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Report No.: 0041/17/ED/0504A

Quarterly EM&A Report August 2019 - October 2019

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/0504A

Prepared by: Andy K. H. Choi

Reviewed by: Cyrus C. Y. Lai

Certified by:

A handwritten signature in black ink, appearing to be "C. Yung", written over a horizontal line.

Colin K. L. Yung
Environmental Team Leader
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Our Ref. 1458/19-0030



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Attn: Mr. LAU Ka Kin, Marcus (E/CM16)

31 December 2019

By Post and E-mail

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 2019 TO OCTOBER 2019)

Reference is made to the submission of Quarterly Environmental Monitoring and Audit (EM&A) Report (August 2019 to October 2019) (Report No.: 0041/17/ED/0504A) received from the Environmental Team (ET), Fugro Technical Services Ltd., on 23 December 2019 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.

A handwritten signature in black ink, appearing to be 'Grace M. H. Kwok', written in a cursive style.

Grace M. H. KWOK
Independent Environmental Checker

GK/ri/ck/sc

c.c. Fugro Technical Service (ET Leader)
AECOM

Attn: Mr. Colin YUNG
Attn: Ms. Joanne TSOI

(By E-mail)
(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 ninth Quarterly EM&A Report presents the environmental monitoring and audit works for the period between 1 August 2019 and 31 October 2019. As informed by the Contractor, major activities in the reporting period included:

August 2019 - October 2019

- 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

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

Water quality monitoring, sediment quality monitoring and benthic survey were carried out on August 2019 and October 2019. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

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.



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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 ninth quarterly OEM&A Report which summaries the impact monitoring results and audit findings for the Project within the period between 1 August 2019 and 31 October 2019.

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. Marcus Lau	2594 7218	3104 6426
AECOM	Engineer Representative (ER)	Ms. Joanne Tsoi	3922 9423	3922 9797

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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 2019 - October 2019
<ul style="list-style-type: none">▪ 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.

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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, H₂S 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 (H₂S 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.



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Table 2.2 Durations and Frequencies of Air Quality Monitoring Programme

	Duration	Frequency
H ₂ S 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 H₂S 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 H₂S 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)	<i>E. coli</i> (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)



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Monitoring Parameters	
Sediment Quality Monitoring	Rinsate Blank for Benthic Survey
Lead (mg/kg)	
Mercury (mg/kg)	
Nickel (mg/kg)	
Zinc (mg/kg)	
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 D**.

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, H₂S 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 H₂S concentration (ppb) with the odour unit (OU/m³). 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 H₂S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). 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 H₂S 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 8 August 2019 and 17 October 2019 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

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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 C** and **Appendix E** respectively.

Table 2.5 Summary of In-situ Monitoring Results on 8 August 2019 (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	8.09	22.90	28.43	5.49	3.3	0.26	219.6
	F	8.42	23.55	29.03	5.41	4.6	0.45	182.4
B	E	7.54	21.57	29.61	5.20	3.9	0.24	225.9
	F	8.02	22.58	28.98	5.71	4.6	0.30	195.0
C	E	7.41	22.77	27.38	5.60	3.7	0.25	216.7
	F	7.99	22.40	29.11	5.87	6.0	0.21	164.4
D	E	7.50	21.62	27.41	4.65	3.8	0.23	176.2
	F	8.58	23.06	29.08	5.22	4.8	0.23	153.2
E	E	7.92	23.03	28.21	4.91	6.9	0.14	239.4
	F	8.61	23.99	29.83	6.20	4.5	0.23	175.7
F	E	7.99	23.45	28.22	4.92	5.5	0.31	225.0
	F	8.49	21.73	29.83	5.73	4.6	0.24	198.7
G	E	8.56	23.45	27.87	4.93	3.2	0.35	186.9
	F	7.91	21.73	31.24	7.17	4.8	0.32	162.6
H	E	8.07	23.45	28.28	5.27	7.4	0.19	216.7
	F	8.07	21.73	29.90	7.34	3.7	0.33	196.8

Table 2.6 Summary of In-situ Monitoring Results on 17 October 2019 (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	8.83	31.76	29.22	5.21	13.8	0.28	214.8
	F	8.41	32.00	28.51	5.52	10.9	0.27	199.8
B	E	9.05	32.24	28.89	5.18	14.6	0.24	198.2
	F	8.38	31.43	28.32	5.50	14.0	0.25	219.2
C	E	8.79	32.16	29.13	5.36	15.3	0.18	210.3
	F	8.58	31.91	28.57	5.31	10.0	0.20	213.6
D	E	8.66	32.24	28.93	5.37	15.1	0.25	188.5
	F	8.37	32.00	28.37	5.33	10.0	0.32	208.5
E	E	8.66	31.34	28.76	5.37	14.5	0.17	204.5
	F	8.38	32.35	28.59	5.24	10.7	0.21	202.2
F	E	8.36	31.93	28.85	5.16	13.4	0.22	178.0
	F	8.53	31.23	28.39	5.08	13.2	0.26	220.4
G	E	8.34	32.54	28.50	5.45	13.0	0.28	220.7
	F	8.42	31.79	28.61	5.37	8.6	0.17	180.4
H	E	8.38	32.61	28.15	5.24	11.3	0.24	196.3
	F	8.42	31.72	28.58	5.40	10.5	0.25	182.8



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Table 2.7 Summary of Laboratory Analysis Results on 8 August 2019 (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	9.0	0.007	0.201	0.795	0.999	9	0.05	1.5
	F	7.9	<0.005	0.173	0.722	0.895	<1	0.33	1.2
B	E	10.1	0.009	0.188	0.805	1.001	6.3	0.06	1.7
	F	6.5	<0.005	0.174	0.760	0.934	1	0.05	1.7
C	E	8.3	<0.005	0.191	0.797	0.987	38	0.06	1.1
	F	7.3	<0.005	0.175	0.815	0.990	3	0.05	1.5
D	E	10.4	<0.005	0.199	0.794	0.993	34	0.05	1.2
	F	9.3	<0.005	0.179	0.784	0.962	1	0.05	2.1
E	E	8.9	<0.005	0.171	0.737	0.907	9	0.05	1.8
	F	9.2	<0.005	0.179	0.769	0.948	4	0.05	1.2
F	E	8.6	0.012	0.201	0.775	0.986	12	0.05	1.4
	F	12.6	<0.005	0.177	0.772	0.949	<1	0.05	1.5
G	E	9.3	0.008	0.203	0.743	0.951	13	0.05	2.1
	F	8.2	<0.005	0.177	0.729	0.906	<1	0.05	1.2
H	E	9.2	0.053	0.204	0.733	0.987	9	0.05	2.0
	F	8.4	0.006	0.183	0.751	0.935	<1	0.06	2.0

Table 2.8 Summary of Laboratory Analysis Results on 17 October 2019 (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	11.7	0.053	0.088	0.233	0.374	4	0.03	<1.0
	F	13.1	0.043	0.096	0.241	0.381	7	0.03	1.1
B	E	14.5	0.049	0.086	0.221	0.356	18	0.03	<1.0
	F	12.2	0.057	0.091	0.242	0.391	22	0.03	1.1
C	E	14.5	0.058	0.092	0.244	0.394	22	0.03	1.0
	F	12.4	0.040	0.097	0.243	0.380	28	0.03	1.0
D	E	12.1	0.088	0.090	0.239	0.417	18	0.03	<1.0
	F	12.4	0.041	0.095	0.247	0.384	40	0.03	<1.0
E	E	13.1	0.079	0.081	0.205	0.365	19	0.03	1.2
	F	16.7	0.054	0.085	0.215	0.354	47	0.03	<1.0
F	E	11.0	0.070	0.080	0.191	0.340	24	0.03	<1.0
	F	16.1	0.054	0.085	0.232	0.371	51	0.03	1.1
G	E	11.5	0.066	0.083	0.201	0.350	35	0.03	<1.0
	F	14.0	0.055	0.089	0.236	0.380	24	0.03	1.1
H	E	8.3	0.075	0.084	0.206	0.365	20	0.03	1.1
	F	11.2	0.068	0.087	0.259	0.413	28	0.03	1.2

Table 2.9 Summary of laboratory analysis results for sediment monitoring on 8 August 2019

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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)
A	8.8	5	826	303	<0.10	30.3	25.9	35.4	0.14	17.8	88.0	13.9	0.23
B	8.6	8	1220	397	<0.10	42.0	38.5	44.6	0.20	25.1	117	15.5	0.44
C	8.5	14	1170	450	0.10	48.0	41.8	51.4	0.22	29.5	130	14.1	0.31
D	8.5	12	1180	477	<0.10	46.1	40.4	50.8	0.22	27.8	127	16.0	0.29
E	8.6	14	1510	487	<0.10	48.9	43.6	51.0	0.23	29.0	133	13.0	0.36
F	8.5	26	1880	593	<0.10	48.9	45.1	51.9	0.24	30.1	138	13.3	0.38
G	8.6	18	1540	497	0.11	48.4	49.2	54.7	0.25	29.8	137	13.1	0.39
H	8.5	11	1180	439	0.10	46.0	43.6	46.0	0.18	27.8	113	14.8	0.29

Table 2.10 Summary of laboratory analysis results for sediment monitoring on 17 October 2019

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	3	936	479	<0.10	40.3	31.5	44.8	0.15	23.4	101	17.4	0.24
B	8.6	3	846	417	<0.10	35.1	32.8	37.0	0.10	20.4	92.1	14.4	0.36
C	8.3	10	1140	585	<0.10	49.4	41.8	52.9	0.12	28.9	130	16.6	0.40
D	8.5	5	947	477	0.11	40.7	35.4	43.6	0.11	24.6	109	11.3	0.30
E	8.4	12	1300	562	<0.10	46.6	42.0	49.5	0.12	28.0	126	12.2	0.36
F	8.3	26	1440	589	<0.10	45.8	40.5	48.0	0.15	27.8	121	12.4	0.32
G	8.4	6	1030	502	0.11	46.4	103	67.7	0.11	25.8	216	15.6	0.37
H	8.4	2	941	463	0.13	44.6	43.7	45.7	0.11	26.2	108	14.1	0.39

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	
8 August 2019	A	0.63	13	43	21	23	Dark grey, slightly gravelly, sandy SILT/CLAY with shell fragments
	B	0.86	0	33	36	31	Dark grey, slightly sandy SILT/CLAY with shell fragments
	C	0.92	0	3	55	42	Dark grey, slightly sandy SILT/CLAY
	D	0.93	0	4	56	40	Dark grey, slightly sandy SILT/CLAY with shell fragments
	E	1.07	0	6	52	42	Dark grey, slightly sandy SILT/CLAY with shell fragments
	F	1.19	1	4	55	40	Dark grey, slightly sandy SILT/CLAY with shell fragments
	G	0.90	13	21	36	30	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
	H	0.90	0	1	53	40	Dark grey, slightly sandy SILT/CLAY with shell fragments
17 October 2019	A	0.95	3	27	37	33	Dark grey, slightly sandy SILT/CLAY with shell fragments
	B	0.65	6	25	41	28	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell



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Monitoring Day	Monitoring Station	Total organic carbon (%)	Grain size profile (%)				Description
			Gravel	Sand	Silt	Clay	
							fragments
	C	0.90	0	3	58	39	Dark grey, slightly sandy SILT/CLAY with shell fragments
	D	0.86	0	15	53	32	Dark grey, slightly sandy SILT/CLAY with shell fragments
	E	1.11	0	6	56	38	Dark grey, slightly sandy SILT/CLAY with shell fragments
	F	1.18	0	4	55	41	Dark grey, slightly sandy SILT/CLAY with shell fragments
	G	0.87	10	17	44	29	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
	H	0.85	3	10	54	33	Dark grey, slightly sandy SILT/CLAY with shell fragments

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

I. August 2019

II. Abundance

A total of 255 macrobenthic organisms was recorded from the eight monitoring stations during the August 2019 monitoring period. Compared to both dry (March 2004) and wet (August 2004) seasons baseline data, the present total abundance was relatively lower. This trend was observed since the start of the monitoring activities in April 2018. Generally, decreasing abundances were observed during wet season monitoring periods while increasing abundances during dry season monitoring periods. These variations in the abundances might be attributed to the natural response of the macrobenthic communities to seasonal changes. However, similar to the previous monitoring periods, these observed seasonal variation are not statistically significant (F-value = 1.38; F-crit = 2.10; P-value = 0.22; $\alpha = 0.05$).

Similar to the previous monitoring periods, a more apparent variation (F-value = 2.89; F-crit = 2.15; P-value = 0.01 ; $\alpha = 0.05$) in the total abundances were observed. The lowest abundance with 13 individuals (ind.) was recorded in Station C and the highest (58 ind.) was recorded in Station E. Abundance distribution showed that the impact stations, Stations C and D, has relatively lower values compared to the reference stations, a similar trend was observed in the baseline data. Sediments in these stations remained to be well-sorted composed silt/clay substrate. However, during the present monitoring period, abundance-sediment size correlation was less apparent compared to other monitoring periods.

III. Biomass

The total wet biomass recorded in the eight monitoring stations was 129.87g, which is higher compared to the previous monitoring period (94.27g) but remained higher compared to the baseline data. The highest total biomass was observed in Station E (32.37g) while the impact stations, Station C (0.03g) and Station D (5.97g) exhibited the lowest biomass. The relatively higher biomass observed in Station E was



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contributed by the relatively higher biomass of the molluscan species, *Paphia undulata*. Relatively higher biomass were also recorded in Stations F and G due to the presence of this species.

IV. Taxonomic Composition

A total of eight (8) phyla comprising of 34 families and 50 taxa were identified. The macrobenthic assemblage is remained to be dominated by annelida (64.32%), molluscs (17.25 %), and arthropods (9.80%). The dominant species (abundance ≥ 10) were the polychaetes, *Poecilochaetus* sp. (10 ind.) and *Mediomastus* sp. (11 ind.) recorded in Stations E and Station H, respectively. Similar to the baseline data, the most dominant groups during the present monitoring period were the capitellids (21.57% of the population identified), typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

Highest number of genera was recorded in Station E (21) and the lowest in Station C (8). Similar to abundance and biomass, relatively lower number of taxa was observed at impact stations compared to the reference stations.

V. Diversity

Benthic diversity index (H') and evenness index (J) ranged from 1.99 – 2.28 and 0.89 – 0.96 in impact stations, and 2.41 – 2.76 and 0.85 – 0.94 in the reference station. These suggest that benthic faunal diversity is relatively higher at reference stations than those at impact stations. However, overall diversity in the eight monitoring stations was within the range of typical values recorded in the previous monitoring periods. Compared with the baseline survey result, apparent increase in diversity index and evenness index was observed.

Table 2.12 Summary of Benthic Survey Data on 8 August 2019

Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	30	13.00	18	2.62	0.91
B	27	12.44	15	2.43	0.90
C	13	0.03	8	1.99	0.96
D	22	5.97	13	2.28	0.89
E	58	32.37	21	2.76	0.91
F	43	21.34	15	2.42	0.89
G	27	29.50	14	2.48	0.94
H	35	15.23	17	2.41	0.85
TOTAL	255	129.87			

VI. October 2019

VII. Abundance

A total of 319 macrobenthic organisms were recorded from the eight monitoring stations during the October 2019 monitoring period. Compared to both dry (March 2004) and wet (August 2004) seasons baseline data, the current total abundance remained to be relatively lower. This trend has been observed since the commencement of the monitoring activities in April 2018. As previously reported, generally, decreasing abundances were observed during wet season monitoring



periods while increasing abundances during dry monitoring periods. These variations might be attributed to the natural response of macrobenthic communities to seasonal changes. However, similar to previous monitoring periods, these observed seasonal variation are not statistically significant (F-value = 1.32, F-crit = 1.90, P-value = 0.22).

Similar to the previous monitoring periods, statistically significant (F-value = 3.10, F-crit = 2.11, P-value = 0.006) in total abundances across monitoring stations was observed. The lowest abundances were recorded in the impact stations, Station C and Station D, with 14 ind. and 26 ind., respectively. The highest abundance (56 ind.) was recorded in Station G. Abundance distribution showed that the impact stations have relatively lower abundances compared to the reference stations, a similar trend observed in the baseline data. Sediments in these stations remained to be well-sorted composed silt/clay substrate. During the present monitoring period, stations with moderately sorted sediments have generally higher abundances compared to stations with well-sorted sediments. The abundance-sediment size correlation was more apparent compared to the previous two monitoring periods.

VIII. Biomass

The total wet biomass recorded in the eight monitoring stations was 72.67g, which is lower compared to the previous monitoring period (129.87g). The current biomass is higher compared to the wet season but lower compared to the dry season baseline data. The highest total biomass was recorded in Station E (20.33 g) while the lowest was in the impact station Station C (0.072g), same observation with the previous monitoring period. The higher biomass observed in Station E was contributed by the relatively larger molluscan species, *Paphia undulata*.

IX. Taxonomic Composition

Specimens were identified to family, genus and species level or to the lowest practicable taxon as possible. Fauchald (1977), Huang Z.G. (1994), Rouse & Pleijel (2001), and Xu et al. (2008) were used as the reference for taxonomic or species identification and nomenclature. A total of seven phyla comprising of 33 families and 49 taxa were identified. The benthic fauna composition is dominated by annelids (66.14%), arthropods (19.75%), and molluscs (8.15%). Same as the baseline study, the most dominant group for the October 2019 monitoring period was the polychaetes *Capitellidae*. The most dominant species (abundance ≥ 10) was the polychaete, *Capitella* sp., with the abundance of 11 ind. in Station G. Capitellids are typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

Highest number of genera was recorded in Station E (24) and Station G (24) and the lowest in was in the impact station Station C (9). Similar to abundance and biomass, relatively lower number of taxa was observed at impact stations compared to the reference stations.

X. Diversity

Diversity index (H') and Evenness index (J) ranged from 2.11 – 2.26 and 0.88 – 0.96 in impact stations, and 2.76 – 2.97 and 0.88 – 0.96 among the reference stations, which suggest that benthic faunal diversity is relatively higher at reference stations than those at impact stations. However, overall diversity in the eight monitoring stations was within the range of typical values recorded in the previous monitoring



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periods. Compared with the baseline survey result, the diversity index and evenness index increased.

Table 2.13 Summary of Benthic Survey Data on 17 October 2019

Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	43	9.04	21	2.93	0.96
B	45	7.25	22	2.84	0.92
C	14	0.07	9	2.11	0.96
D	26	7.62	13	2.26	0.88
E	45	20.33	24	2.97	0.94
F	41	8.66	19	2.76	0.94
G	56	14.28	24	2.79	0.88
H	49	5.41	22	2.97	0.96
TOTAL	319	72.67			

2.4.6 The latest AFCD’s report dated 1 August 2019, “*Monitoring of Marine Mammals in Hong Kong Waters (2018-19)*”, in terms of the distribution and abundance of CWDs, was reviewed in the Monthly EM&A report in August 2019. Referring to the latest AFCD’s report, “*Monitoring of Marine Mammals in Hong Kong Waters (2018-19)*”, 192 line-transect vessel surveys with a total survey effort of 6055.6km was conducted amongst 10 survey areas in Hong Kong from April 2018 to March 2019. The impact of increased effluent discharged from Siu Ho Wan outfall on CWDs is not mentioned in this report. However, as mentioned in the 2017 - 2018 AFCD study; there has been a dramatic decline in dolphin occurrence at Northeast Lantau (NEL) from 2012 where dolphins were still frequently spotted near Brothers Islands. Presently, there is a complete absence of dolphins in NEL waters continuing from 2018, as no dolphin was sighted there in the past four consecutive years during AFCD surveys.

2.4.7 Dolphin decline in NEL waters has been strongly linked to the construction works of HZMB and increase in high-speed ferry traffic to/from the Sky Pier as reported in previous monitoring periods. Unfortunately, there was still no sign of recovery even though the marine works for the HZMB was completed in 2017. The lack of recovery in dolphins usage in this once-important dolphin habitat could also be related to the persistent disturbance of construction works in the nearby massive reclamation project for the 3RS works, since 2016, and such disturbance will continue at least for several years which may continue to affect the potential recovery of dolphin usage in NEL waters. Continued systematic dolphin surveying in Lantau Island is necessary to further study this issue.

2.4.8 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 (2019-20) is uploaded to AFCD’s webpage.

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3. ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION 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 F**.

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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 F**.

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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 8 August 2019 and 17 October 2019. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

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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 6.1** and **Table 6.2**.

Table 6.1 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 6.2 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



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7. CONCLUSION

- 7.1.1 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 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 H₂S concentration (ppb) with the odour unit (OU/m³). 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 H₂S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). 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 H₂S 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 8 August 2019 and 17 October 2019 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 1 August 2019, "*Monitoring of Marine Mammals in Hong Kong Waters (2018-19)*" in terms of the distribution and abundance of CWDs was reviewed in the Monthly EM&A report in August 2019. Referring to the latest AFCD's report, "*Monitoring of Marine Mammals in Hong Kong Waters (2018-19)*", 192 line-transect vessel surveys with a total survey effort of 6055.6km was conducted amongst 10 survey areas in Hong Kong from April 2018 to March 2019. The impact of increased effluent discharged from Siu Ho Wan outfall on CWDs is not mentioned in this report. However, as mentioned in the 2017 - 2018 AFCD study; there has been a dramatic decline in dolphin occurrence at Northeast Lantau (NEL) from 2012 where dolphins were still frequently spotted near Brothers Islands. Presently, there is a complete absence of dolphins in NEL waters continuing from 2018, as no dolphin was sighted there in the past four consecutive years during AFCD surveys.
- 7.1.5 Dolphin decline in NEL waters has been strongly linked to the construction works of HZMB and increase in high-speed ferry traffic to/from the Sky Pier as reported in previous monitoring periods. Unfortunately, there was still no sign of recovery even though the marine works for the HZMB was completed in 2017. The lack of recovery in dolphins usage in this once-important dolphin habitat could also be related to the persistent disturbance of construction works in the nearby massive reclamation project for the 3RS works, since 2016, and such disturbance will continue at least for several years which may continue to affect the

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potential recovery of dolphin usage in NEL waters. Continued systematic dolphin surveying in Lantau Island is necessary to further study this issue.

7.1.6 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 (2019-20) is uploaded to AFCD's webpage.

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

7.1.8 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

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 H₂S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). 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 H₂S 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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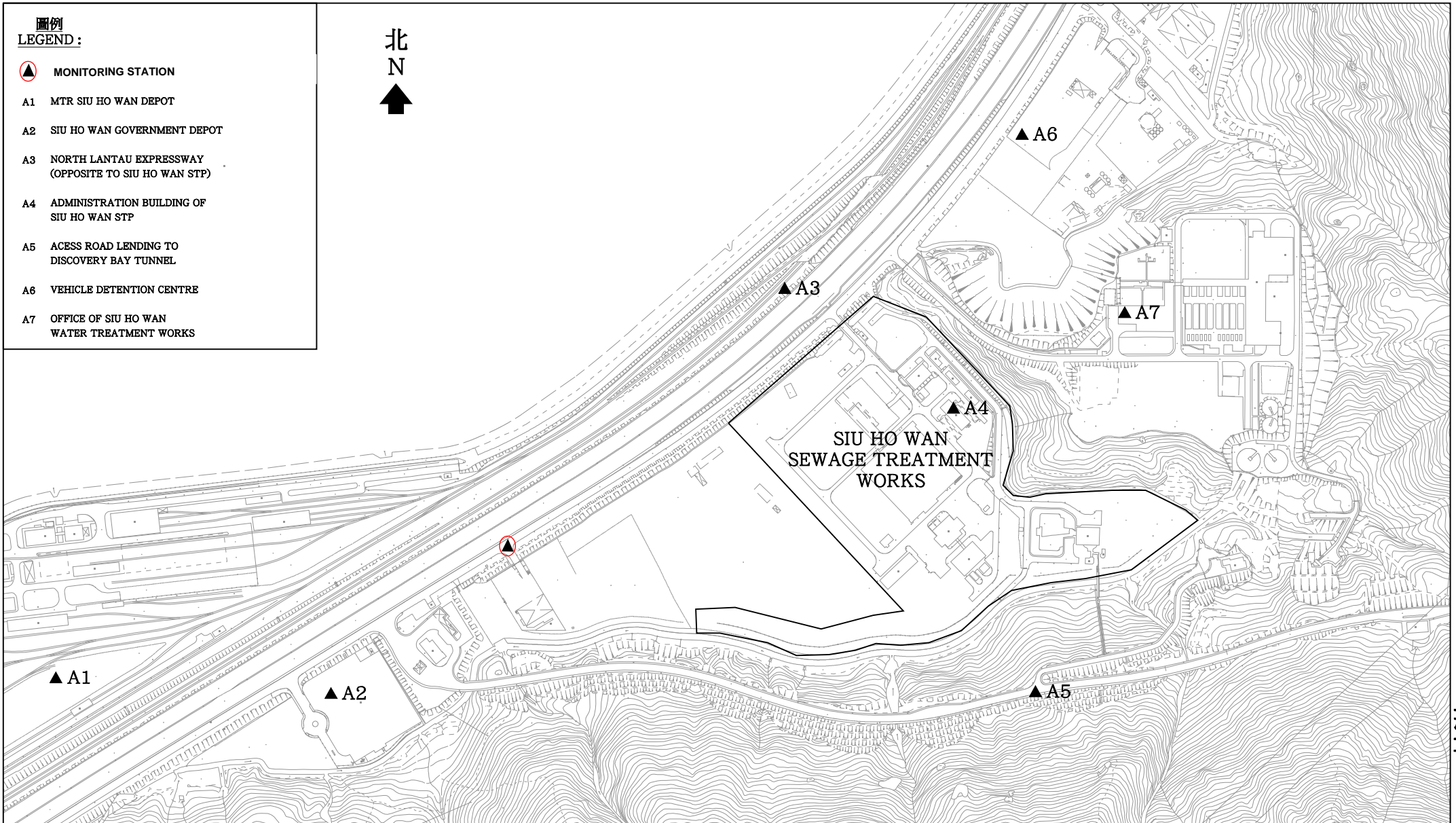
Report No.: 0041/17/ED/0504A


Figure 1

Monitoring Location of Air Sensitive Receiver

圖例
LEGEND :

-  **MONITORING STATION**
- A1** MTR SIU HO WAN DEPOT
- A2** SIU HO WAN GOVERNMENT DEPOT
- A3** NORTH LANTAU EXPRESSWAY
(OPPOSITE TO SIU HO WAN STP)
- A4** ADMINISTRATION BUILDING OF
SIU HO WAN STP
- A5** ACCESS ROAD LENDING TO
DISCOVERY BAY TUNNEL
- A6** VEHICLE DETENTION CENTRE
- A7** OFFICE OF SIU HO WAN
WATER TREATMENT WORKS



<p>圖則名稱 drawing title</p> <p>UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT OPTIONAL ENVIRONMENTAL MONITORING AND AUDIT PLAN ODOUR PATROL MONITORING STATIONS</p>	繪畫 drawn	C.W. CHAN	日期 date	16-08-2006	圖則編號 drawing no.	DCM/2006/063	比例 scale	N.T.S.
	核對 checked	C.K. LAM	日期 date	16-08-2006	保留版權 COPYRIGHT RESERVED			
	批核 approved	S.K. WONG	日期 date	16-08-2006	 <p>香港特別行政區政府渠務署 DRAINAGE SERVICES DEPARTMENT GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION</p>			
	部門 office		顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION					

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Figure 2

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



816000E

818000E

820000E

822000E

822000N

大小磨刀
BROTHERS

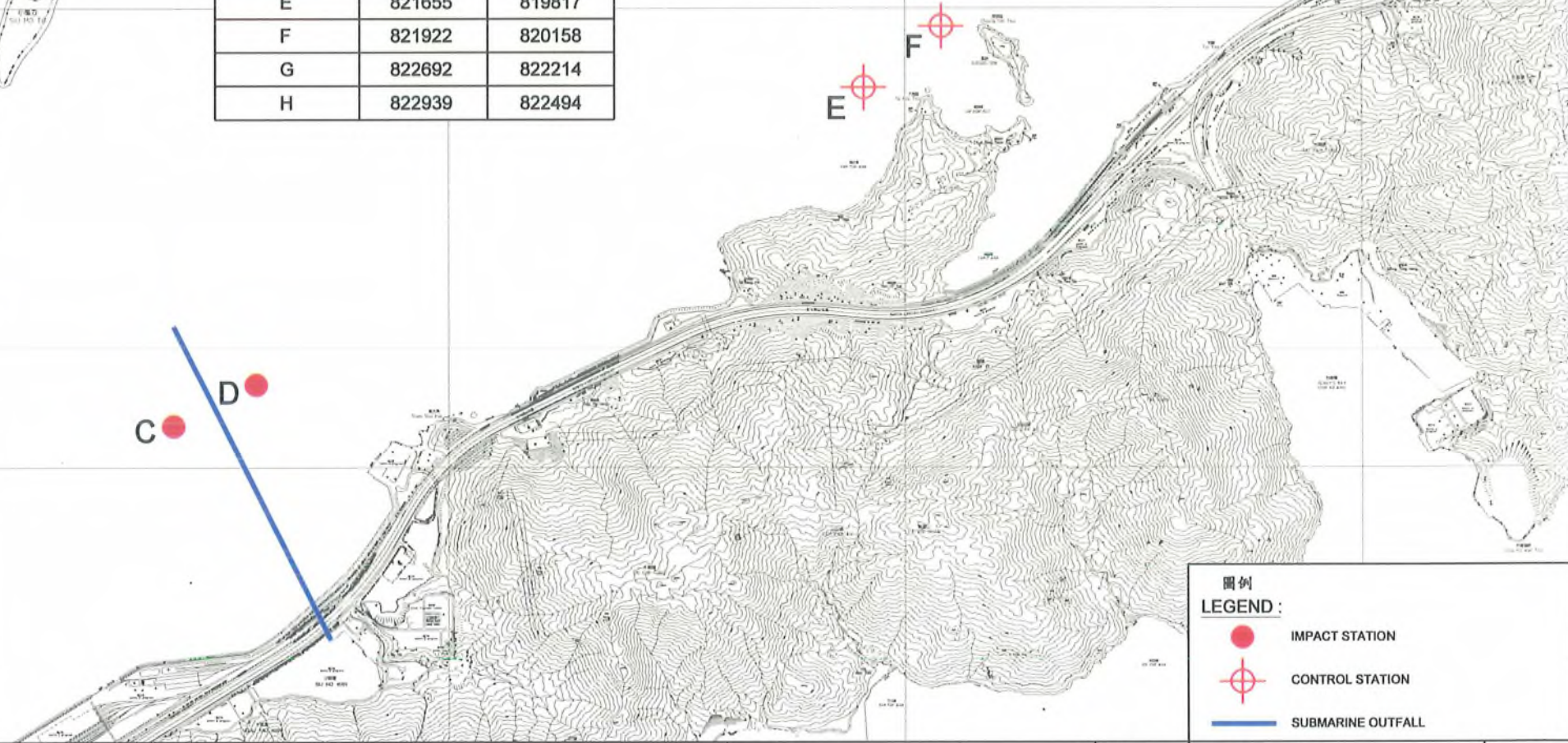
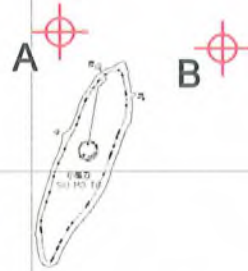
820000N

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.

