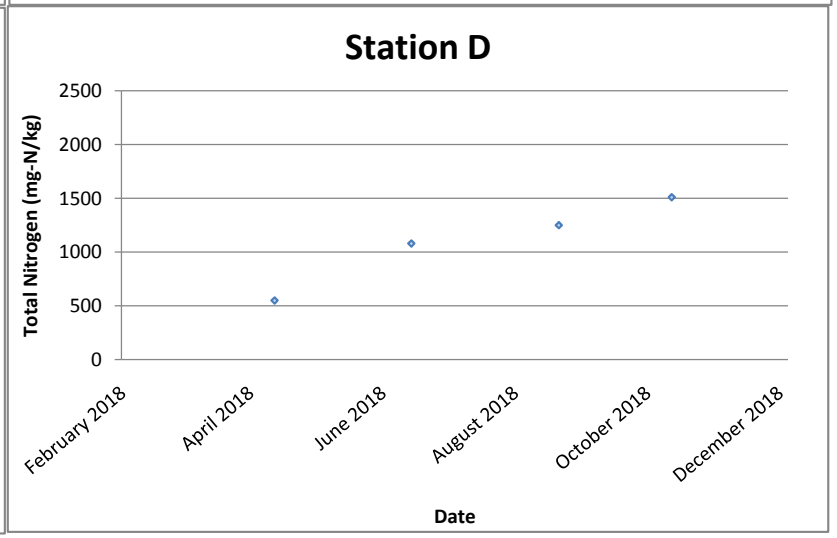

Station D
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

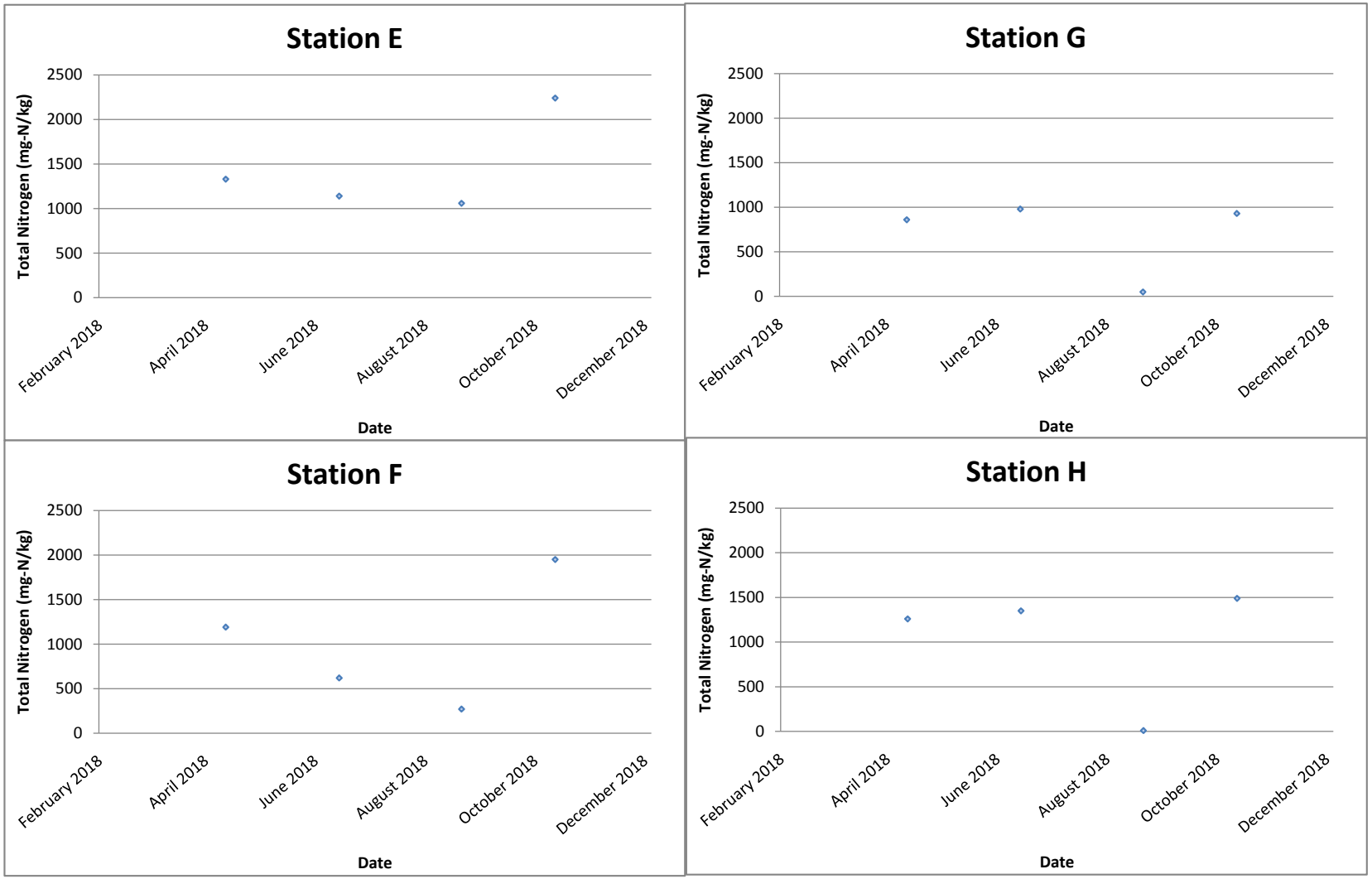

Station E
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station G
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station F
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station H
Ammonia as N (mg-N/kg)
35
30
25
20
15
10
5
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station A
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

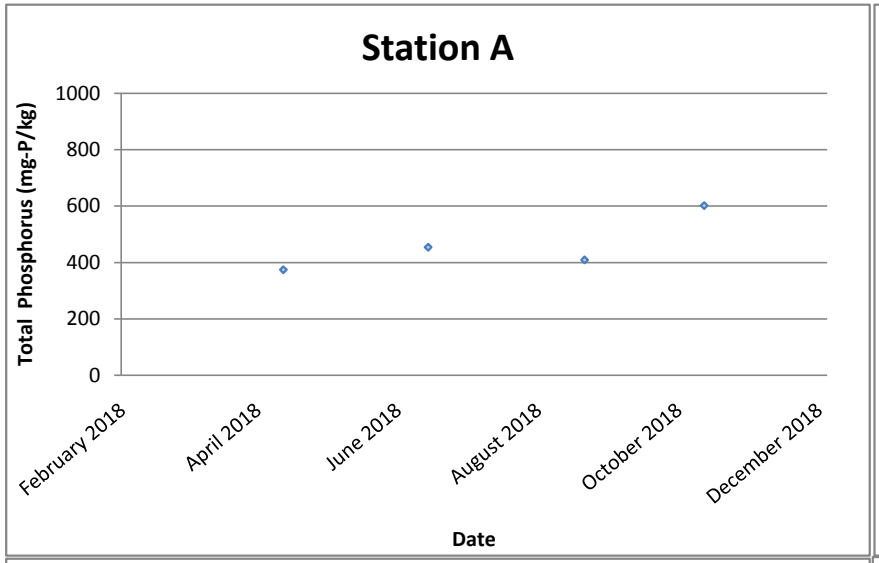

Station C
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

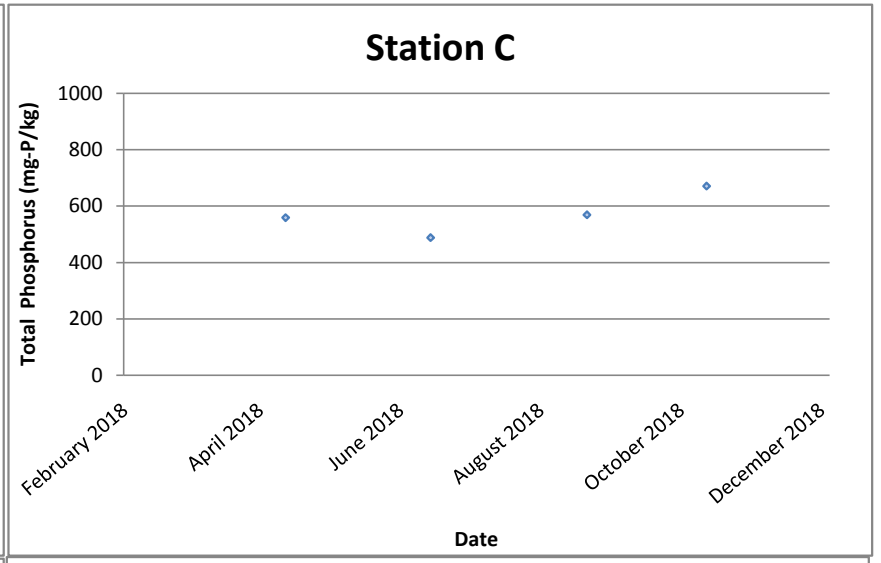

Station B
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

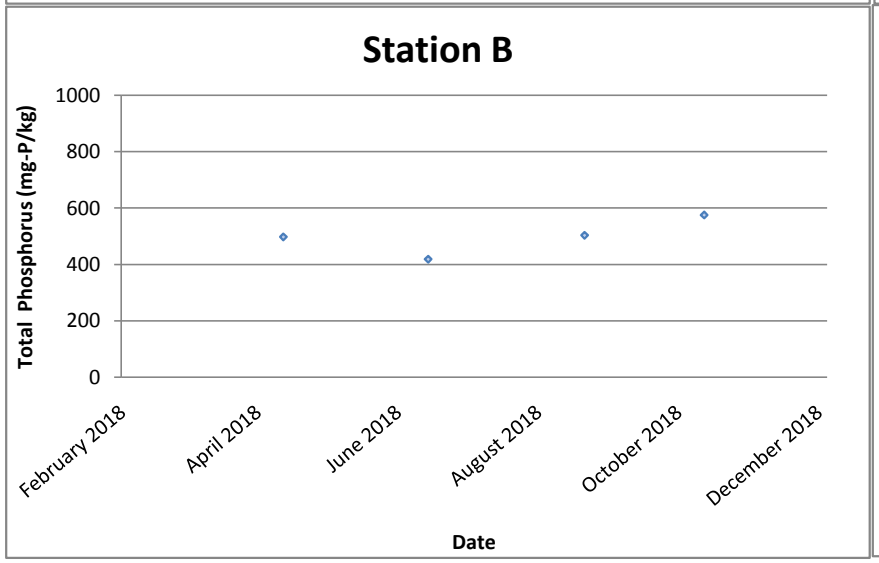

Station D
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

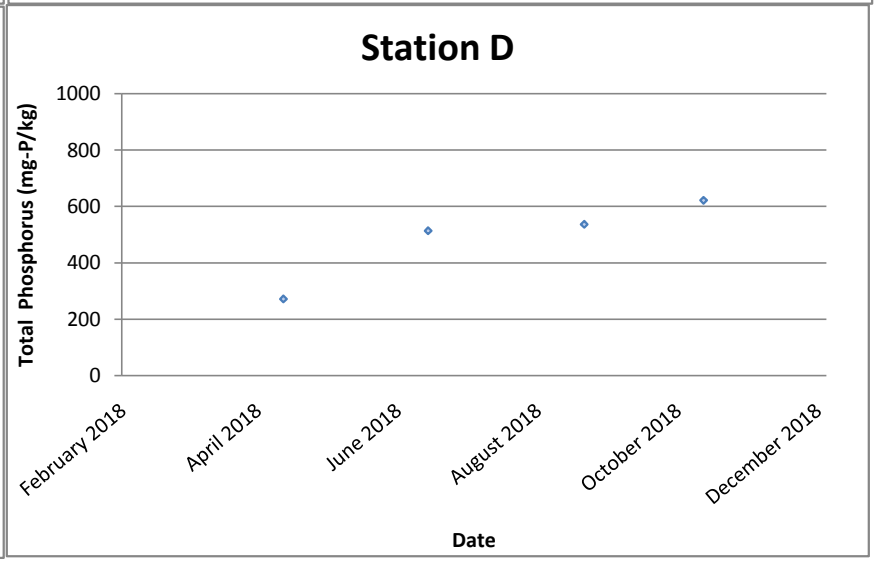

Station E
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station G
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station F
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station H
Total Nitrogen (mg-N/kg)
2500
2000
1500
1000
500
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

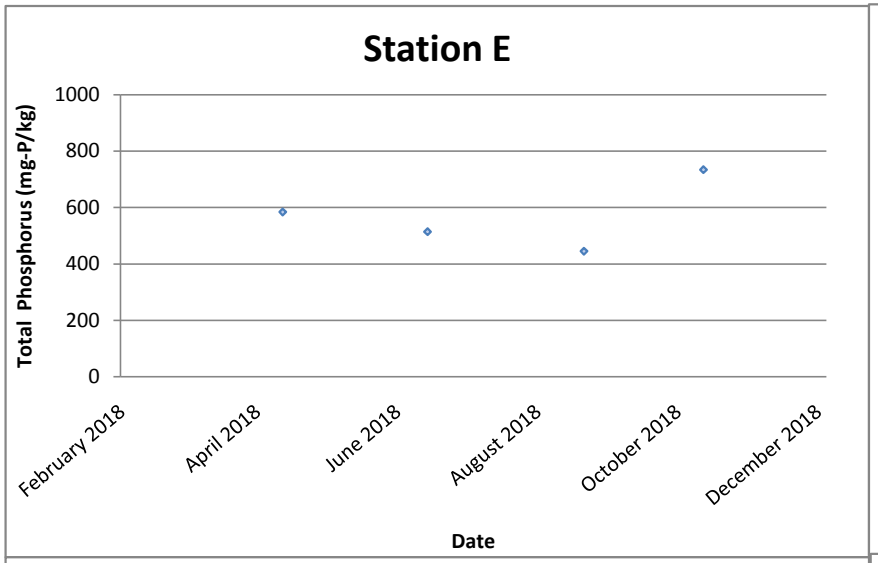
Total Phosphorus (mg-P/kg)

