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Report No.: 0041/17/ED/0442C

Monthly EM&A Report April 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/0442C

Prepared by: Andy K. H. Choi

Reviewed by: Cyrus C. Y. Lai

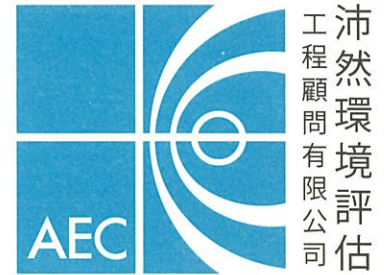
Certified by:

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

Colin K. L. Yung
Environmental Team Leader
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Our Ref: 1458/19-0011

24 May 2019

By Post and E-mail

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

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

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)
MONTHLY ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REPORT (APRIL 2019)

Reference is made to the submission of Monthly Environmental Monitoring and Audit (EM&A) Report for April 2019 (Report No.: 0041/17/ED/0442C) from the Environmental Team (ET), Fugro Technical Services Ltd., received on 23 May 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 monthly 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/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

This Monthly Environmental Monitoring and Audit (EM&A) Report is prepared for Contract No. CM 14/2016 – “Environmental Monitoring and Audit for Operation of Siu Ho Wan Sewage Treatment Works” (hereafter referred to as “the Contract”) for the Drainage Services Department (DSD) of Hong Kong Special Administrative Region. Fugro Technical Services Limited (hereafter referred to as “FTS”) was appointed as the Environmental Team (ET) by DSD, to implement the Environmental Monitoring & Audit (EM&A) programme in accordance with the Operational EM&A Plan of the Contract.

The Contract is part of the “Upgrading of Siu Ho Wan Sewage Treatment Works” (hereinafter referred as “the Project”) which was classified as “Designated Project” under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap 499) and Environmental Impact Assessment (EIA) Report (Register No. EIA-124BC) was completed in September 1997. The current Environmental Permit (EP) No. EP-076/2000 was issued in August 2000 to DSD.

In accordance with the EP, an approved operational EM&A Plan was submitted. According to the approved EM&A plan, air quality monitoring (i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis of H₂S), in addition, water quality monitoring, sediment quality monitoring, benthic survey, Chinese White Dolphin (CWD) monitoring and waste management are the key environmental concern of the Project.

This is the Twenty-first Monthly EM&A Report for the Project which summarizes findings of the EM&A works during the reporting period from 1 April 2019 to 30 April 2019 (the “reporting period”).

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 9 April 2019. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

Complaint Log

There were no complaints received in relation to environmental impact during the reporting 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 were implemented during the reporting period.

**Future Key Issues**

The key issues to be considered in the succeeding reporting month include:

Potential environmental impacts arising from the operations of Siu Ho Wan Sewage Treatment Works (SHWSTW) are mainly associated with air quality, water quality, sediment quality, benthic ecology, waste management and distribution and abundance of Chinese White Dolphins (CWDs).

Due to inadequacy of representative data collected between August 2017 and May 2018, current H₂S measurement and olfactometry analysis were considered as unsuitable methods 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 ASRs, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASRs are not the appropriate locations for the correlation study as the change of both odour level and H₂S concentrations at ASRs 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 is approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

1. INTRODUCTION

1.1 Background

1.1.1 The Project "Upgrading of Siu Ho Wan Sewage Treatment Works" is to upgrade 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 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 Environmental Monitoring and Audit (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.

1.2 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 CWDs 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
AEC	Independent Environmental Checker (IEC)	Ms. Grace Kwok	2815 7028	2815 5399
FTS	ET Leader (ETL)	Mr. Colin Yung	3565 4114	2450 8032

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1.4 Works Undertaken during the Reporting Period

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

- 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. AIR QUALITY MONITORING

2.1 Methodology of H₂S Concentration Monitoring

2.1.1 15-min H₂S concentration was measured using a Jerome 631-X analyzer. This analyzer is capable of measuring H₂S concentration in the range of 1 ppb to 50 ppm with a resolution of 1 ppb and operates within a temperature range of 0°C to 40°C at an air flow rate of 0.15 L/min. Odour gas samples were drawn by built-in a suction pump of the analyzer and passed through a gold film sensor. The trace level of H₂S of the samples were determined electrochemically on the gold film sensor. Meteorological conditions including temperature, wind speed, wind direction and relative humidity were also measured at the time of the monitoring. Table 2.1 summarizes the equipment used in H₂S monitoring.

Table 2.1 Equipment used for H₂S Concentration Monitoring

Equipment	Manufacturer / Model	Serial Number	Sensor Number
Gold Film Hydrogen Sulphide Analyzer	JEROME X631 0003	2966	14-11-23-R2D

2.2 Methodology of Odour Patrol Monitoring

2.2.1 Odour patrol monitoring was carried out in accordance with the European Standard method: BS EN13725, to ensure the odour sensitivities of all patrol members are within 20-80 ppb/V. Environmental conditions were record as follows:

- i. Prevailing Weather Condition;
- ii. Wind Direction;
- iii. Wind Speed;
- iv. Location where Odour is detected;
- v. Source of Odour detected;
- vi. Perceived intensity of Odour detected;
- viii. Duration of Odour detected; and
- ix. Characteristics of Odour detected

The perceived intensity is classified into 5 categories as shown in **Table 2.2** below.



Table 2.2 Categories of Odour Intensity

Odour Level	Odour Intensity	Classification Criteria
0	Not detected	No odour perceives or an odour so weak that it cannot be readily characterised or described
1	Slight	Identifiable odour, barely noticeable
2	Noticeable	Identifiable odour, noticeable
3	Strong	Identifiable odour, strong
4	Extreme	Severe odour

2.3 Methodology of Odour Sampling and Olfactometry Analysis

- 2.3.1 Odour gas samples were collected in a Nalophan sampling bag placed inside a vacuum air-tight sampler using passive sampling technique. Approximately 60 liter of gas sample was collected at each sampling. All samples collected on the sampling day were returned to laboratory for olfactometry analysis within 24 hours and analyzed within 2 hours upon receiving.
- 2.3.2 ALS Technichem (HK) Pty Ltd. (HOKLAS Reg. No. 066), was the appointed laboratory for olfactometry analysis of the gas sample.
- 2.3.3 The odour concentration of the samples were determined by Forced-choice Dynamic Olfactometer in accordance with the European Standard Method: BS EN13725. Testing were also performed by a panel of six members who have been trained to comply with the requirement of European Standard Method: BS EN13725. All testing were completed within 24 hours upon sampling.