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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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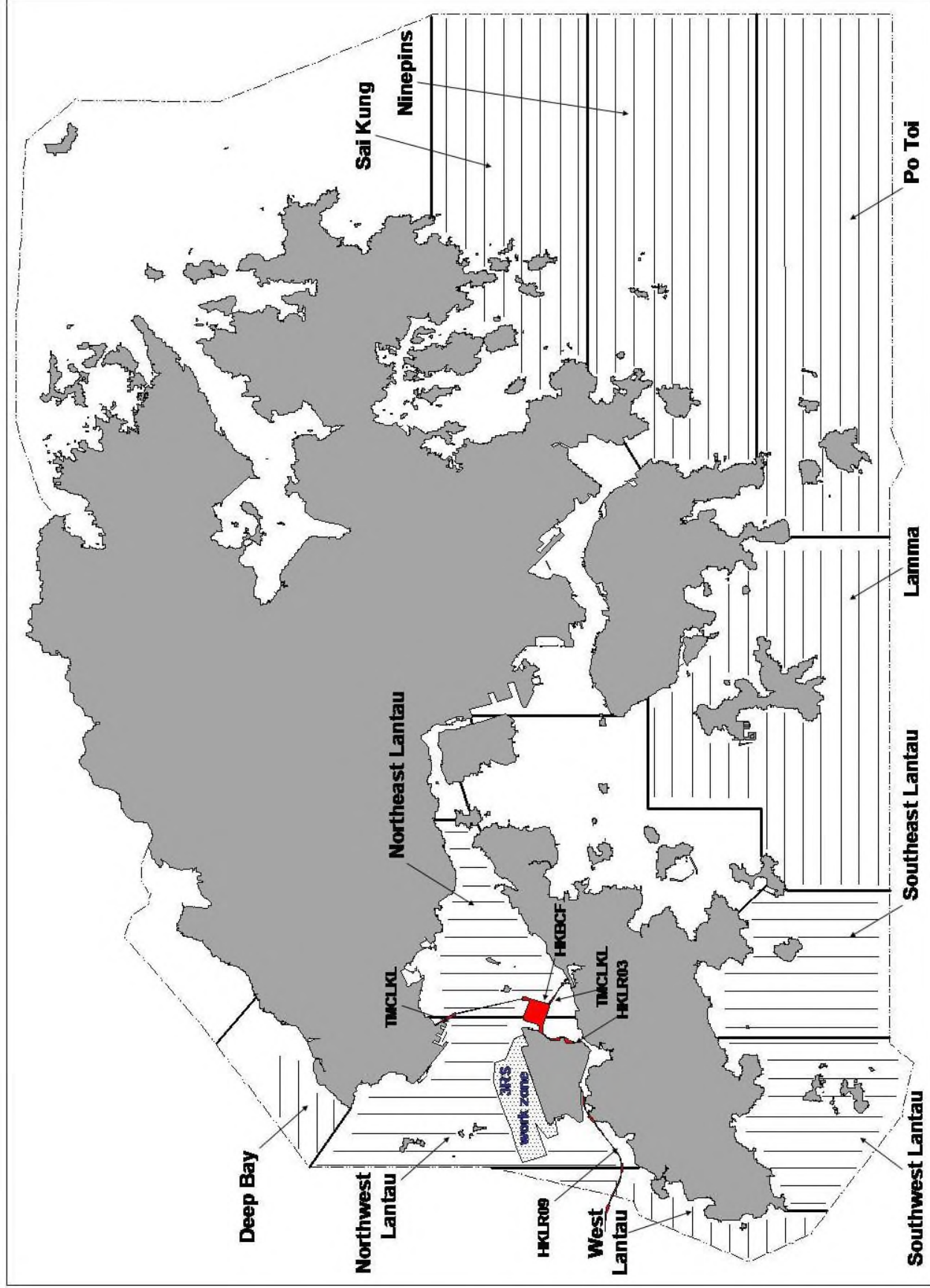
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Figure 4

Location of Survey Areas of Chinese White Dolphins



Ten Line-Transect Survey Areas within the Study Area for the 2018-19 Monitoring Study

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Appendix A Project Organization Chart

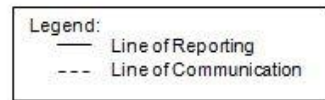
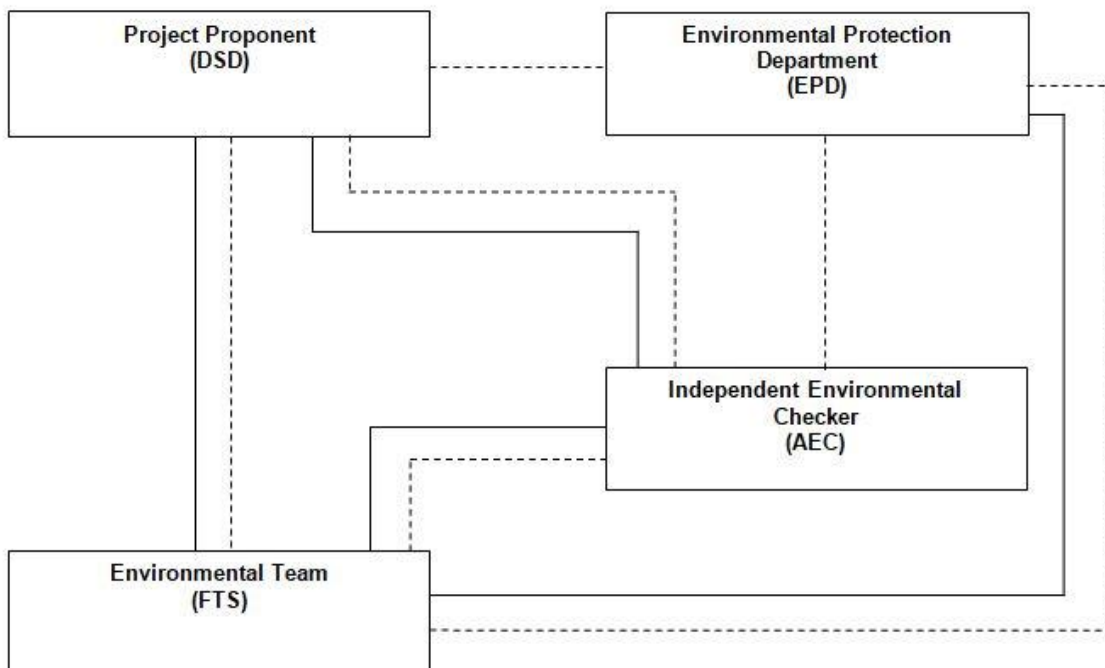
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Appendix B

Action and Limit Levels for Air Quality Monitoring

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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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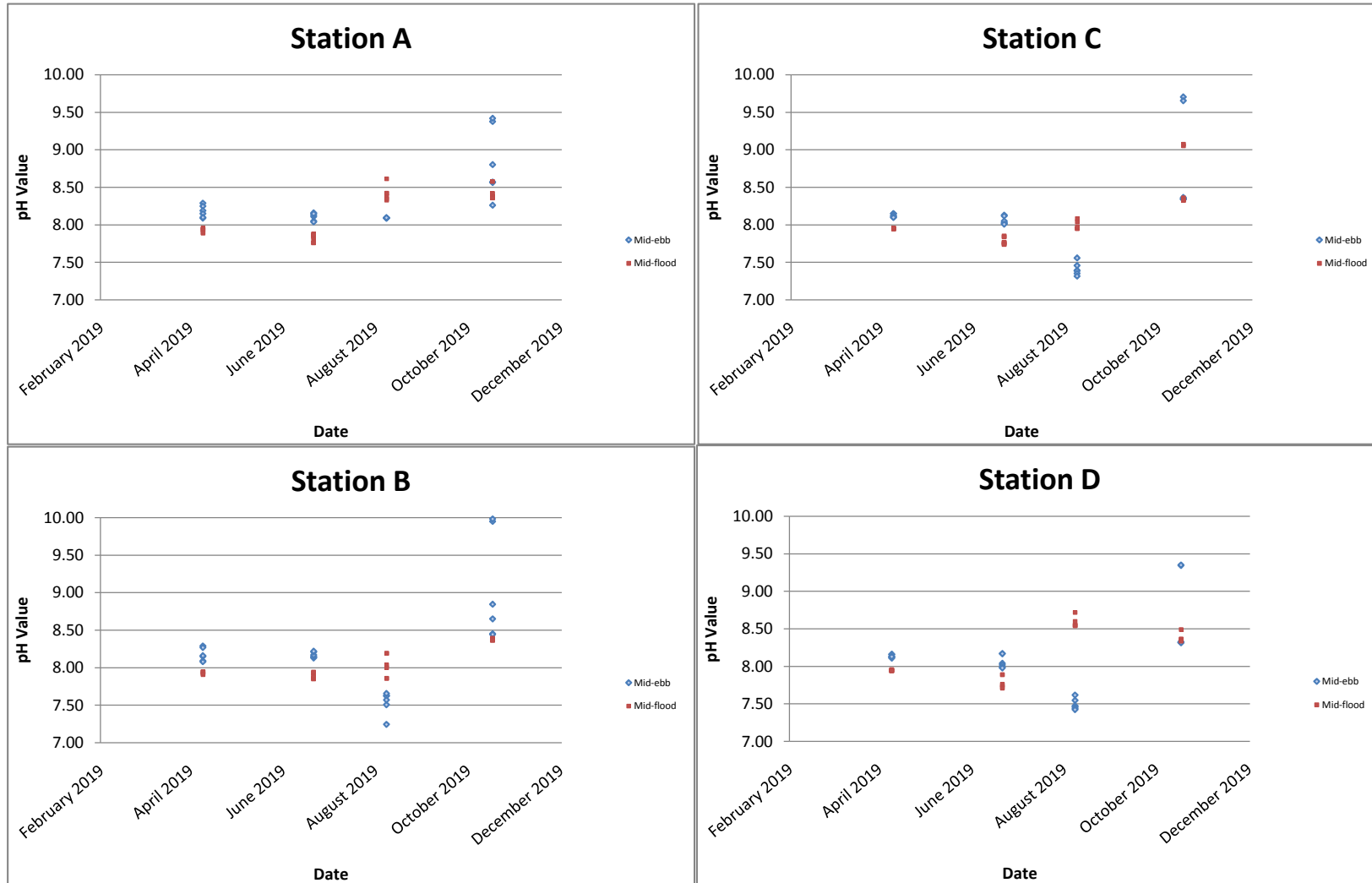


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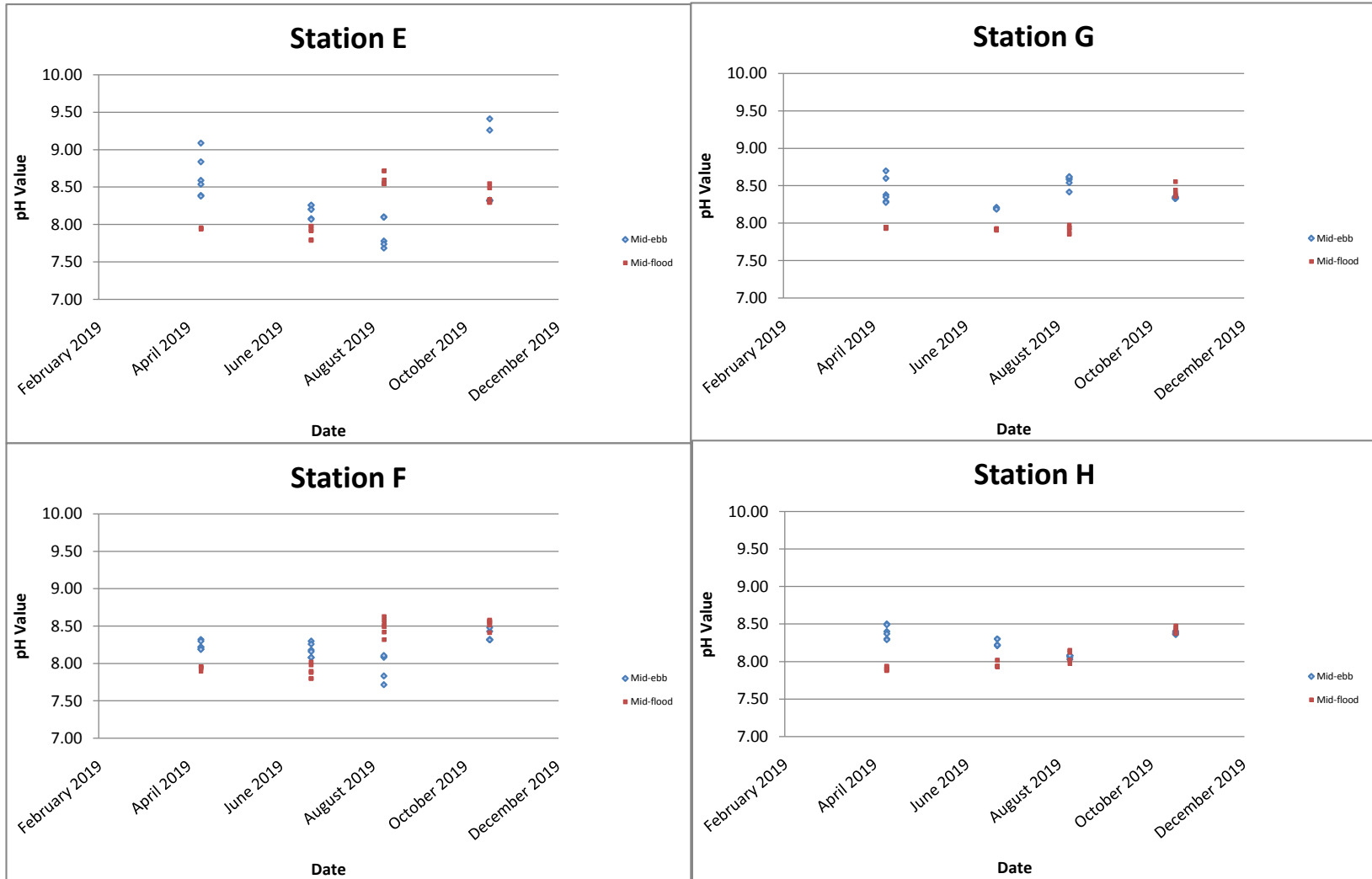
Appendix C

Graphical Presentation of Water Quality Monitoring

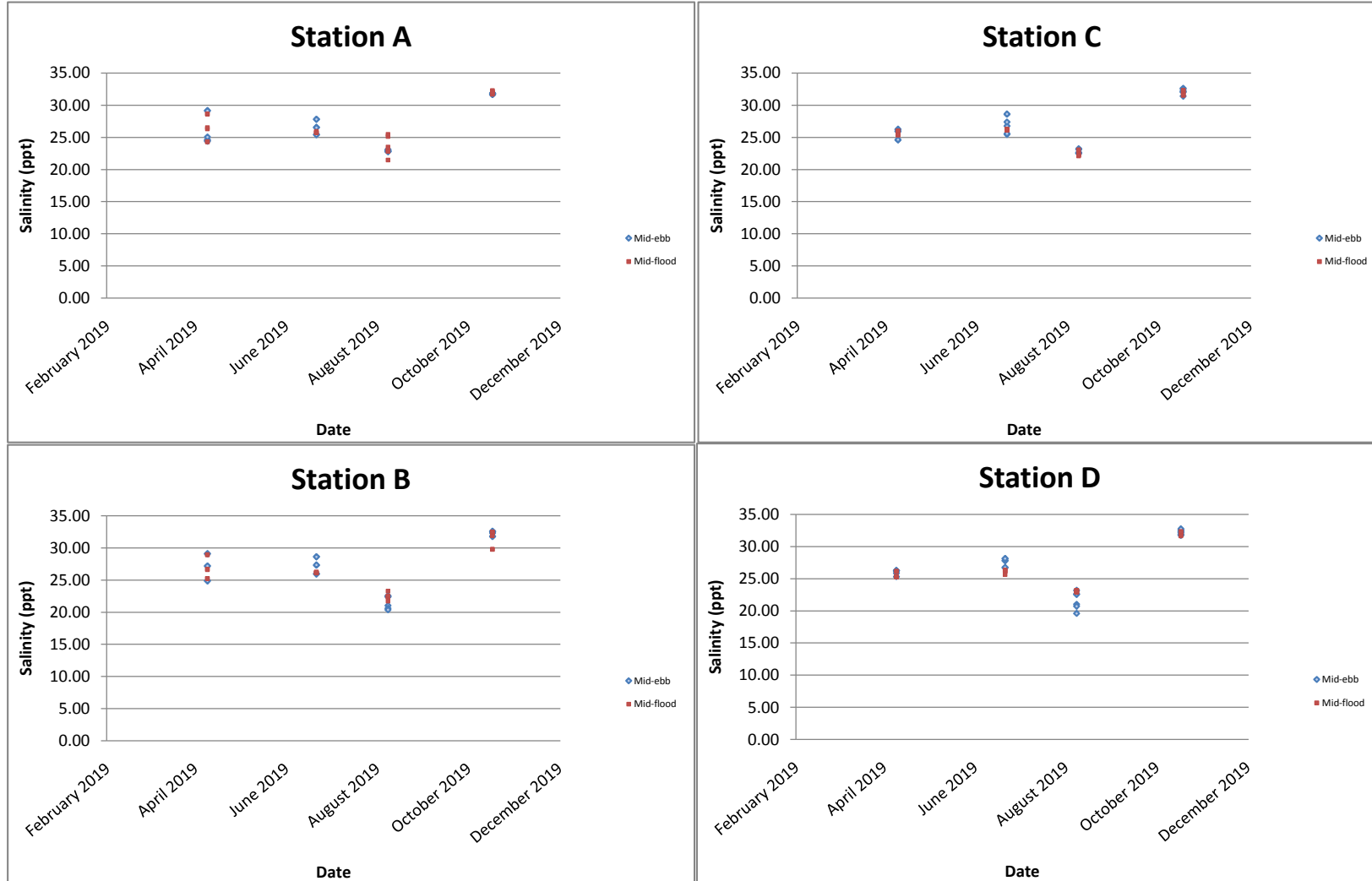
pH value



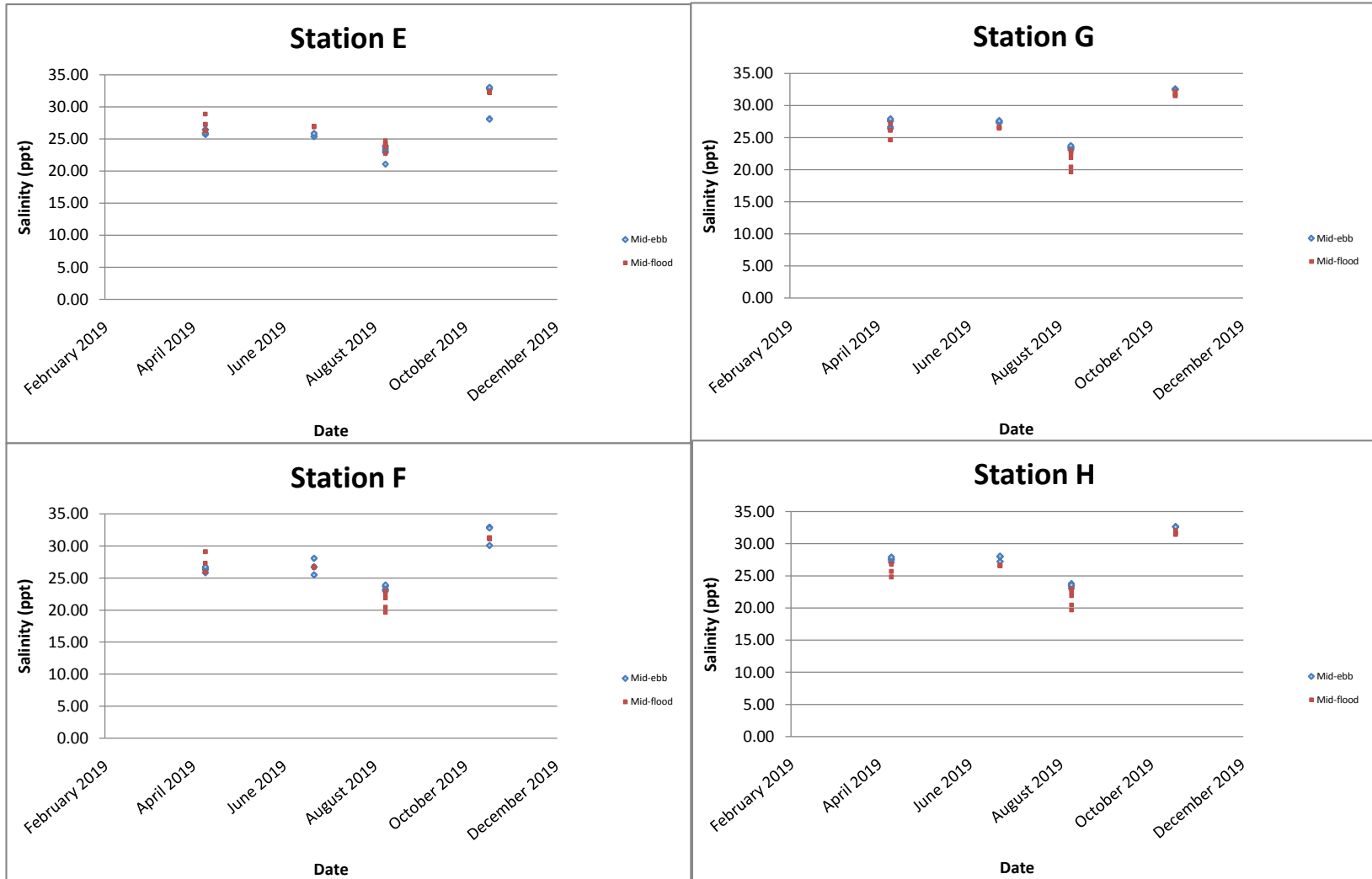
pH value



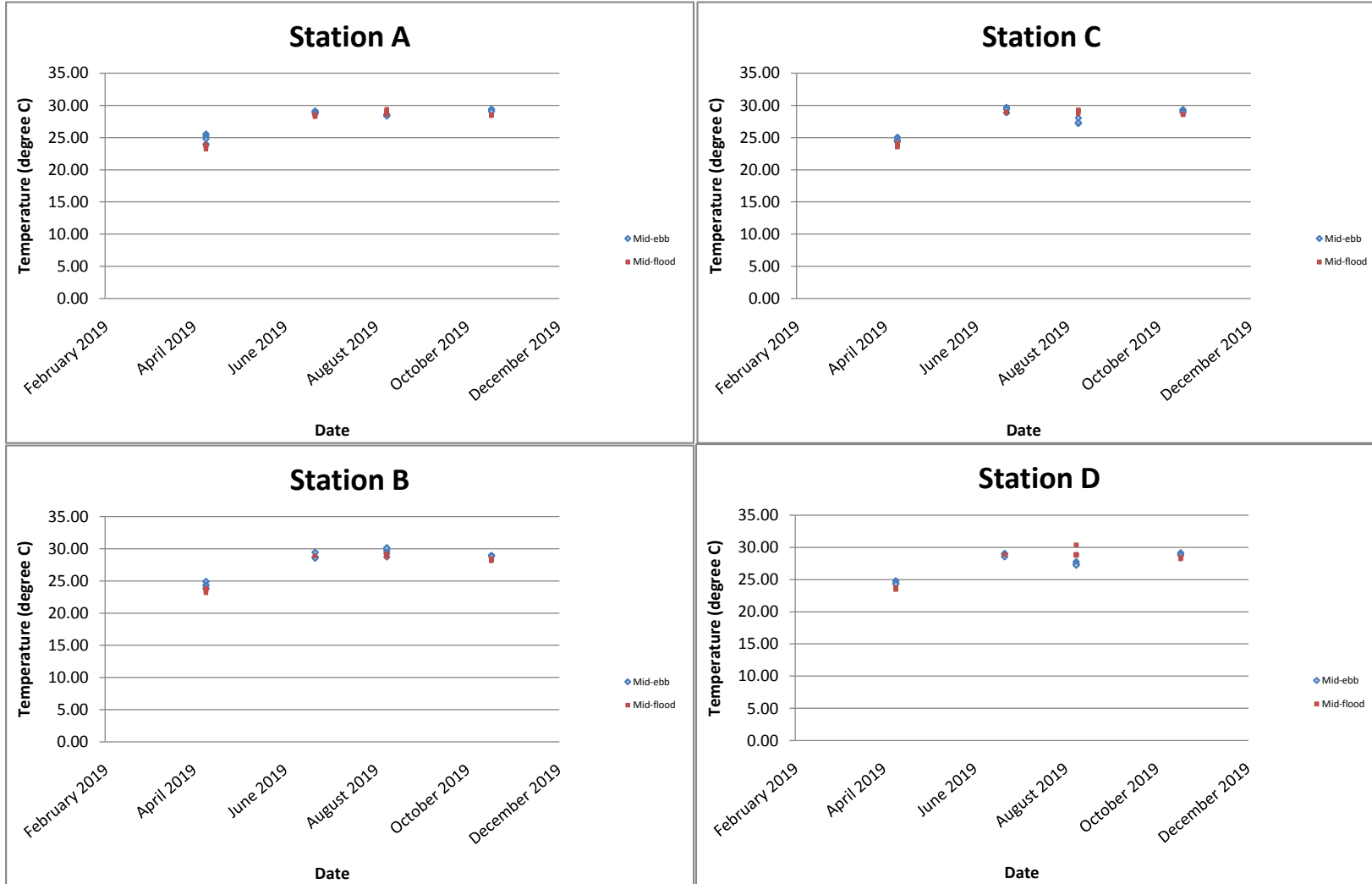
Salinity (ppt)



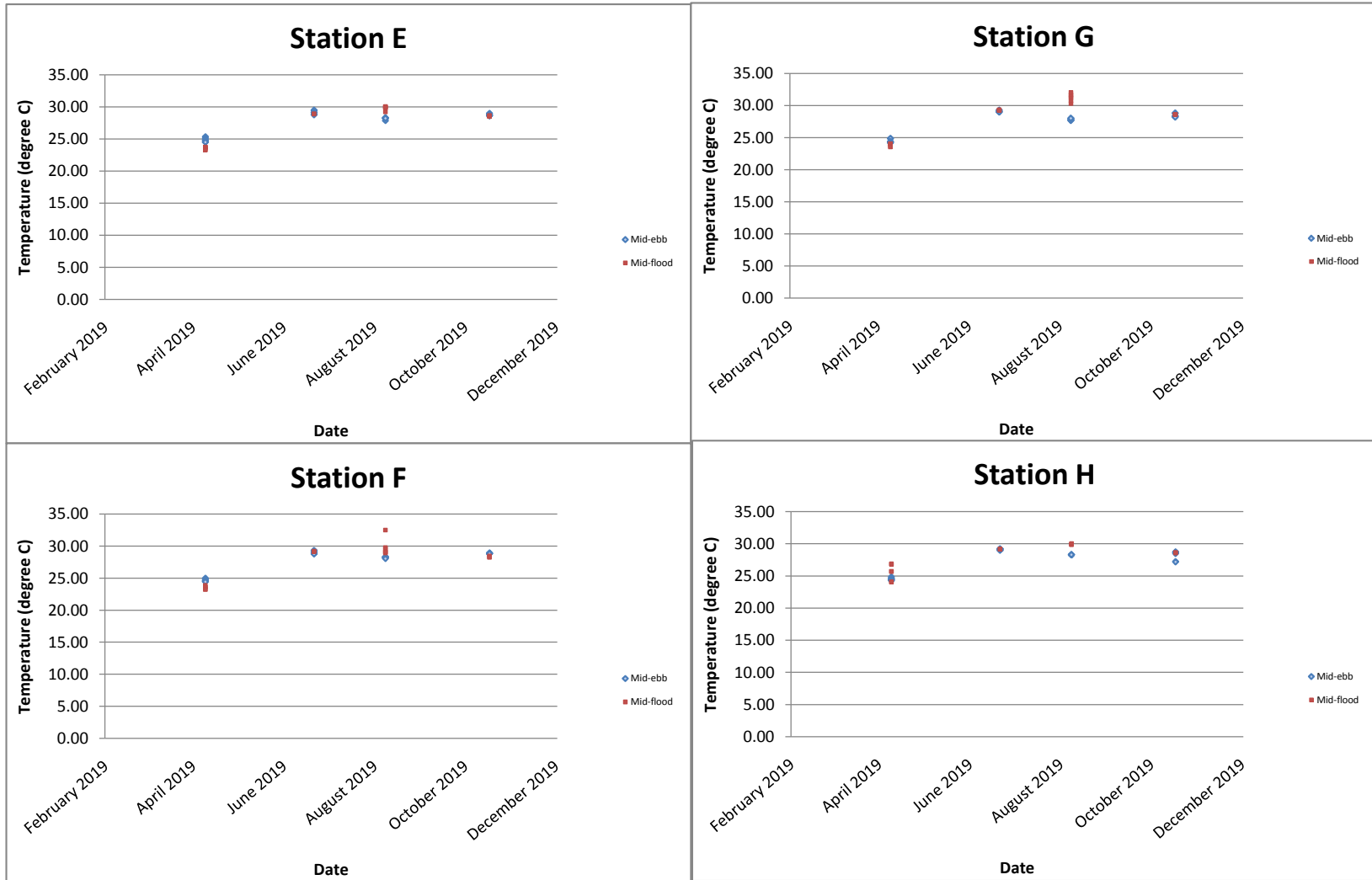
Salinity (ppt)