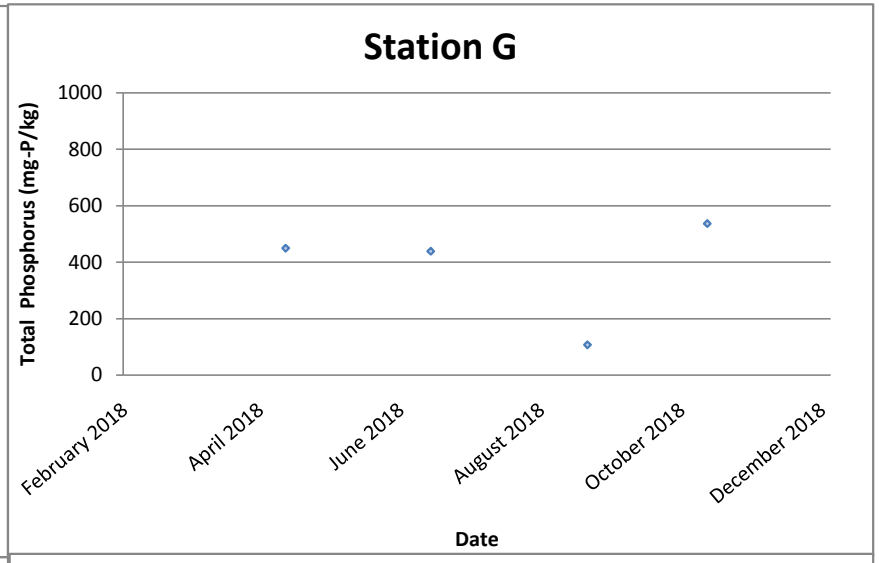


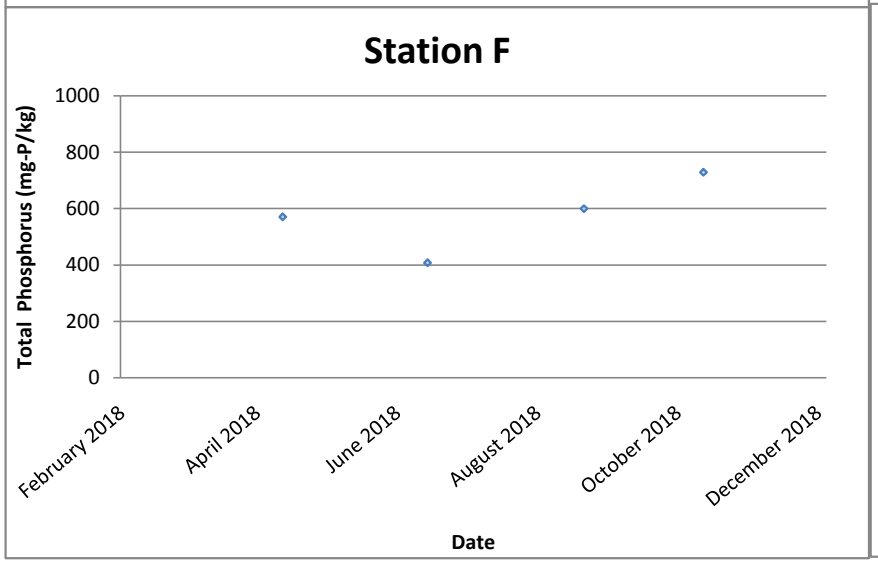


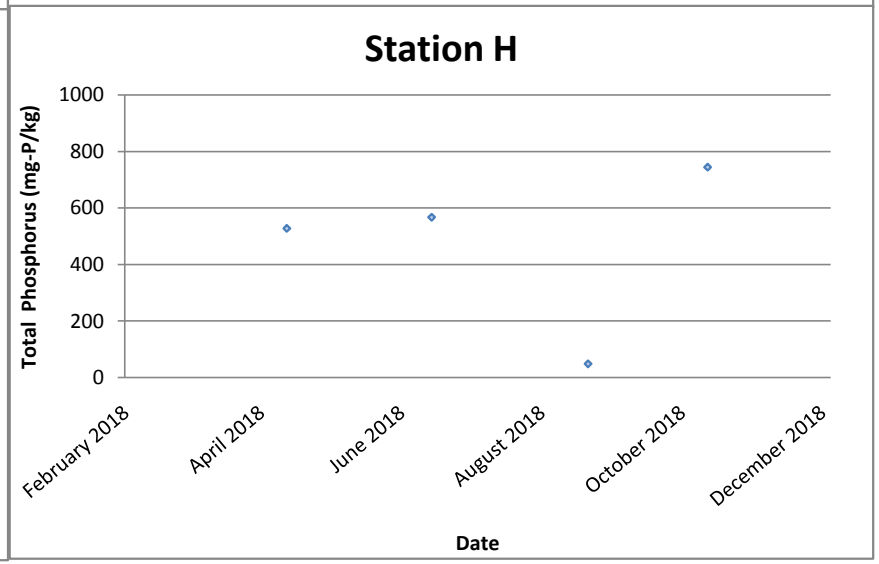


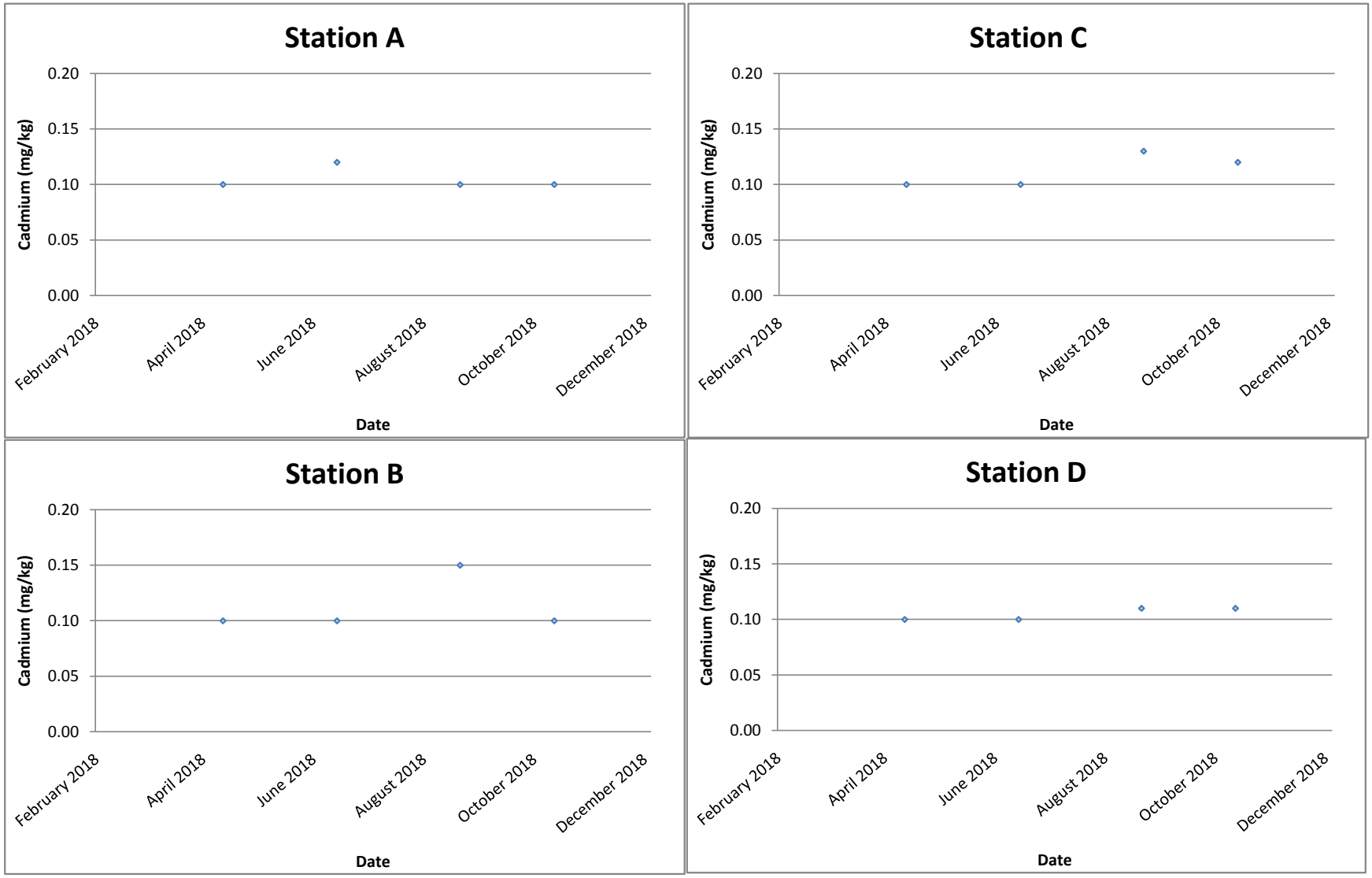


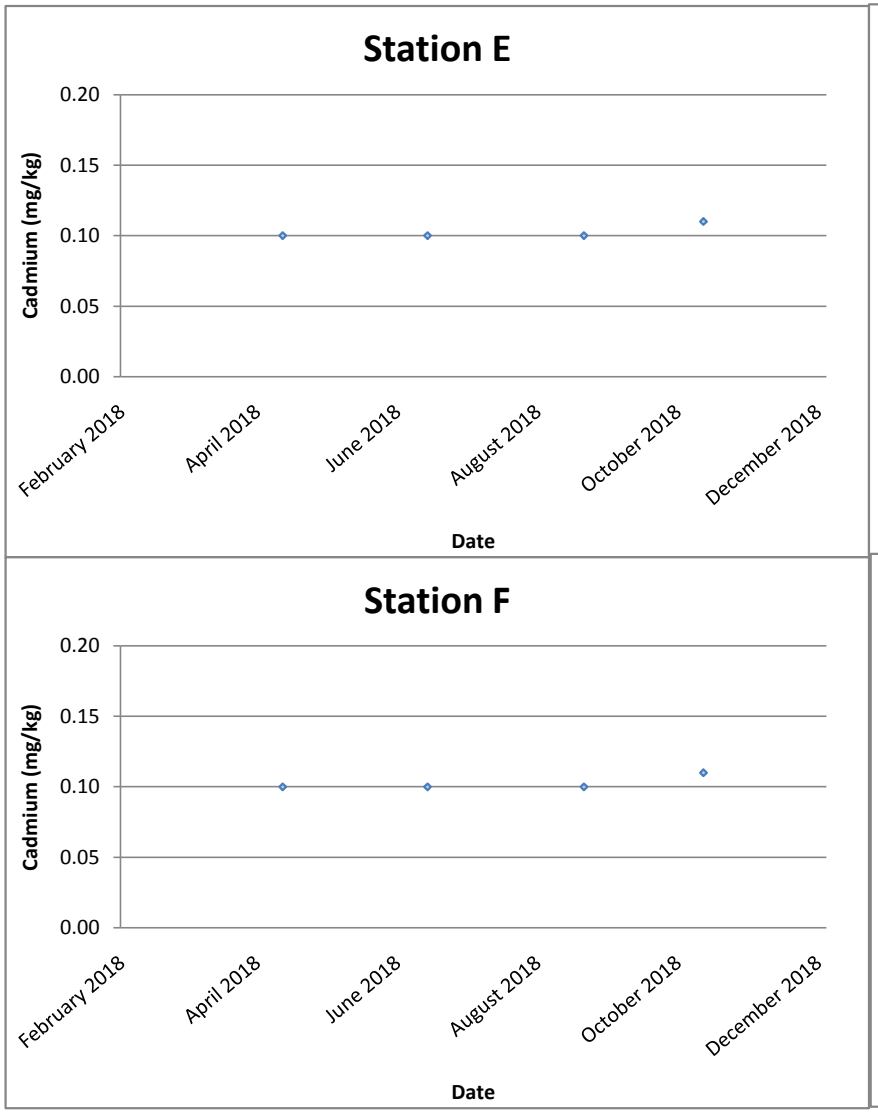

Station E
Total Phosphorus (mg-P/kg)
1000
800
600
400
200
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

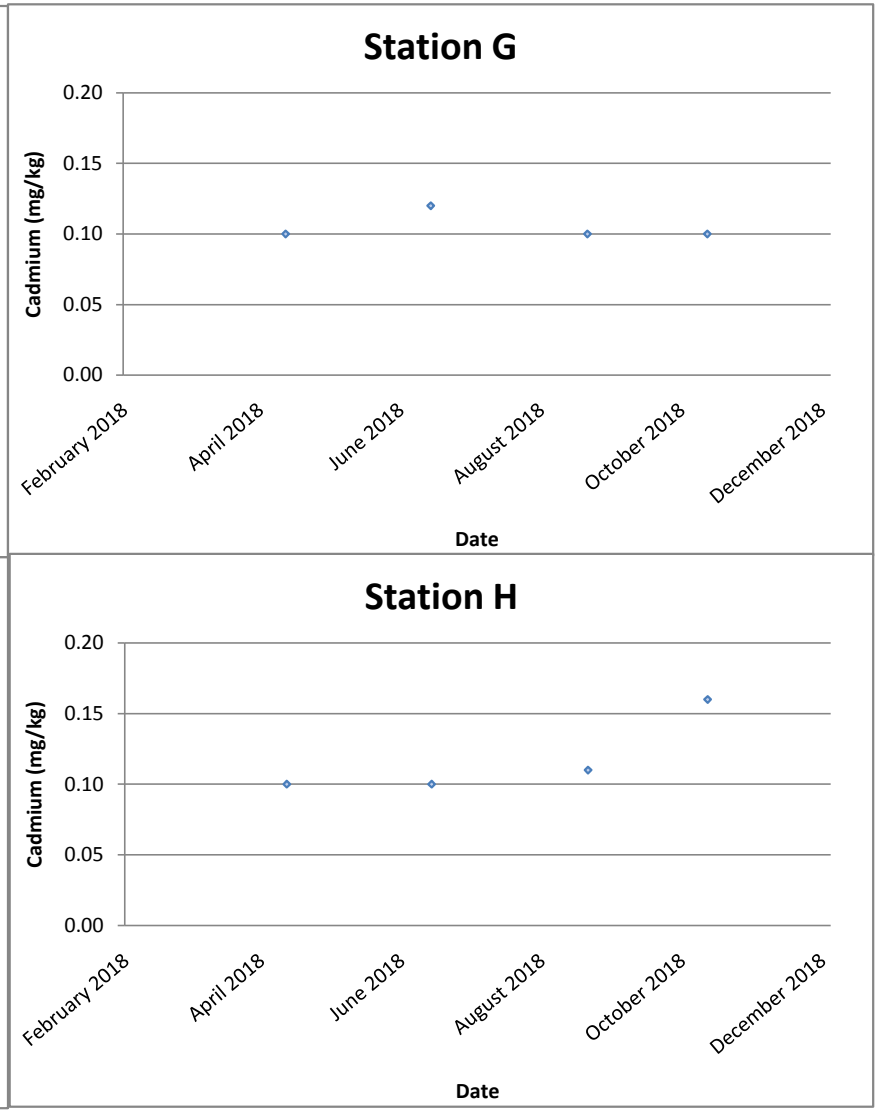

Station G
Total Phosphorus (mg-P/kg)
1000
800
600
400
200
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station F
Total Phosphorus (mg-P/kg)
1000
800
600
400
200
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station H
Total Phosphorus (mg-P/kg)
1000
800
600
400
200
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

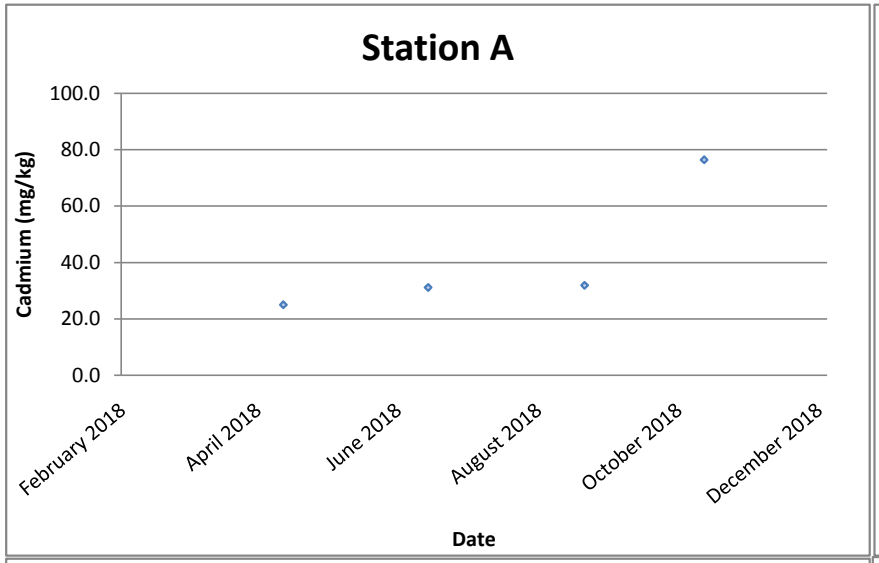

Station A
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station C
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station B
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station D
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