2.4 Monitoring Location

- 2.4.1 H₂S concentration monitoring, odour patrol monitoring and odour sampling were carried out at ASR, Cheung Tung Road near the Bus Depot at the west of the Siu Ho Wan Treatment Plant. The location of ASR is shown in **Figure 1**.

2.5 Monitoring Frequency and Duration

The durations and frequencies of H₂S concentration measurement, odour patrolling and odour sampling are summarized in **Table 2.3** below.

Table 2.3 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.

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- 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.

2.5.1 The monitoring schedule for the present and next reporting period is provided in **Appendix B**.

2.6 Event and Action Plan

2.6.1 Action and limit levels for air quality monitoring are presented in **Table 2.4**.

Table 2.4 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

2.6.2 The event and action plan for air quality monitoring is provided in **Appendix C**.

2.7 Quality Assurance and Quality Control

2.7.1 A control sample was collected by purging odour-free nitrogen gas from a certified gas cylinder on site at each sampling.

2.7.2 Calibration of the analyzer is conducted every year at the laboratory of the manufacturer.

2.7.3 In order to ensure the analyzer is functioning properly, manual sensor regeneration and zero adjustment were performed before each set of odour monitoring.

2.8 Monitoring Results and Observations

2.8.1 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.

2.8.2 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 ASRs, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASRs are not the appropriate locations for the correlation study as the change of both odour level and H₂S concentrations at ASRs were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.

2.8.3 No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period.

2.8.4 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.

2.8.5 Odour mitigation measures 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 were implemented during the reporting period.



3. WATER QUALITY MONITORING

3.1 Monitoring Station

3.1.1 In accordance with Section 5 of the EM&A Plan, water quality monitoring should be carried out at eight designated monitoring stations (two impact stations and six control stations) during the first five years of the operational phase of the Project. The monitoring stations shall be the same monitoring stations that were used for the baseline monitoring programme and have been approved by EPD. The coordinates of the monitoring stations are shown in **Table 3.1** and their locations are shown in **Figure 2**.

Table 3.1 Location of Water Quality Monitoring

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

3.2 Monitoring Parameter

3.2.1 The monitoring parameters for water quality monitoring are summarized in **Table 3.2**.

Table 3.2 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)

3.2.2 Apart from the parameters listed in the **Table 3.2**, other relevant supplementary information such as monitoring location, time, weather conditions and any special phenomena will be also recorded.

3.2.3 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**.

3.3 Monitoring Equipment

3.3.1 A multifunctional meter (YSI 6920 V2/ Aqua TROLL 600) will be used to measure dissolved oxygen (DO), concentration, DO saturation, temperature, salinity, pH and turbidity, simultaneously at the same location and water depth. An Acoustic Doppler Current Profiler (ADCP) integrated with echo sounder function will be used to measure water depth, current velocity (speed and direction). The data measured by ADCP will then be downloaded on site to computer on-board. The water depth data measured by the ADCP shall be electronically logged and available for output. All measurement data from the multiparameter monitoring device and ADCP will be integrated with the GPS data from the DGPS logging device, so that data collected at a specific time and location can be shown. The water sampler will be equipped with a multiparameter monitoring device (with water depth probe to determine the exact sampling depth at which a sample is collected). The equipment employed for the monitoring and sampling and their specifications are presented in **Table 3.3**. **Table 3.4** summarizes the equipment used in water quality monitoring.

Table 3.3 Water Quality Monitoring and Sampling Equipment

Parameter	Equipment	Model	Range	Equipment Accuracy
Temperature, Dissolved Oxygen, salinity, pH, Turbidity, Sampling Depth	Water Quality Monitoring Device	1) YSI 6920V2-2-M Sonde 2) Aqua TROLL 600 Multiparameter Sonde	Temp: -5 to 50°C DO: 0-50mg/L DO%: 0-500% Sal: 0 to 70 ppt pH: 0 to 14 pH units Turb: 0-1000NTU Depth: 0-61 meters	Temp: ±0.15°C DO: ±0.1mg/L or 1% (whichever greater) for 0-20mg/L; ±15% for 20-50mg/L (with correction for salinity and temperature) Sal: ±1% or 0.1ppt (whichever greater) pH: ±0.2 units Turb: ±2% or 0.3NTU (whichever greater) Depth: ±0.12m
Water Depth, Current Speed, Current Direction	Acoustic Doppler Current Profiler	RiverSurveyor M9	Water Depth: 0-80m	Water Depth: 1% Current speed: ±0.25% of measured velocity or ±0.2cm/s Current direction: ±2degree magnetic
Positioning	DGPS	Simrad MX521B Smart Antenna with Simrad MX610 CDU	NA	GPS: ±1m
Water Sampling	Water Sampler	Aquatic Research Transparent PC Vertical Water Sampler 2.2L / 3L / 5L	NA	NA



Table 3.4 Equipment used for H₂S Concentration Monitoring

Equipment	Manufacturer / Model	Serial Number
Water Quality Monitoring Device	Aqua TROLL 600 Multiparameter Sonde	584601
		525120
Acoustic Doppler Current Profiler	RiverSurveyor M9	5906

3.3.2 Apart from the equipment mentioned in Section 3.3.1, a Class III commercially licensed vessel will be used as survey vessel. DGPS logging device with accuracy of ±1m at 95% confidence level will be installed on the survey vessel to ascertain that measurement can be made accurately on the specific transects. All GPS data collected during the whole survey will be automatically and electronically logged. Powered winch will be used on-board the Survey Vessel to assist the monitoring. Experienced supervisor will be present all throughout the monitoring activities on-board the survey vessel.

3.3.3 Water samples will be collected by water sampler and stored in high density polythene bottles and sterilized glass bottles (for bacterial analysis), packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory on the same day of collection for analysis. All sampling bottles will be pre-rinsed with the same water samples. The sampling bottles will then be taken to a HOKLAS accredited laboratory for analysis of *E. coli*, BOD₅, Suspended Solids, NH₃-N, NO₃-N, NO₂-N, Total inorganic nitrogen, Total phosphorus (soluble and particulate).