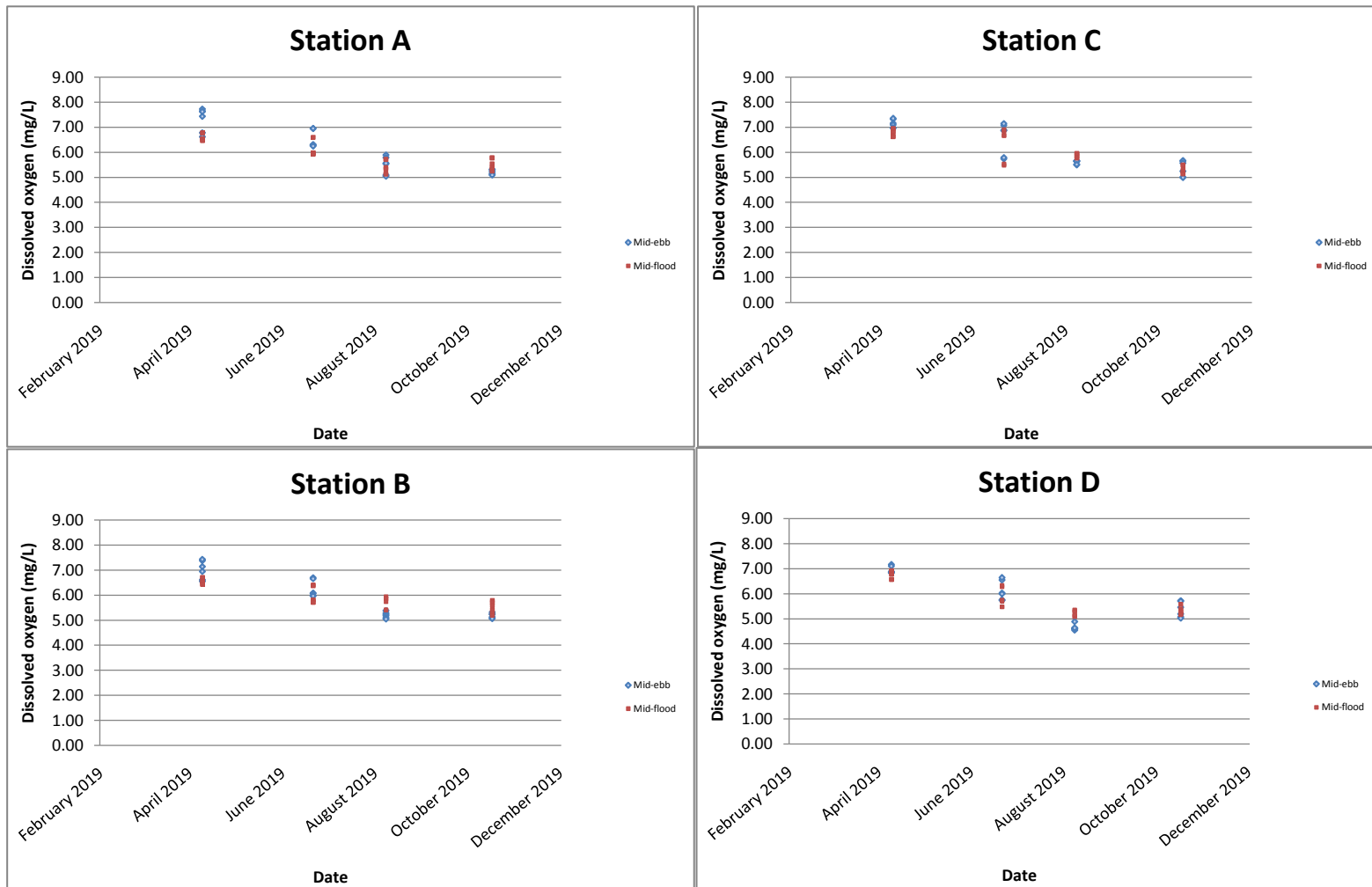
Temperature (degree C)



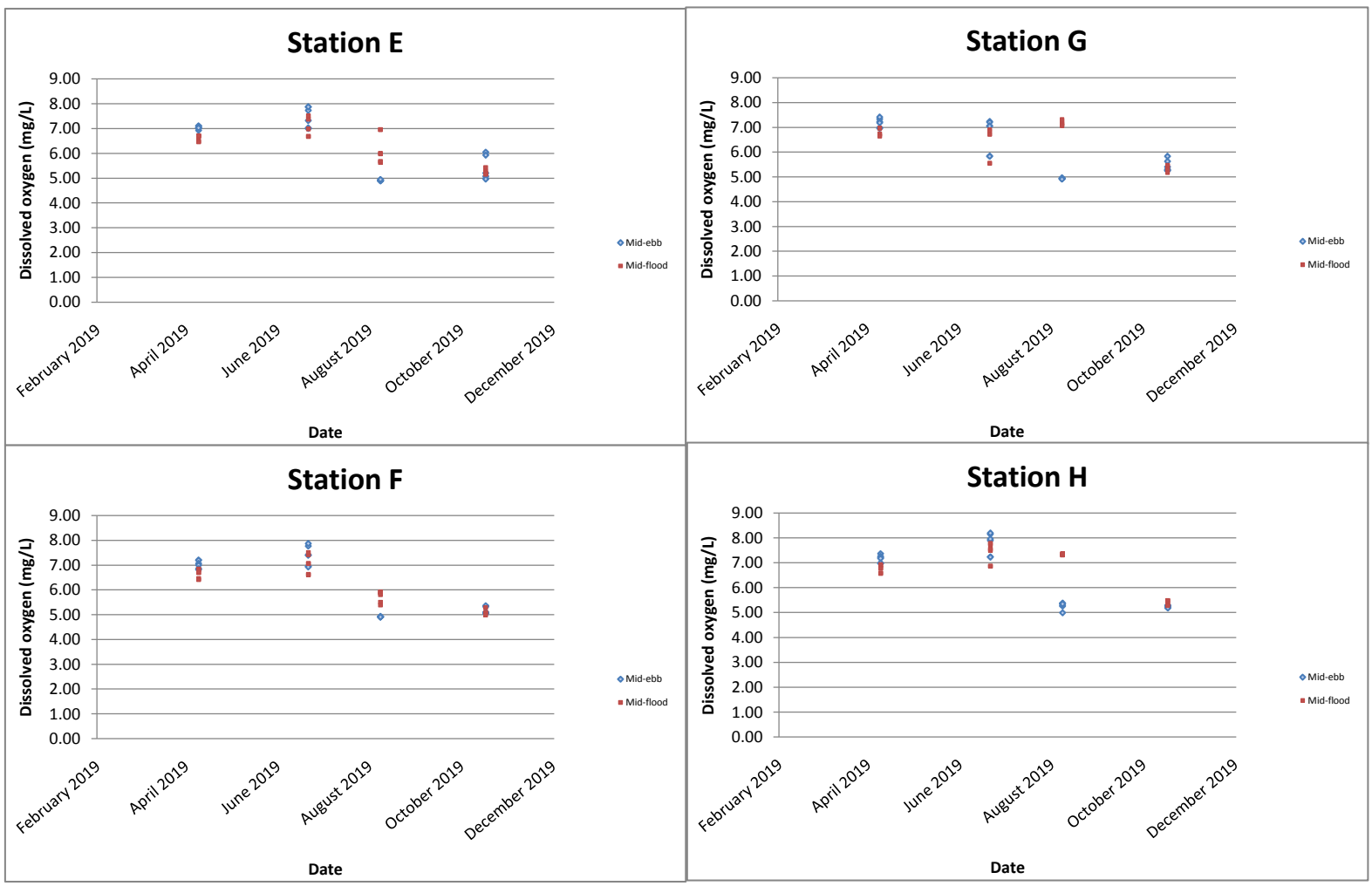
Temperature (degree C)



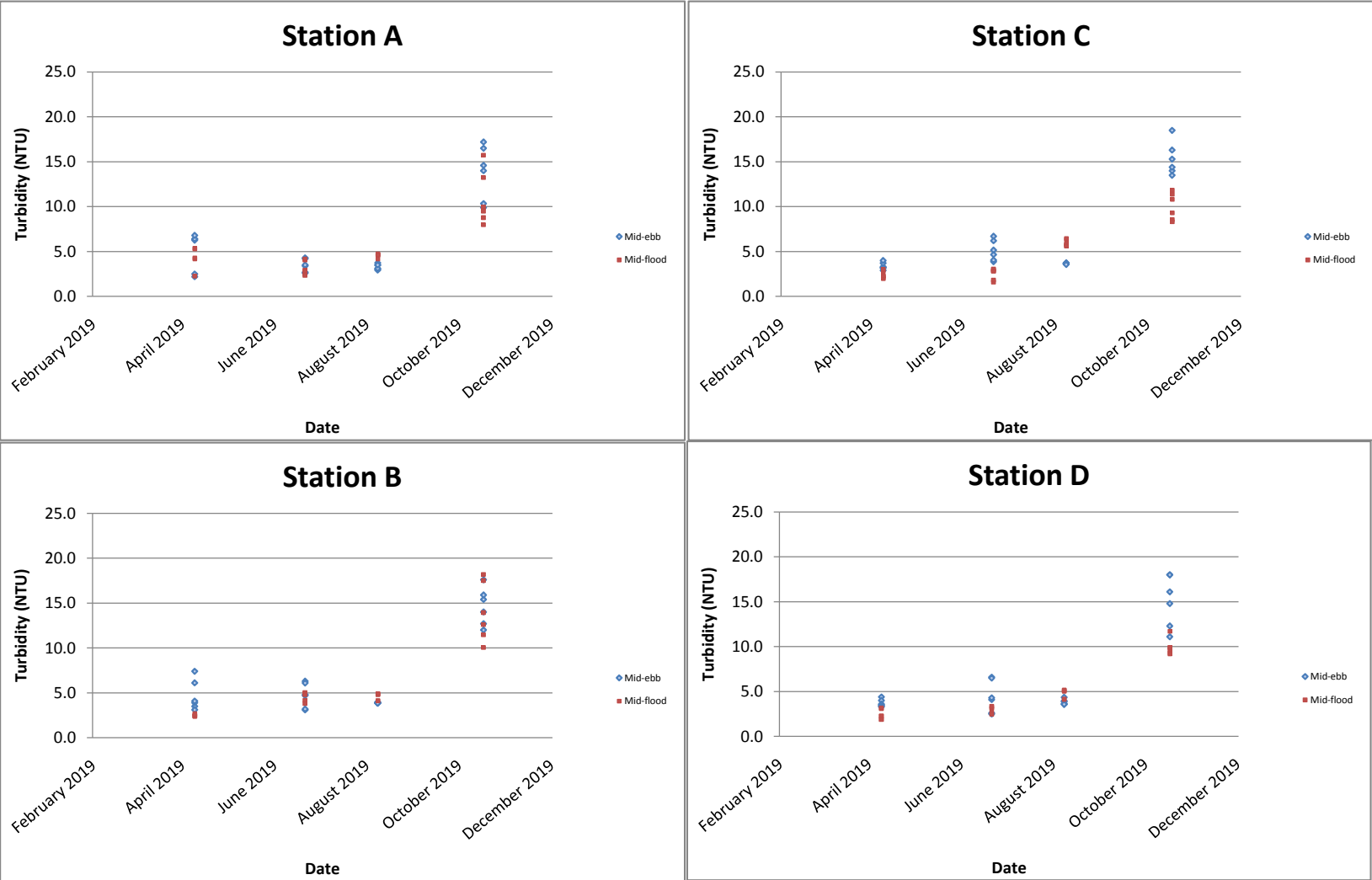
Dissolved oxygen (mg/L)



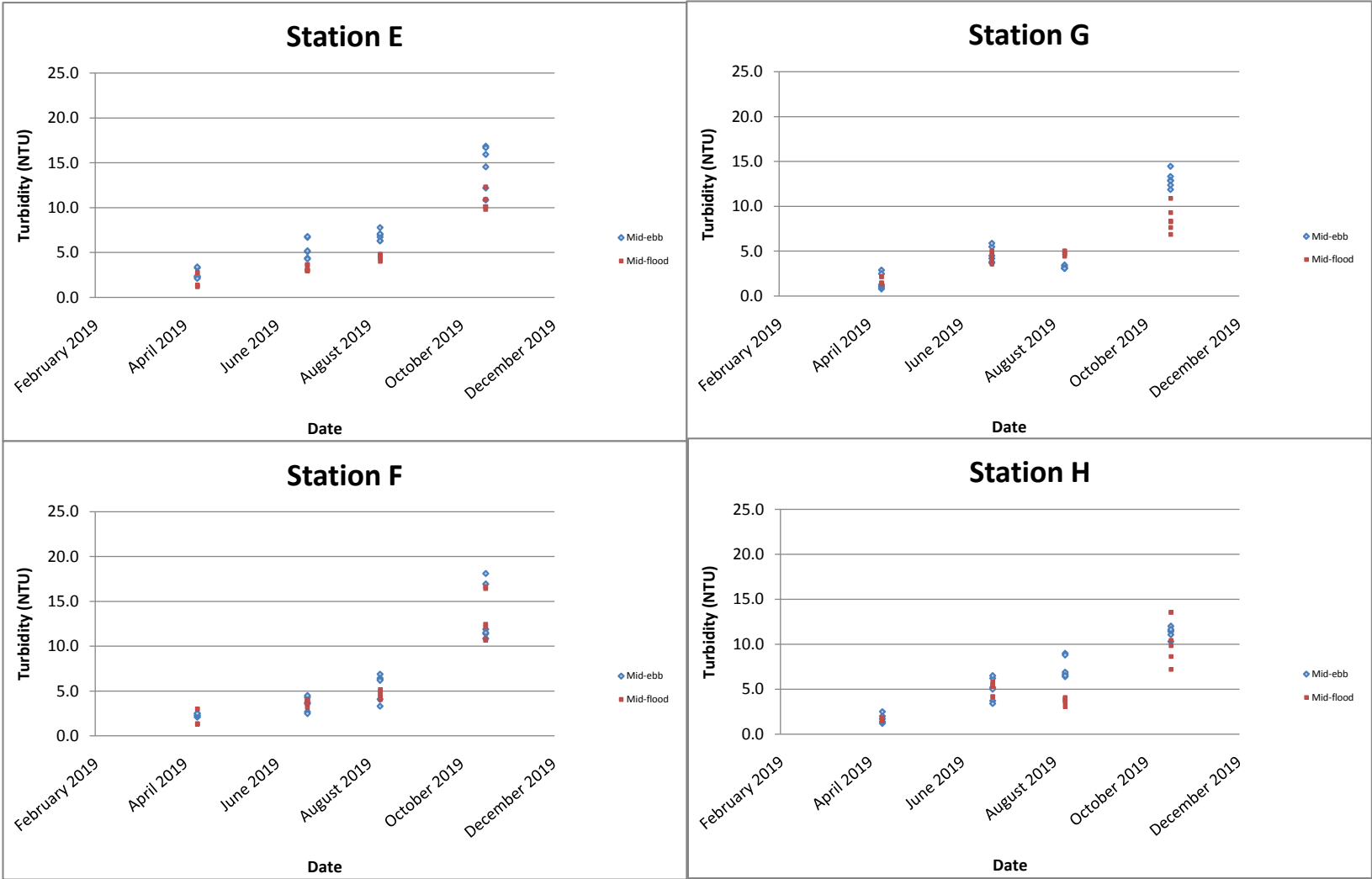
Dissolved oxygen (mg/L)



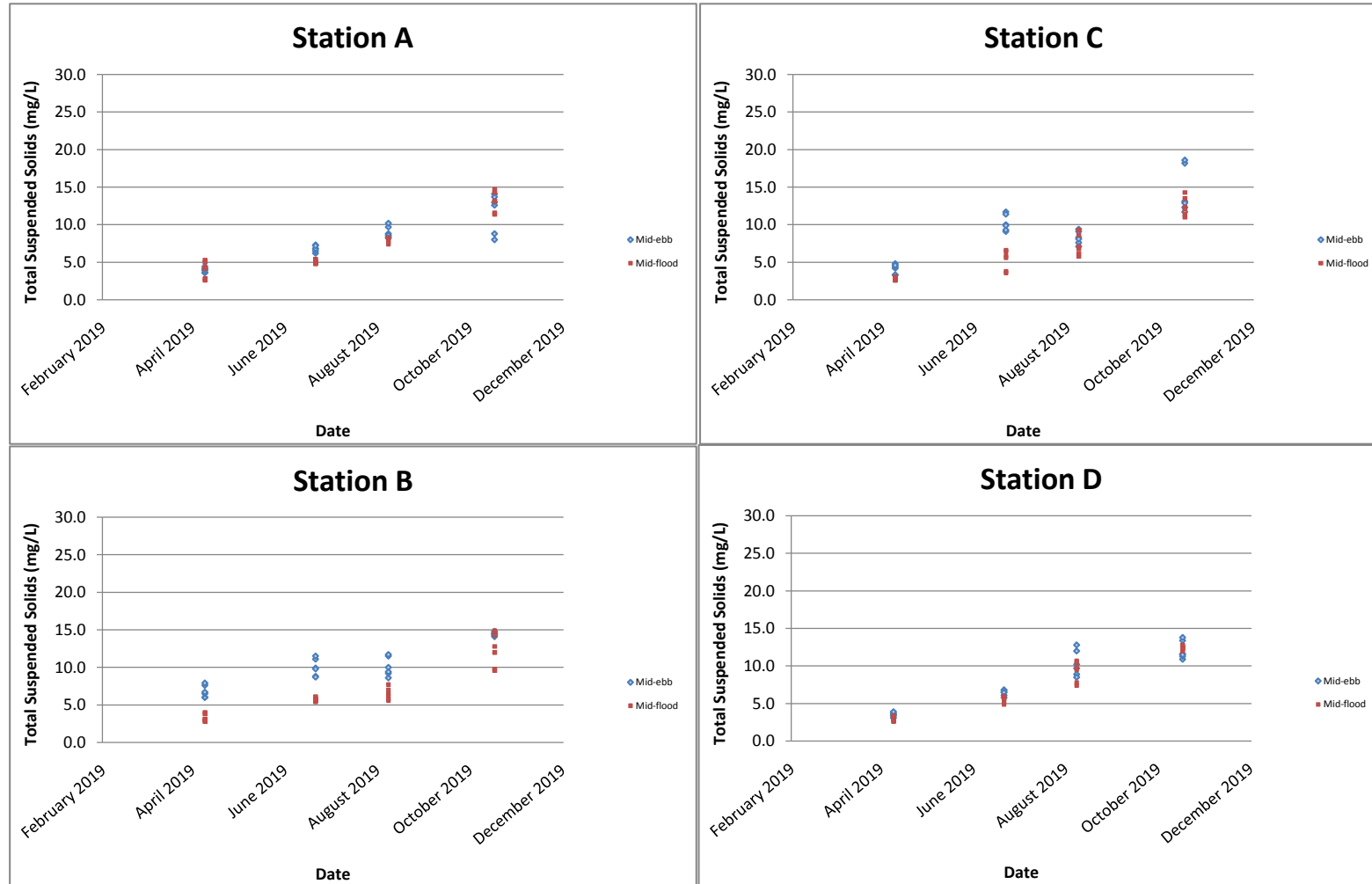
Turbidity (NTU)



Turbidity (NTU)

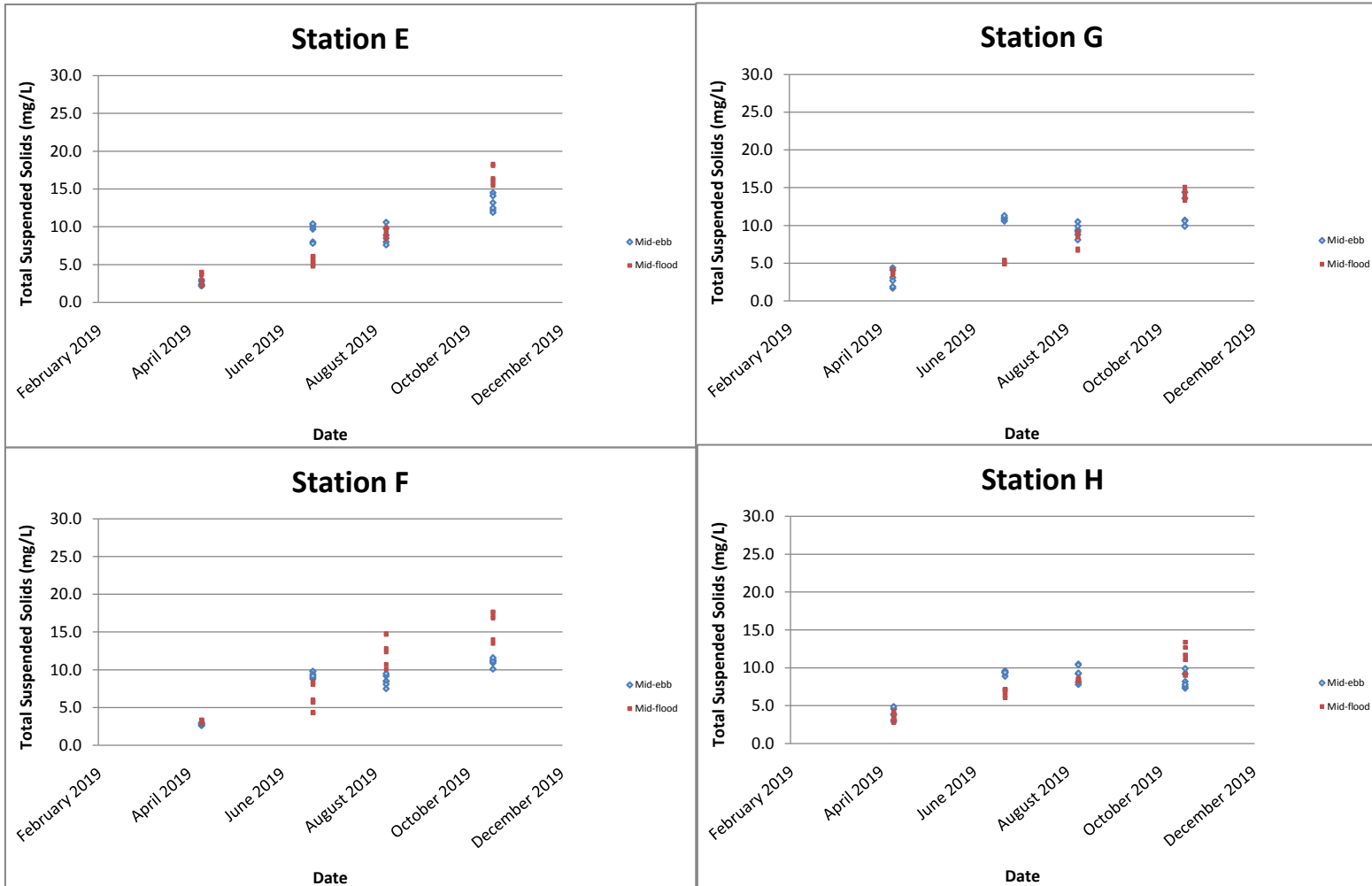


Total Suspended Solids (mg/L)



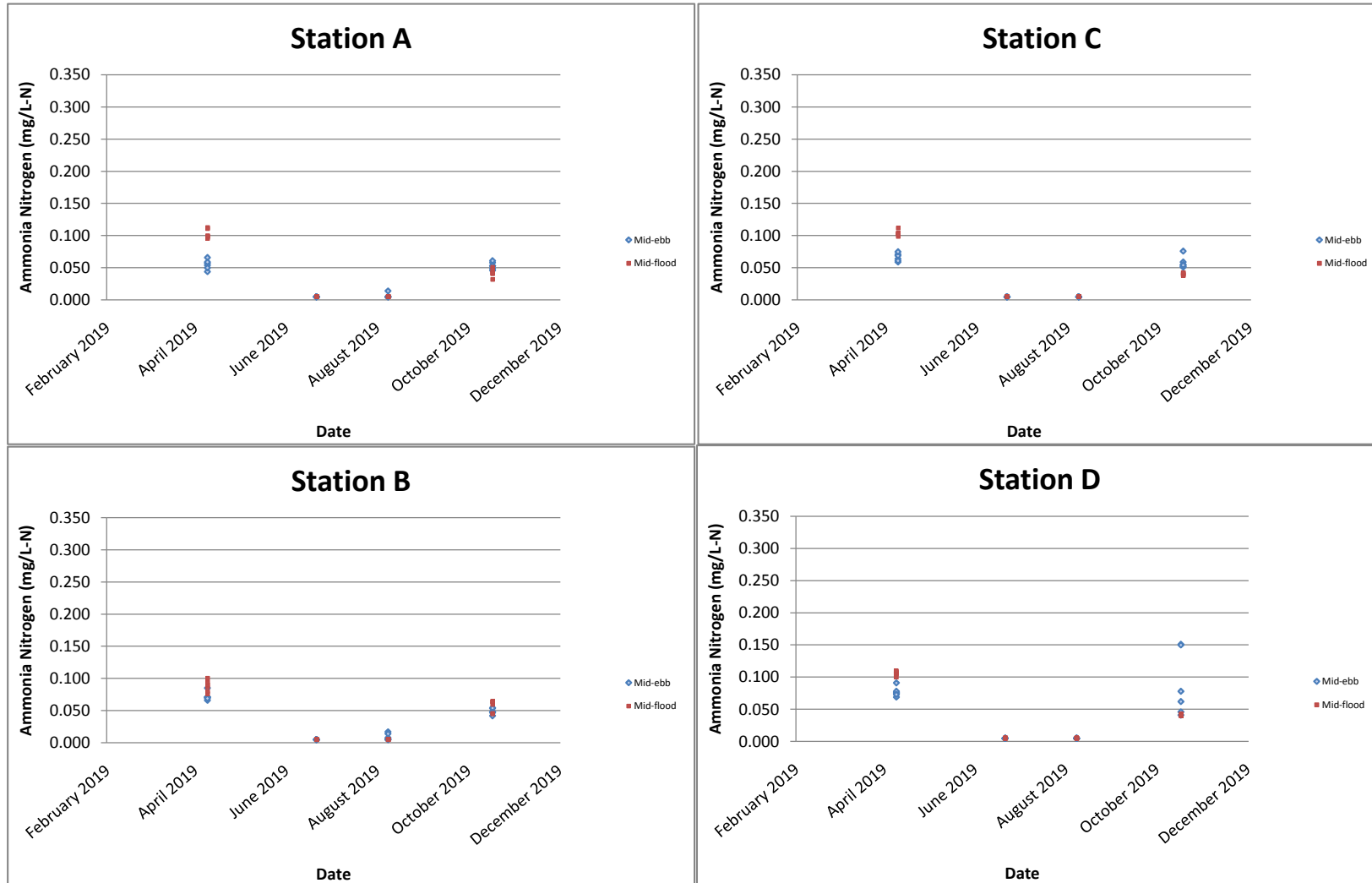
Remark: All below the Limit of Report sample results (<0.5 mg/L) for Total Suspended Solids is regarded as 0.5 mg/L in graphical presentation.

Total Suspended Solids (mg/L)



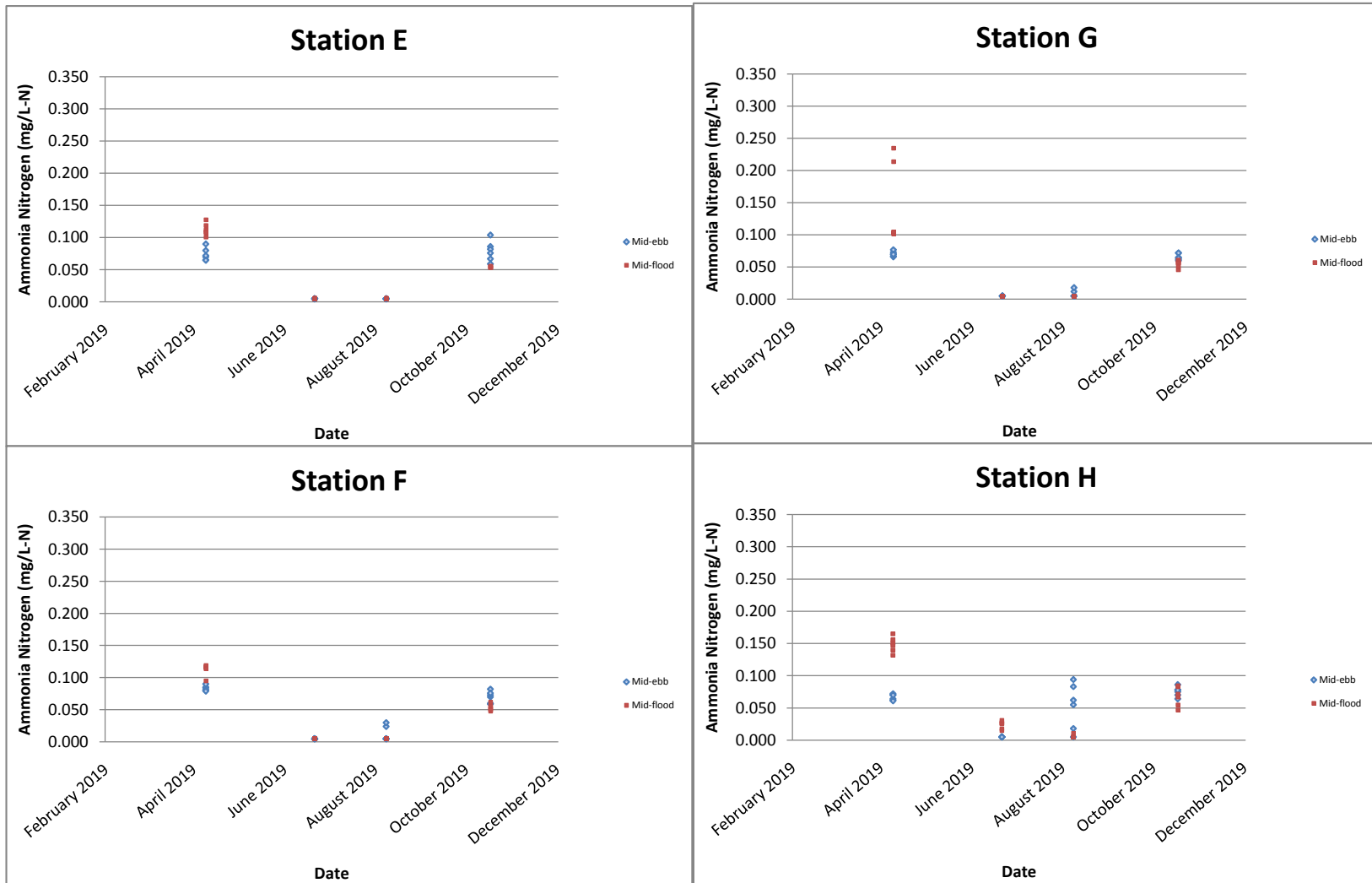
Remark: All below the Limit of Report sample results (<0.5 mg/L) for Total Suspended Solids is regarded as 0.5 mg/L in graphical presentation.