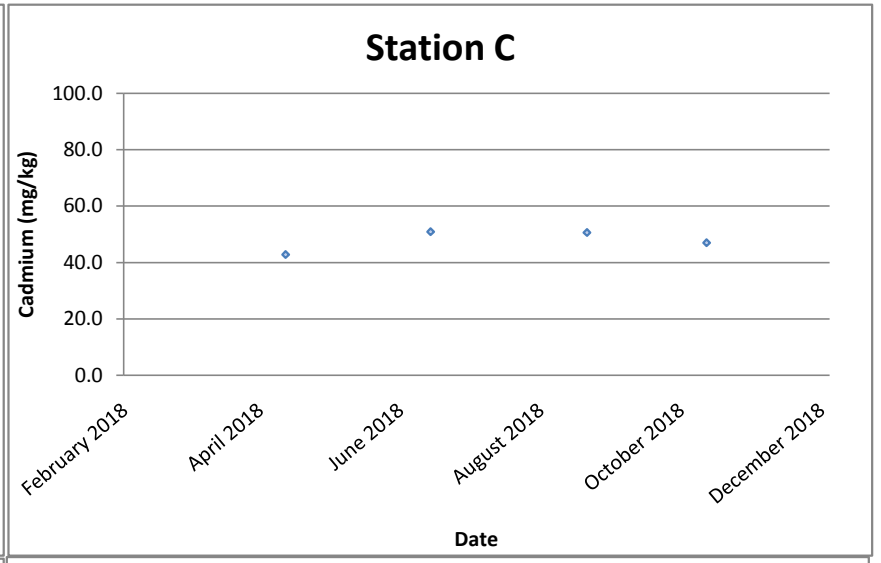

Station E
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

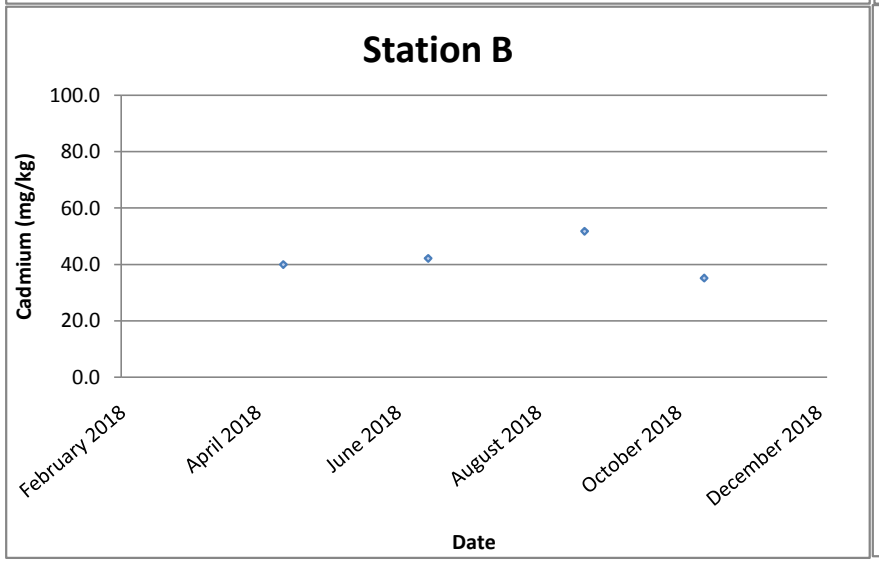

Station G
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

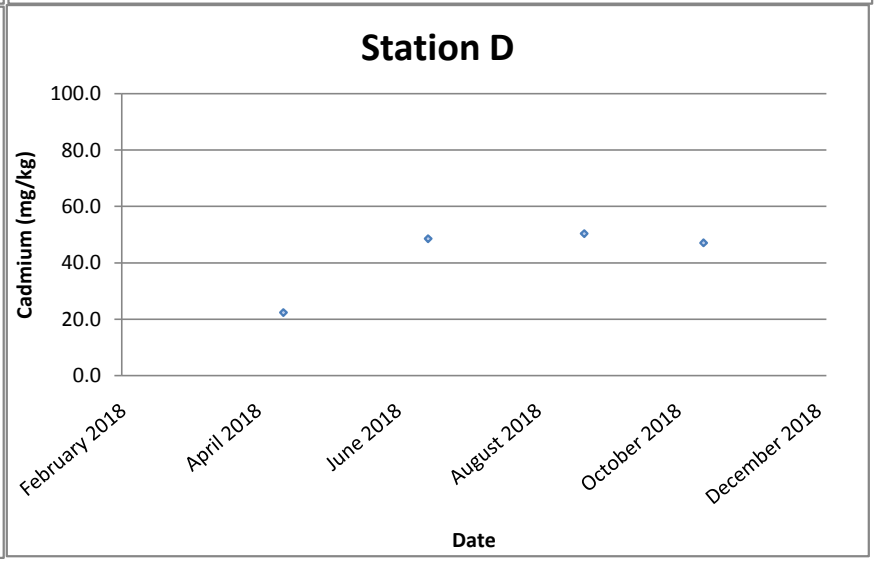
Station F
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

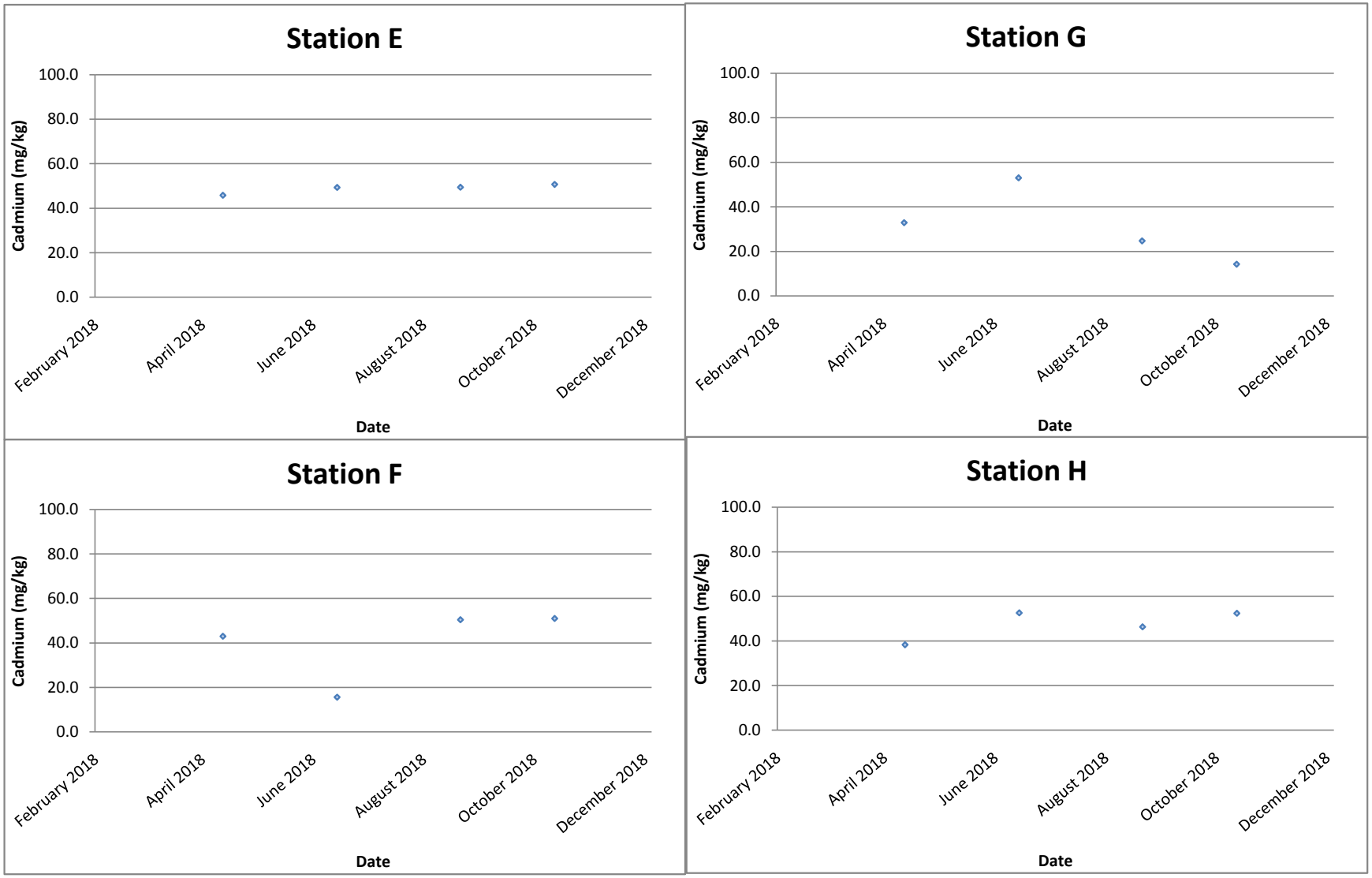
Station H
Cadmium (mg/kg)
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