3.4 Laboratory Measurement and Analysis

3.4.1 ALS Technichem (HK) Pty Ltd (HOKLAS Reg. No. 066), is the appointed laboratory for analysis of water samples. The methods adopted by the laboratory and the reporting limits are detailed in **Table 3.5**.

Table 3.5 Laboratory Measurement/Analysis Methods and Reporting Limits

Analysis Description	Method	Reporting limits
<i>E. coli</i>	DoE Section 7.8, 7.9.4.2& 7.9.4.4 plus in situ urease test	1 cfu/100mL
5-day Biochemical Oxygen Demand	APHA 5210B	1 mg/L
Total Suspended Solid	APHA 2540D	0.5 mg/L
Ammonia as N	APHA 4500 NH3: G	0.005 mg/L
Nitrate as N	APHA 4500 NO3: I	0.005 mg/L
Nitrite as N	APHA 4500 NO2 B&H	0.005 mg/L
Total Inorganic Nitrogen	By Calculation	0.01 mg/L
Total phosphorus (soluble and particulate)	APHA 4500 P: J	0.01 mg/L



3.5 Monitoring Frequency and Duration

- 3.5.1 The water quality monitoring programme will be carried out once per two months for a period of five years of the operational phase of the Project.
- 3.5.2 Water quality monitoring for two tides at eight designated stations will be carried out for each monitoring event. For each station at each tide, duplicate samples for in-situ parameter and laboratory analysis at three designated water depths (1 m below water surface, mid-depth and 1 m above the seabed) will be taken and analyzed.
- 3.5.3 The monitoring schedule for the present and next reporting period is provided in **Appendix B**.

3.6 Quality Assurance / Quality Control

- 3.6.1 The equipment is in compliance with the requirements set out in the EM&A Plan. All in-situ monitoring instruments were calibrated by a HOKLAS-accredited laboratory or by standard solutions. Calibration of temperature, DO, salinity, pH and turbidity is conducted in three month interval.
- 3.6.2 During the measurements of DO concentration, DO saturation, salinity, turbidity, pH and temperature, duplicate readings will be taken. If the difference between the first and second readings of DO or turbidity is more than 25% of the value of the first reading, the reading was discarded and further readings will be taken.
- 3.6.3 The laboratory incorporates a variety of QA/QC monitoring programme into their testing system. Where applicable or available, the quality of the analysis will be monitored by conducting the following QC analysis:

For each batch of 20 samples:

- A minimal of 1 laboratory method blank will be analyzed;
- A minimal of 1 sample duplicate will be analyzed;
- A minimal of 1 sample matrix spike will be analyzed.

3.7 Event and Action Plan

- 3.7.1 Since the purpose of the water quality monitoring is to collect data for future propose, no specific event and action has to be followed.

3.8 Monitoring Results and Observations

- 3.8.1 Water quality monitoring is carried out on 9 April 2019. A summary of the in-situ water quality monitoring results are presented in **Table 3.6** (Mid-ebb) and **Table 3.7** (Mid-flood) respectively. The complete record and graphical presentation of the in-situ water quality monitoring results is given in **Appendix E**.

Table 3.6 Summary of In-situ Monitoring Results (Mid-ebb)

Monitoring Station	Water Depth (m)	Sampling Depth (m)	Dissolved oxygen (mg/L)	Temperature (degree Celsius)	pH	Salinity (ppt)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
A	17	S 1	7.65	25.56	8.29	24.40	6.4	0.26	181.4

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Monitoring Station	Water Depth (m)	Sampling Depth (m)	Dissolved oxygen (mg/L)	Temperature (degree Celsius)	pH	Salinity (ppt)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
		S 1	7.73	25.41	8.25	24.51	6.3	0.25	177.2
		M 8.5	7.63	25.14	8.19	24.64	6.4	0.23	152.5
		M 8.5	7.44	24.79	8.15	25.06	6.8	0.21	137.4
		B 16	6.78	24.00	8.09	29.16	2.2	0.58	122.4
		B 16	6.62	23.87	8.10	29.14	2.5	0.49	127.8
B	14	S 1	7.38	24.92	8.29	24.86	3.5	0.22	196.8
		S 1	7.43	24.88	8.27	24.86	3.9	0.23	198.0
		M 7	7.14	24.37	8.15	27.15	6.1	0.59	248.9
		M 7	6.95	24.23	8.16	27.19	7.4	0.51	232.3
		B 13	6.61	23.76	8.09	29.07	4.1	0.82	259.7
		B 13	6.55	23.80	8.08	29.11	3.1	0.71	244.4
C	12	S 1	7.33	25.05	8.15	24.59	2.9	0.17	139.8
		S 1	7.36	24.96	8.15	24.65	3.3	0.23	148.2
		M 6	7.16	24.59	8.12	25.94	3.2	0.13	174.1
		M 6	7.10	24.54	8.12	25.93	3.2	0.11	169.2
		B 11	6.98	24.39	8.10	26.28	3.7	0.10	244.8
		B 11	6.97	24.38	8.10	26.21	4.0	0.12	231.2
D	13	S 1	7.17	24.84	8.16	25.32	4.4	0.65	143.5
		S 1	7.11	24.74	8.16	25.87	4.0	0.43	134.7
		M 6.5	6.89	24.40	8.11	26.24	3.6	0.38	173.2
		M 6.5	6.87	24.39	8.12	26.21	3.5	0.45	164.9
		B 12	6.84	24.31	8.13	26.23	3.4	0.29	210.4
		B 12	6.86	24.30	8.13	26.29	3.3	0.34	194.7
E	16	S 1	6.93	25.37	9.09	25.69	2.3	0.27	193.8
		S 1	7.03	25.14	8.84	25.78	2.3	0.12	187.4
		M 8	7.11	24.86	8.59	25.92	2.4	0.16	91.1
		M 8	7.10	24.80	8.54	25.96	2.1	0.20	125.8
		B 15	7.03	24.54	8.39	26.48	3.3	0.21	138.6
		B 15	7.03	24.53	8.38	26.44	3.4	0.28	126.4
F	23	S 1	7.20	24.96	8.32	25.82	2.1	0.74	124.0
		S 1	7.20	24.94	8.30	25.83	2.1	0.79	111.0
		M 11.5	7.07	24.66	8.22	26.28	2.3	0.42	142.1
		M 11.5	7.00	24.60	8.22	26.44	2.3	0.49	118.1
		B 22	6.86	24.48	8.19	26.68	2.5	0.67	99.8
		B 22	6.82	24.44	8.19	26.72	2.5	0.58	100.5
G	22	S 1	7.33	24.88	8.70	26.67	0.8	0.20	184.0
		S 1	7.41	24.91	8.60	26.42	1.0	0.15	166.2
		M 11	7.22	24.42	8.38	27.57	1.1	0.24	218.2
		M 11	7.18	24.40	8.35	27.62	1.3	0.28	220.5
		B 21	6.98	24.24	8.29	27.91	2.9	0.27	209.6
		B 21	6.96	24.21	8.28	27.94	2.5	0.33	211.5
H	19	S 1	7.37	24.85	8.50	27.10	1.2	0.57	173.0
		S 1	7.26	24.65	8.49	27.42	1.3	0.55	166.1
		M 9.5	7.21	24.49	8.40	27.58	1.4	0.54	128.4
		M 9.5	7.18	24.47	8.37	27.60	1.7	0.64	123.2
		B 18	6.98	24.34	8.30	27.91	2.5	0.67	127.6
		B 18	6.99	24.27	8.29	27.87	2.0	0.76	129.2