Ammonia Nitrogen (mg/L-N)



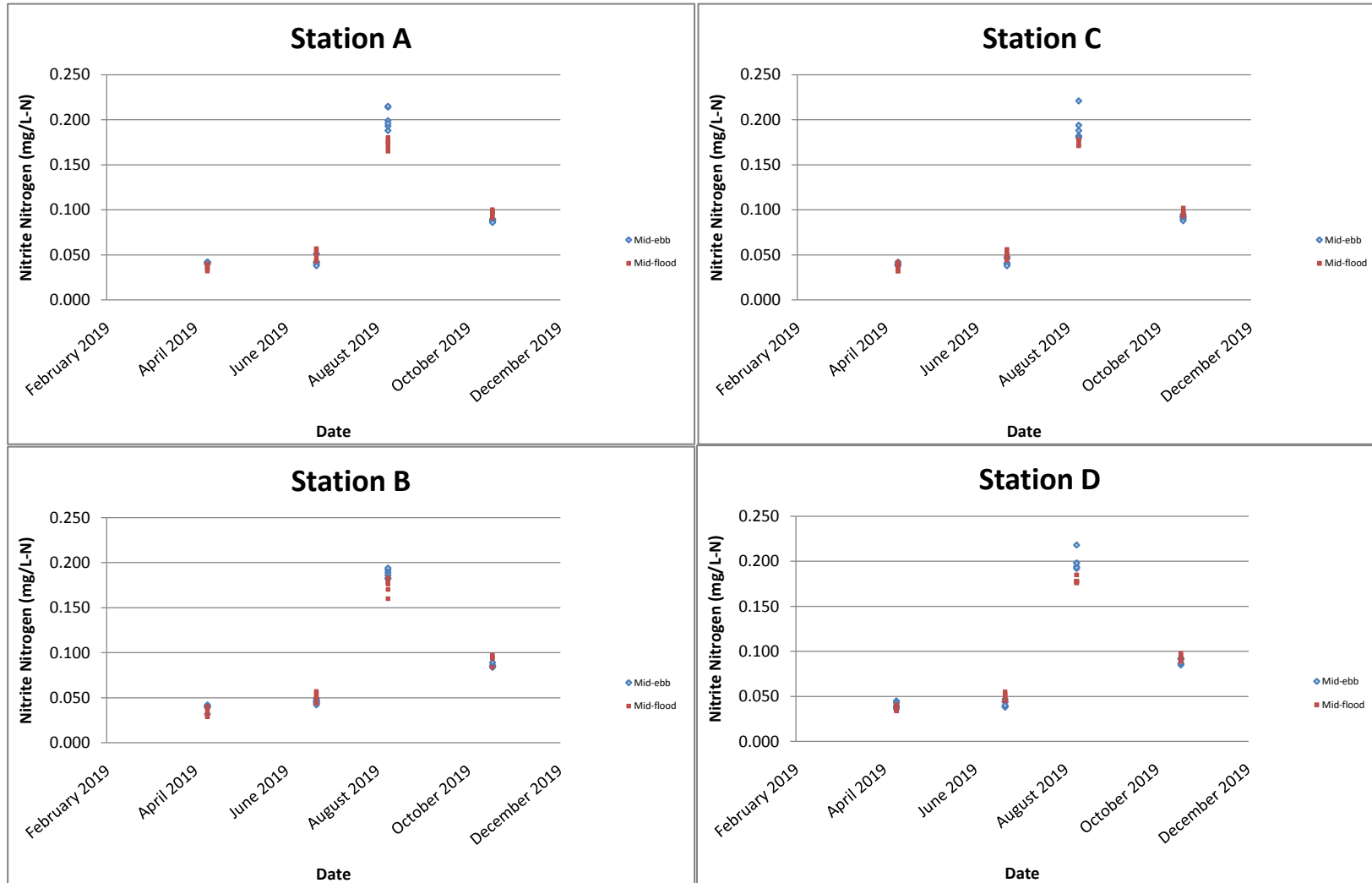
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Ammonia Nitrogen is regarded as 0.005 mg/L in graphical presentation.

Ammonia Nitrogen (mg/L-N)



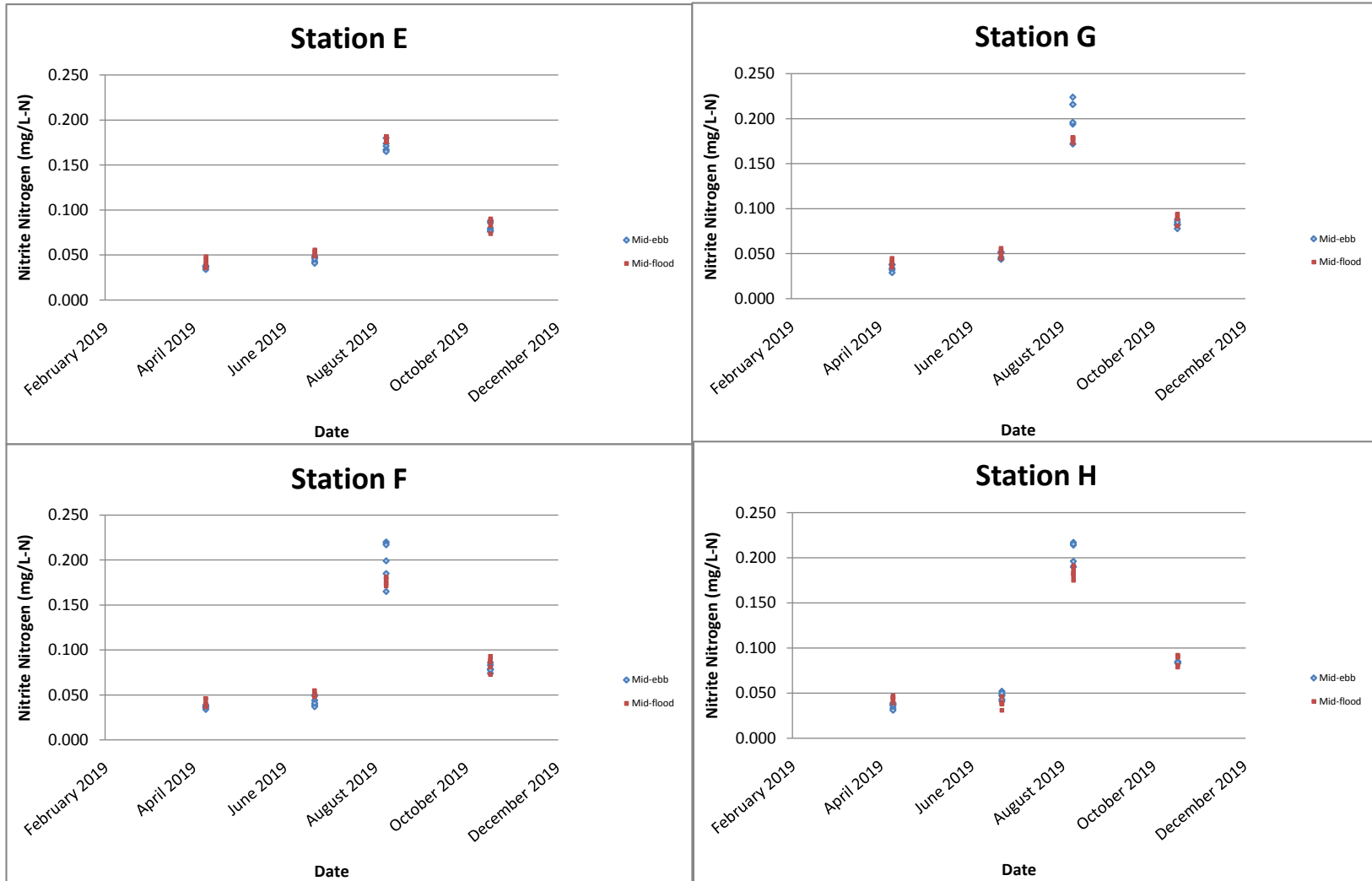
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Nitrite Nitrogen (mg/L-N)



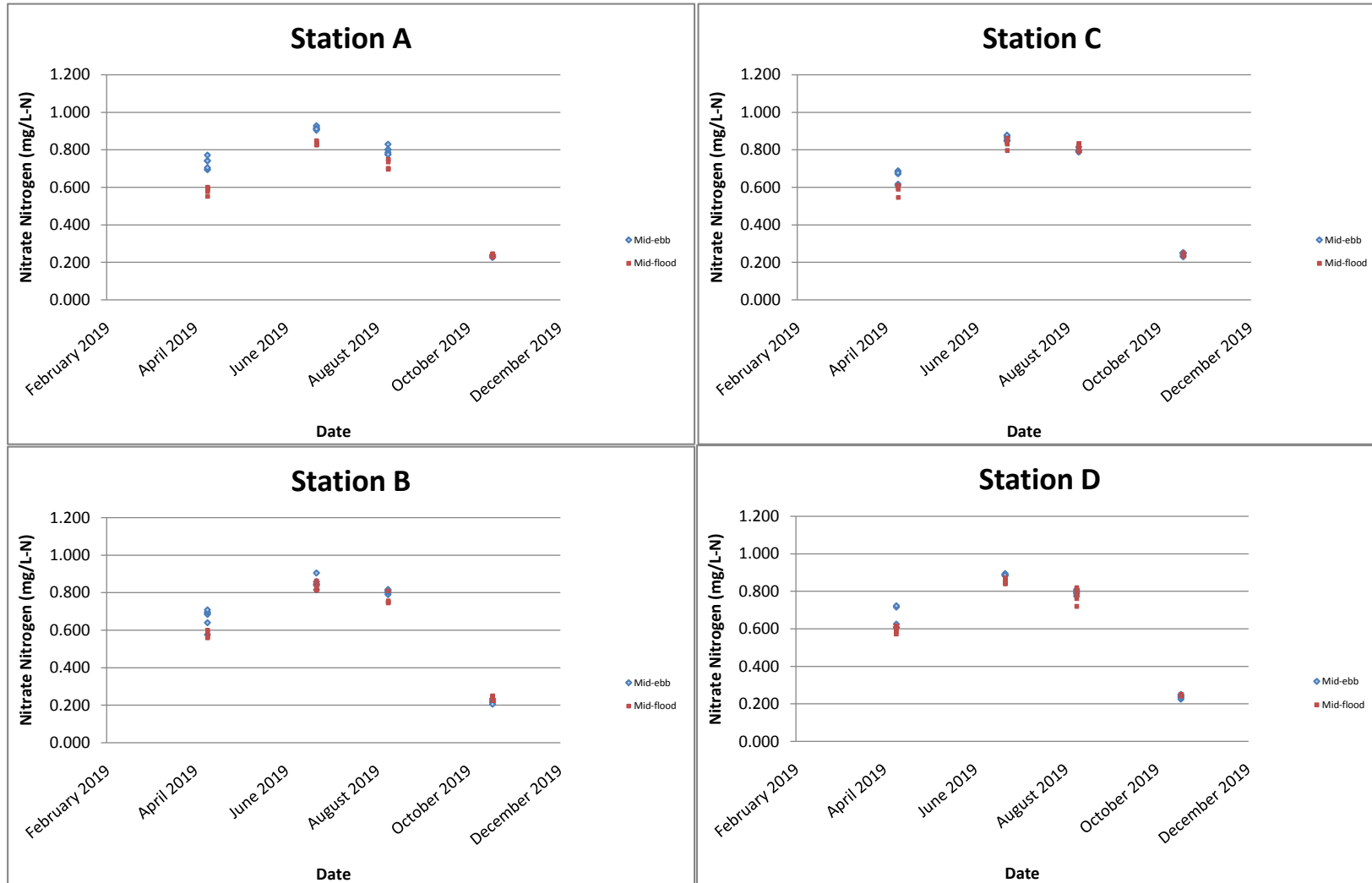
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Nitrite Nitrogen (mg/L-N)



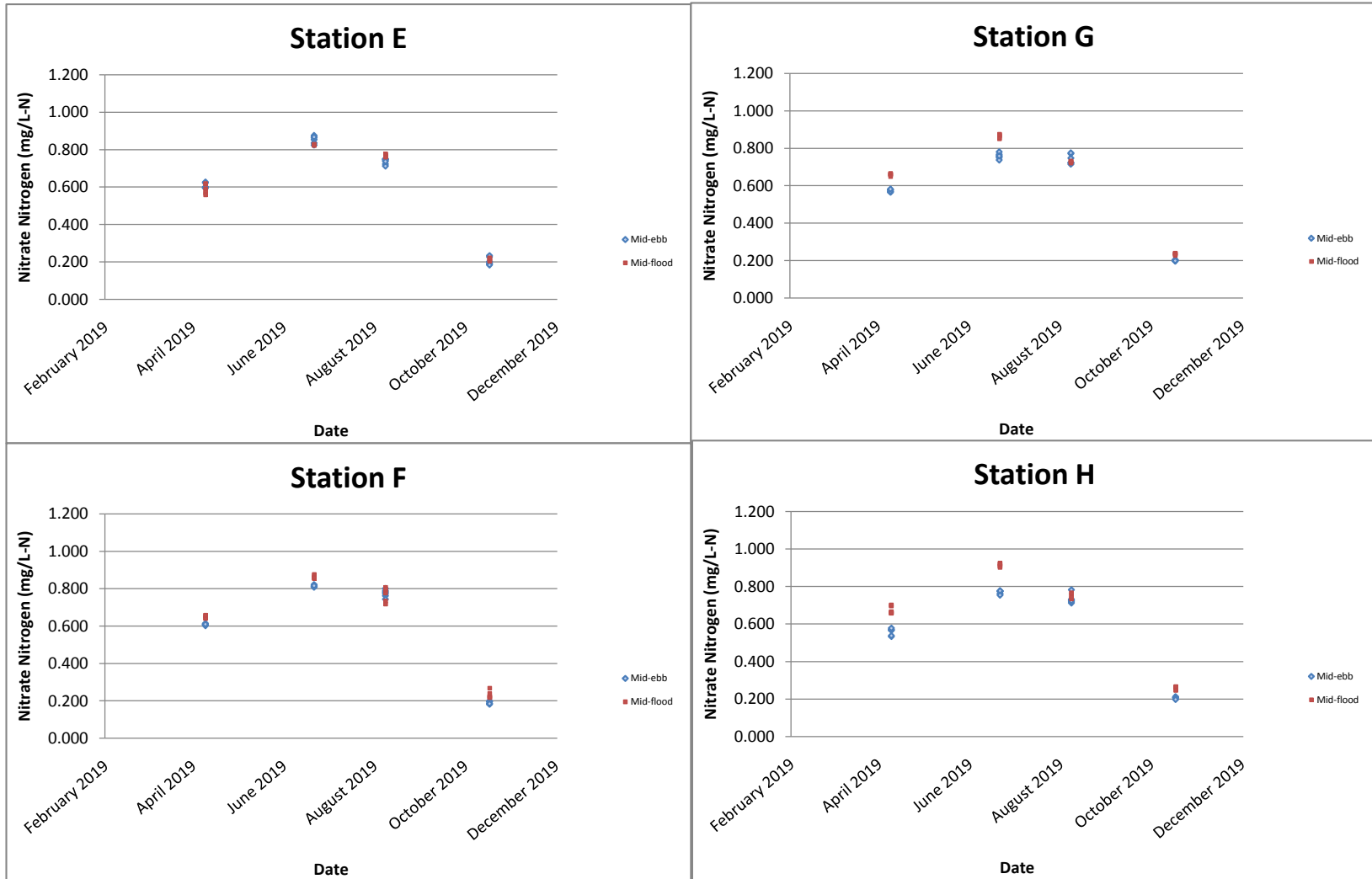
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Nitrate Nitrogen (mg/L-N)



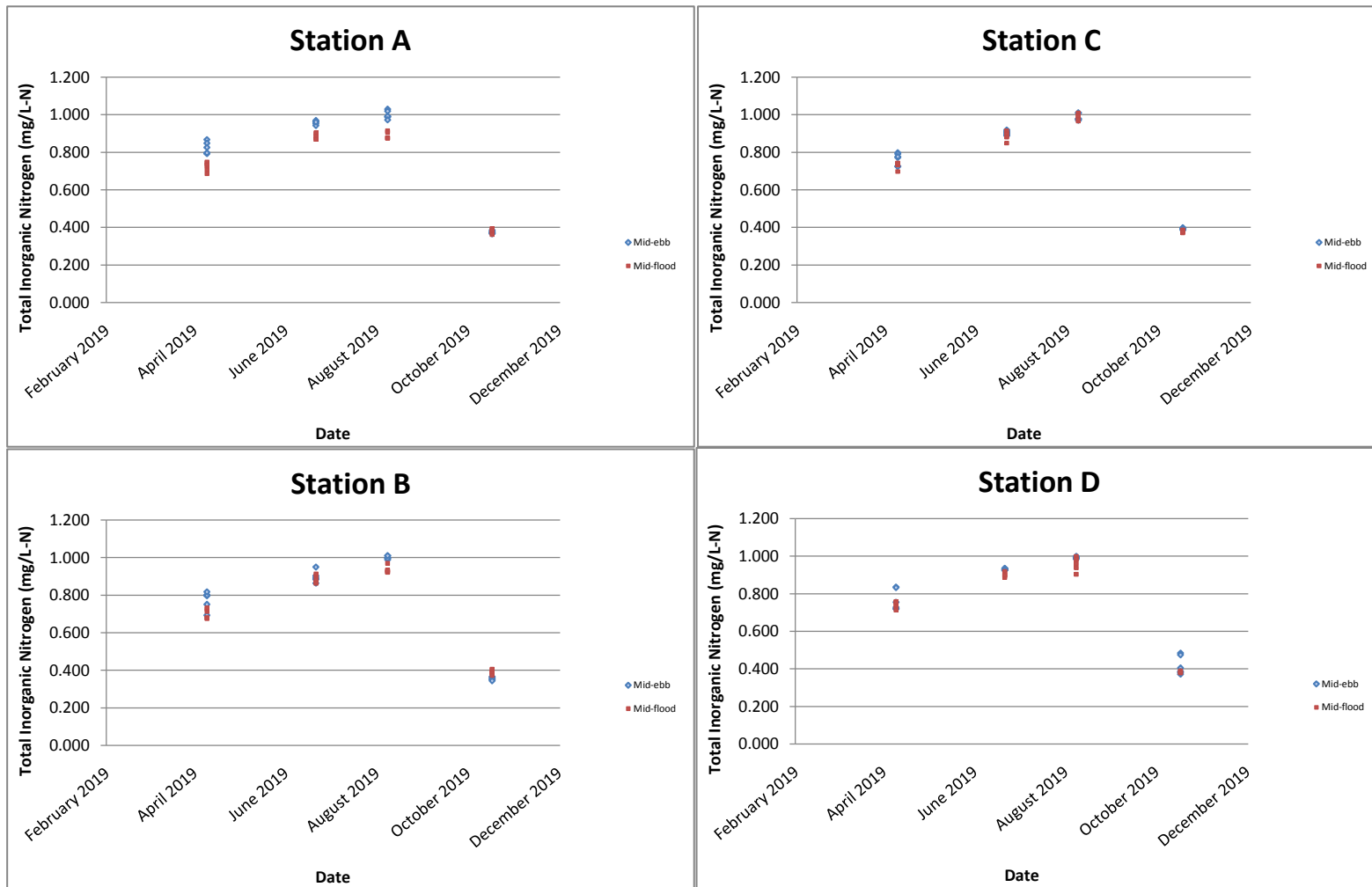
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Nitrate Nitrogen (mg/L-N)



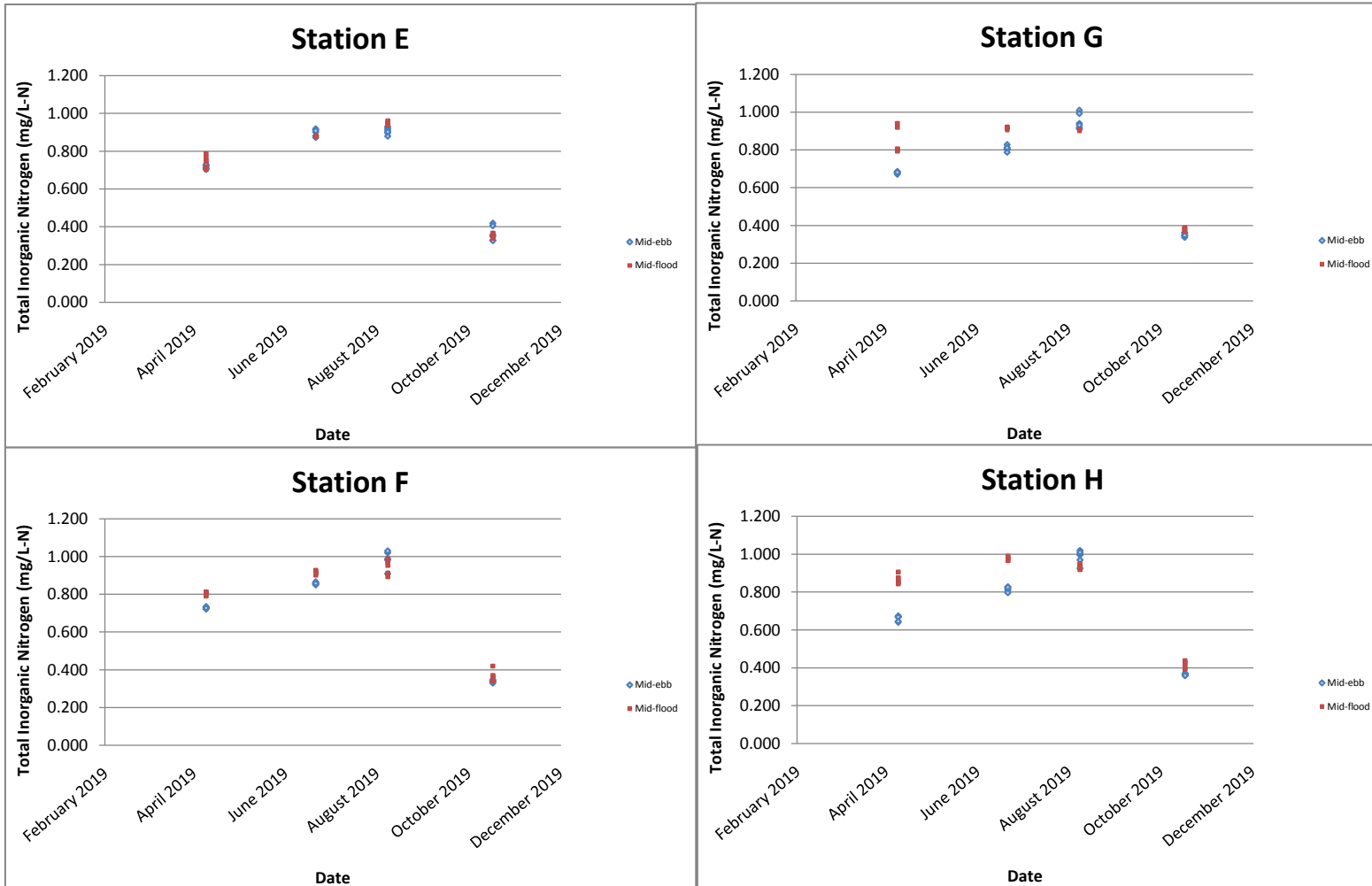
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Total Inorganic Nitrogen (mg/L-N)



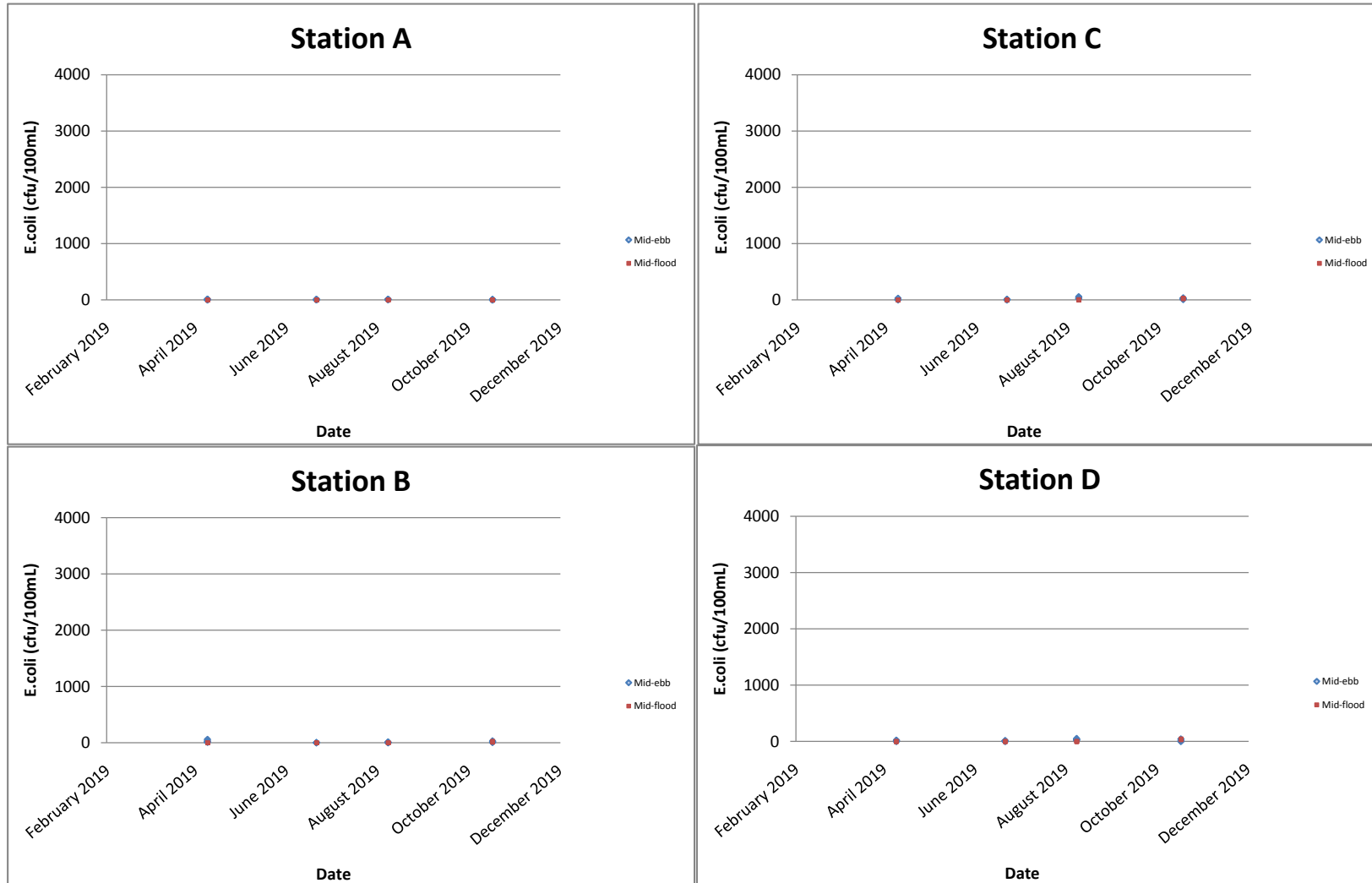
Remark: All below the Limit of Report sample results (<0.010 mg/L) for Total Inorganic Nitrogen is regarded as 0.010 mg/L in graphical presentation.