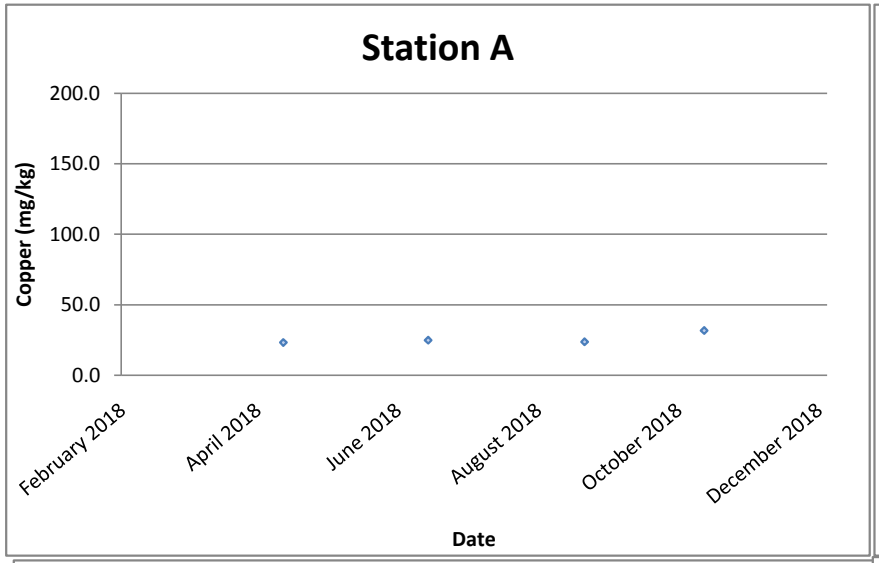

Station A
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

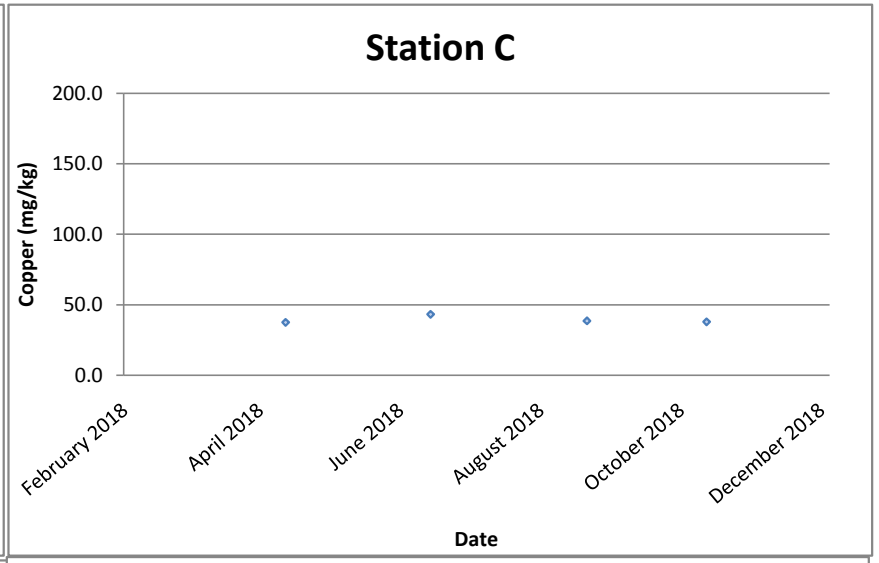

Station C
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

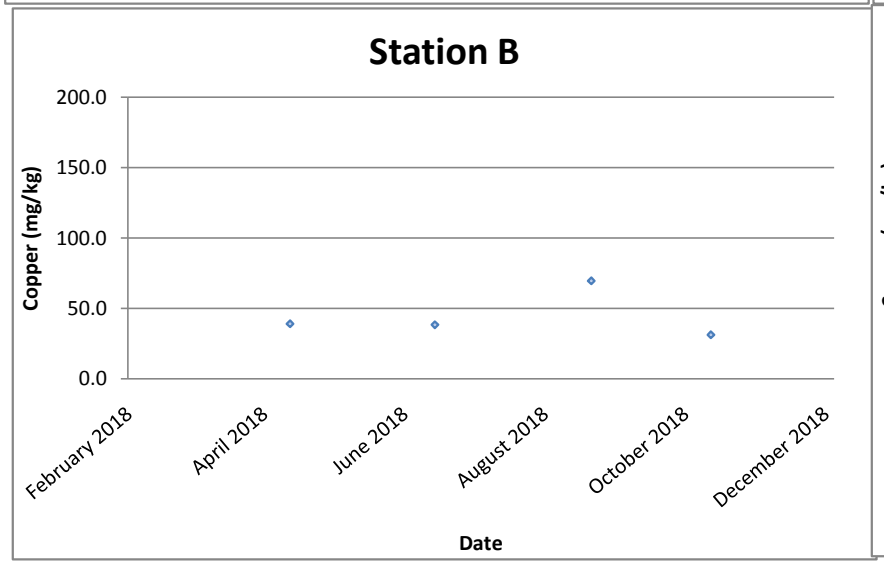

Station B
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

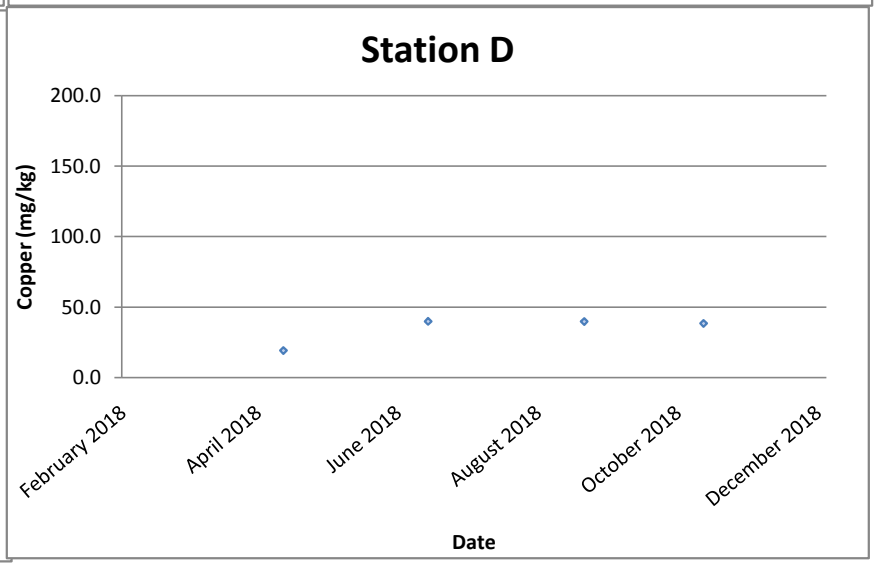

Station D
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

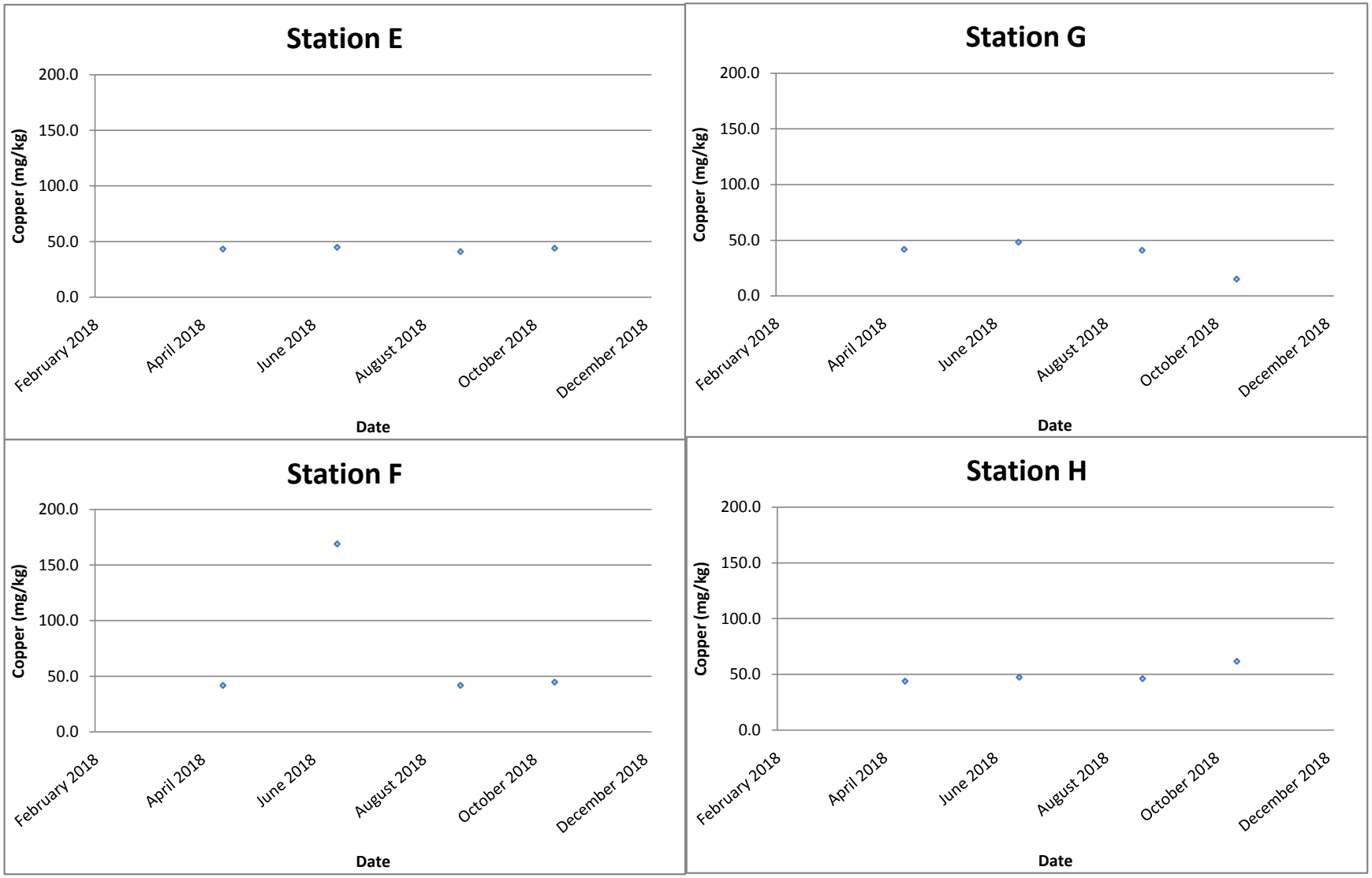

Station E
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station G
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station F
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station H
Cadmium (mg/kg)
100.0
80.0
60.0
40.0
20.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

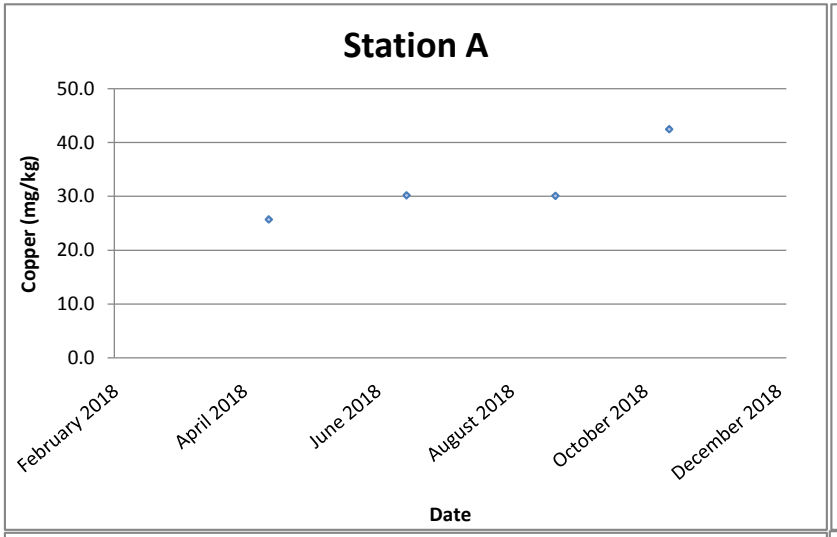

Station A
200.0
150.0
100.0
50.0
0.0
Copper (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

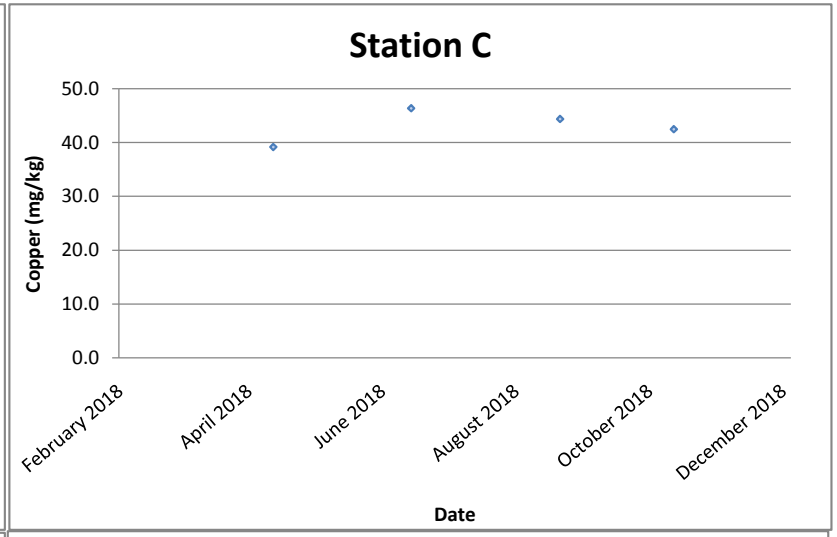

Station C
200.0
150.0
100.0
50.0
0.0
Copper (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

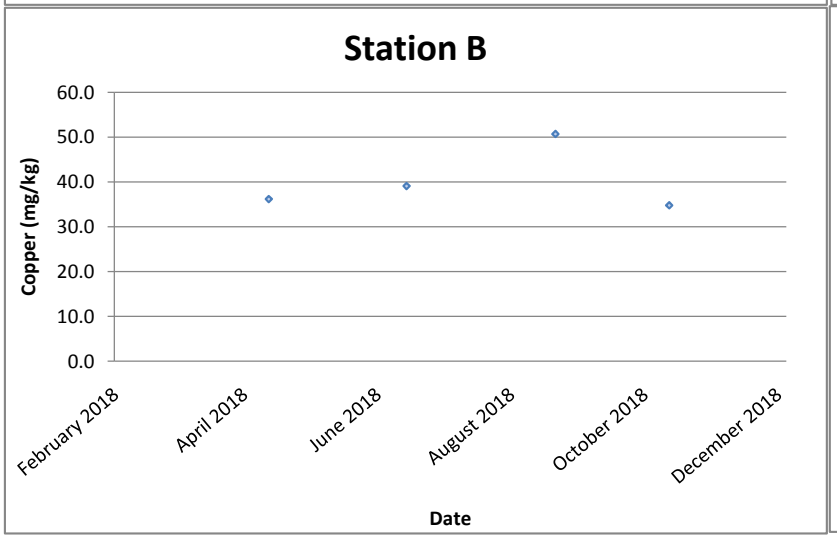

Station B
200.0
150.0
100.0
50.0
0.0
Copper (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

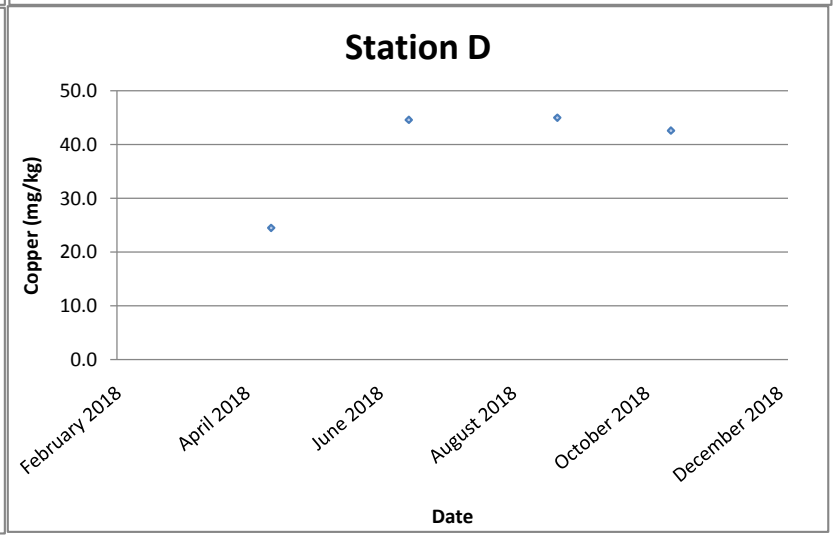

Station D
200.0
150.0
100.0
50.0
0.0
Copper (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

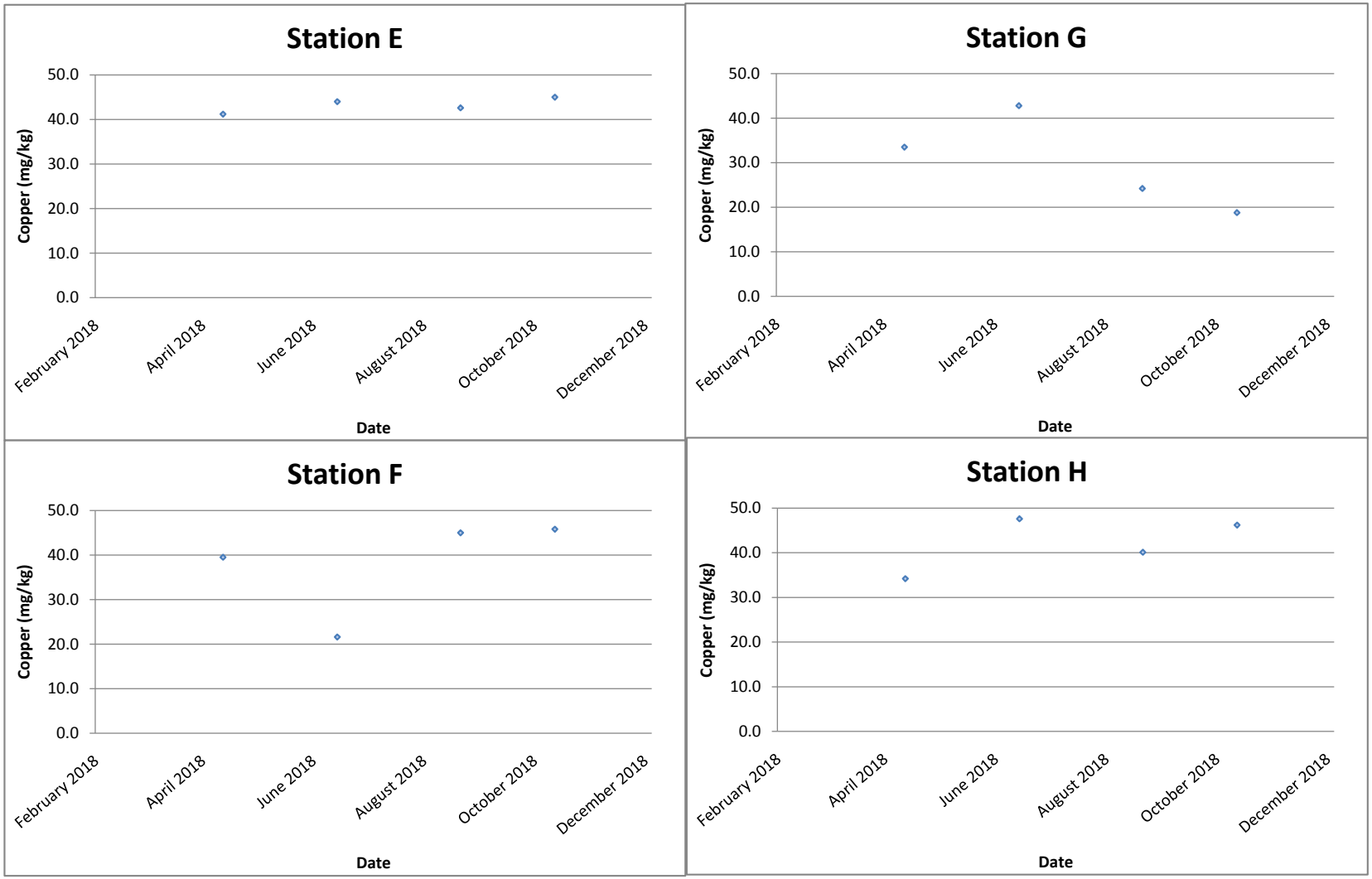

Station E
Copper (mg/kg)
200.0
150.0
100.0
50.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station G
Copper (mg/kg)
200.0
150.0
100.0
50.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station F
Copper (mg/kg)
200.0
150.0
100.0
50.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station H
Copper (mg/kg)
200.0
150.0
100.0
50.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