Table 3.7 Summary of In-situ Monitoring Results (Mid-flood)

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Monitoring Station	Water Depth (m)	Sampling Depth (m)	Dissolved oxygen (mg/L)	Temperature (degree Celsius)	pH	Salinity (ppt)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
A	15	S 1	6.78	23.86	7.94	24.33	5.4	0.11	249.3
		S 1	6.76	23.82	7.95	24.32	5.3	0.13	243.5
		M 7.5	6.53	23.72	7.96	26.32	4.2	0.13	193.2
		M 7.5	6.55	23.75	7.94	26.51	4.3	0.15	189.7
		B 14	6.48	23.21	7.89	28.62	2.3	0.29	204.3
		B 14	6.46	23.22	7.90	28.66	2.3	0.21	217.3
B	14	S 1	6.69	23.79	7.93	25.21	2.4	0.19	244.6
		S 1	6.72	23.82	7.94	25.23	2.4	0.16	249.7
		M 7	6.54	23.54	7.95	26.67	2.4	0.24	254.3
		M 7	6.54	23.56	7.95	26.60	2.5	0.29	268.3
		B 13	6.43	23.17	7.91	28.89	2.7	0.25	234.9
		B 13	6.45	23.18	7.92	28.92	2.6	0.23	237.1
C	12	S 1	6.96	24.08	7.95	25.34	2.1	0.18	154.3
		S 1	6.95	24.10	7.96	25.37	2.0	0.15	158.2
		M 6	6.84	23.73	7.95	25.43	2.3	0.21	163.7
		M 6	6.82	23.69	7.95	25.46	2.3	0.26	164.2
		B 11	6.66	23.52	7.95	25.97	2.8	0.17	204.3
		B 11	6.63	23.52	7.96	25.98	3.0	0.15	198.8
D	14	S 1	6.92	23.74	7.96	25.27	1.9	0.22	173.2
		S 1	6.93	23.74	7.95	25.24	1.9	0.28	145.7
		M 7	6.78	23.62	7.95	25.34	2.3	0.31	222.4
		M 7	6.79	23.67	7.94	25.38	2.3	0.35	197.3
		B 13	6.57	23.44	7.95	26.17	3.1	0.26	172.7
		B 13	6.59	23.45	7.94	26.13	3.2	0.13	186.4
E	14	S 1	6.72	23.76	7.95	26.29	1.3	0.15	273.4
		S 1	6.70	23.73	7.96	26.31	1.2	0.23	267.5
		M 7	6.68	23.67	7.95	27.30	1.4	0.19	255.9
		M 7	6.71	23.65	7.94	27.34	1.4	0.20	256.0
		B 13	6.50	23.35	7.96	28.93	2.8	0.24	214.3
		B 13	6.46	23.31	7.94	28.92	2.8	0.34	218.5
F	18	S 1	6.84	23.87	7.96	25.92	1.4	0.36	154.5
		S 1	6.81	23.86	7.90	25.91	1.4	0.17	153.7
		M 9	6.69	23.61	7.96	27.33	1.3	0.16	109.3
		M 9	6.71	23.58	7.94	27.30	1.3	0.14	108.4
		B 17	6.46	23.27	7.96	29.14	3.0	0.14	117.5
		B 17	6.41	23.25	7.94	29.10	3.0	0.15	119.3
G	13	S 1	6.97	24.05	7.94	24.69	1.4	0.17	90.3
		S 1	6.97	24.07	7.93	24.67	1.4	0.15	107.3
		M 6.5	6.72	23.72	7.94	26.12	1.5	0.17	249.2
		M 6.5	6.74	23.73	7.95	26.23	1.5	0.13	281.6
		B 12	6.65	23.57	7.94	27.20	2.2	0.14	108.3
		B 12	6.65	23.57	7.95	27.20	2.2	0.18	104.8
H	19	S 1	6.93	24.03	7.90	24.83	1.6	0.36	273.3
		S 1	6.90	24.06	7.88	24.79	1.5	0.38	288.2
		M 9.5	6.80	25.70	7.93	25.70	1.8	0.42	190.8
		M 9.5	6.78	25.66	7.89	25.66	1.6	0.45	228.3
		B 18	6.60	26.88	7.94	26.88	1.9	0.34	138.9
		B 18	6.57	26.80	7.90	26.80	1.8	0.33	149.2



3.8.2 Results of laboratory analysis of water quality are presented in **Table 3.8** (Mid-ebb) and **Table 3.9** (Mid-flood) respectively. The complete record and graphical presentation of laboratory analysis results are given in **Appendix E**.