Total Inorganic Nitrogen (mg/L-N)



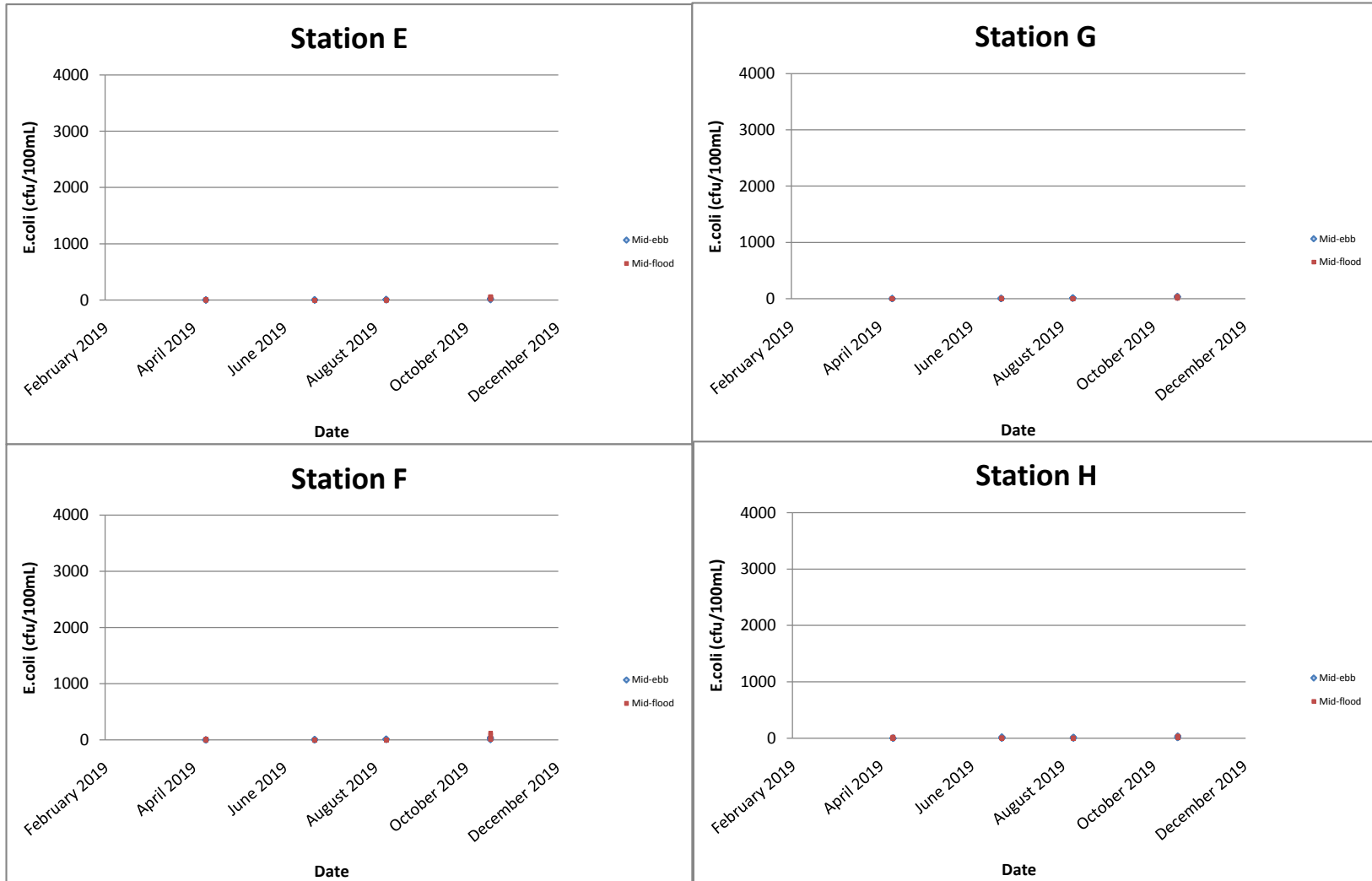
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E.coli (cfu/100mL)



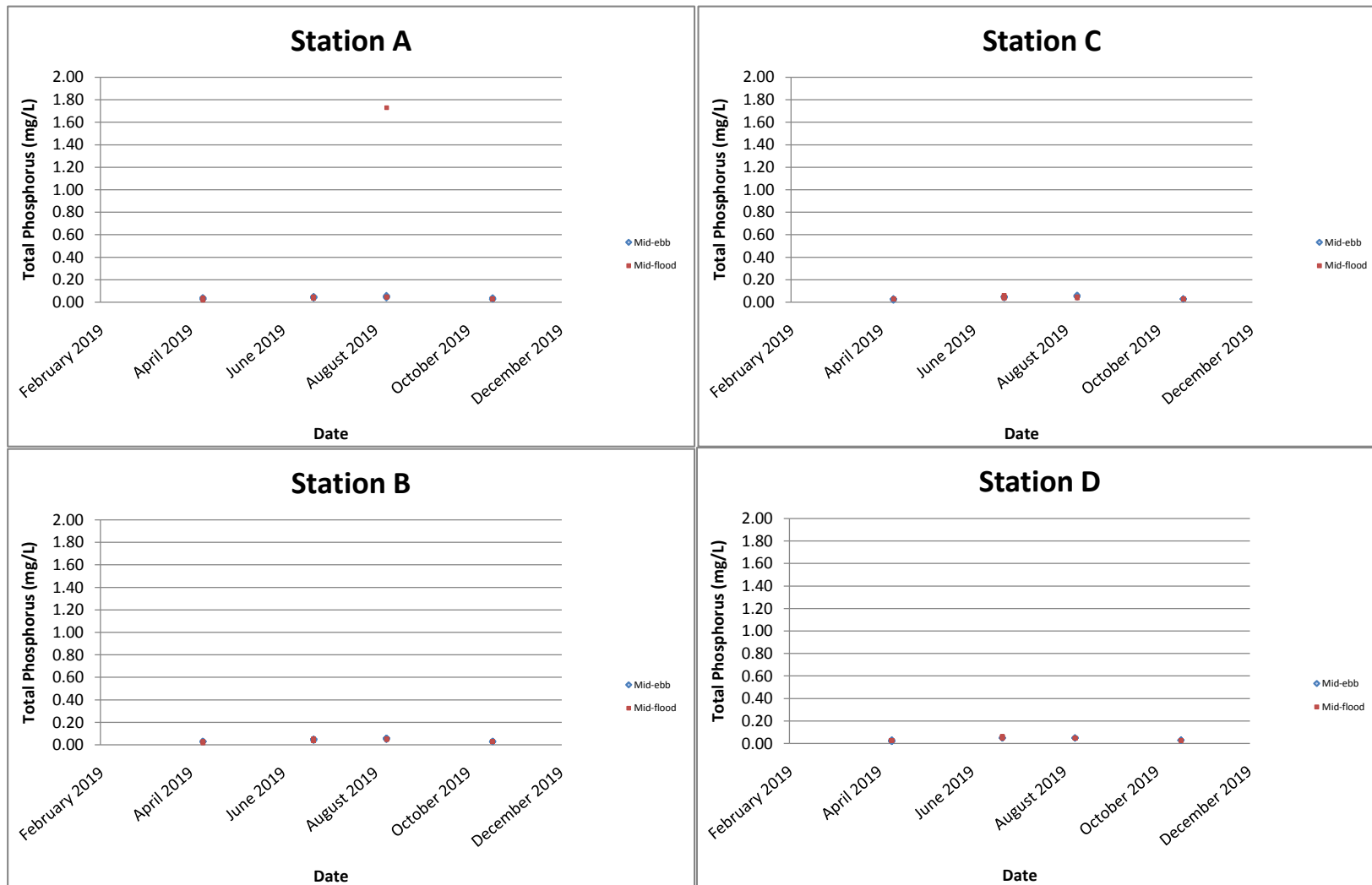
Remark: All below the Limit of Report sample results (<1 CFU/100mL) for E.coli is regarded as 1 CFU/100mL in graphical presentation.

E.coli (cfu/100mL)



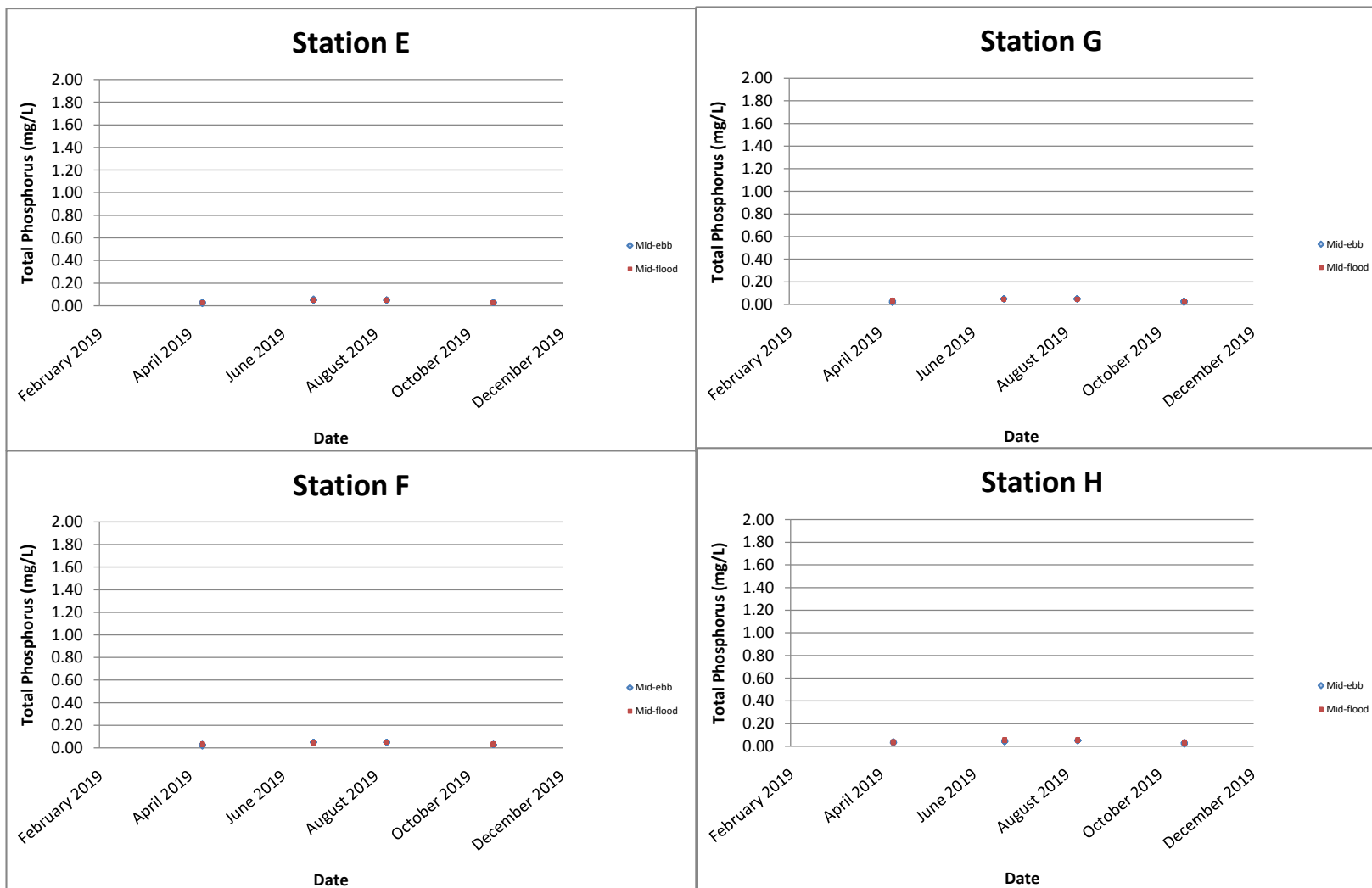
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Total Phosphorus (soluble and particulate) (mg/L)



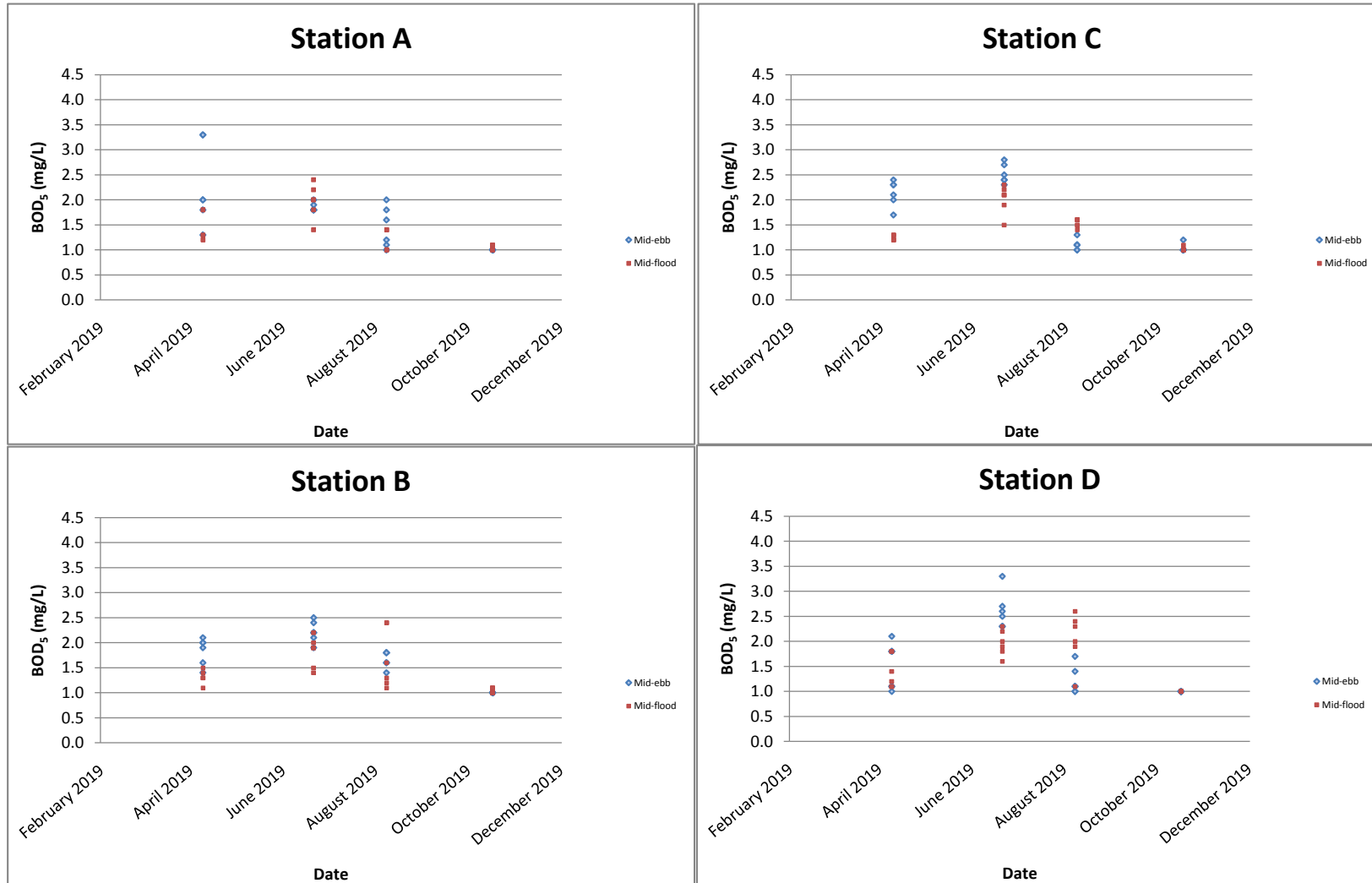
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Total Phosphorus (soluble and particulate) (mg/L)



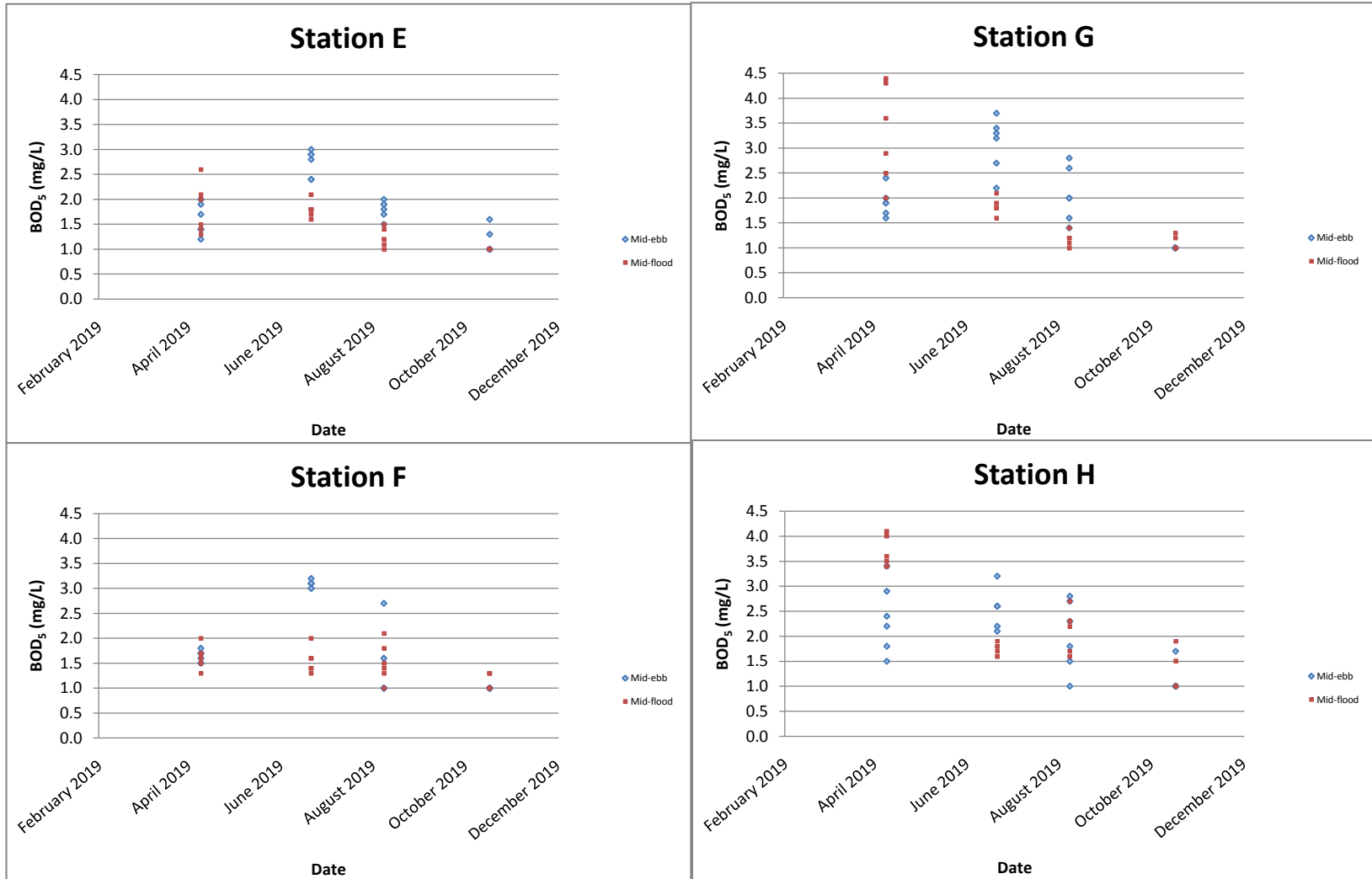
Remark: All below the Limit of Report sample results (<0.01 mg/L) for Total Phosphorus is regarded as 0.01 mg/L in graphical presentation.

BOD₅ (mg/L)



Remark: All below the Limit of Report sample results (<1.0 mg/L) for BOD₅ is regarded as 1.0 mg/L in graphical presentation.

BOD₅ (mg/L)



Remark: All below the Limit of Report sample results (<1.0 mg/L) for BOD₅ is regarded as 1.0 mg/L in graphical presentation.

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Appendix D

Tidal Data obtained from Ma Wan Marine Traffic Station

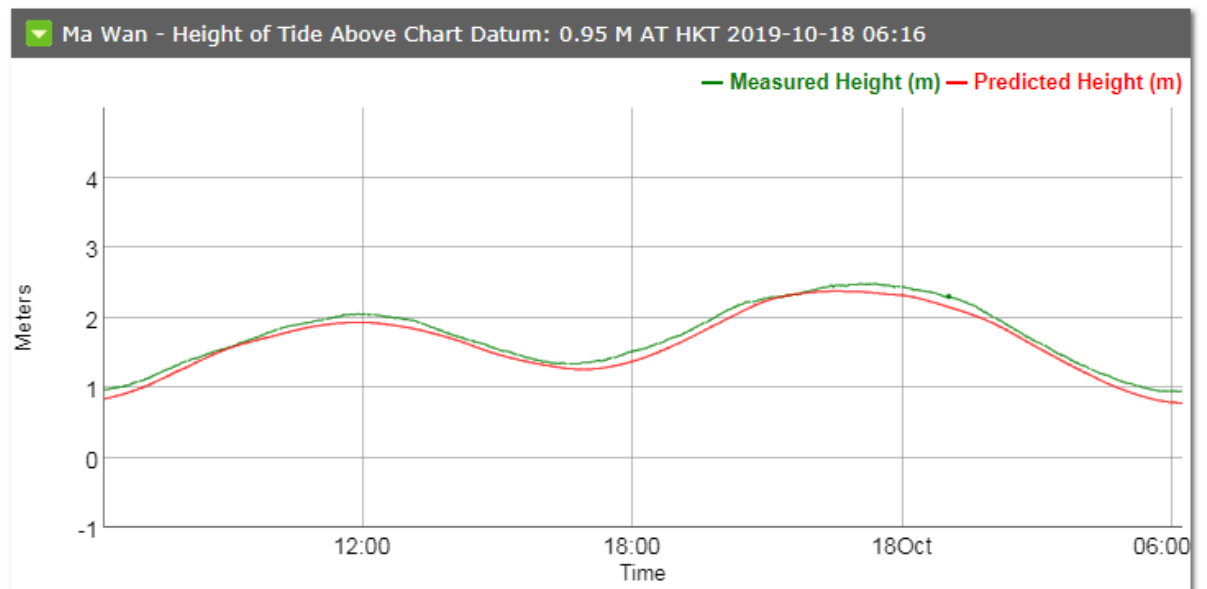
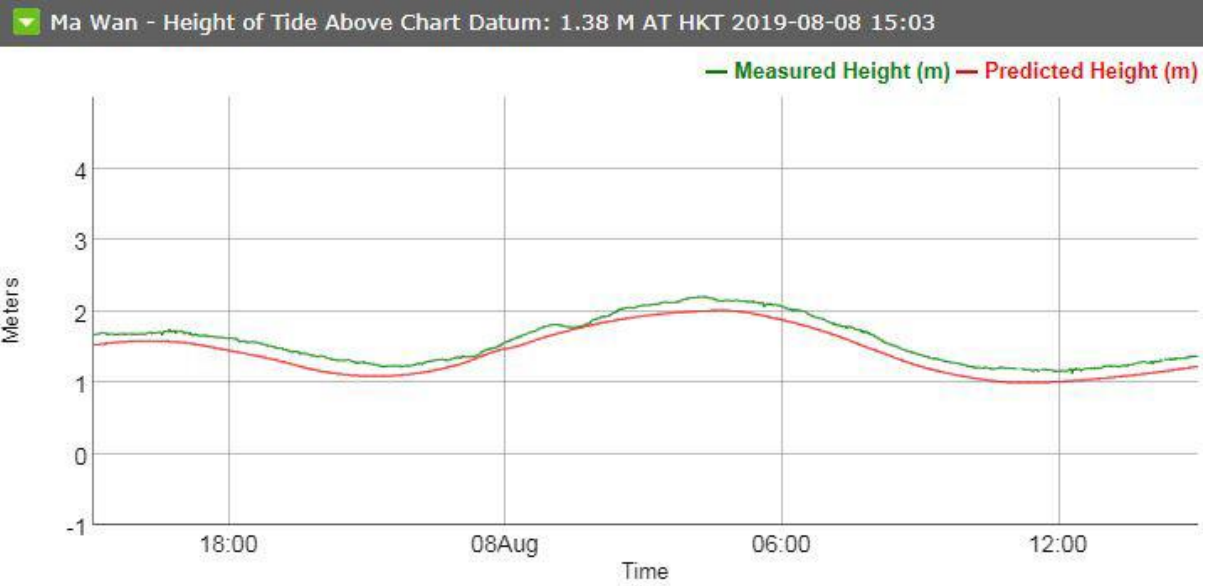
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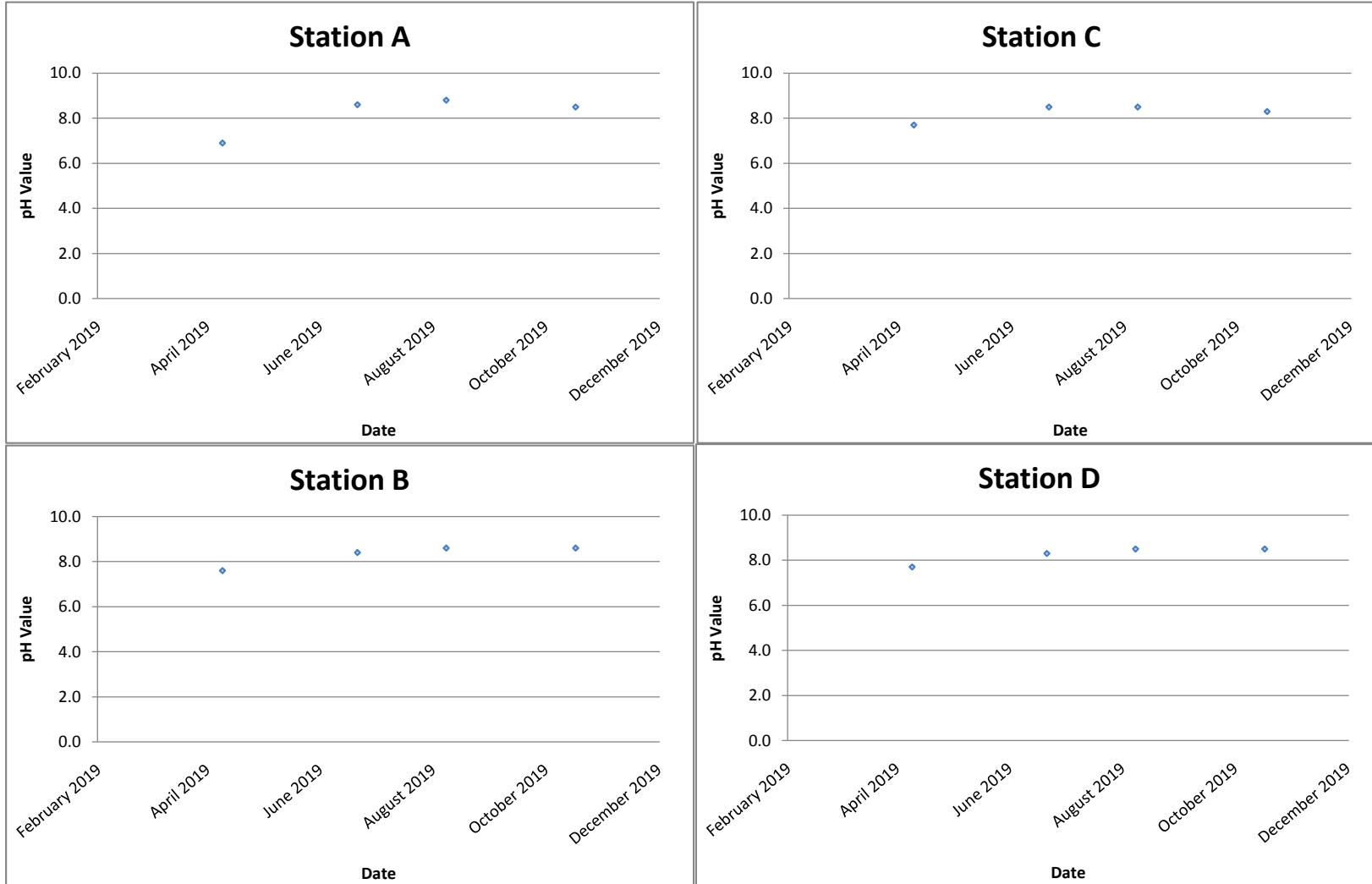


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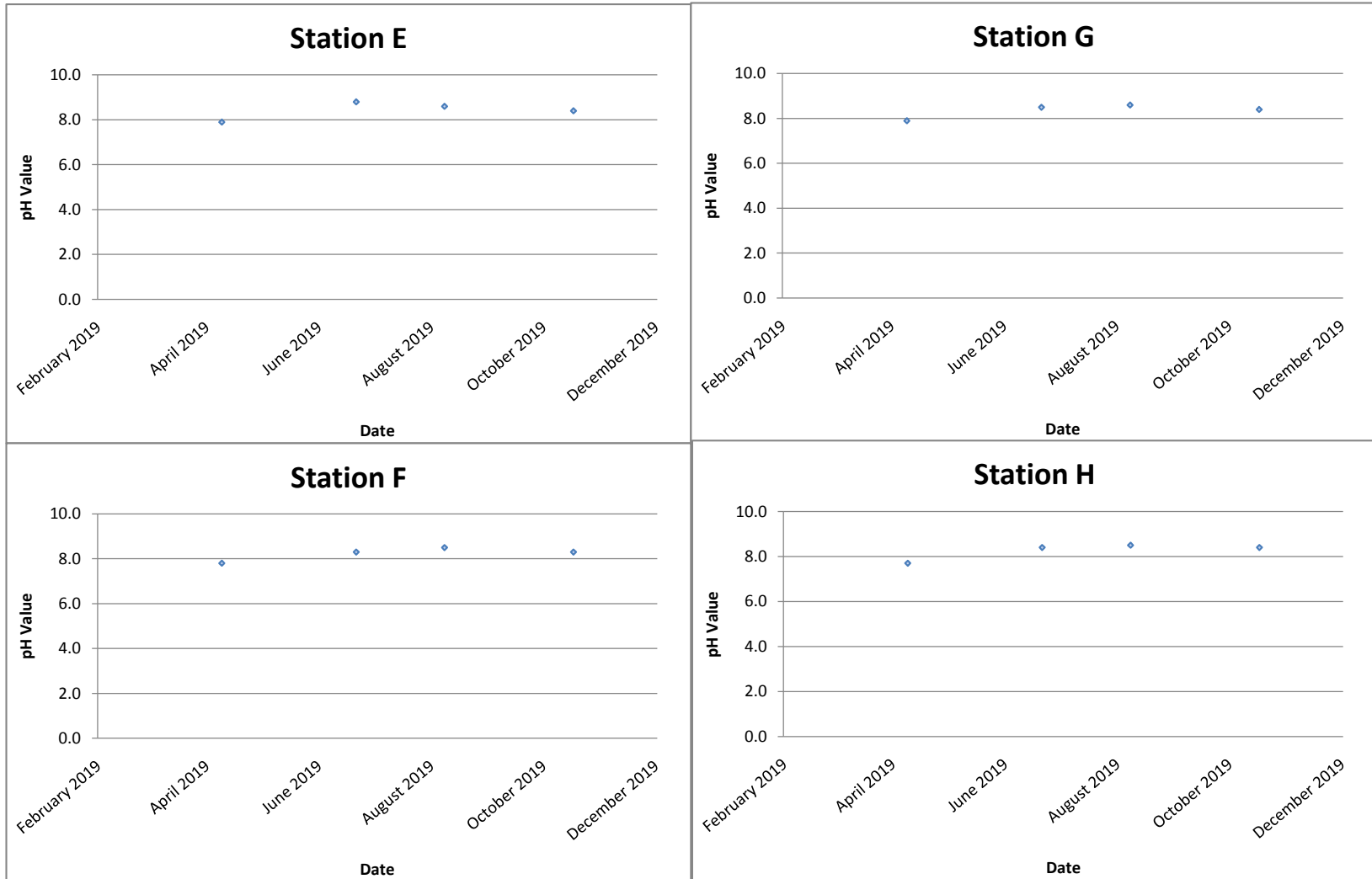
Appendix E