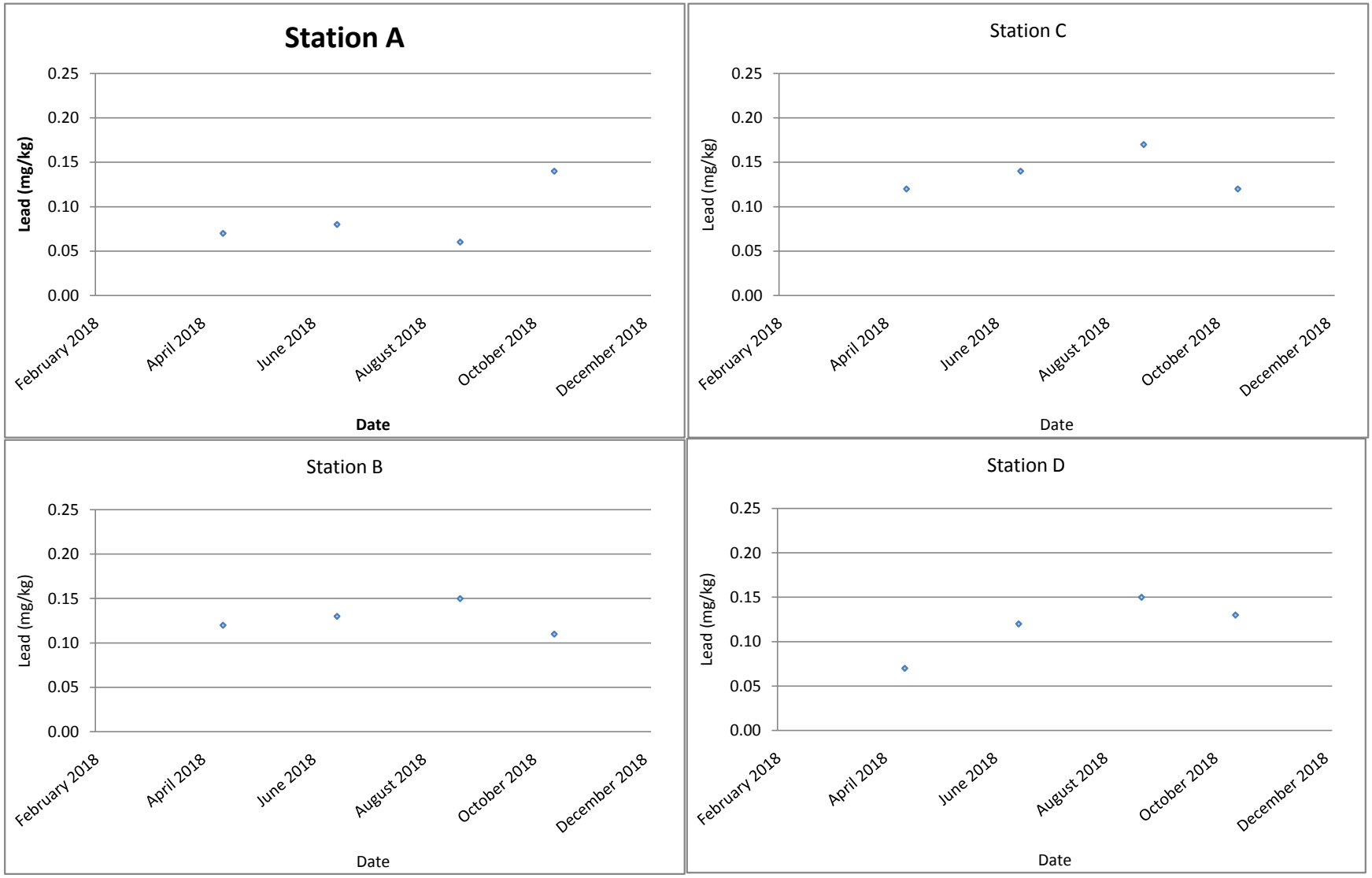

Station A
Copper (mg/kg)
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station C
Copper (mg/kg)
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

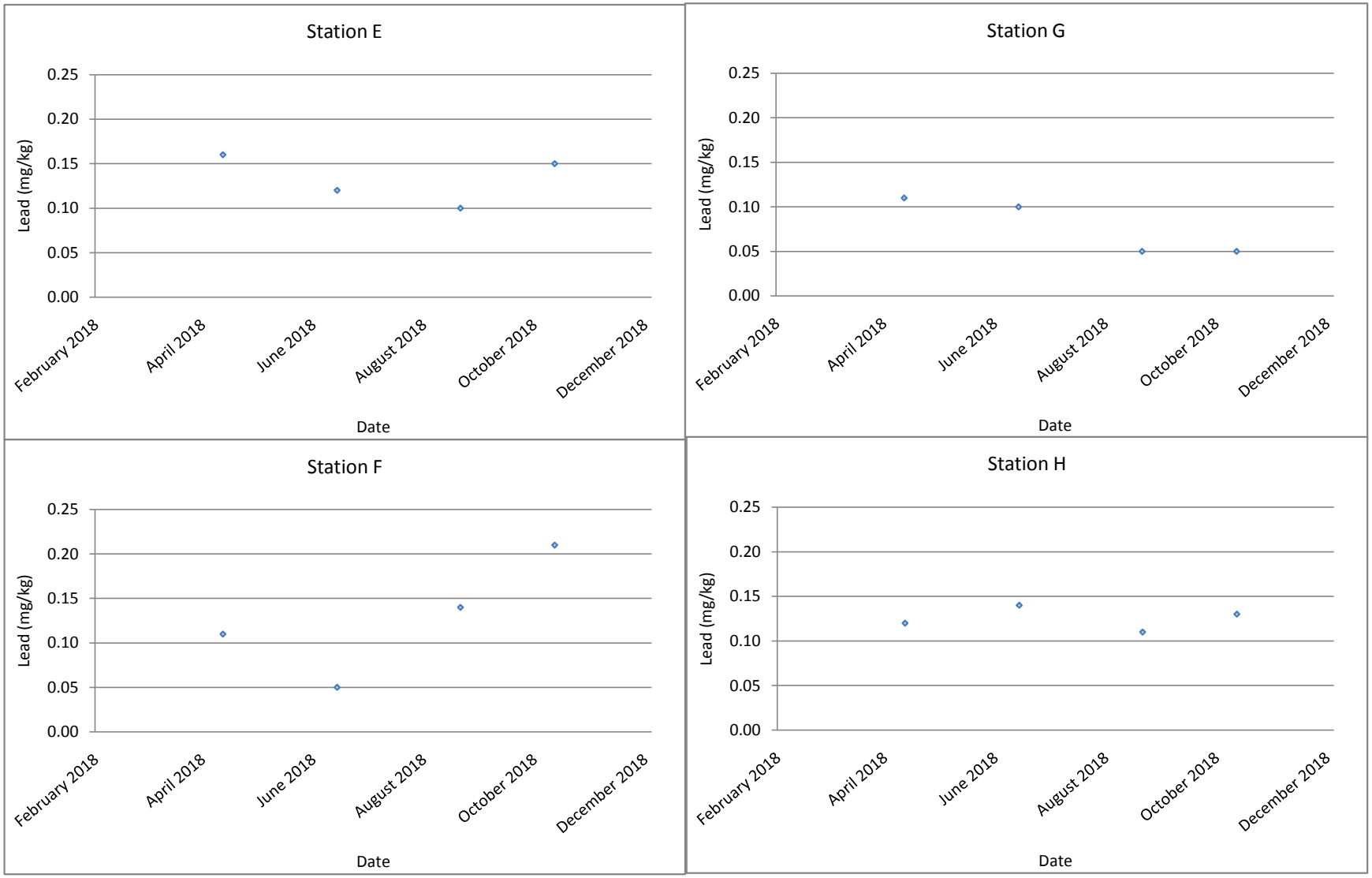

Station B
Copper (mg/kg)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

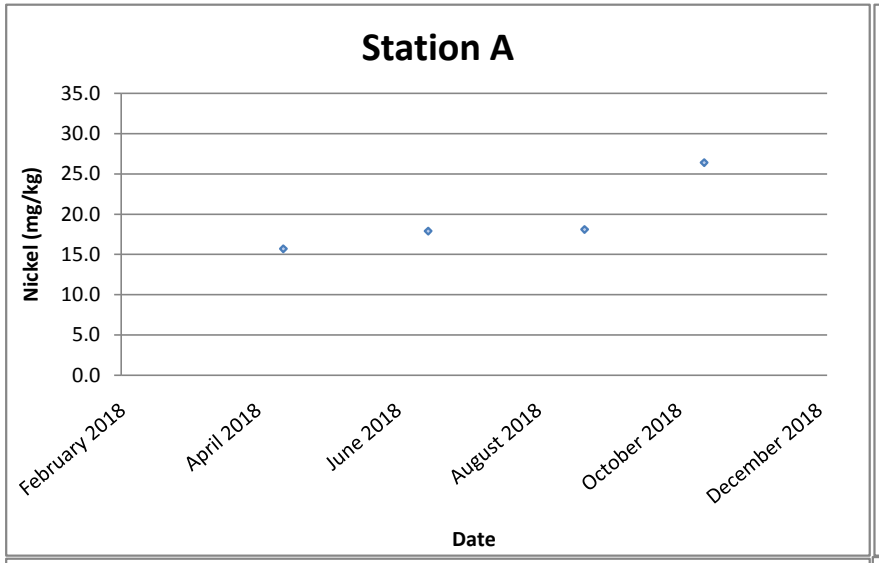

Station D
Copper (mg/kg)
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

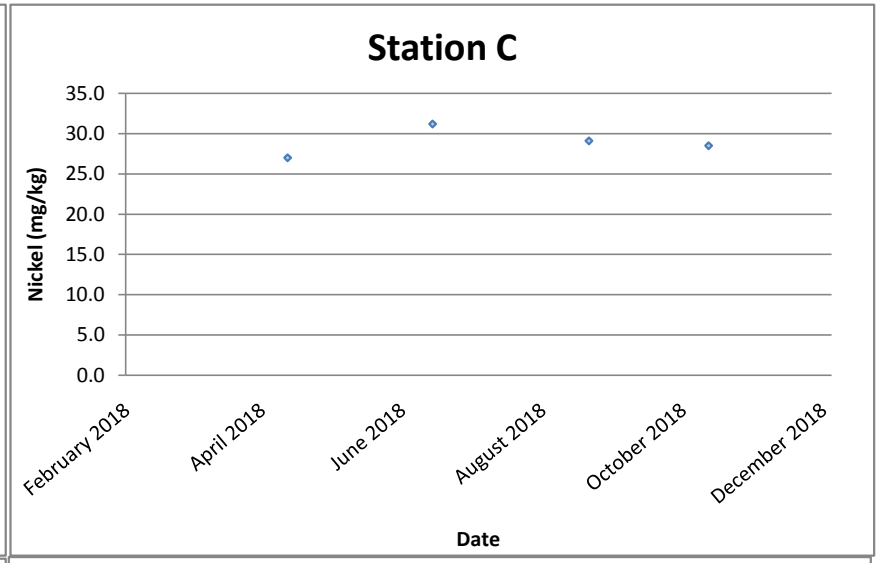

Station E
Copper (mg/kg)
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station G
Copper (mg/kg)
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station F
Copper (mg/kg)
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station H
Copper (mg/kg)
50.0
40.0
30.0
20.0
10.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

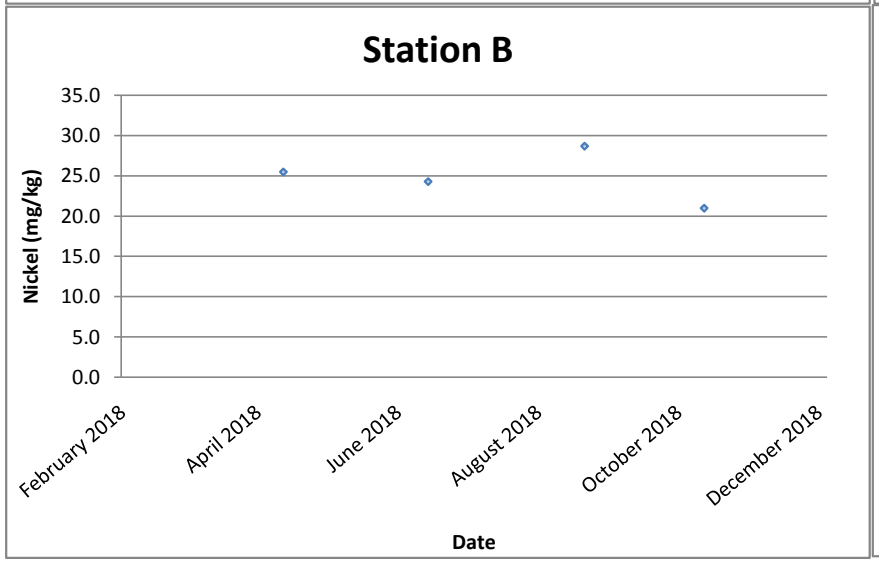

Station A
Lead (mg/kg)
0.25
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station C
Lead (mg/kg)
0.25
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station B
Lead (mg/kg)
0.25
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station D
Lead (mg/kg)
0.25
0.20
0.15
0.10
0.05
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

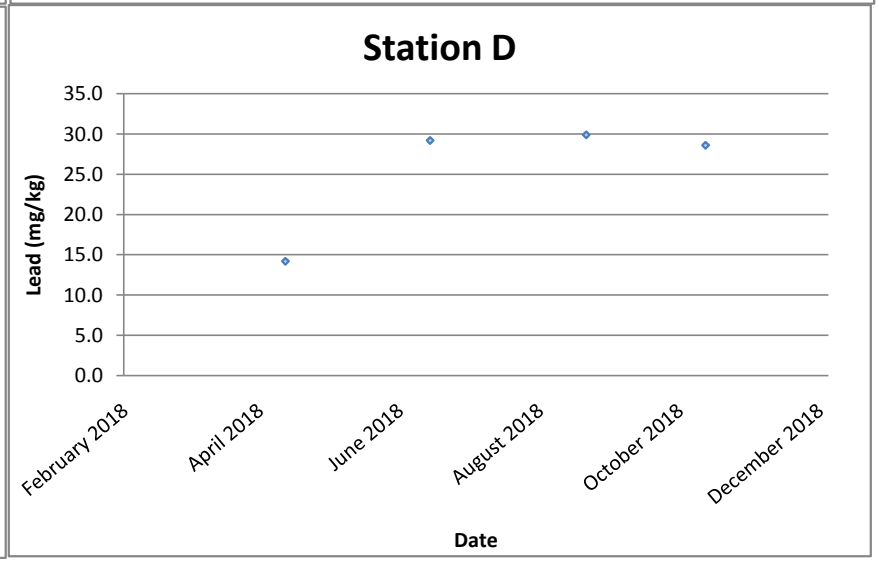
Mercury (mg/kg)