Table 3.8 Summary of Laboratory Analysis Results (Mid-ebb)

Monitoring Station	Water Depth (m)	Sampling Depth (m)	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	17	S 1	3.6	0.057	0.042	0.694	0.793	8	0.03	1.8
		S 1	3.6	0.054	0.041	0.772	0.868	13	0.04	3.3
		M 8.5	3.9	0.066	0.042	0.741	0.849	ND	0.03	2.0
		M 8.5	4.1	0.059	0.040	0.697	0.796	1	0.03	1.3
		B 16	4.4	0.044	0.040	0.742	0.826	14	0.04	3.3
		B 16	4.1	0.050	0.042	0.705	0.797	10	0.03	2.0
B	14	S 1	6.0	0.071	0.040	0.691	0.801	9	0.03	2.0
		S 1	6.0	0.071	0.042	0.684	0.797	11	0.03	2.1
		M 7	6.5	0.066	0.039	0.696	0.800	49	0.03	2.0
		M 7	6.7	0.071	0.04	0.64	0.751	62	0.03	1.4
		B 13	7.6	0.085	0.032	0.576	0.693	24	0.03	1.6
		B 13	7.9	0.069	0.041	0.708	0.818	26	0.03	1.9
C	12	S 1	3.3	0.071	0.040	0.687	0.798	6	0.03	2.4
		S 1	3.3	0.064	0.040	0.687	0.792	1	0.03	2.3
		M 6	4.2	0.059	0.042	0.672	0.773	6	0.03	2.1
		M 6	4.4	0.061	0.038	0.678	0.777	5	0.03	2.0
		B 11	4.8	0.069	0.039	0.617	0.726	24	0.02	1.7
		B 11	4.6	0.075	0.039	0.610	0.725	32	0.03	2.3
D	13	S 1	3.1	0.075	0.045	0.716	0.836	ND	0.03	2.1
		S 1	3.4	0.069	0.043	0.723	0.834	ND	0.03	1.8
		M 6.5	3.4	0.091	0.038	0.625	0.755	10	0.03	1.8
		M 6.5	3.6	0.076	0.036	0.608	0.720	16	0.02	<1.0
		B 12	3.7	0.078	0.040	0.609	0.728	20	0.02	1.1
		B 12	3.9	0.073	0.038	0.608	0.720	23	0.02	1.1
E	16	S 1	2.2	0.090	0.038	0.596	0.723	3	0.03	2.0
		S 1	2.3	0.080	0.036	0.598	0.713	3	0.03	1.9
		M 8	2.2	0.070	0.038	0.601	0.709	3	0.02	1.4
		M 8	2.4	0.072	0.034	0.597	0.704	ND	0.03	1.7
		B 15	2.8	0.065	0.037	0.623	0.725	3	0.03	1.2
		B 15	3.0	0.065	0.038	0.627	0.730	1	0.03	1.4
F	23	S 1	2.6	0.084	0.037	0.614	0.735	ND	0.03	1.8
		S 1	2.7	0.085	0.036	0.609	0.730	ND	0.03	1.7
		M 11.5	2.9	0.090	0.037	0.602	0.729	1	0.02	1.5
		M 11.5	2.7	0.081	0.034	0.611	0.726	3	0.03	1.6
		B 22	3.0	0.080	0.037	0.605	0.722	ND	0.03	1.5
		B 22	2.9	0.079	0.039	0.610	0.728	2	0.02	1.7
G	22	S 1	1.7	0.070	0.034	0.578	0.682	ND	0.02	2.0
		S 1	1.9	0.073	0.038	0.569	0.680	ND	0.03	1.9
		M 11	3.1	0.066	0.032	0.579	0.678	1	0.02	1.6
		M 11	2.7	0.067	0.038	0.566	0.671	1	0.02	1.9
		B 21	4.4	0.077	0.038	0.571	0.686	ND	0.03	2.4
		B 21	4.1	0.070	0.029	0.583	0.682	ND	0.03	1.7
H	19	S 1	2.9	0.064	0.039	0.566	0.669	ND	0.03	3.4
		S 1	3.1	0.070	0.033	0.571	0.674	ND	0.04	2.9
		M 9.5	3.8	0.062	0.038	0.568	0.668	ND	0.03	2.2

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Monitoring Station	Water Depth (m)	Sampling Depth (m)	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)
		M 9.5	3.9	0.061	0.031	0.578	0.669	1	0.03	2.4
		B 18	4.6	0.072	0.036	0.533	0.641	ND	0.03	1.5
		B 18	4.9	0.070	0.037	0.538	0.646	ND	0.03	1.8

Table 3.9 Summary of Laboratory Analysis Results (Mid-flood)

Monitoring Station	Water Depth (m)	Sampling Depth (m)	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	15	S 1	2.8	0.113	0.038	0.592	0.744	ND	0.02	1.8
		S 1	2.6	0.111	0.036	0.602	0.749	ND	0.03	1.8
		M 7.5	4.3	0.096	0.032	0.580	0.708	ND	0.03	1.2
		M 7.5	4.2	0.098	0.036	0.552	0.686	ND	0.04	1.3
		B 14	5.3	0.100	0.040	0.587	0.727	ND	0.03	1.2
		B 14	5.0	0.100	0.034	0.600	0.734	ND	0.03	1.3
B	14	S 1	2.8	0.087	0.034	0.560	0.681	ND	0.03	1.5
		S 1	3.1	0.100	0.040	0.572	0.713	ND	0.02	1.3
		M 7	3.1	0.076	0.029	0.570	0.675	ND	0.02	1.4
		M 7	2.9	0.09	0.04	0.594	0.725	ND	0.03	1.3
		B 13	4.0	0.080	0.030	0.567	0.677	ND	0.03	1.1
		B 13	3.8	0.094	0.038	0.600	0.733	ND	0.03	1.3
C	12	S 1	2.6	0.104	0.037	0.592	0.733	1	0.03	1.3
		S 1	2.6	0.099	0.032	0.612	0.743	ND	0.03	1.2
		M 6	2.7	0.103	0.034	0.604	0.742	1	0.03	1.2
		M 6	2.8	0.112	0.039	0.547	0.698	3	0.03	1.2
		B 11	3.1	0.104	0.042	0.592	0.738	2	0.03	1.3
		B 11	2.9	0.102	0.032	0.608	0.741	ND	0.03	1.3
D	14	S 1	3.0	0.100	0.041	0.587	0.728	ND	0.03	1.1
		S 1	2.6	0.106	0.035	0.572	0.713	ND	0.03	1.8
		M 7	3.3	0.105	0.036	0.597	0.739	ND	0.03	1.2
		M 7	2.8	0.108	0.034	0.617	0.759	ND	0.03	1.8
		B 13	3.2	0.107	0.036	0.610	0.752	ND	0.03	1.1
		B 13	3.4	0.110	0.039	0.606	0.754	ND	0.03	1.4
E	14	S 1	2.2	0.112	0.036	0.568	0.716	4	0.03	1.3
		S 1	2.3	0.119	0.046	0.579	0.745	7	0.03	2.1
		M 7	2.9	0.101	0.042	0.560	0.703	4	0.03	1.4
		M 7	2.7	0.109	0.036	0.620	0.766	8	0.03	2.0
		B 13	4.0	0.128	0.041	0.618	0.787	ND	0.03	2.6
		B 13	3.7	0.108	0.048	0.593	0.749	ND	0.03	1.5
F	18	S 1	3.1	0.116	0.046	0.642	0.804	16	0.03	1.7
		S 1	2.9	0.117	0.037	0.659	0.813	17	0.04	1.5
		M 9	3.1	0.116	0.041	0.654	0.811	6	0.03	1.6
		M 9	3.3	0.119	0.040	0.642	0.802	2	0.03	1.7
		B 17	3.4	0.114	0.046	0.643	0.802	ND	0.03	2.0
		B 17	3.3	0.095	0.038	0.658	0.791	2	0.03	1.3
G	13	S 1	3.7	0.235	0.042	0.664	0.941	3	0.04	4.4
		S 1	3.5	0.214	0.045	0.660	0.919	1	0.04	4.3
		M 6.5	3.6	0.103	0.041	0.662	0.806	3	0.04	3.6
		M 6.5	3.8	0.102	0.037	0.666	0.804	6	0.04	2.9
		B 12	3.9	0.104	0.035	0.660	0.799	3	0.03	2.0
		B 12	4.1	0.105	0.039	0.650	0.794	1	0.04	2.5