Graphical Presentation of Sediment Quality Monitoring and Benthic Survey

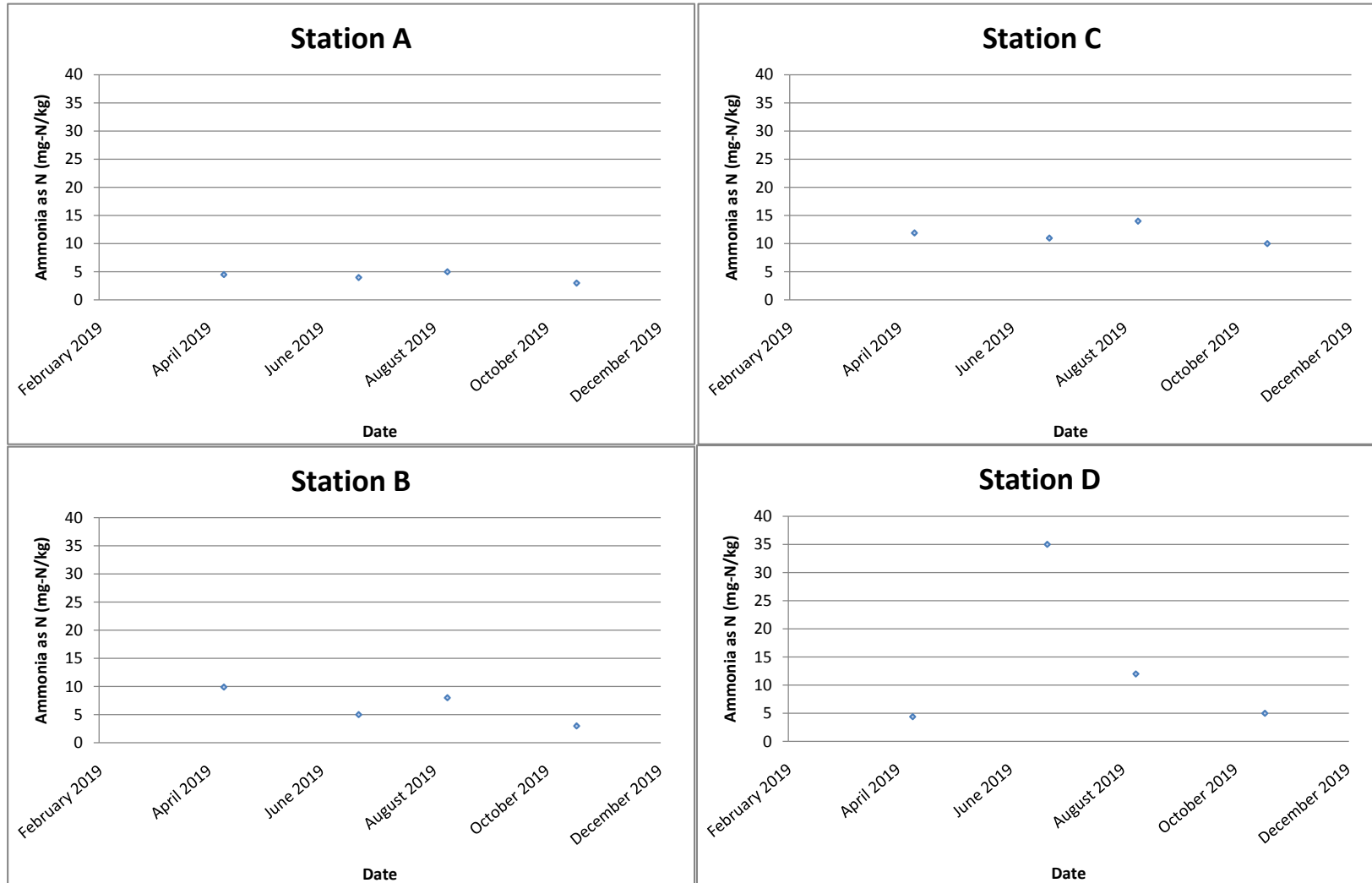
pH value



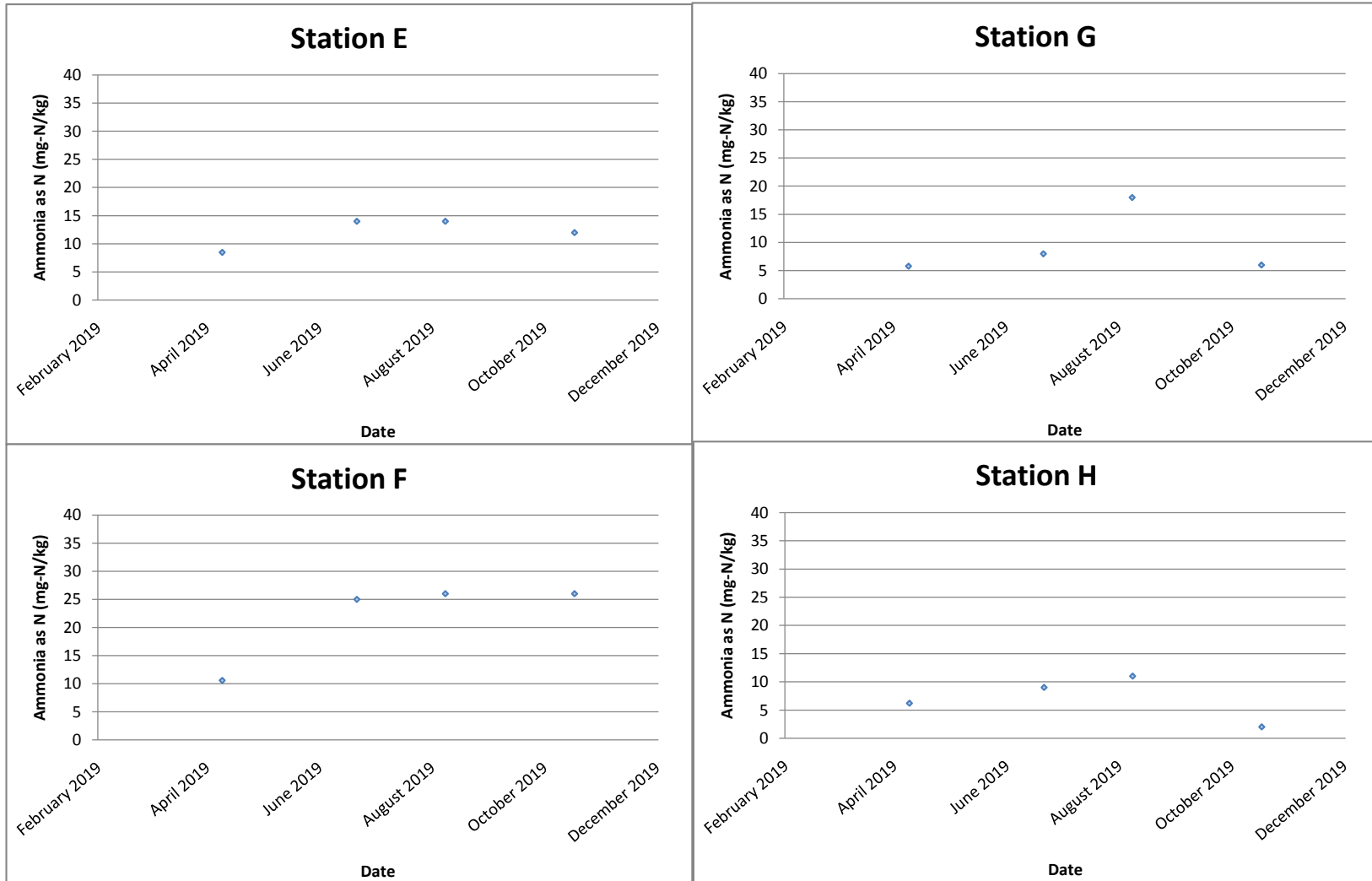
pH value



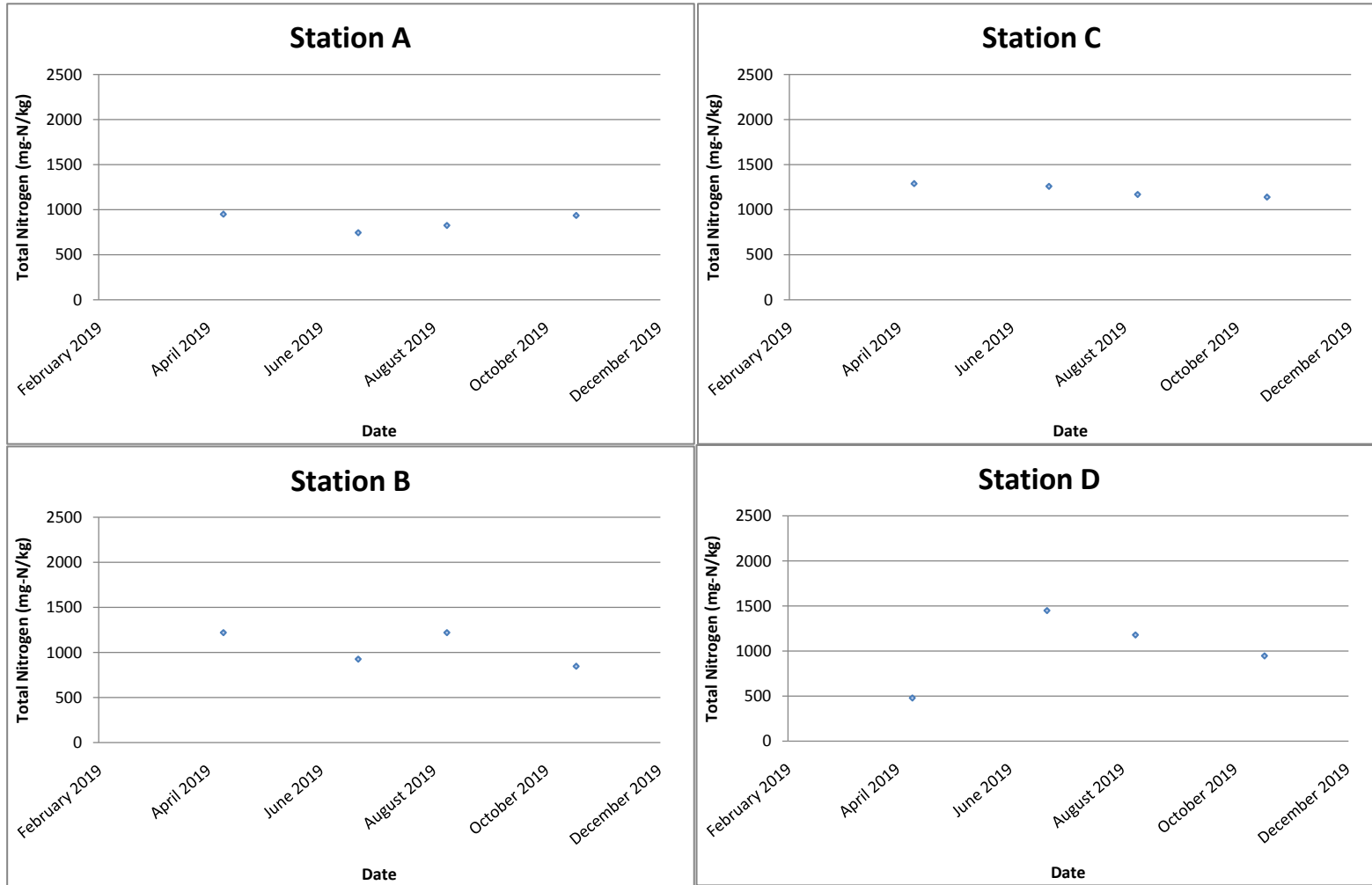
Ammonia Nitrogen (mg-N/kg)



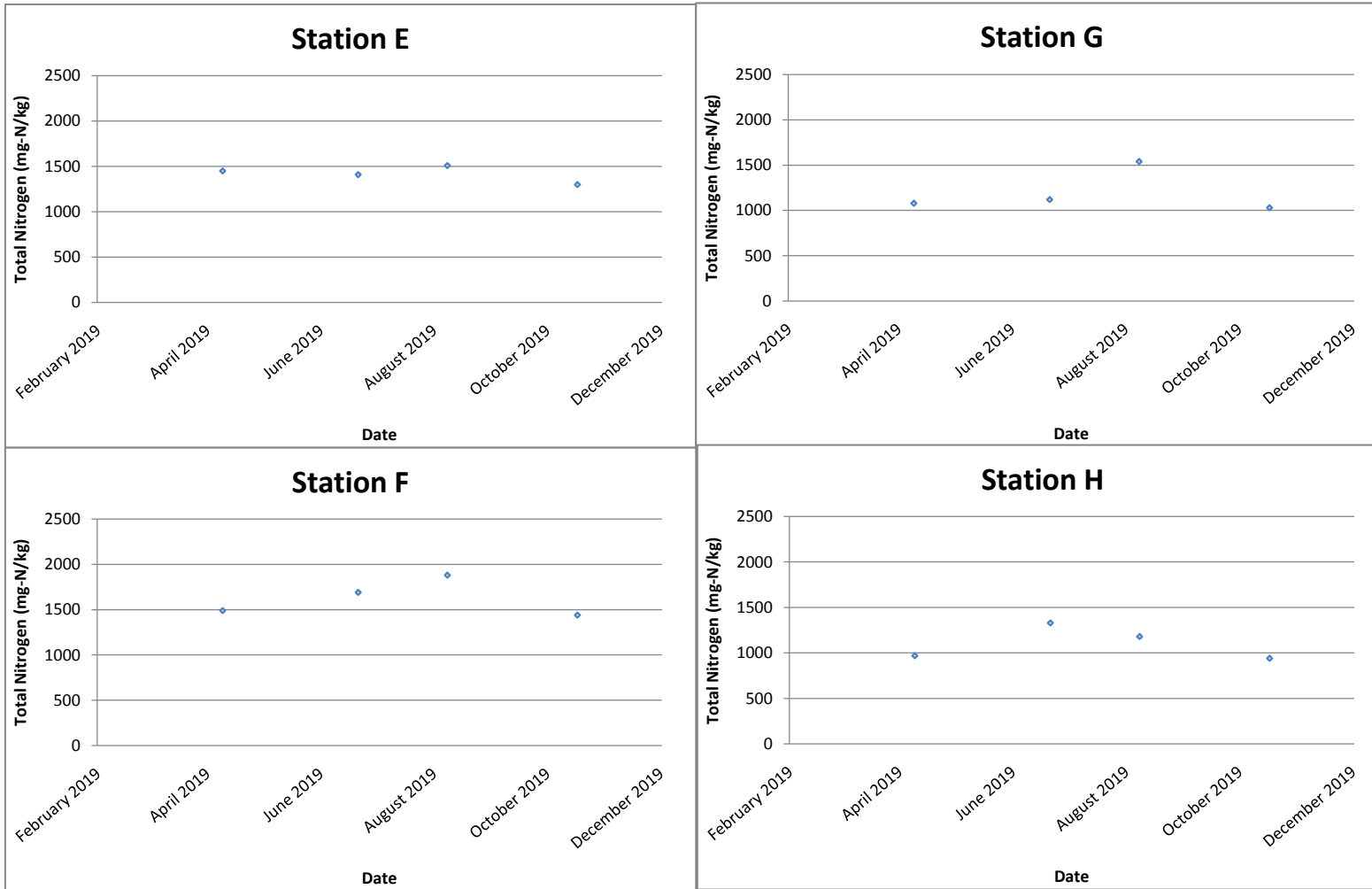
Ammonia Nitrogen (mg-N/kg)



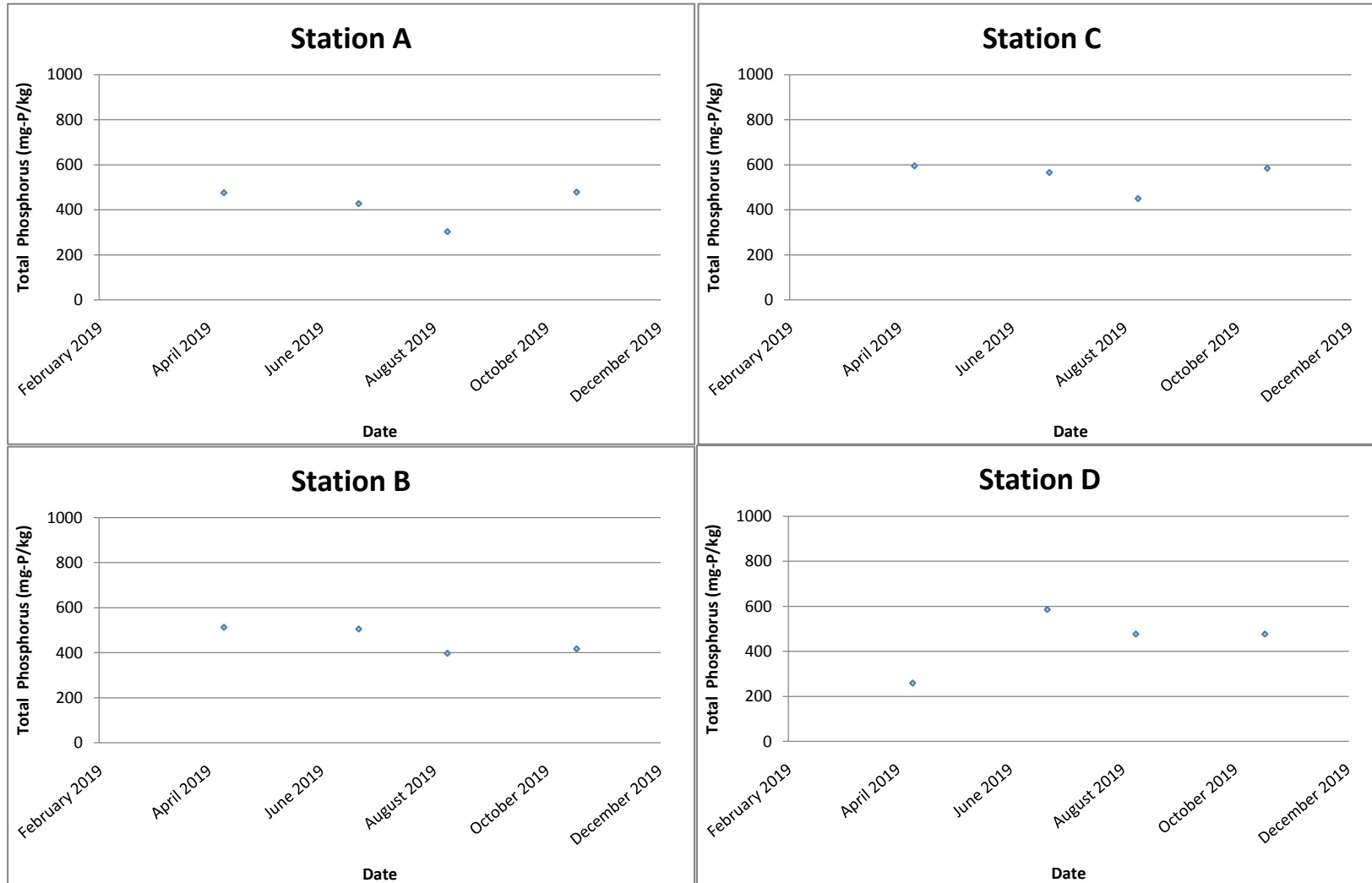
Total Nitrogen (mg-N/kg)



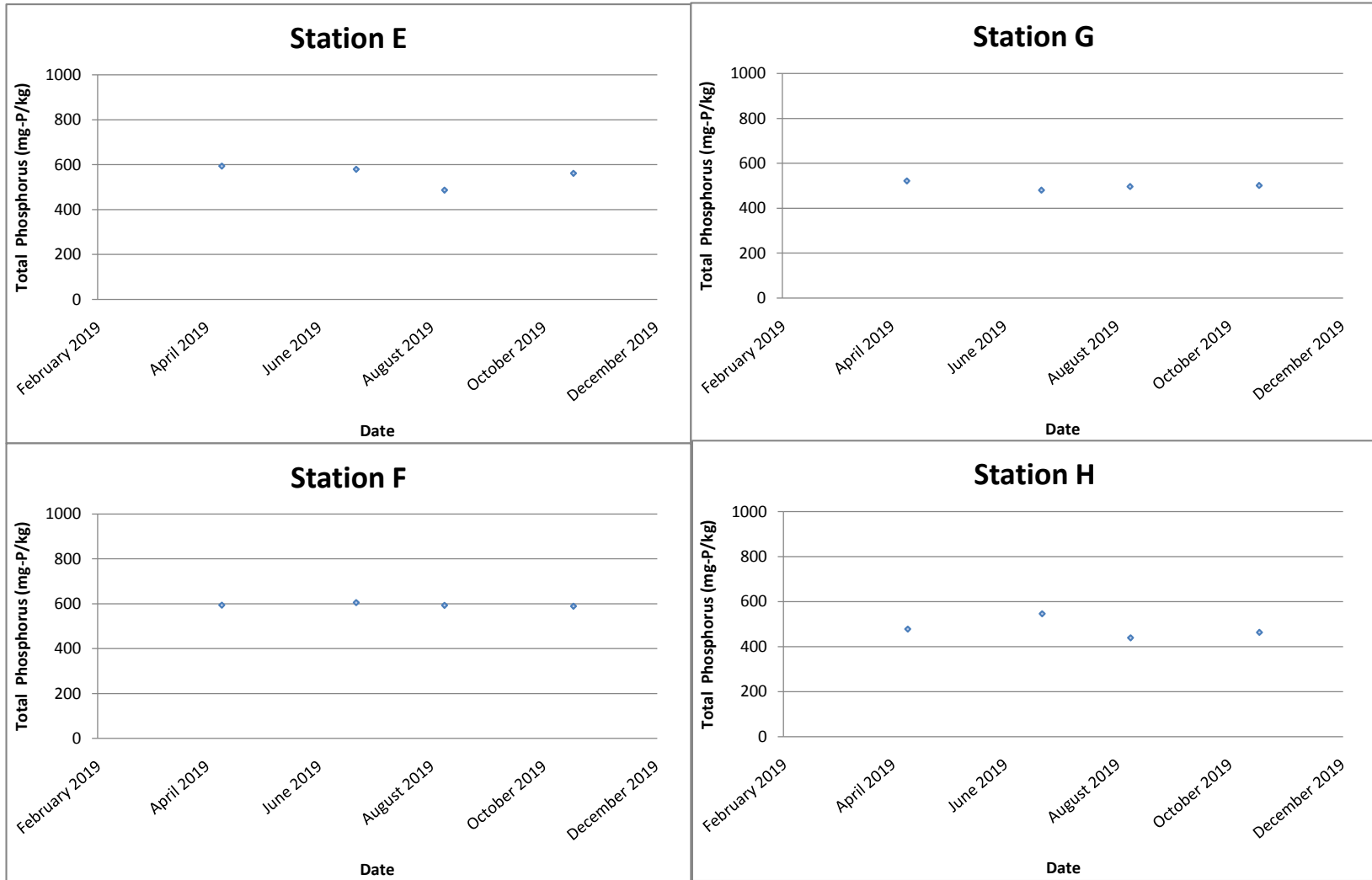
Total Nitrogen (mg-N/kg)



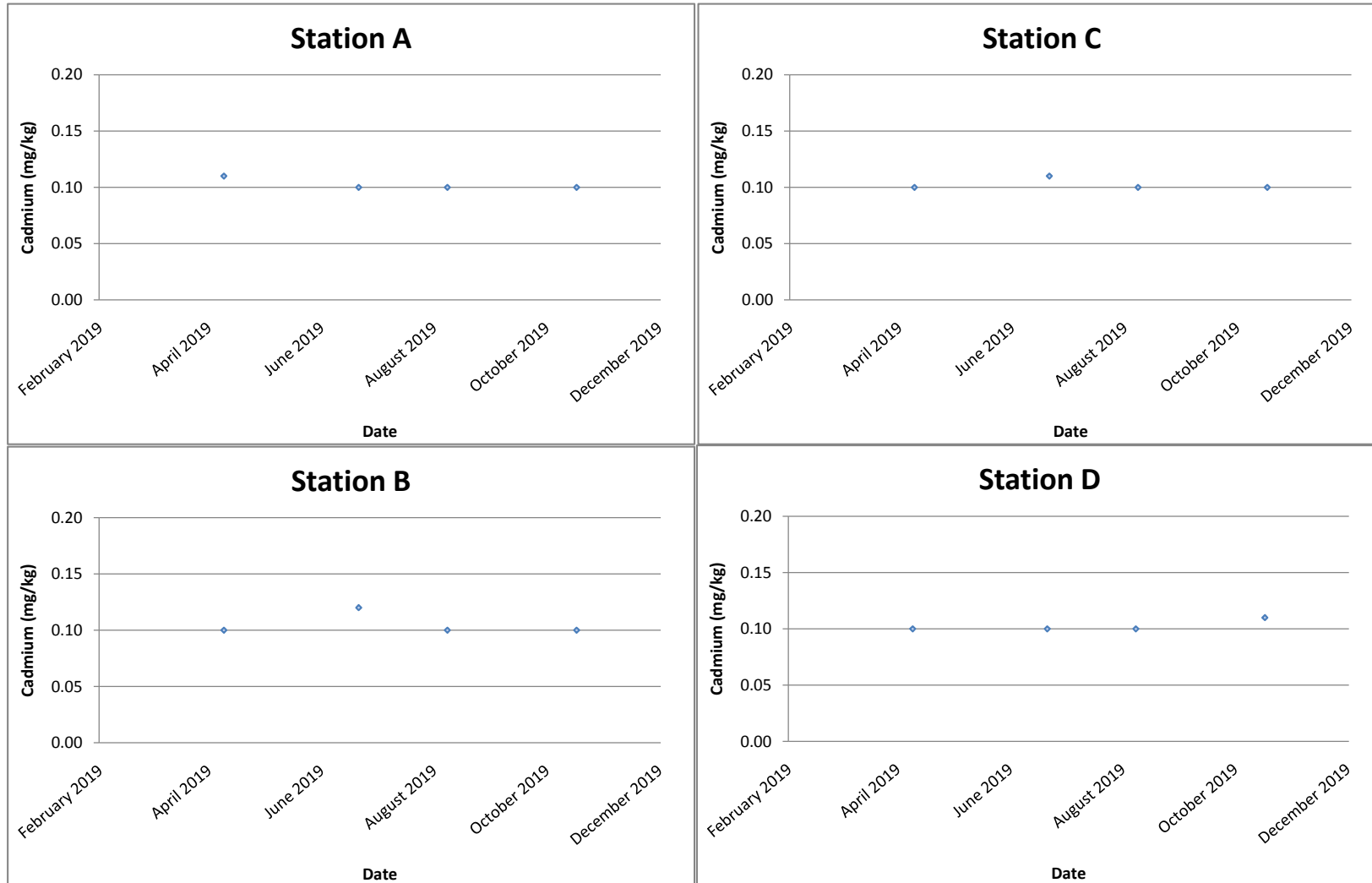
Total Phosphorus (mg-P/kg)



Total Phosphorus (mg-P/kg)

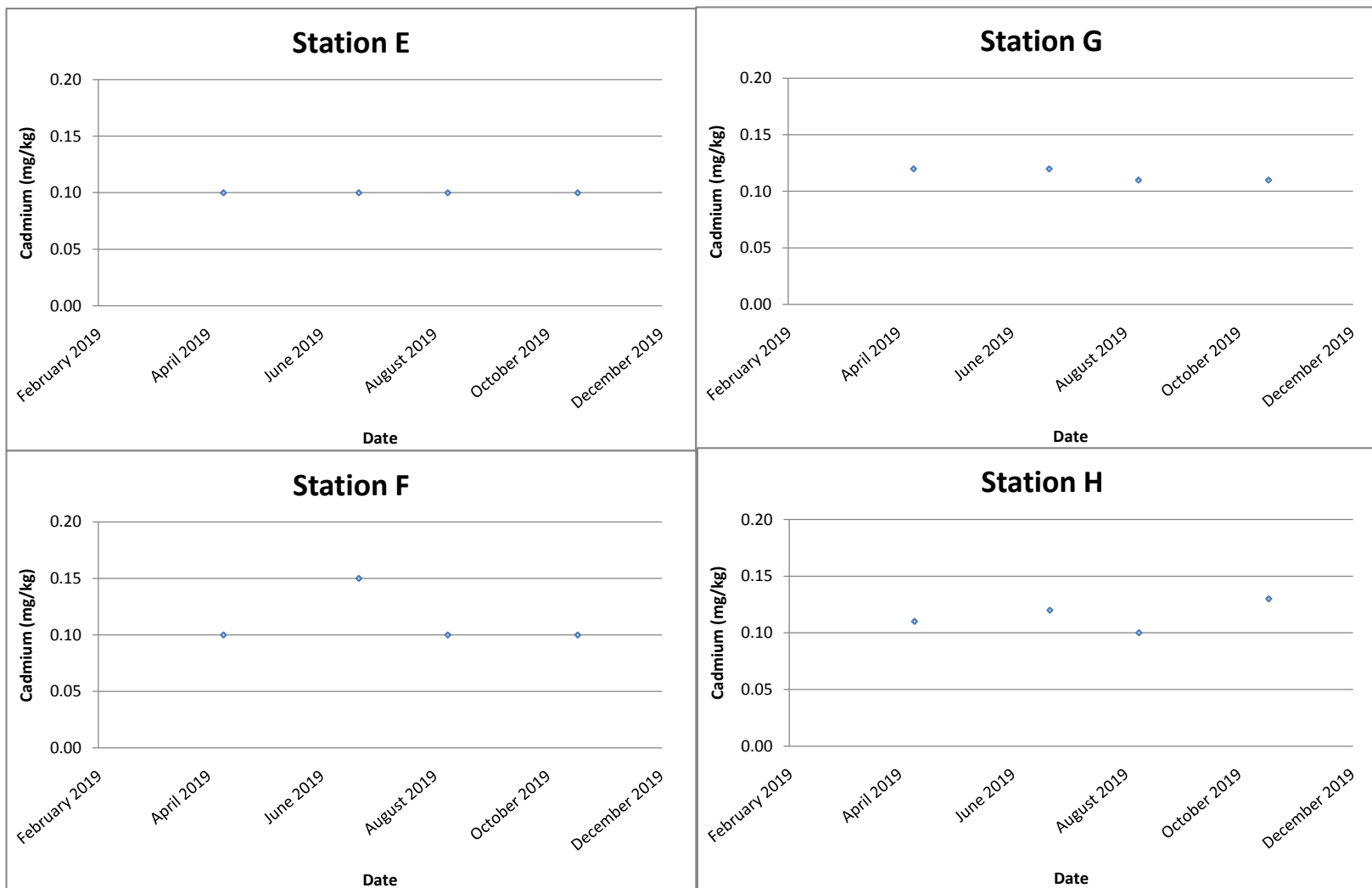


Cadmium (mg/kg)