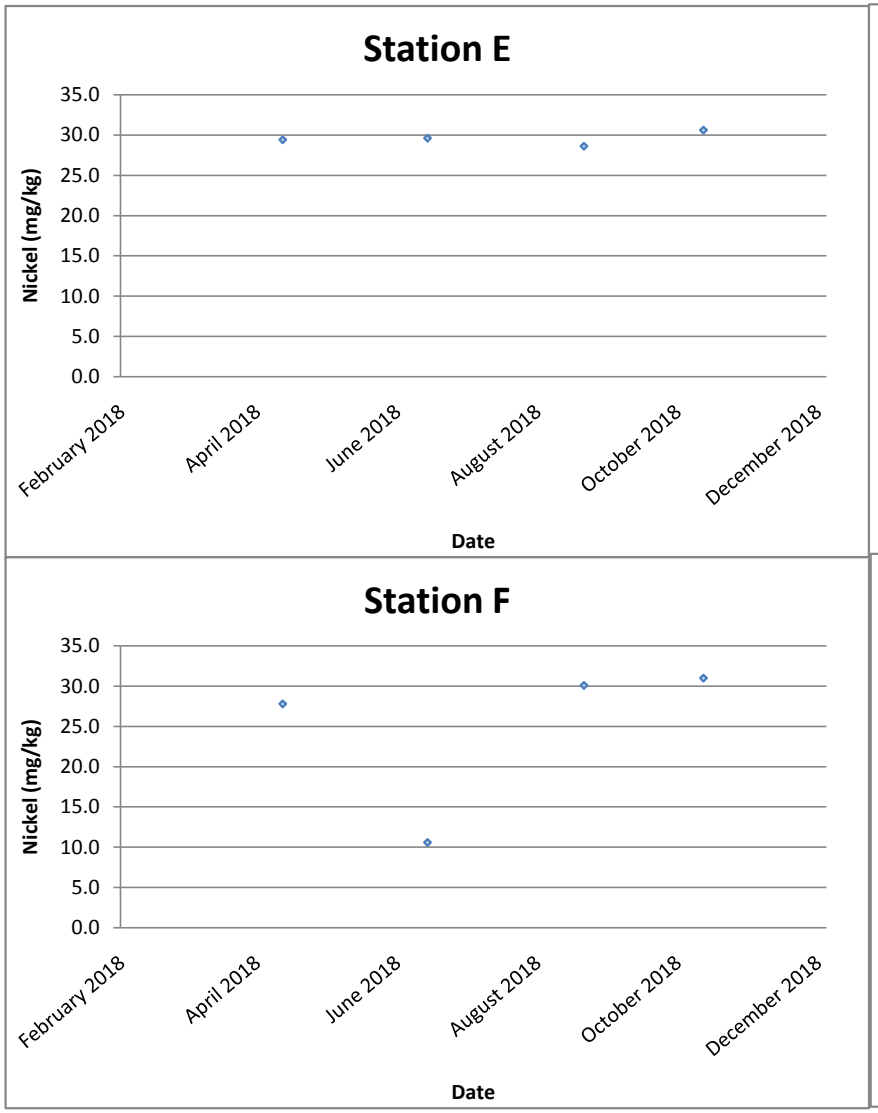


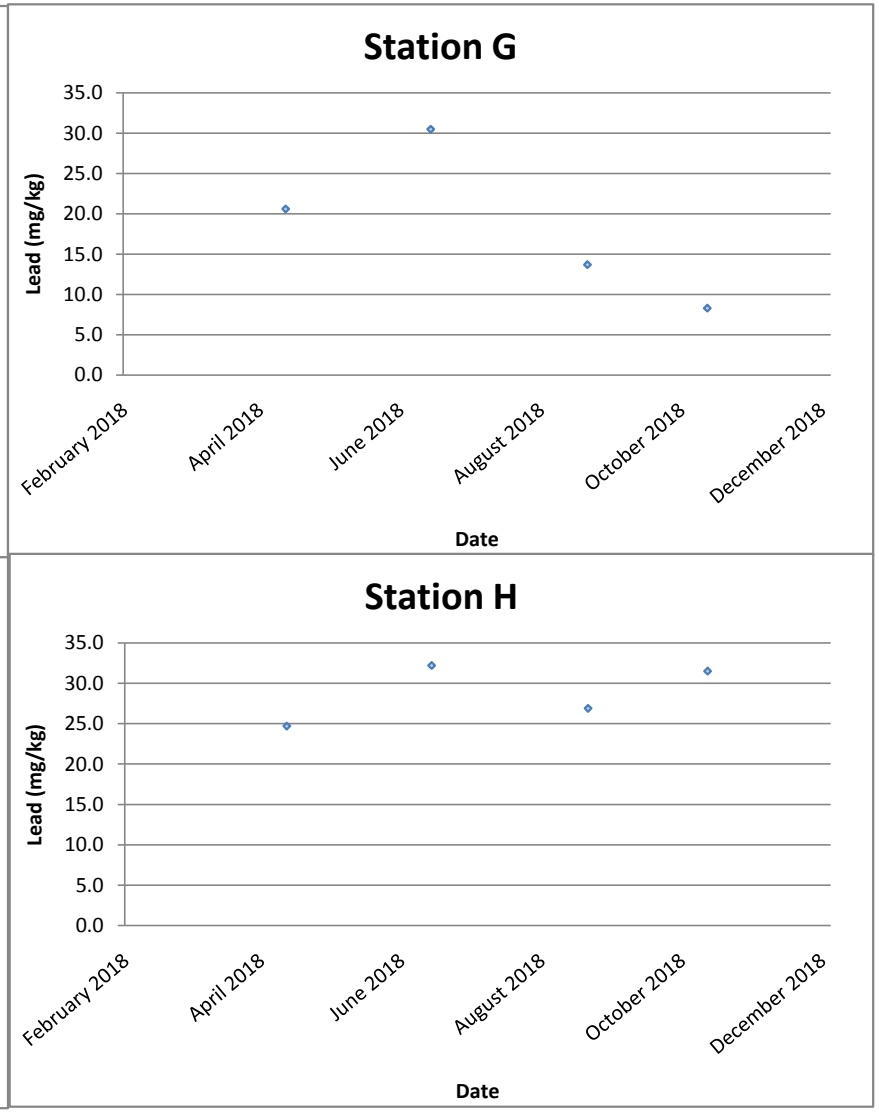

Station A
Nickel (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station C
Nickel (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station B
Nickel (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

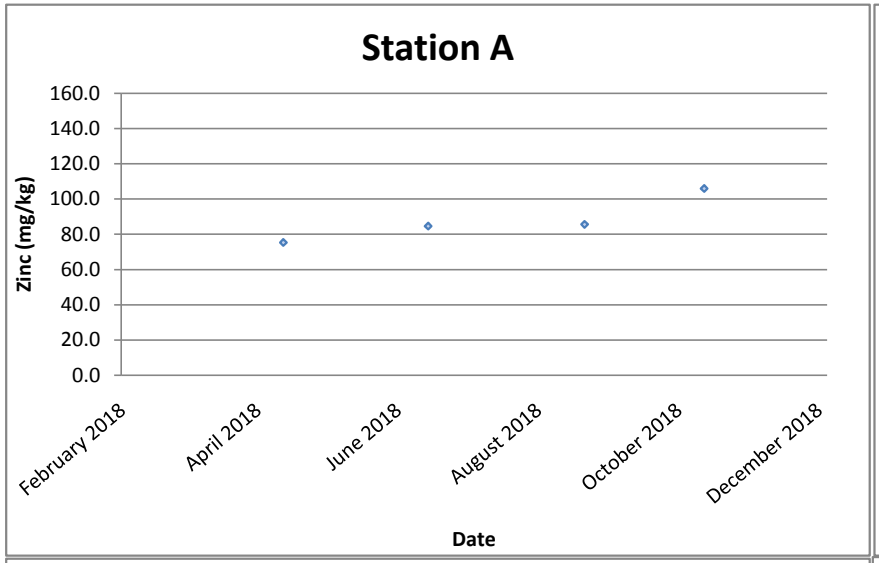

Station D
Lead (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

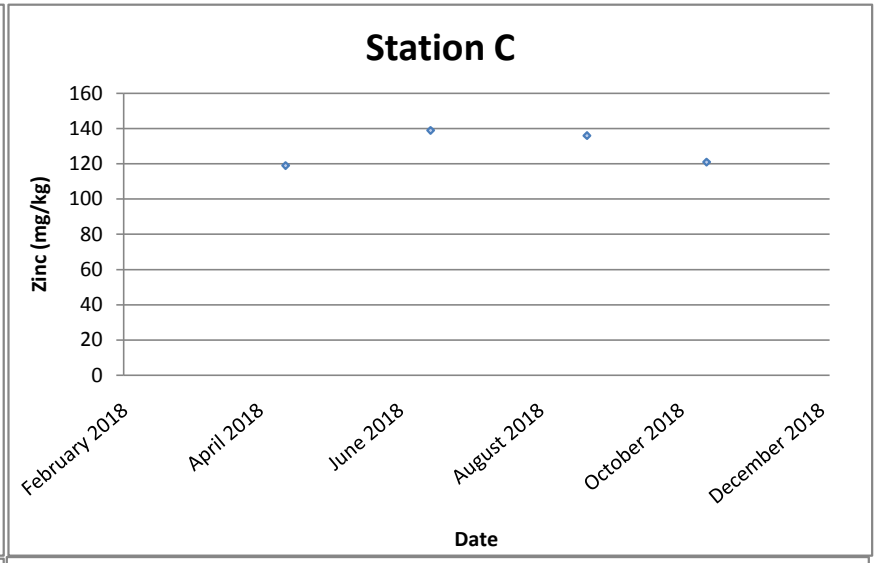

Station E
Nickel (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

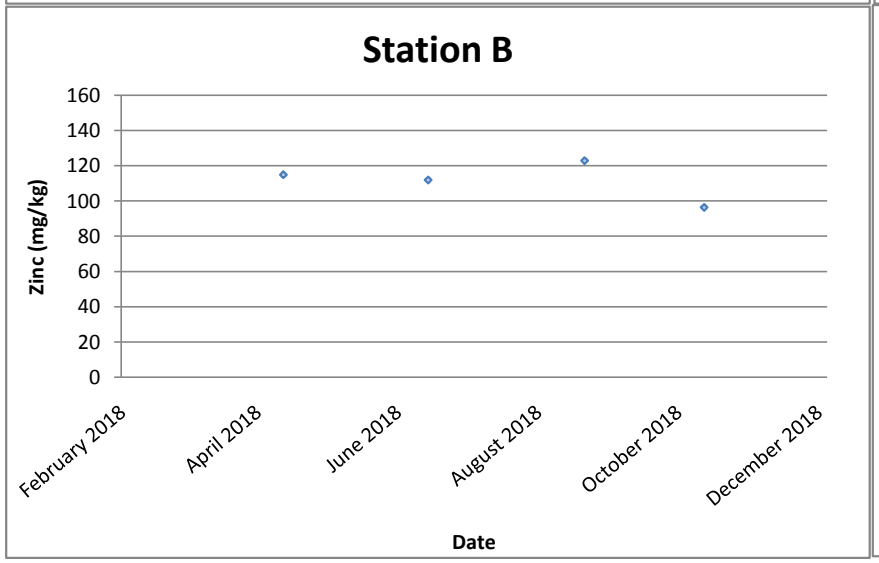

Station G
Lead (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

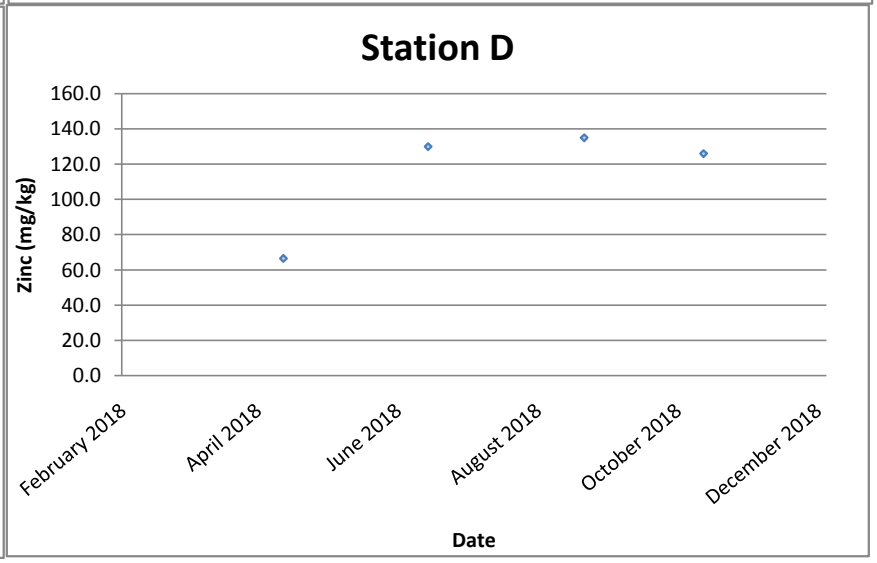
Station F
Nickel (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

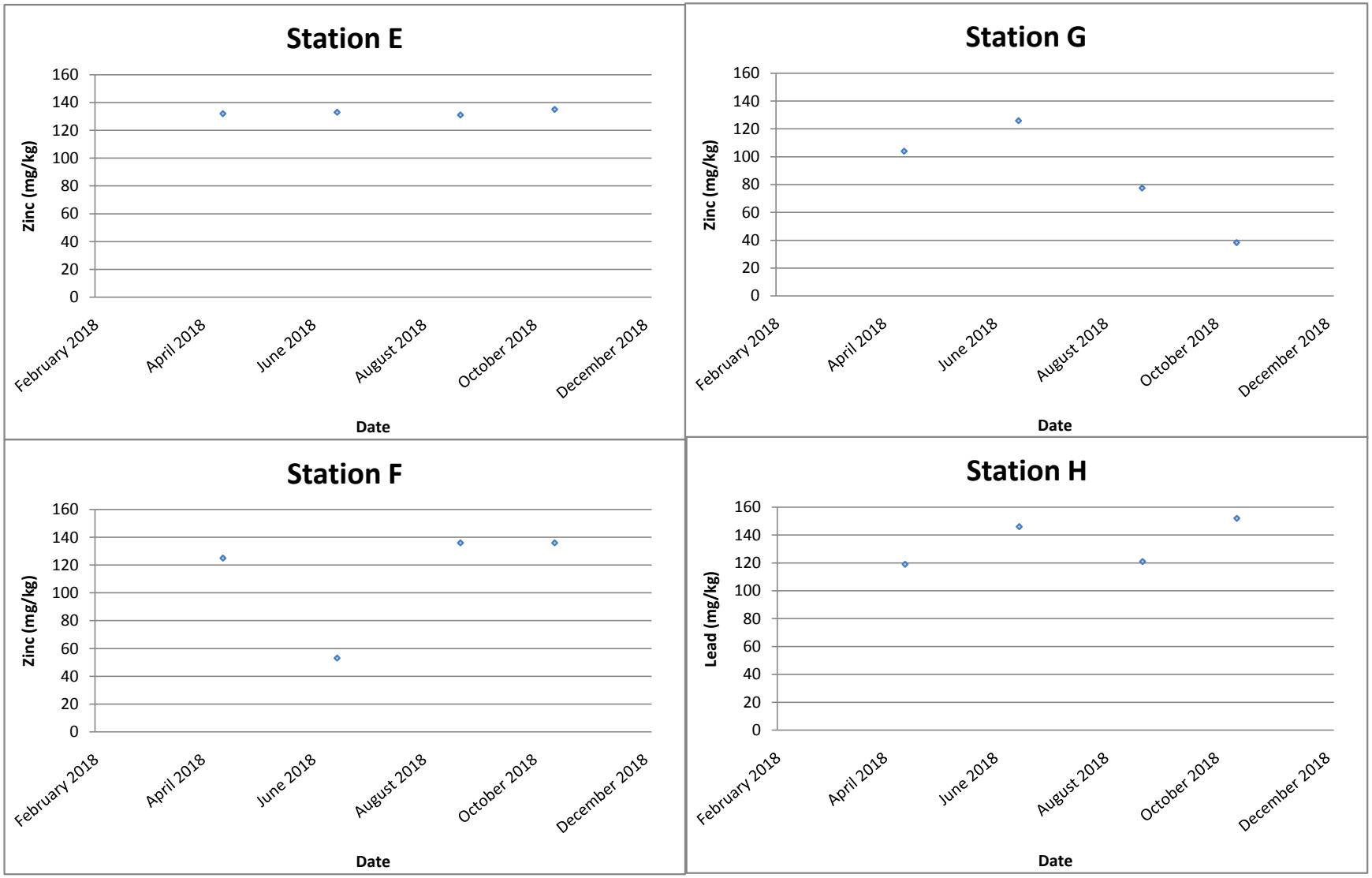
Station H
Lead (mg/kg)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