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Monitoring Station	Water Depth (m)	Sampling Depth (m)	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)	
H	19	S	1	2.8	0.151	0.042	0.661	0.854	1	0.03	3.5
		S	1	3.1	0.147	0.046	0.658	0.851	4	0.04	3.4
		M	9.5	3.4	0.132	0.044	0.667	0.843	11	0.04	3.4
		M	9.5	3.3	0.140	0.039	0.697	0.876	24	0.04	4.1
		B	18	3.9	0.156	0.047	0.703	0.906	4	0.04	4.0
		B	18	4.3	0.165	0.045	0.661	0.870	ND	0.04	3.6

3.8.3 The tidal data is obtained from the tide gauge installed in Ma Wan Marine Traffic Station, managed by Hydrographic Office of Marine Department. The predicted tidal data is present in **Appendix F**.

3.8.4 Heavy marine traffic was observed nearby the Project site and its vicinity and may affect the water quality. The above conditions may affect monitoring results. The weather condition is summarized and presented in **Table 3.10**.

Table 3.10 Weather condition of water quality monitoring

Date	Air Temperature			Mean Relative Humidity (%)	Total Rainfall (mm)
	Maximum (deg. C)	Mean (deg. C)	Minimum (deg. C)		
9 April 2019	28.9	26.6	25.5	81	0.0

Source: Hong Kong Observatory

4. SEDIMENT QUALITY MONITORING AND BENTHIC SURVEY

4.1 Monitoring Station

4.1.1 In accordance with Section 6 of the EM&A Plan, sediment quality monitoring and benthic survey should be carried out at eight designated monitoring stations (two impact stations and six control stations) during the first five years of the operational phase of the Project. The proposed monitoring stations shall be the same monitoring stations that were used for the baseline monitoring programme and have been approved by EPD. The coordinates of the monitoring stations are shown in **Table 4.1** and their locations are shown in **Figure 2**.

Table 4.1 Location of 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

4.2 Monitoring Parameter

4.2.1 The monitoring parameters for sediment quality monitoring and benthic survey are summarized in **Table 4.2**.

Table 4.2 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)	
Arsenic (mg/kg)	
Silver (mg/kg)	

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

4.2.2 Apart from the parameters listed in the Table 4.2, other relevant supplementary information such as monitoring location, time, weather conditions and any special phenomena will be also recorded.

4.2.3 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**.

4.3 Sampling Equipment

4.3.1 Ponar grab sampler (capacity of ~ 1 litre) will be used for collection of samples for sediment analysis. The grab will be capable of collecting sufficient amount of surficial (top 5 cm) sediment for the required analysis in a single deployment at each sampling location. The grab will be constructed with non-contaminating material to prevent sample contamination. Photos of ponar grab sampler are shown in **Appendix I**.

4.3.2 A modified Van Veen grab sampler (capacity of ~ 11.3 litres) will be used for collecting sediment samples for benthic survey. The top of the grab will have openings to allow the easy flow of water through the grab as it descends. The openings will be covered with 0.5 mm mesh to prevent the loss of any benthic fauna once sediment samples are taken. In addition the top openings will be sealable by movable flaps which will close when the grab is hauled to surface. Photos of modified Van Veen grab sampler are shown in **Appendix I**.

4.3.3 Class III commercially licensed vessel will be used as survey vessel. DGPS logging device in the ADCP with accuracy of $\pm 1\text{m}$ at 95% confidence level will be installed on the survey vessel to ascertain that measurement can be made accurately on the specific transects. All GPS data collected during the whole survey will be automatically and electronically logged. Powered winch will be used on-board the survey vessel to assist the monitoring. 4 fixed sieve stations will be equipped on survey vessel. Experienced supervisor will be present all throughout the monitoring activity on-board the survey vessel.

4.4 Sampling Procedure

Benthic Survey, Particle Size Distribution and TOC Analysis

4.4.1 A modified Van Veen grab sampler (capacity of ~ 11.3 litres) will be deployed using a winch at each of the benthic survey stations to collect single grab sample at each station. The grab sampler will be lowered through the water column slowly at a constant rate (approximately 30 cm/s) to prevent the formation of a pressure wave that may disturb surficial deposits. The grab will then be retrieved and evaluated on board of the survey vessel. Any sample showing uneven penetration or only partially filled with sediment shall be rejected. Samples will be placed in a plastic box with an identification card. Sub-samples (approximately 1 kg) will be splitted up for analysis of particle size distribution and TOC. The remaining sediment samples will be washed gently to separate the benthic organisms and the sediment using a watering hose with marine seawater supply, by a sieve stack (comprising 1 mm and 0.5 mm meshes). Benthic organisms remaining on the sieve will be removed into pre-labeled ziplock plastic bags. A 10% solution of buffered formalin containing Rose Bengal in seawater will be added to the bag to ensure tissue preservation. Samples will be sealed in plastic containers for transport to the laboratory for sorting and identification of benthic organisms.