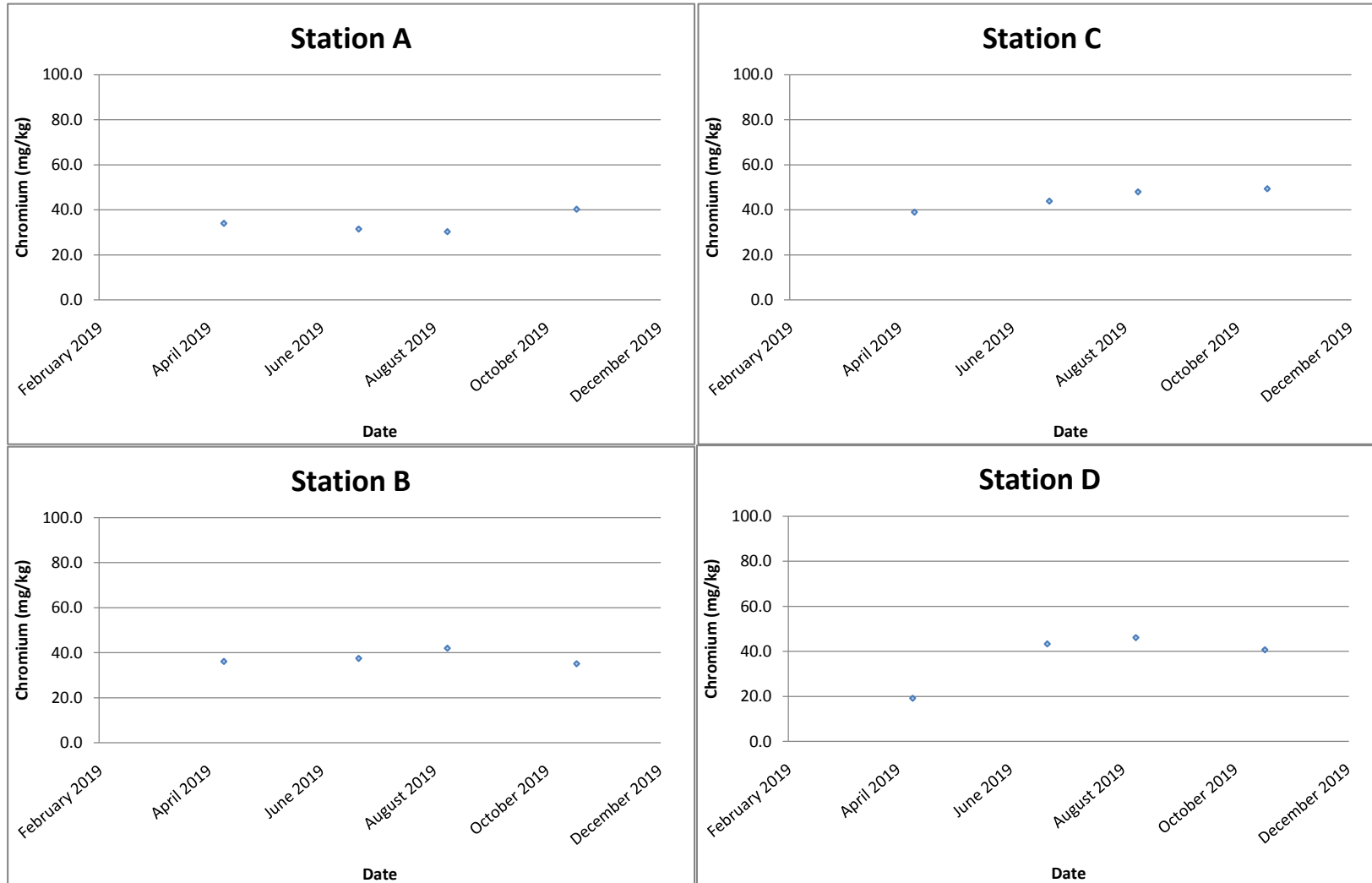
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Cadmium (mg/kg)

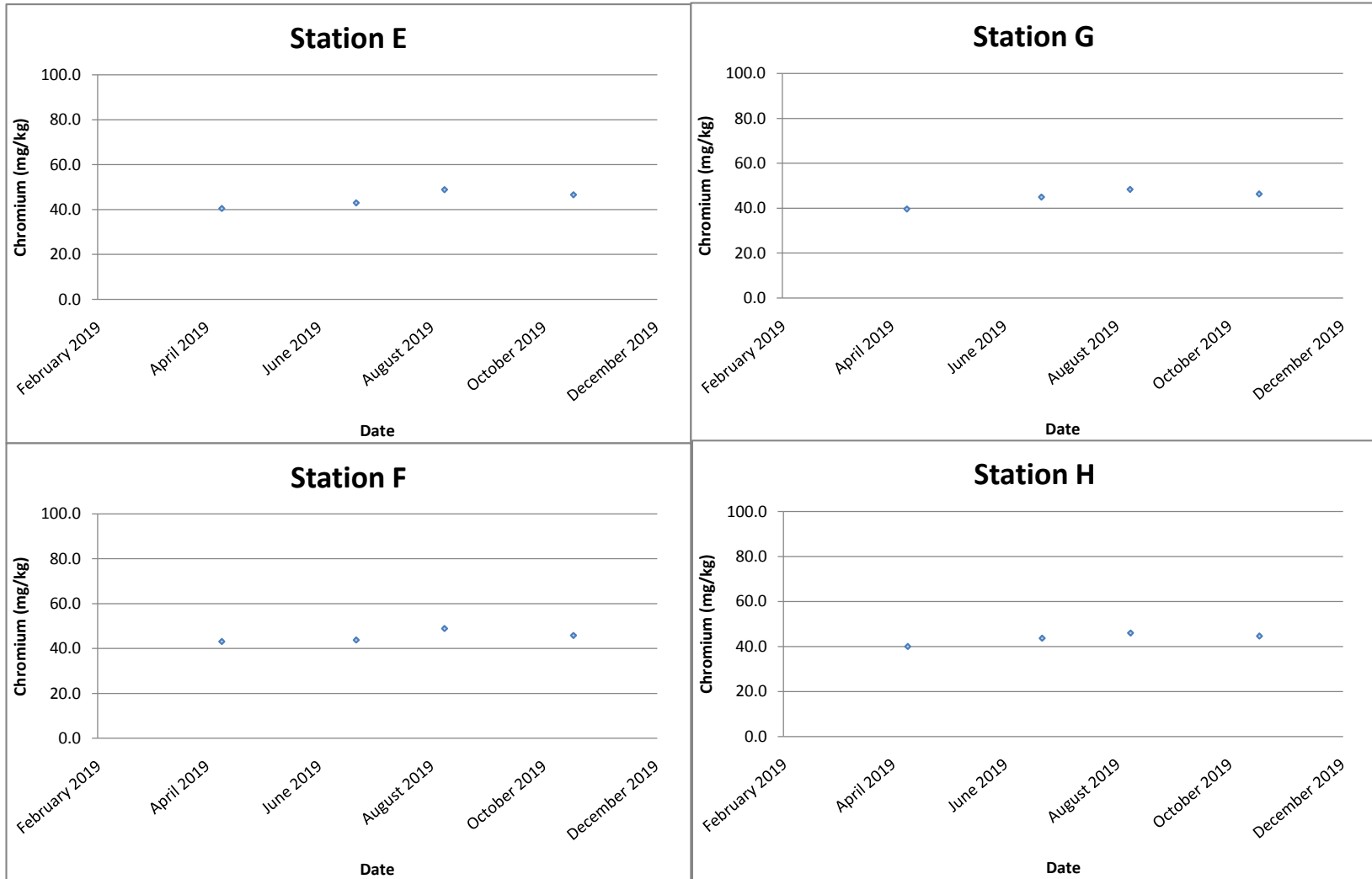


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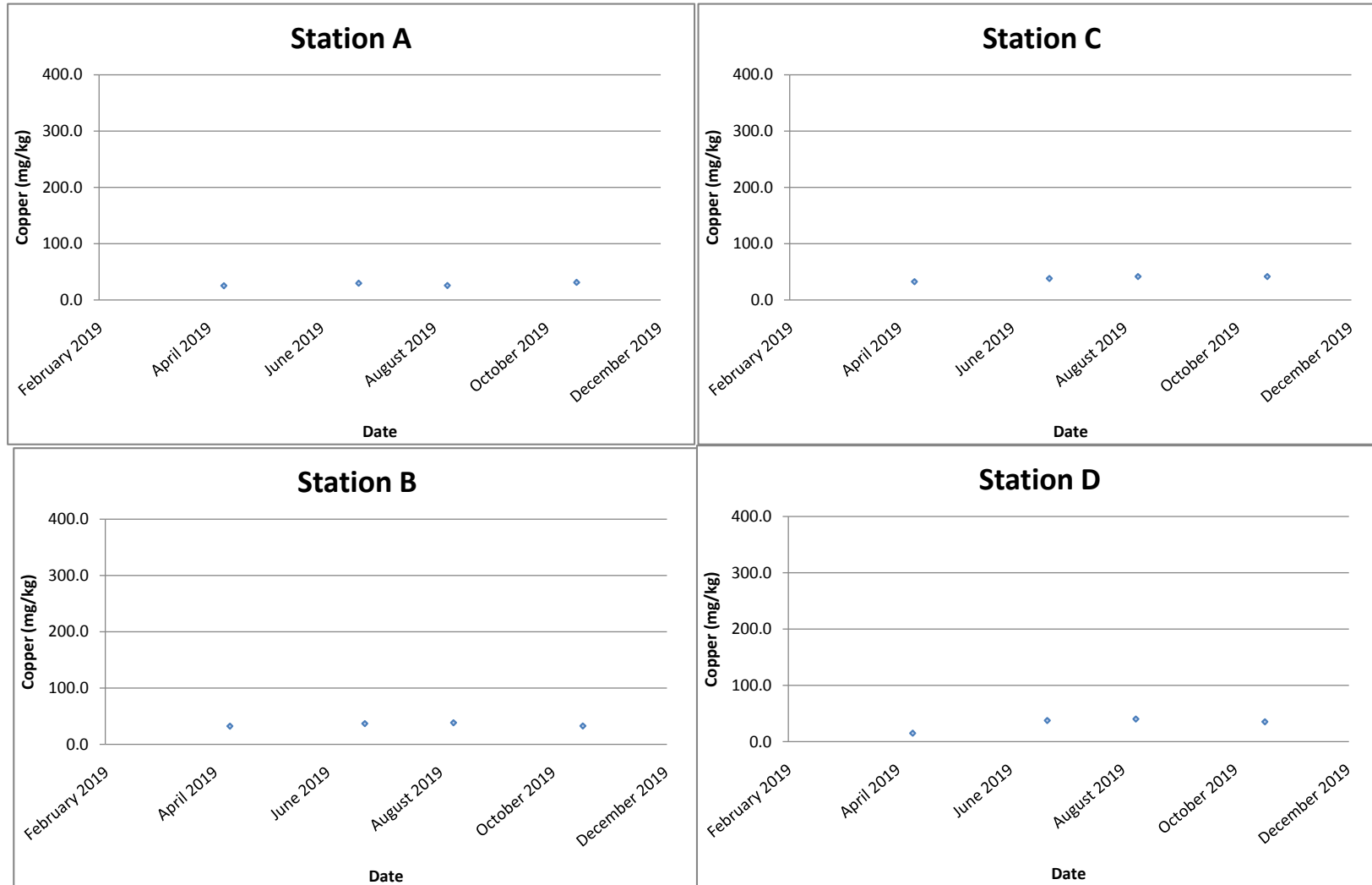
Chromium (mg/kg)



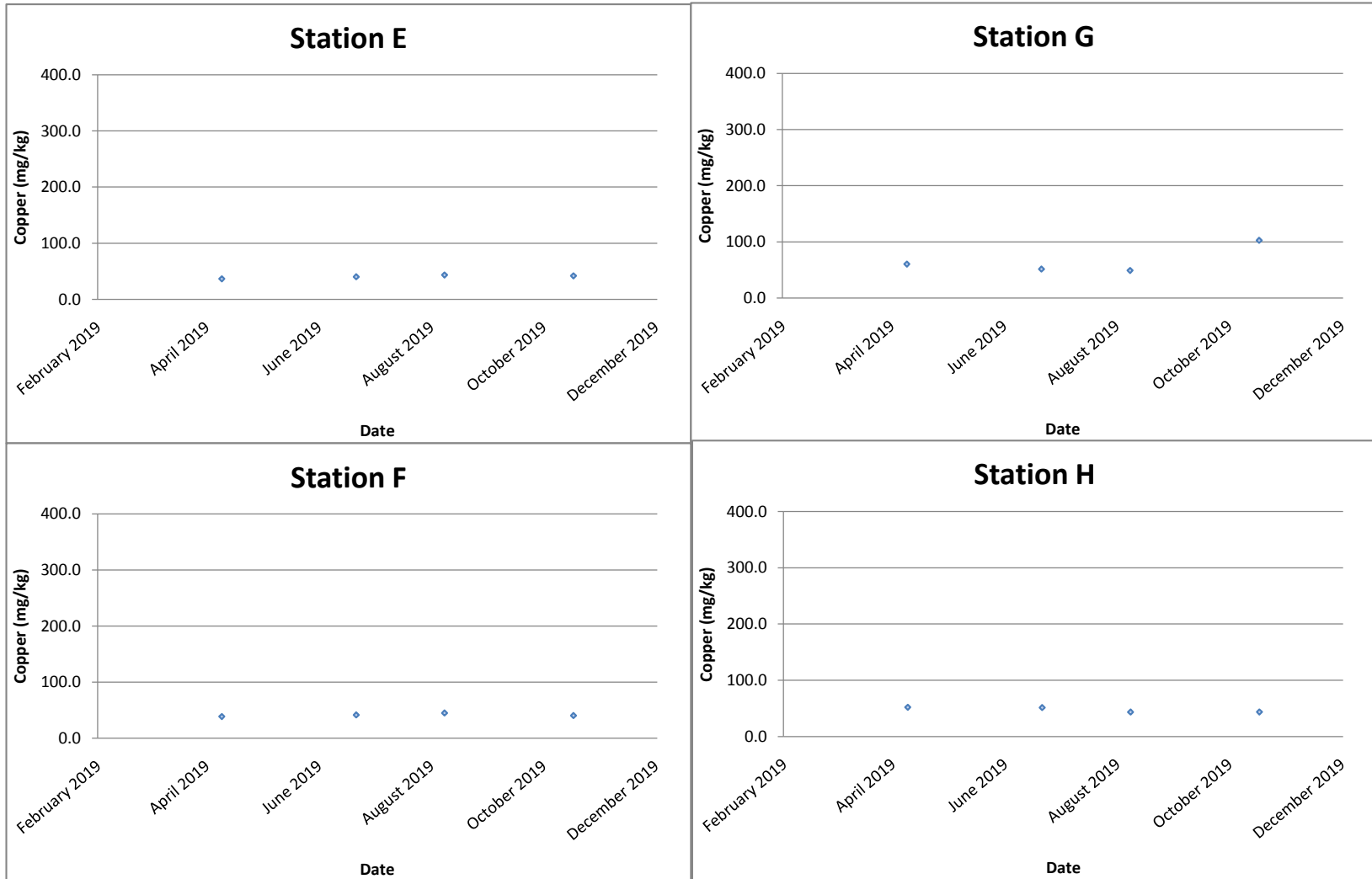
Chromium (mg/kg)



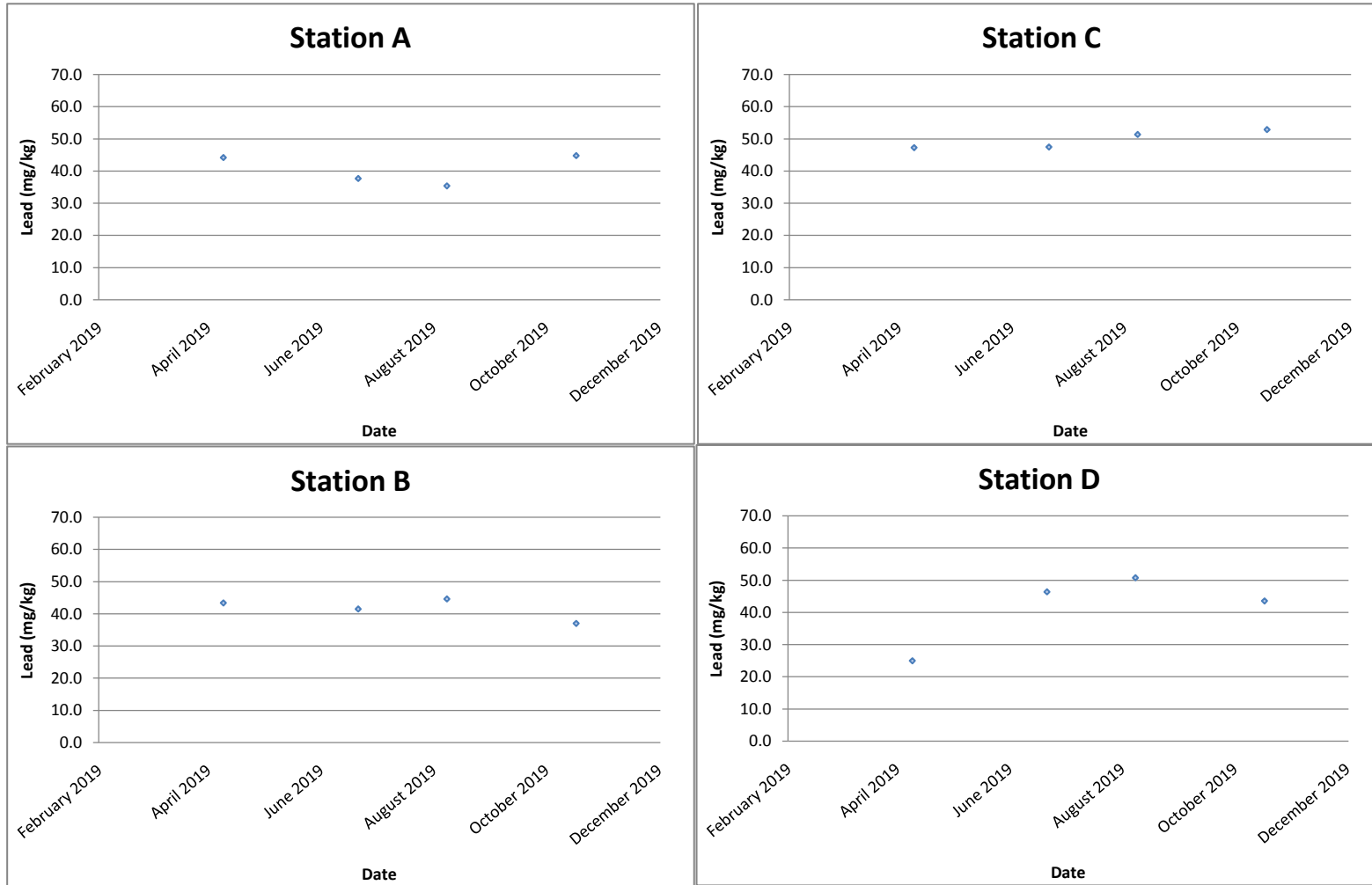
Copper (mg/kg)



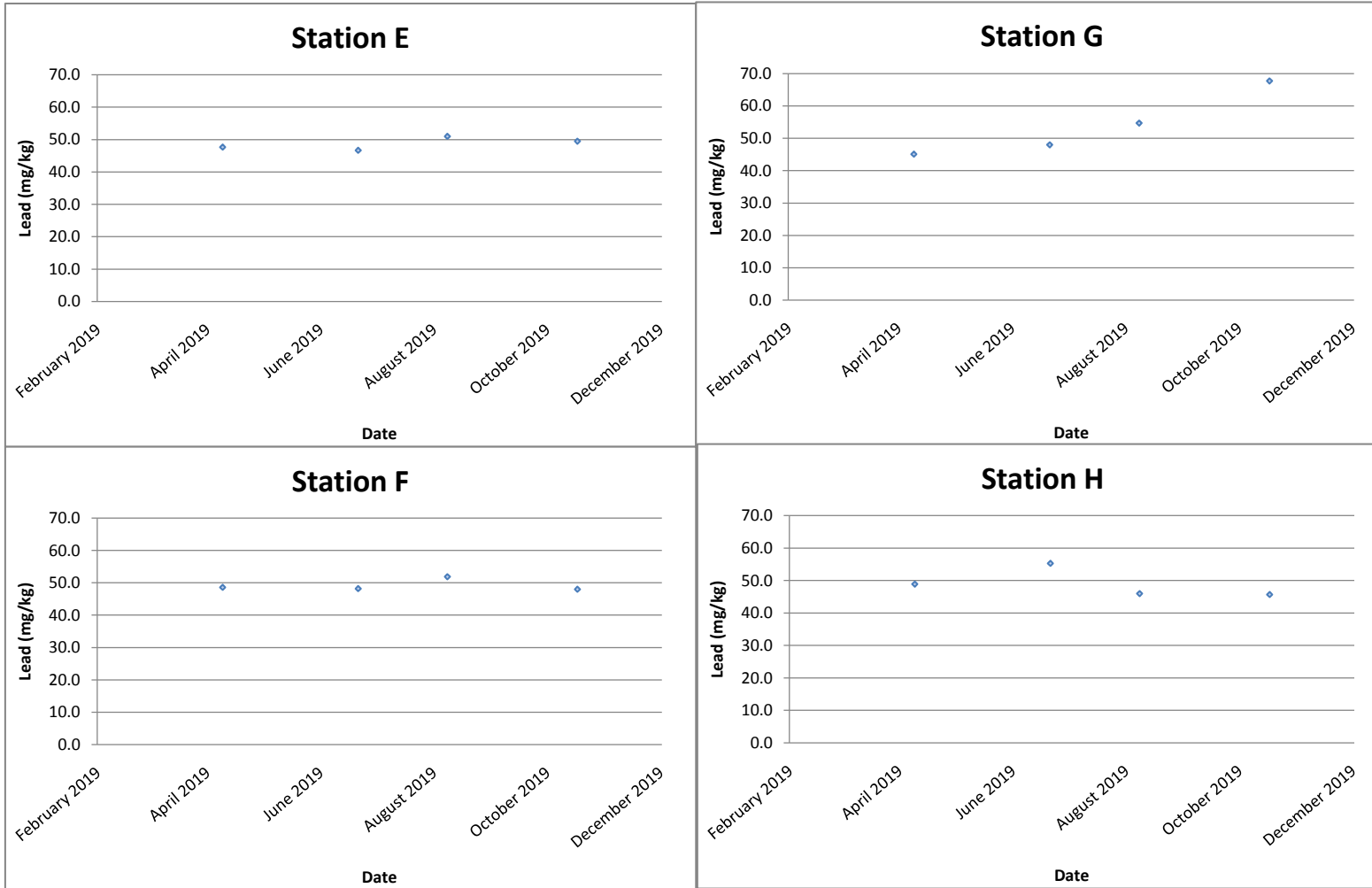
Copper (mg/kg)



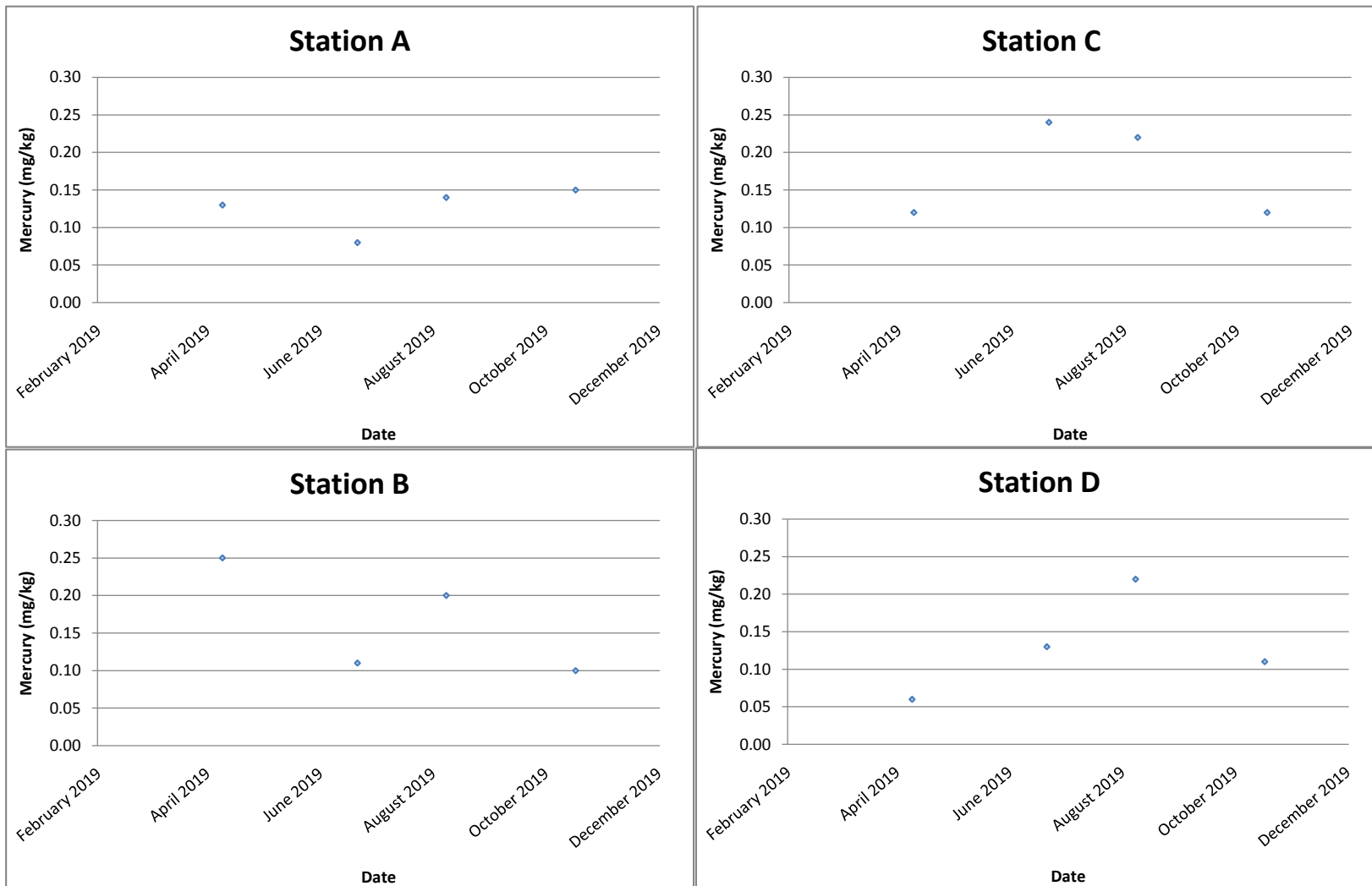
Lead (mg/kg)



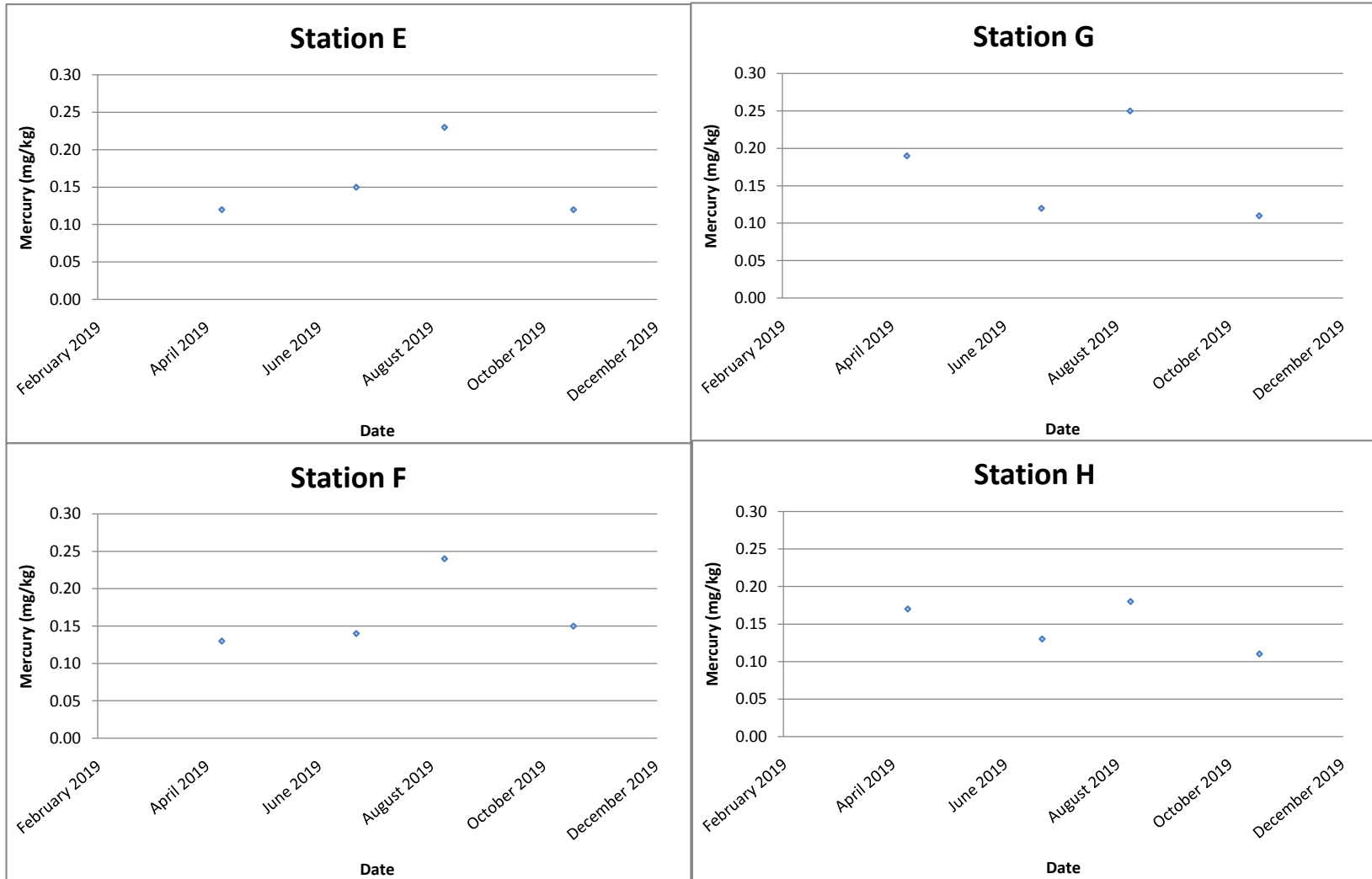
Lead (mg/kg)