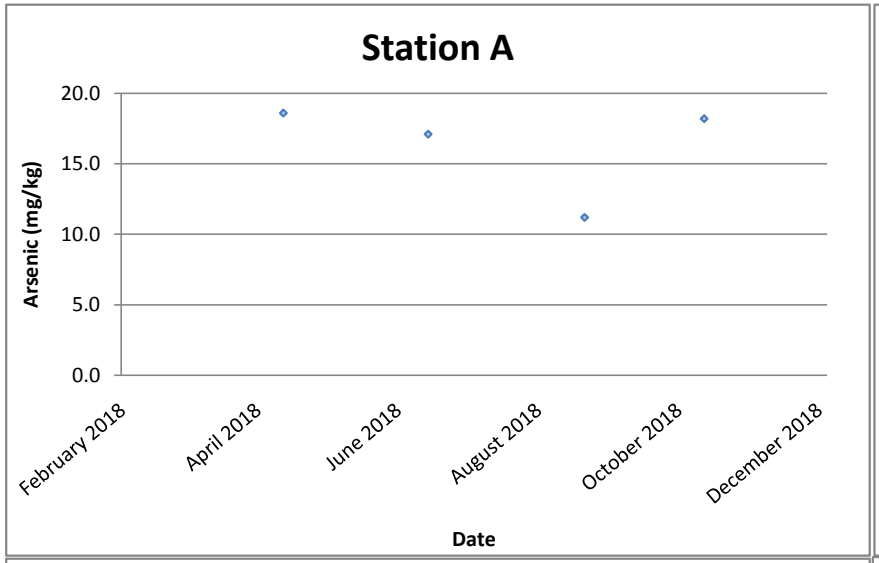

Station A
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Zinc (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

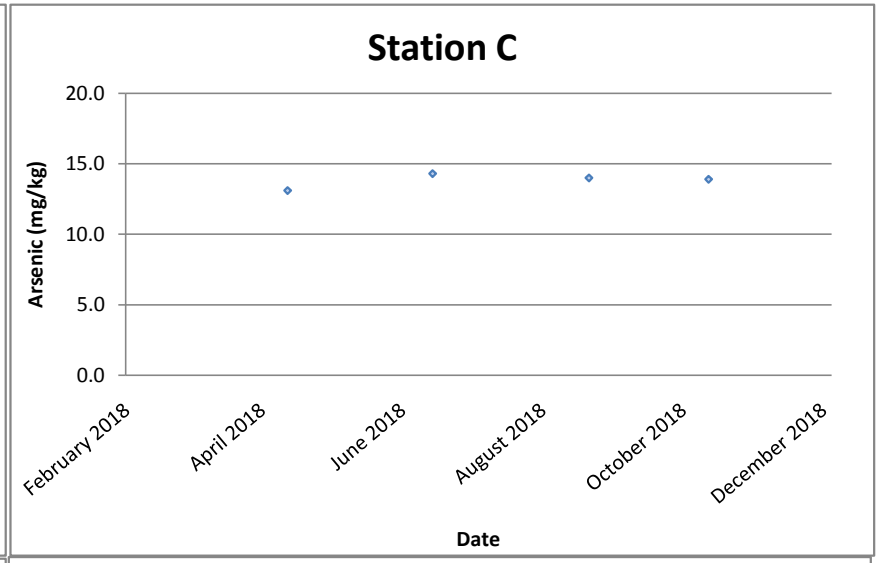

Station C
160
140
120
100
80
60
40
20
0
Zinc (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

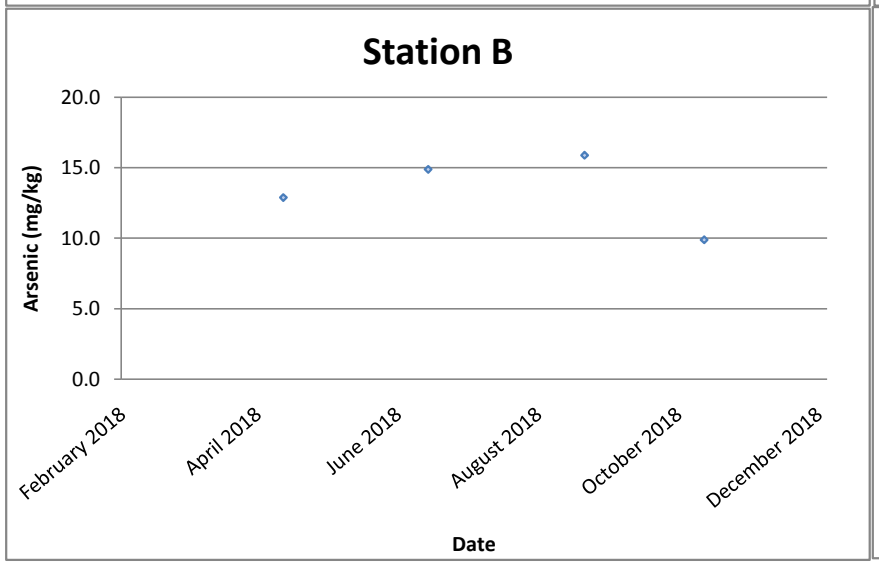

Station B
160
140
120
100
80
60
40
20
0
Zinc (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

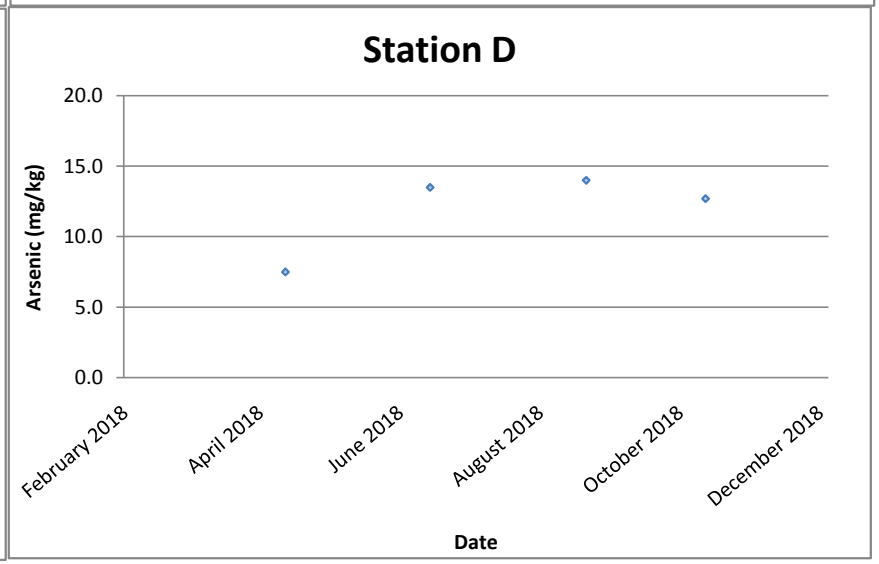

Station D
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Zinc (mg/kg)
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

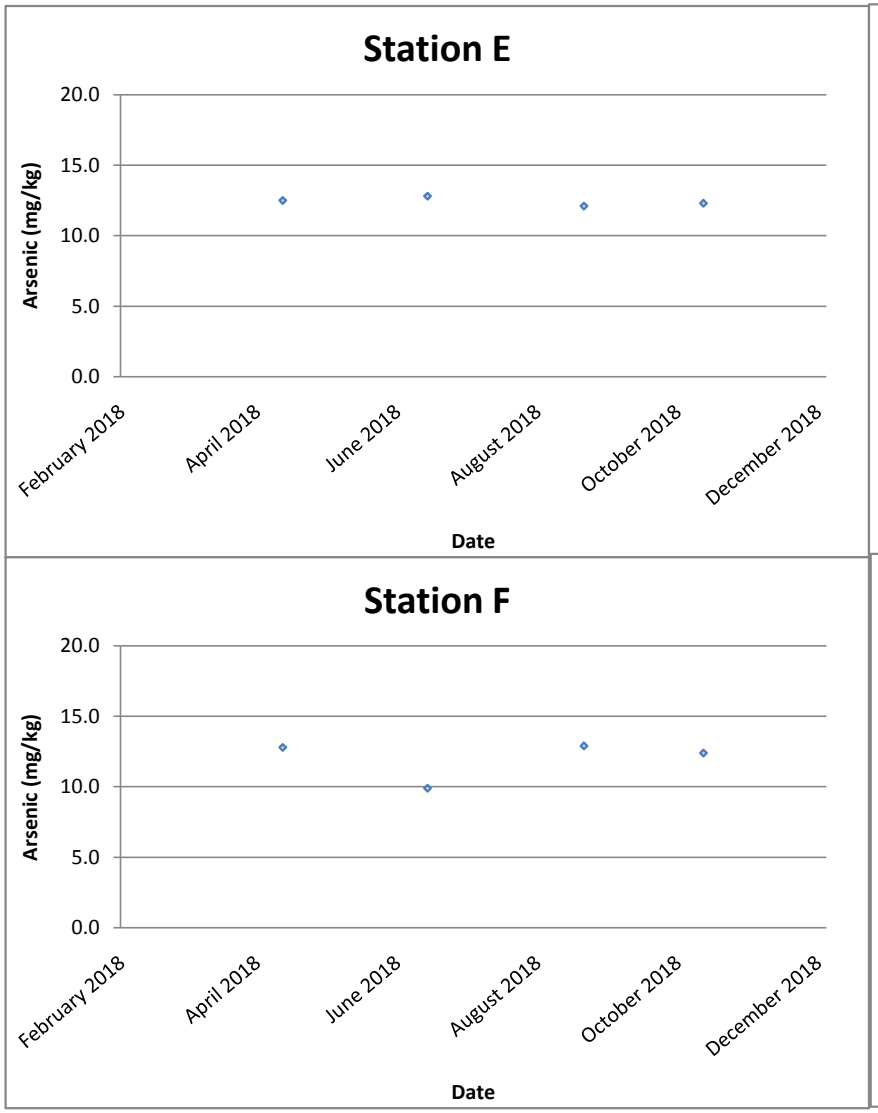

Station E
Zinc (mg/kg)
160
140
120
100
80
60
40
20
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station G
Zinc (mg/kg)
160
140
120
100
80
60
40
20
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station F
Zinc (mg/kg)
160
140
120
100
80
60
40
20
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station H
Lead (mg/kg)
160
140
120
100
80
60
40
20
0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

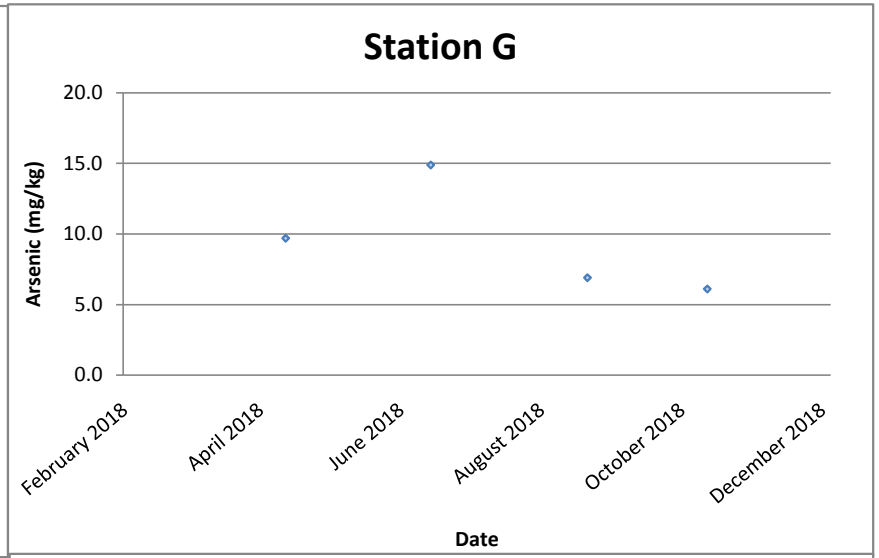

Station A
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station C
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