Sediment Quality Monitoring (Except Particle Size Distribution and TOC Analysis)

4.4.2 Ponar grab sampler (capacity of ~ 1 litres) will be deployed at each of the benthic survey stations to collect single grab sample at each station. The grab sampler should be lowered through the water column slowly at a constant rate (approximately 30 cm/s) to prevent the formation of a pressure wave that may disturb surficial deposits. The grab will then be retrieved and evaluated on board of the survey vessel. Any sample showing uneven penetration or only partially filled with sediment will be rejected. Samples will be placed in a plastic box with an identification card. Sediment samples will be then transferred into brand new soil jars with QA/QC monitoring for laboratory analysis. Samples will be preserved and stored in accordance with approved SOP of HOKLAS accredited laboratory and the recommendations stipulated in ETWB TC (W) No. 34/2002.

4.4.3 Sediment samples shall be collected and packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory on the same day of collection for analysis.

4.5 Laboratory Measurement and Analysis

4.5.1 ALS Technichem (HK) Pty Ltd (HOKLAS Reg. No. 066), is the appointed laboratory for analysis of sediment samples. The methods adopted by the laboratory and the reporting limits are detailed in **Table 4.3**.

Table 4.3 Laboratory Measurement/Analysis Methods and Reporting Limits

Analysis Description	Method	Reporting limits
Particle Size Distribution	Geospec 3: 2001 Test method 8.1, 8.5 and 8.7 (Wet Sieve and Hydrometer Method)	1%
Total Organic Carbon	APHA 5310B	0.05%
pH value	APHA 4500H: B	0.1 pH unit
Ammonia as N	APHA 4500 NH3: B&G	0.5 mg/kg
Total Nitrogen	APHA 4500 Norg: D & APHA 4500 NO3: I	10 mg/kg
Total Phosphorus	APHA 4500P: B&H	10 mg/kg
Cadmium	USEPA 6020A Digestion method: 3051A	0.1 mg/kg
Chromium		0.5 mg/kg
Copper		0.2 mg/kg
Lead		0.2 mg/kg
Mercury		0.05 mg/kg
Nickel		0.2 mg/kg
Zinc		0.5 mg/kg
Arsenic		0.5 mg/kg
Silver		0.1 mg/kg

4.6 Taxonomic Identification of Benthic Organism

4.6.1 Taxonomic identification of benthic organisms will be performed using stereo dissecting and high-power compound microscopes where it is necessary. Benthic organisms will be counted and identified to lower taxonomic levels as far as practicable with biomass (wet weight, to 0.01gram) of each individual recorded. If breakage of soft-bodied organism occurs, only anterior portions of fragments will be counted, although all fragments will be retained and

weighted for biomass determinations (wet weight, to 0.01gram). Data of species abundance and biomass will be recorded.

4.6.2 Data collected during surveys will be presented and summarized in tables and graphics. Species/taxon richness and abundance of marine benthic fauna communities will be analyzed by Shannon-Weiner diversity and Pielou's Evenness.

4.7 Monitoring Frequency and Duration

4.7.1 The sediment quality monitoring and benthic survey programmed shall be carried out once per two months for a period of five years of the operational phase of the Project. Since the purpose of the sediment quality monitoring and benthic survey is to collect data for future reference, only a single round of sediment quality monitoring and benthic survey at 8 designated locations will be carried out for each monitoring event. For each location, only a single sample will be taken and analyzed.

4.8 Quality Assurance / Quality Control

4.8.1 A rinsate blank will be collected in each monitoring location before each sediment sampling for benthic survey, so as to monitor the effectiveness of field decontamination procedure.

4.8.2 The laboratory incorporates a variety of QA/QC monitoring programme into their testing system. Where applicable or available, the quality of the analysis will be monitored by conducting the following QC analysis:

For each batch of 20 samples:

- A minimal of 1 laboratory method blank will be analyzed;
- A minimal of 1 sample duplicate will be analyzed;
- A minimal of 1 sample matrix spike will be analyzed.

4.9 Event and Action Plan

4.9.1 Since the purpose of the sediment quality monitoring and benthic survey is to collect data for future purpose, no specific event and action has to be followed.

4.10 Monitoring Results and Observations

4.10.1 Sediment quality monitoring and benthic survey is carried out on 9 April 2019. A summary of laboratory analysis results for the sediment quality monitoring and benthic survey are presented in **Table 4.4** and **Table 4.5** respectively. The complete record and graphical presentation of the sediment quality monitoring results is given in **Appendix G**.

Table 4.4 Summary of laboratory analysis results for sediment monitoring

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	6.9	4.5	950	476	0.11	34.0	25.5	44.2	0.13	19.8	87.8	14.8	0.23
B	7.6	9.9	1220	513	<0.10	36.1	32.4	43.4	0.25	22.0	106	11.3	0.33
C	7.7	11.9	1290	595	0.10	39.0	32.8	47.3	0.12	23.8	112	11.2	0.31
D	7.7	4.4	480	259	<0.10	19.2	15.1	25.0	0.06	11.8	53.3	6.0	0.14
E	7.9	8.5	1450	594	<0.10	40.5	36.7	47.7	0.12	24.9	117	10.2	0.36
F	7.8	10.6	1490	594	<0.10	43.1	38.8	48.6	0.13	26.6	121	11.6	0.36
G	7.9	5.8	1080	522	0.12	39.7	60.6	45.1	0.19	23.8	109	11.0	0.34
H	7.7	6.2	970	478	0.11	40.0	52.1	48.9	0.17	23.8	153	12.3	0.46