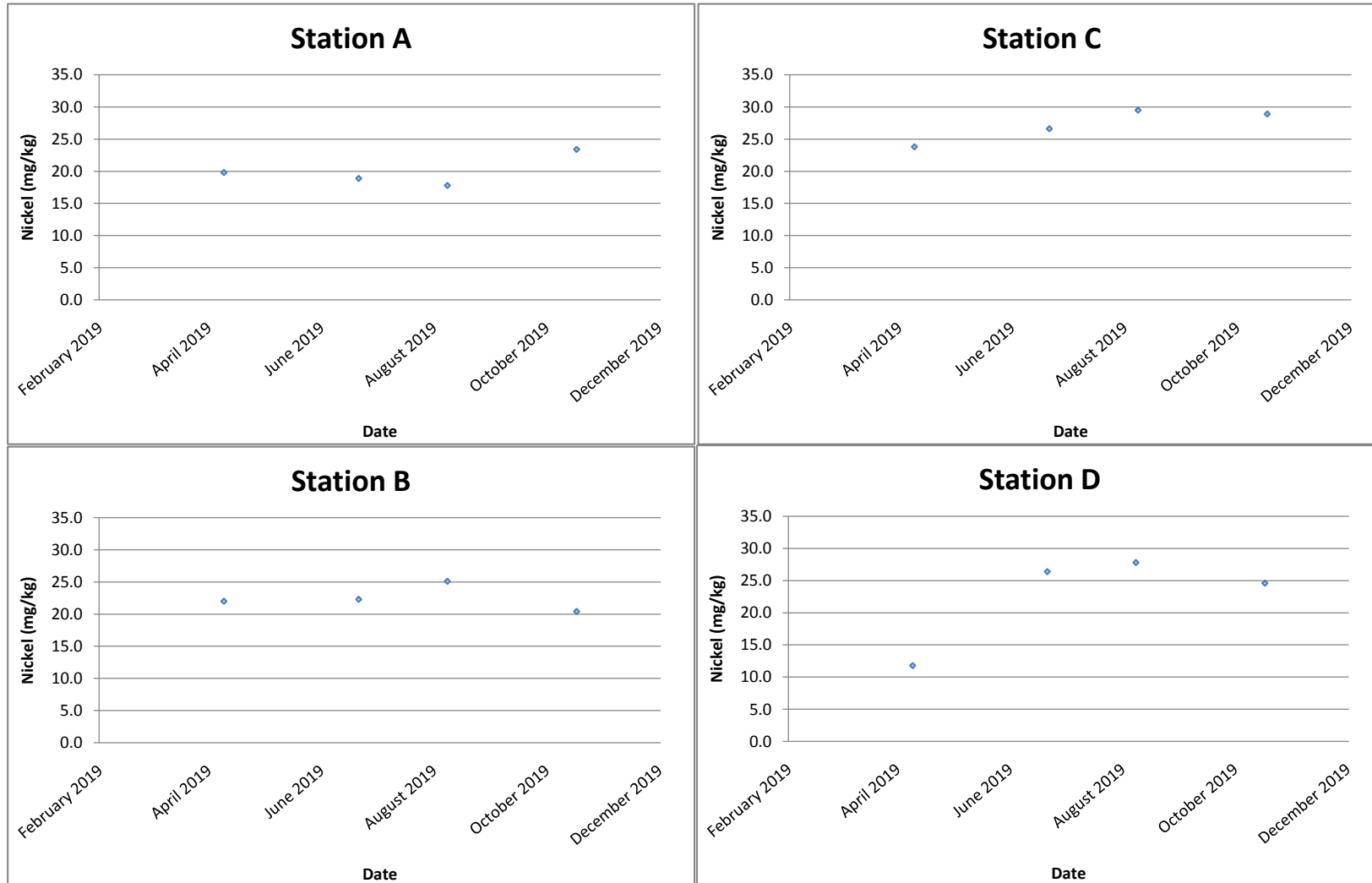
Mercury (mg/kg)



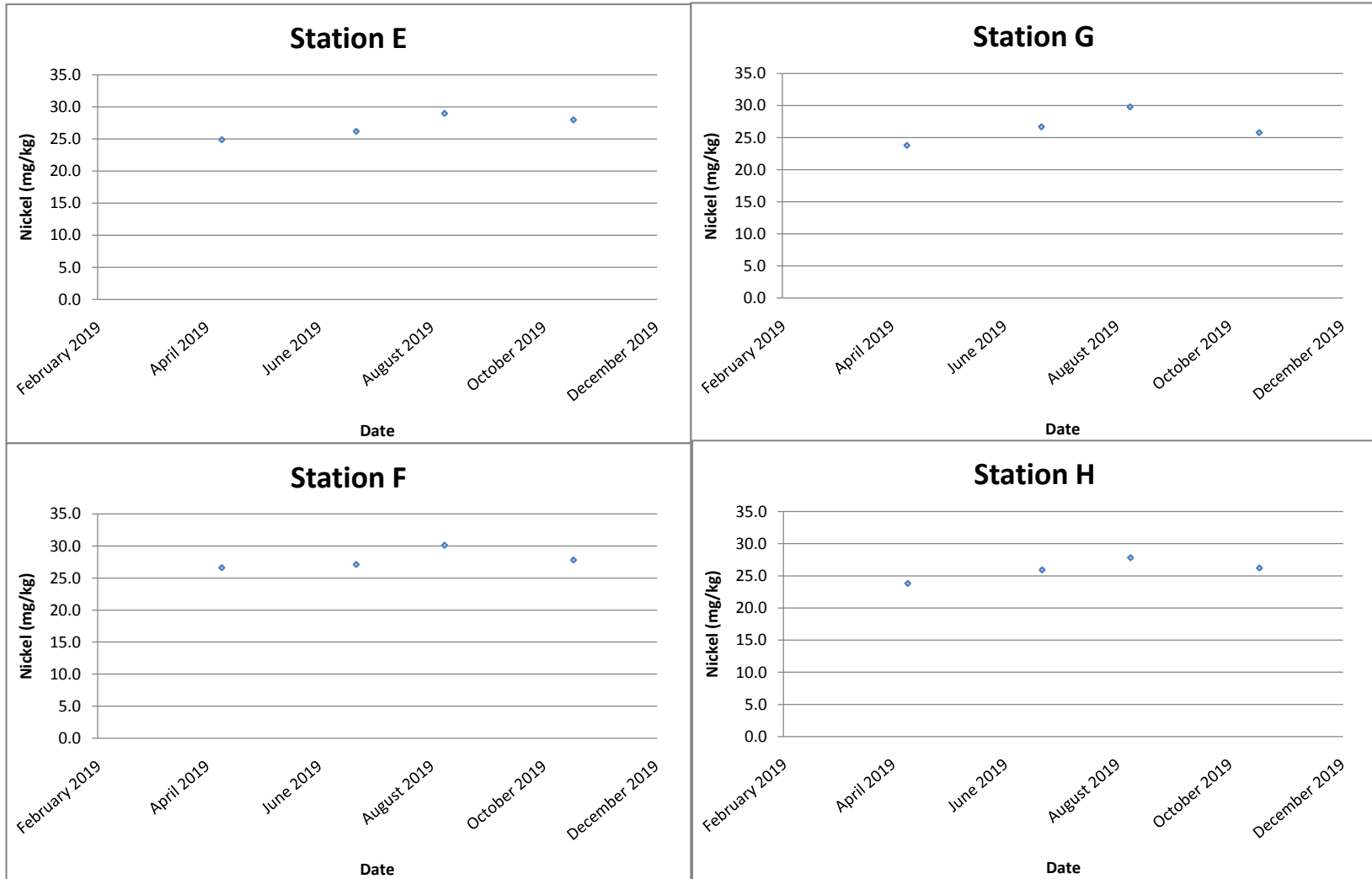
Mercury (mg/kg)



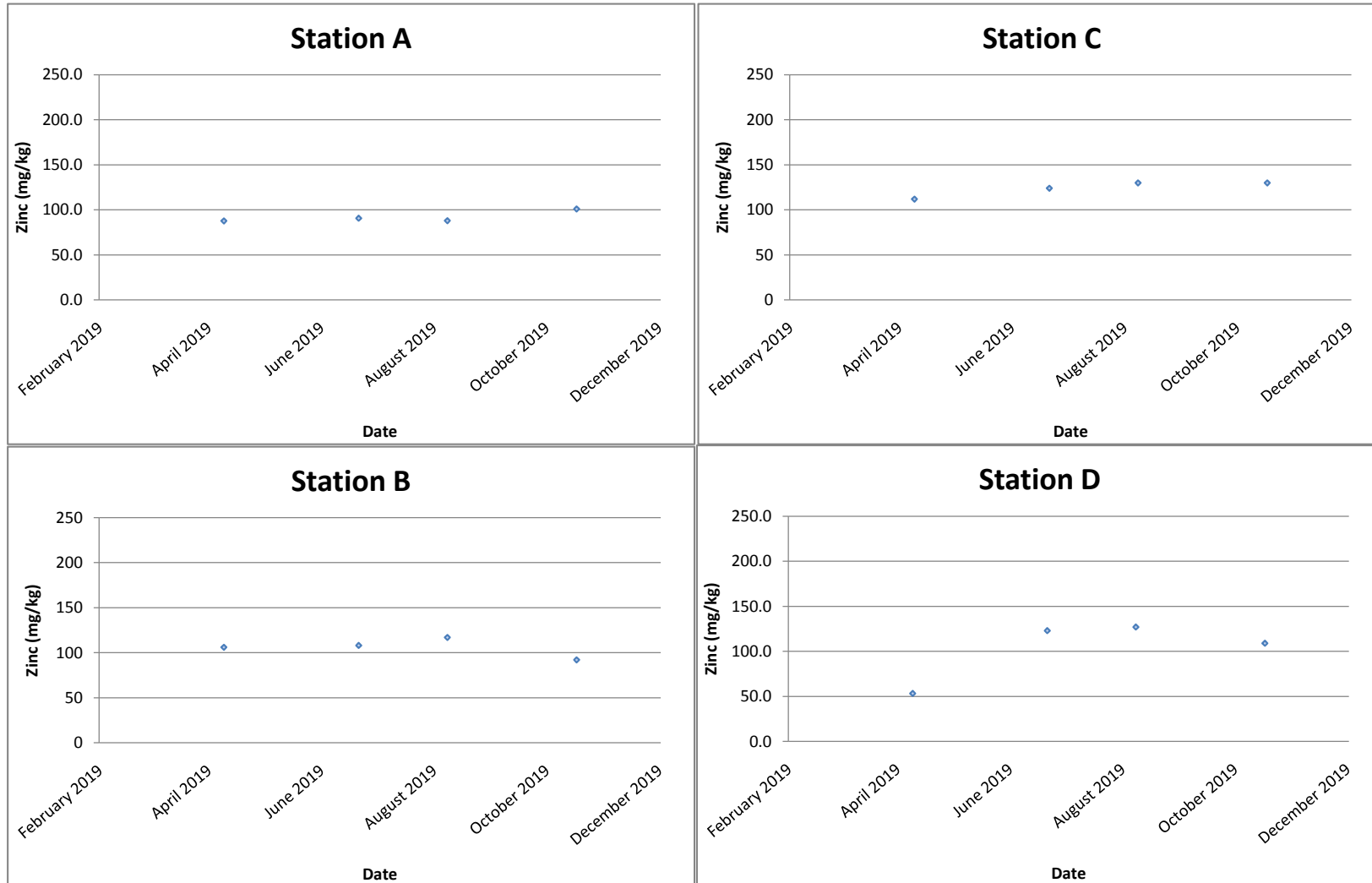
Nickel (mg/kg)



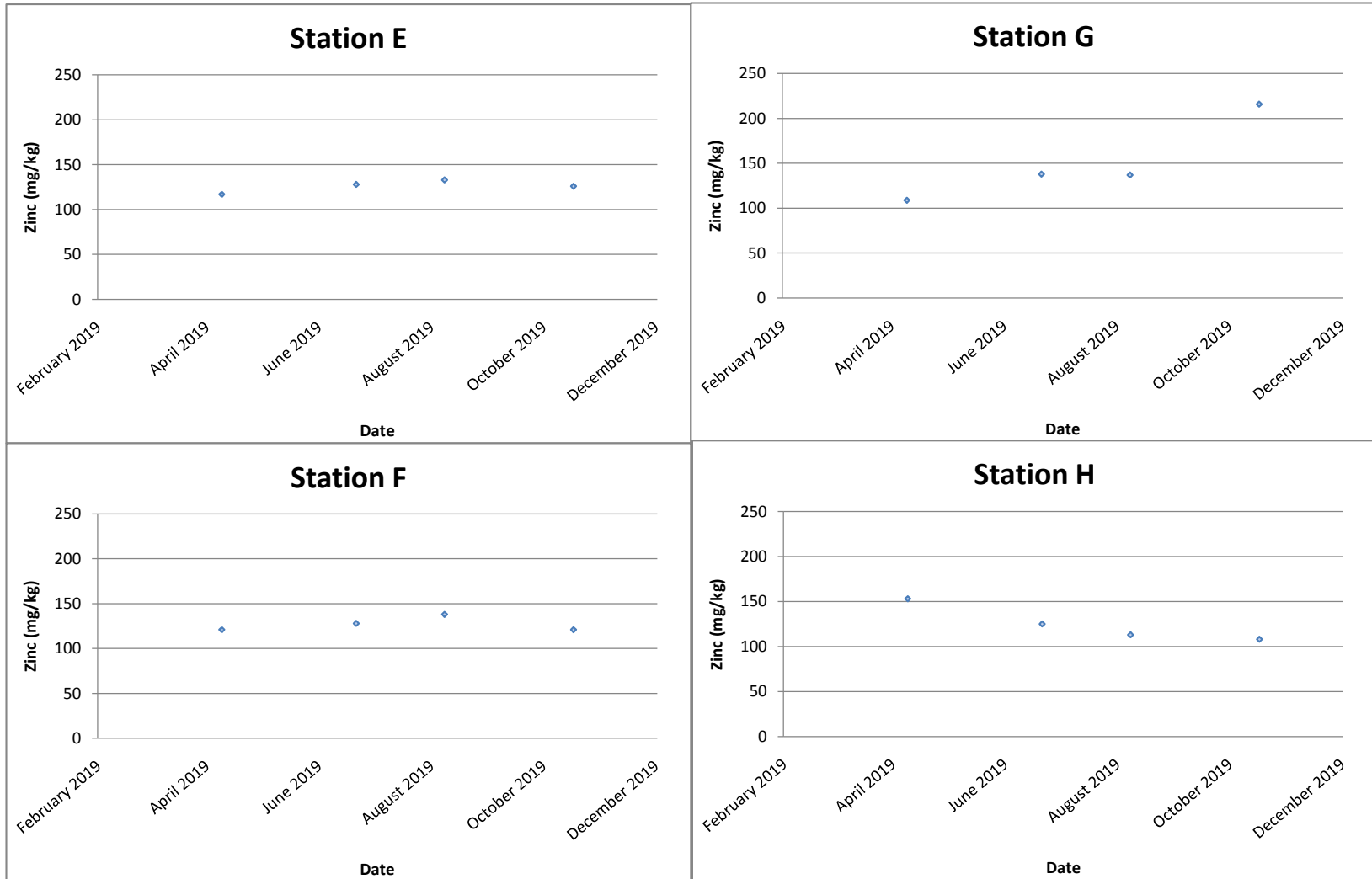
Nickel (mg/kg)



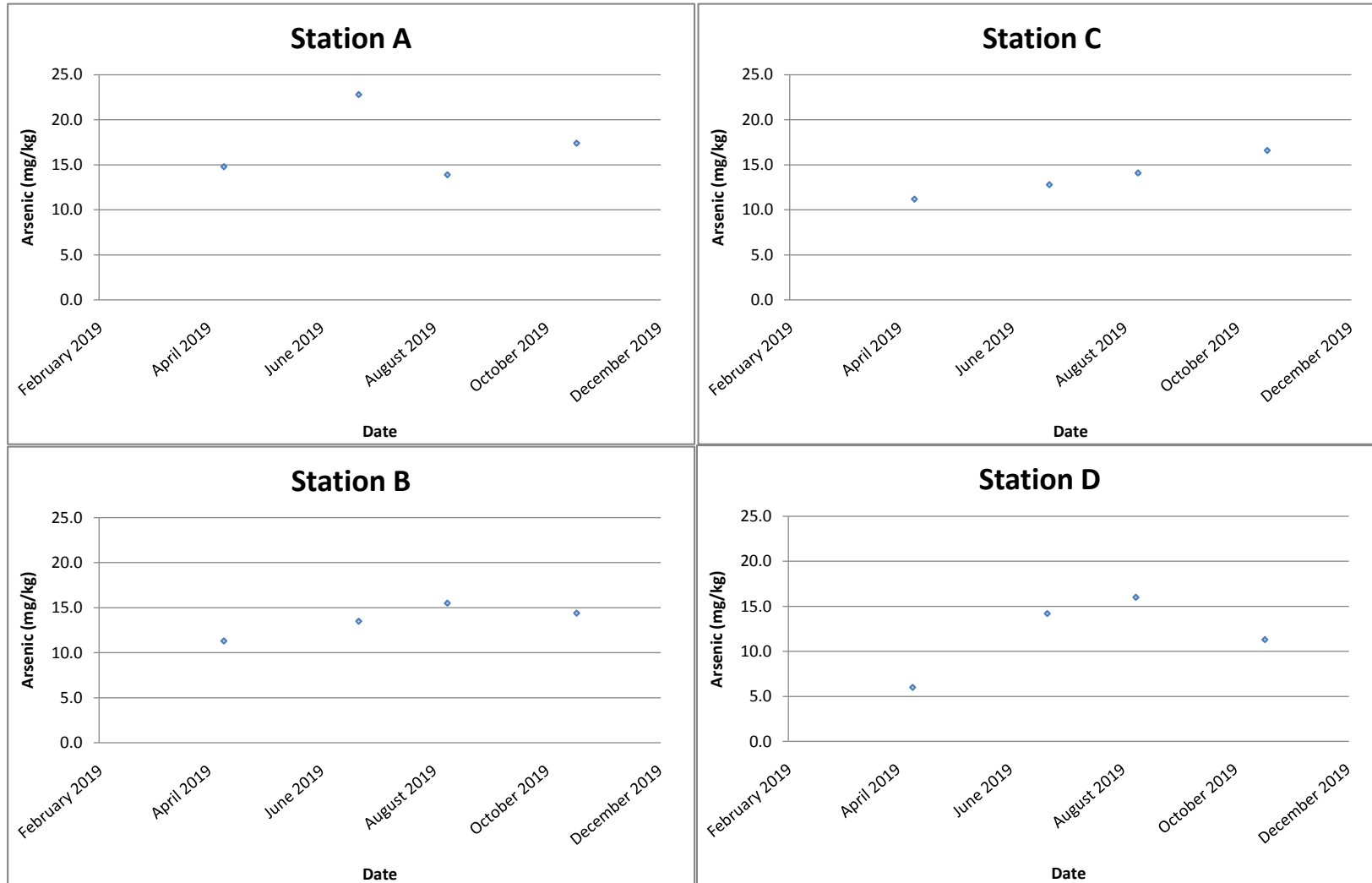
Zinc (mg/kg)



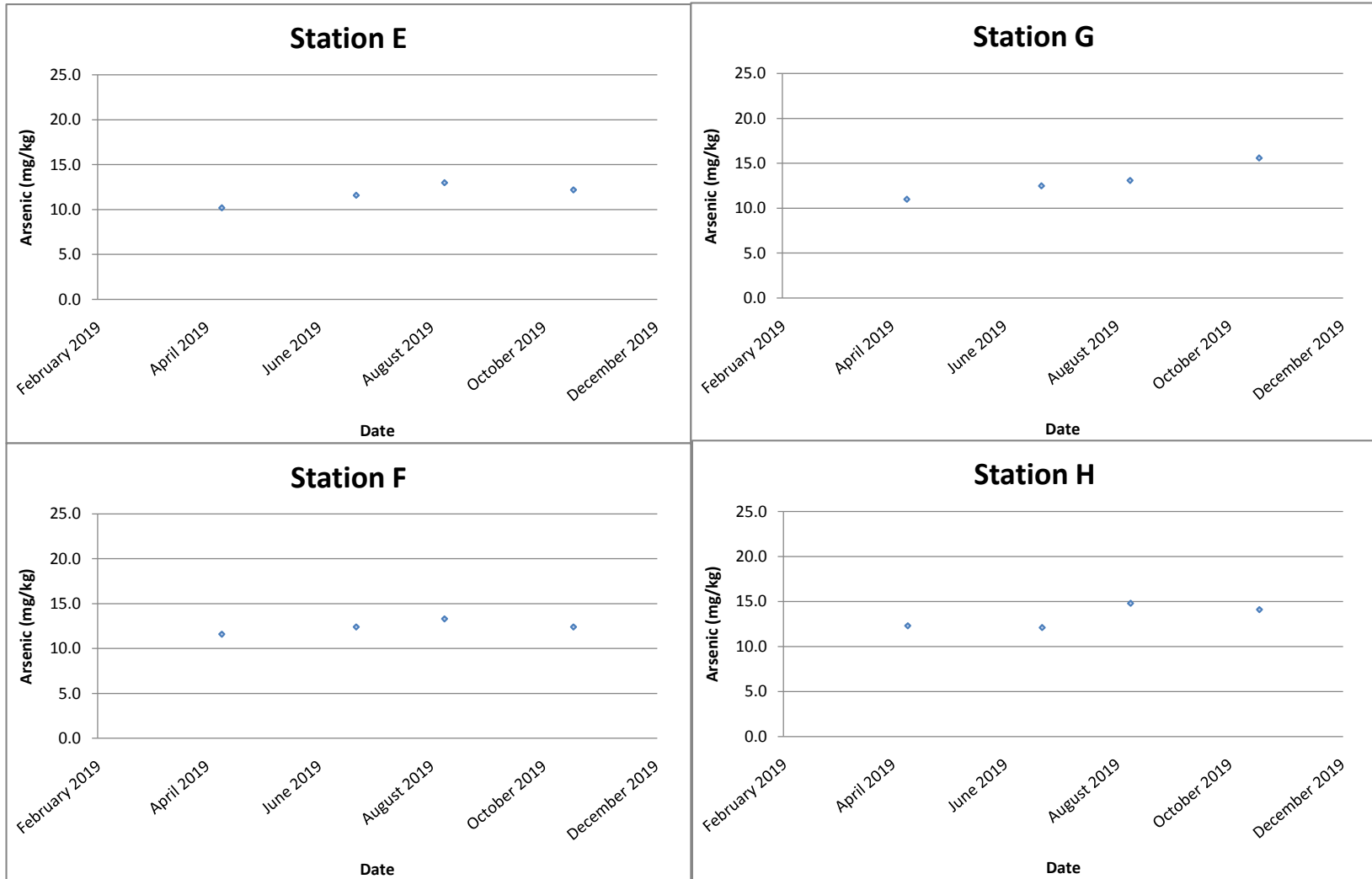
Zinc (mg/kg)



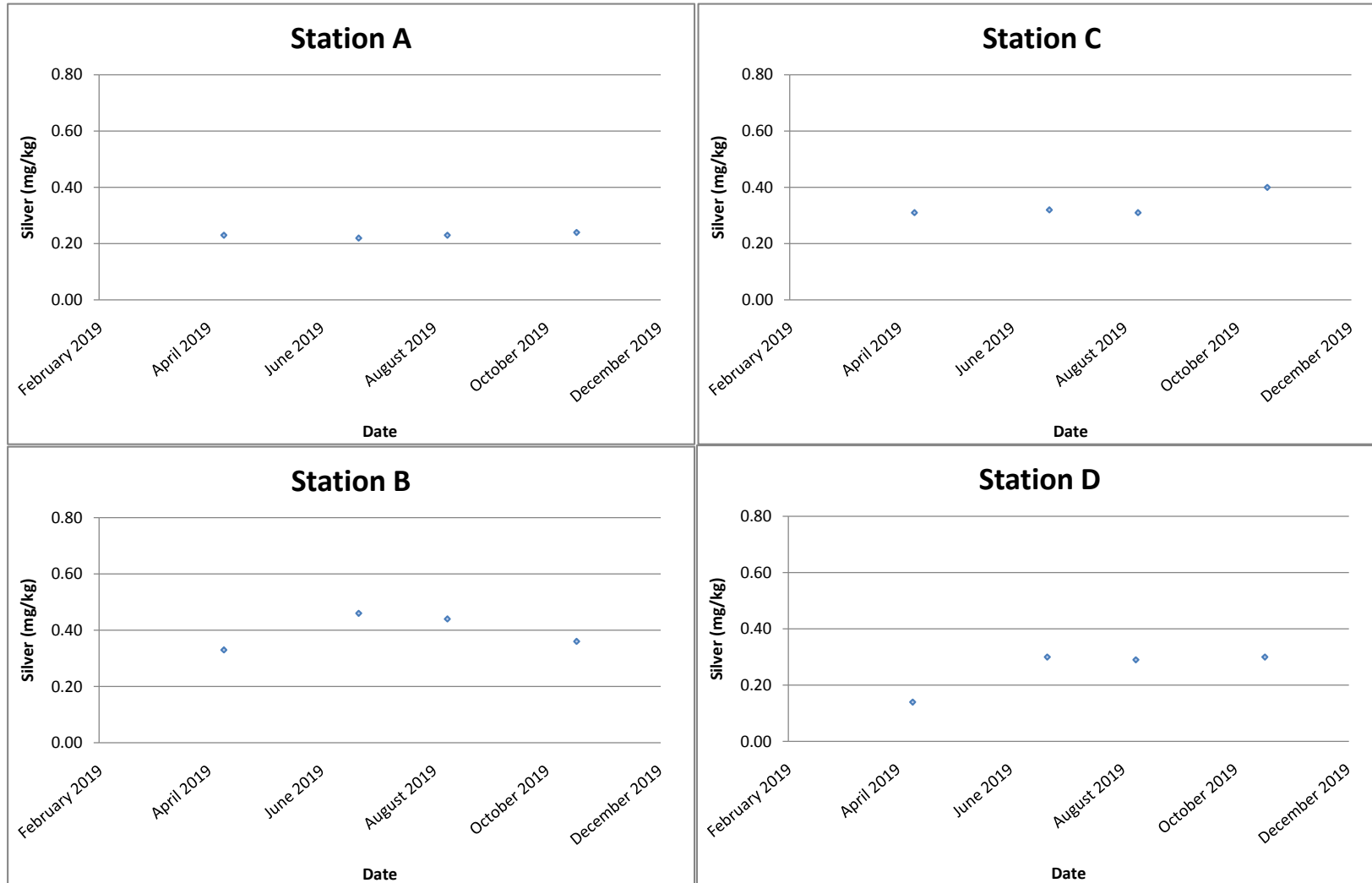
Arsenic (mg/kg)



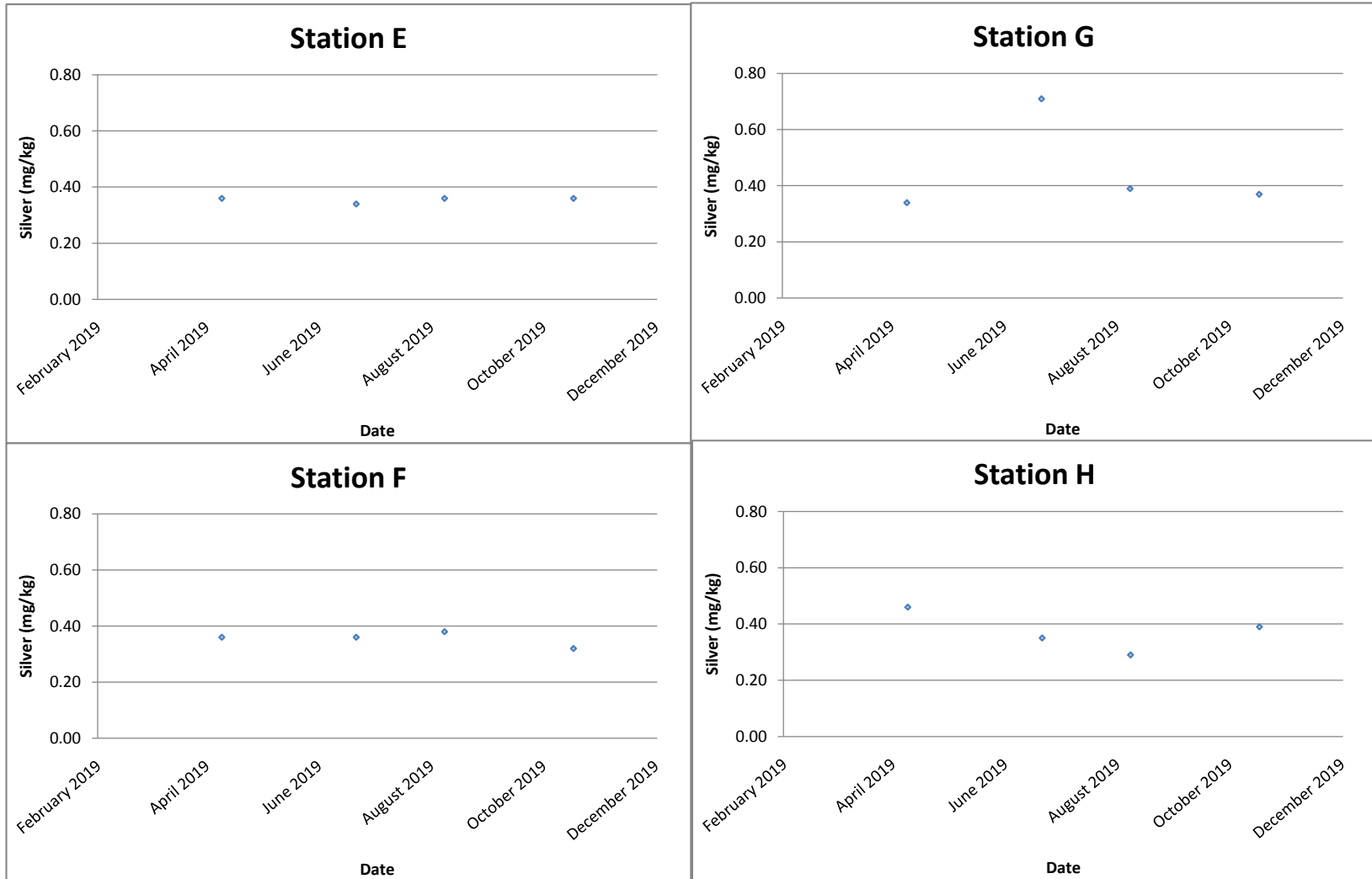
Arsenic (mg/kg)



Silver (mg/kg)



Silver (mg/kg)



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Appendix F

Environmental Mitigation Implementation Schedule (EMIS)

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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 should 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 areas should be identify and provided for the temporary storage of general	SHWSTW	Implemented

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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) should 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 deficiency 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 deficiency 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 managed in accordance with the protocols set out in the WMP Section 5.14.	SHWSTW	Implemented

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