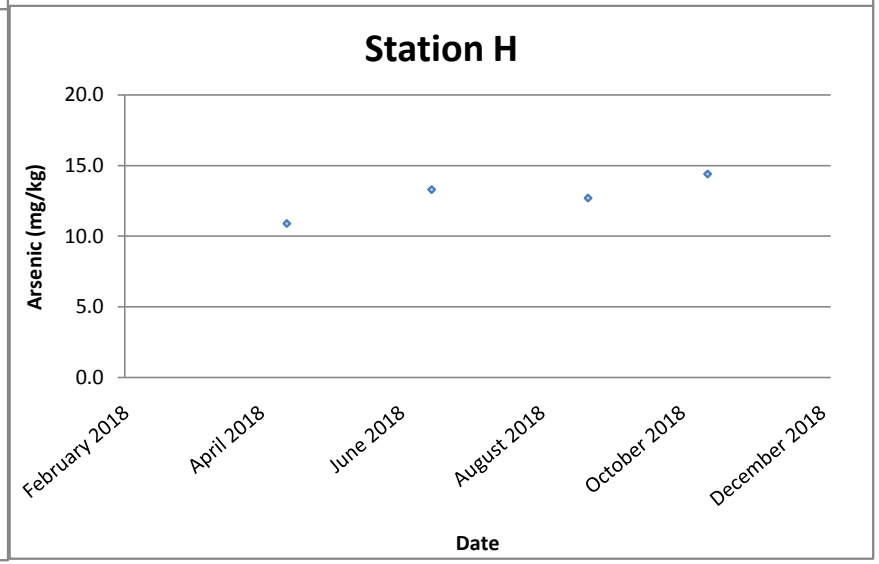

Station B
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

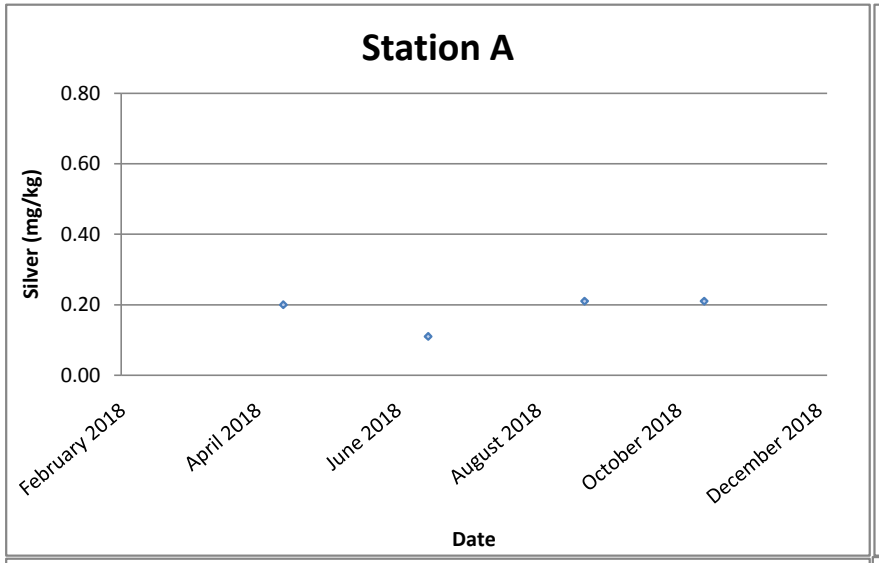

Station D
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

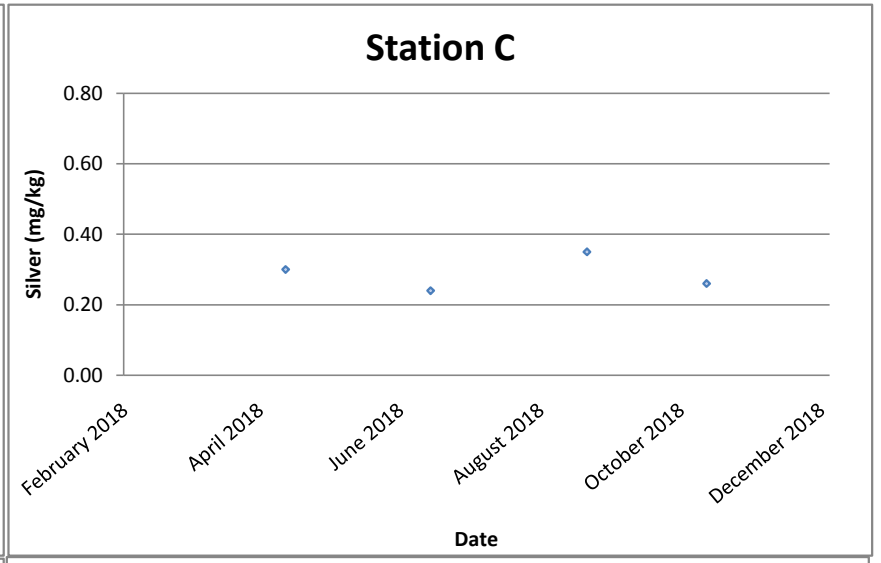

Station E
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

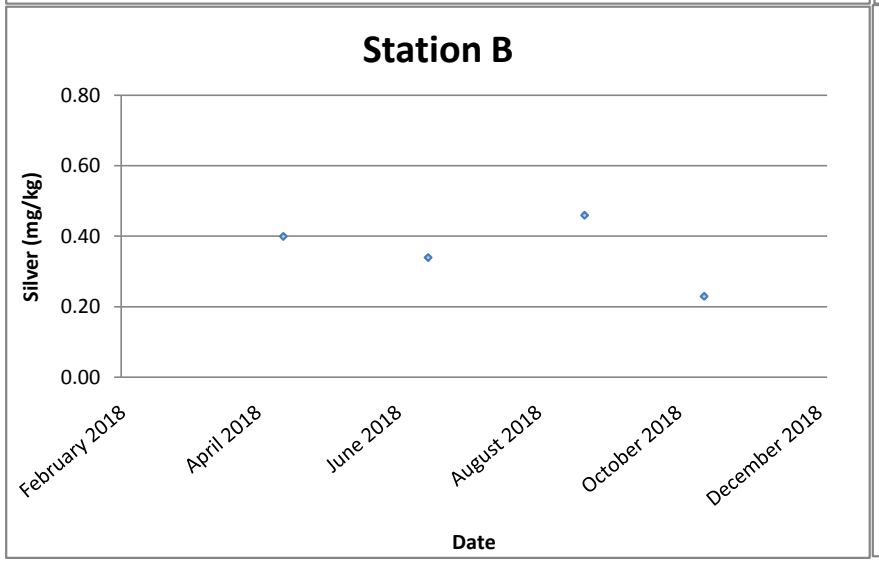

Station G
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

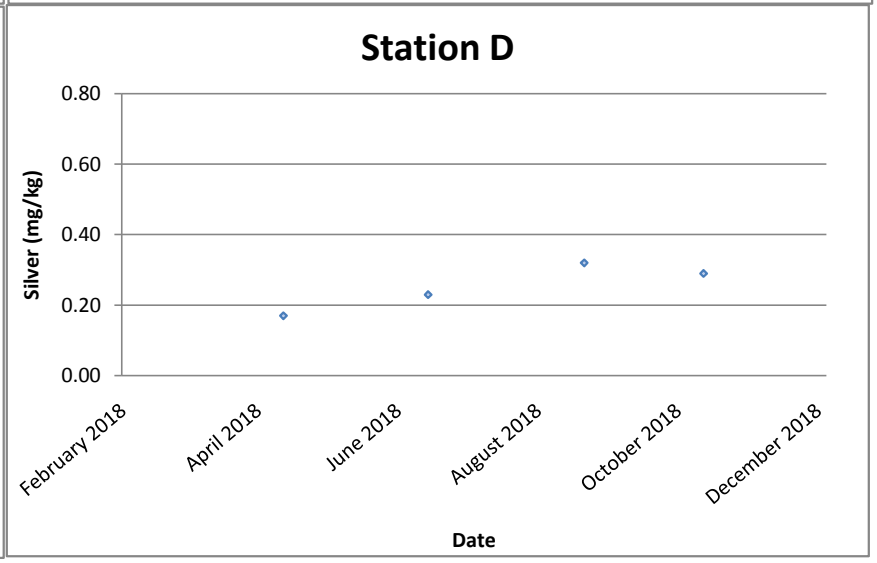
Station F
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

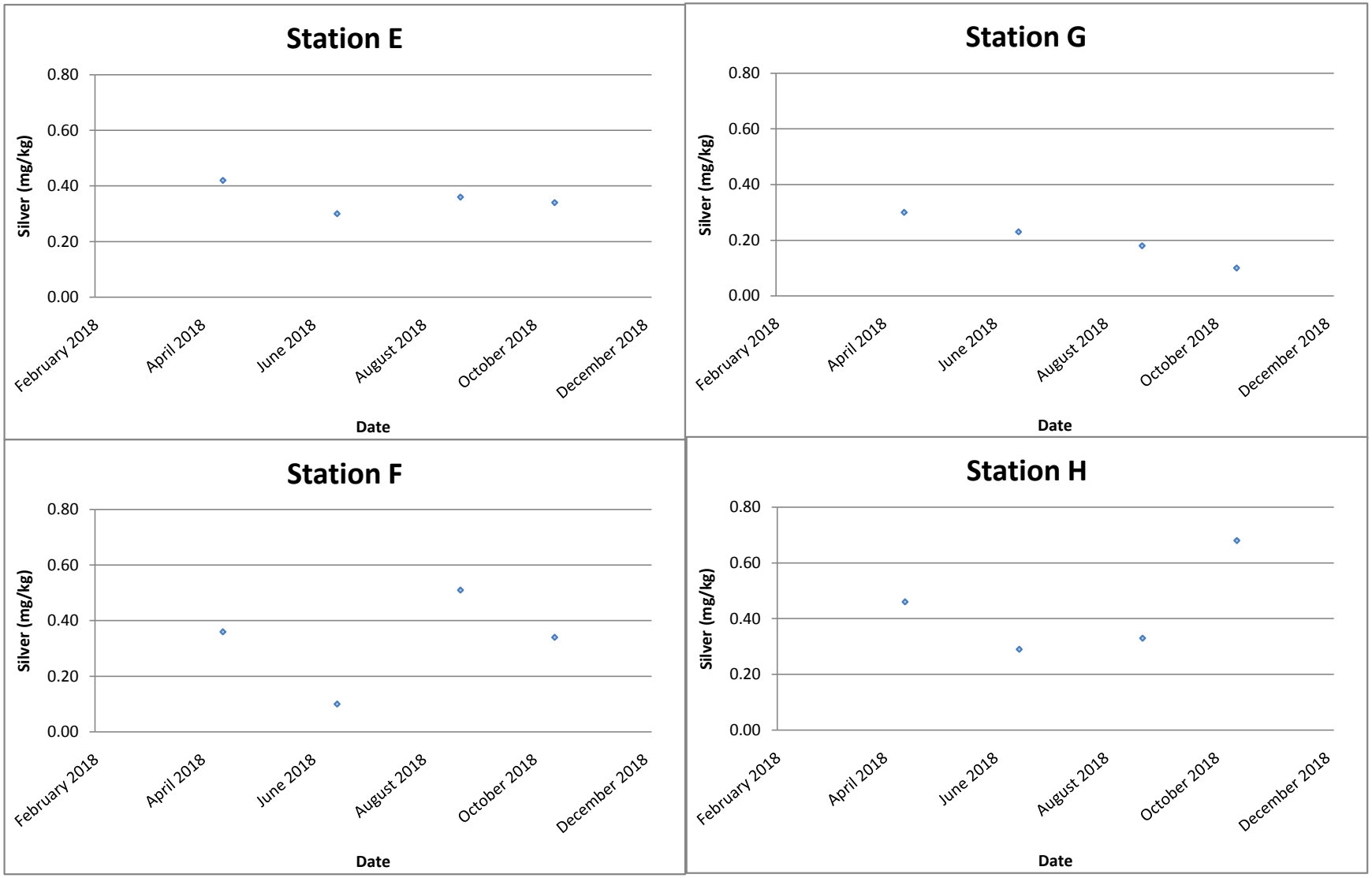

Station H
Arsenic (mg/kg)
20.0
15.0
10.0
5.0
0.0
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station A
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station C
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station B
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station D
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date


Station E
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station G
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station F
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date
Station H
Silver (mg/kg)
0.80
0.60
0.40
0.20
0.00
February 2018
April 2018
June 2018
August 2018
October 2018
December 2018
Date

FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
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Appendix G

Environmental Mitigation Implementation Schedule (EMIS)

FUGRO TECHNICAL SERVICES LIMITED

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EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
Air Quality					
NA	4.5	NA	Odour reduction measures like aeration, chemical dosing system shall be implemented to reduce any odour impacts to an acceptable level.	SHWSTW	Implemented
3.4	4.5	NA	Sewage treatment works including sludge thickening tanks, the sludge pump house and sludge press house shall be completely enclosed.	SHWSTW	Implemented
3.4	4.5	NA	Exhaust air shall be ventilated to an odour scrubber prior to discharge. Ventilating air to a biological treatment unit with 95% odour removal efficiency prior to stack exhaust shall be implemented	SHWSTW	Implemented
Water Quality					
3.3	NA	4.01	To avoid impacts on the marine ecology due to effluent discharge, the disinfection facility as in Part B of the EP shall be equipped with an UV disinfection system capable of removing at least 99.9% of E.coli from the sewage	SHWSTW	Implemented
Waste Management					
3.6	NA	NA	Transportation of sludge shall be carried out in fully enclosed containers, or be placed in sludge skips with tarpaulin covers	SHWSTW	Implemented
NA	NA	5.02	Trip-ticket system mentioned shall be implemented. Trip-ticket is required for each truckload delivered to the landfills facilities according to WBTC No. 31/2004.	SHWSTW	Implemented
NA	NA	5.02	The acceptance criteria for Landfill disposal shoula be followed, i.e. solid content of sludge waste should be more than 30%.	SHWSTW	Implemented
NA	NA	5.02	The disposal of grit & debris (if any) generated during primary screening works should follow the requirement set in the WMP Section 4.05.	SHWSTW	Implemented
NA	NA	5.03	The wet sludge should be temporarily stored at the sludge buffer tank. It should then be transported to the centrifuge building for dewatering and discharged to the container for disposal. The whole process should be managed by the automatic electronic electronic system and monitored by the operators during operation.	SHWSTW	Implemented
NA	NA	5.04	The other solid waste material such as sediment and grit, refuse containers or collection bags should be temporarily stored in slips at designated area. Operators should ensure sufficient space is identified and provided for temporary storage of waste materials to facilitate collection. Storage of waste material on site will be kept to a minimum to avoid nuisance to local residents.	SHWSTW	Implemented
NA	NA	5.05	Chemical wastes which likely to be generated by activities arise from the maintenance, shall followed the Waste Disposal (Chemical Waste) (General) Regulation, includes Schedule 1 of the Regulation.	SHWSTW	Implemented
NA	NA	5.06	In case of unlikely occurred chemical spillage, procedures should be followed as according to the WMP Section 5.06.	SHWSTW	Implemented
NA	NA	5.07	Temporary storage aareas should be identify and provided for the temporary storage of general	SHWSTW	Implemented

EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
			refuse to facilitate collection		
NA	NA	5.07	Domestics wastes refuse generated on-site will be stored in enclosed bins or compaction units separately	SHWSTW	Implemented
NA	NA	5.07	Sufficient dustbins should be provided for domestic waste if required.	SHWSTW	Implemented
NA	NA	5.07	Domestics wastes should be cleared daily and will be disposed off to the nearest licensed landfill or refuse transfer station.	SHWSTW	Implemented
NA	NA	5.07	Spearate labeled bins should be provided to segregate the waste generated by workforce. Waste recycle collector should be employed to collect the segregated waste	SHWSTW	Implemented
NA	NA	5.07	Cardboard and paper packaging (for plant, equipment and materials) shouid be recovered on site, properly stockpiled in dry condition and covered to prevent cross contamination by other materials.	SHWSTW	Implemented
NA	NA	5.07	Office waste should be minimized through using papers on both sides. Communication by electronic means should be used as far as possible.	SHWSTW	Implemented
NA	NA	5.07	The burning of refuse on-site is prohibited by law and shall not be undertaken	SHWSTW	Implemented
NA	NA	5.07	Toilet wastewater shall be transported to the STW for treatment	SHWSTW	Implemented
NA	NA	5.07	Arrangement for collection of recyclable materials by recycling contractors should be followed as according to the WMP Section 5.07.	SHWSTW	Implemented
NA	NA	5.08	All recycling materials removed by the recycling contractors should be properly recorded before the removal. The natures and quantities of the recycling materials, the date of removal and the name of the recycling contractor should be recorded.	SHWSTW	Implemented
NA	NA	5.09	To maintain the site in a clean and tidy condition during the operation, general measures specified in the WMP should be implemented on site at all times. Regular site inspections shall be undertaken by the management team to ensure the measures are implemented.	SHWSTW	Implemented
NA	NA	5.10	Daily cleaning should be performed daily after work within the plant and the public areas immediately next to the site.	SHWSTW	Implemented
NA	NA	5.11	The work officer in charge of the corresponding area should perform daily inspection on the items mentioned in the WMP Section 5.10. If observations were discovered, the work officer should record the result of the inspection on an inspection checklist with photos taken and submitted to the inspectors or Chief Technical Officer for review on the following day. Any deficieny should be rectified promptly.	SHWSTW	Implemented
NA	NA	5.12	Weekly tidying should be performed weekly within the site.	SHWSTW	Implemented
NA	NA	5.13	The inspector should perform Weekly Inspection on the items mentioned in the WMP Section 5.12. If observations were discovered, the work officer should record the result on an inspection checklist and submitted to the Chief Technical Officer for review on the following day. Any deficieny should be rectified promptly.	SHWSTW	Implemented

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EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
NA	NA	5.14	All wastes generated through the operational phase will be manages in accordance with the protocols set out in the WMP Section 5.14.	SHWSTW	Implemented