Table 4.5 Summary of laboratory analysis results for benthic survey

Monitoring Station	Total organic carbon (%)	Grain size profile (%)				Description
		Gravel	Sand	Silt	Clay	
A	0.58	15	39	28	18	Dark grey, slightly gravelly, sandy SILT/CLAY with shell fragments
B	1.00	1	16	54	29	Dark grey, slight gravelly, slightly sandy SILT/CLAY with shell fragments
C	0.93	0	3	68	29	Dark grey, slightly sandy SILT/CLAY with shell fragments
D	0.79	0	17	53	30	Dark grey, slightly sandy SILT/CLAY with shell fragments
E	0.99	0	6	61	33	Dark grey, slightly sandy SILT/CLAY with shell fragments
F	1.04	0	3	61	36	Dark grey, slightly sandy SILT/CLAY
G	0.92	1	12	55	32	Dark grey, slight gravelly, slightly sandy SILT/CLAY with shell fragments
H	0.90	6	18	47	29	Dark grey, slight gravelly, slightly sandy SILT/CLAY with shell fragments

4.10.2 Rinsate blank was collected for chemical analysis. The laboratory data results are provided in **Appendix G**.

4.10.3 Construction works from expansion of Hong Kong International Airport was observed nearby the Project site and its vicinity and may affect the sediment quality. The above conditions may affect monitoring results. The weather condition is summarized and presented in **Table 4.6**.

Table 4.6 Weather condition of water quality monitoring

Date	Air Temperature			Mean Relative Humidity (%)	Total Rainfall (mm)
	Maximum (deg. C)	Mean (deg. C)	Minimum (deg. C)		
9 April 2019	28.9	26.6	25.5	81	0.0

Source: Hong Kong Observatory

4.10.4 The benthic survey data are summarized and presented in **Table 4.7**.

Table 4.7 Summary of benthic survey data on 9 April 2019

Monitoring Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	85	12.35	33	2.92	0.83
B	38	14.19	19	2.74	0.93
C	24	0.15	11	2.20	0.92
D	31	16.86	17	2.65	0.93
E	40	38.39	20	2.66	0.89
F	30	19.37	15	2.56	0.95
G	47	6.77	18	2.52	0.87
H	65	11.16	25	3.00	0.93
TOTAL	360	119.27			

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

i) Abundance

A total of 360 macrobenthic organisms were recorded from the eight monitoring stations during the April 2019 monitoring period. Results of the present monitoring period remained to be lower compared to the baseline data [March 2004 (dry season) and August 2004 (wet season)]. Increasing abundance, however, was observed since December 2018, which can be attributed to calmer weather conditions during these monitoring periods. Previous results also showed that decreasing trend in the abundance was observed during wet season monitoring periods. However, this observed seasonal difference is not statistically significant ($F = 1.26$, $F_{crit} = 2.09$, $p\text{-value} = 0.28$, $\alpha = 0.05$).

Similar to the previous monitoring periods, however, a more apparent variation ($F = 2.84$, $F_{crit} = 2.16$, $p\text{-value} = 0.01$, $\alpha = 0.05$ across monitoring stations) was observed. The lowest abundance with 24 individuals (ind.) was recorded in the impact Station C and the highest (85 ind.) in the reference Station A. As previously reported, macrobenthic abundance showed correlation with particle size distribution. Relatively higher abundances were recorded in stations with moderately sorted sediments such as Stations A (85 ind.) and H (65 ind.) while lower abundances in stations with well-sorted sediments Stations C (24 ind.) and F (30 ind.). 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.

ii) Biomass

The total wet biomass from eight monitoring stations during the present monitoring period is 119.27g, which is lower compared to the biomass recorded during the previous monitoring period (227.02g). The decrease in total wet biomass might be attributed to the decrease in the number of larger bivalves and increase in the number of smaller annelids. The highest total biomass observed in Station E (38.39g) and the lowest biomass in Station C (0.15g). The relatively higher biomass observed in Station E is contributed by the higher biomass of the bivalve species (*Paphia undulata*). The average biomass (8.51g) of the impact Stations (C and D) was lower compared to the average biomass (17.04g) of the reference stations.



iii) Taxonomic Composition

A total of six phyla comprised of 42 families and 58 taxa was identified during the April 2019 monitoring period. With the continuous increase in the number of annelid species and abundance, annelids remained to dominate benthic assemblages comprising 70.28% of the identified population. The current benthic assemblage is observed to be similar with the baseline population, which was dominated by polychaetes, particularly of the capitellids. Capitellids are typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

The most dominant species (abundance >10) was the Polychaeta, *Paraprionospio* sp., with the abundance of 20 ind. and *Capitella capitata* with the abundance of 11 ind. in Station A. In addition, *C. capitata*, with the abundance of 13 ind. was recorded Station G.

Highest number of genera was recorded in Station A (33) and the lowest in Station C (11). Similar to abundance and biomass, relatively lower number of taxa was observed at impact stations compared to the reference stations.

iv) Diversity

Benthic diversity index (H') and evenness index (J) ranged from 2.20-2.65 and 0.92 – 0.93 in impact Stations, and 2.52-3.00 and 0.83-0.95 among the reference stations as shown in Appendix A, 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 periods. Apparent increase in diversity and evenness indices was observed compared with the baseline data.

The detailed benthic survey results are provided in **Appendix H**.

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5. CHINESE WHITE DOLPHIN MONITORING

5.1 Data Interpretation

- 5.1.1 In accordance with Section 4.1 of the EM&A Plan, relevant information on the distribution and abundance of CWDs in Hong Kong should be obtained from the Agriculture, Fisheries and Conservation Department (AFCD), and be reviewed on a bimonthly basis during the operational phase of the Project for a period of 5 years.
- 5.1.2 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.

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6. ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

6.1 Implementation Status

- 6.1.1 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 the 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 J**.



7. ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS

7.1.1 SHWSTW is reminded to fully comply with EP conditions. All measures and recommendations in the EP, EIA Report and approved Waste Management Plan (WMP) shall be fully and properly implemented. During the reporting period, following measures in related to solid and liquid waste management were 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.

7.1.2 A summary of mitigation measures implementation schedule is provided in **Appendix J**.

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8. SUMMARY OF EXCEEDANCE OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMITS

- 8.1.1 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.
- 8.1.2 Water quality monitoring, sediment quality monitoring and benthic survey were carried out on 9 April 2019. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

9. SUMMARY OF ENVIRONMENTAL COMPLAINTS

9.1.1 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to 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



10. FUTURE KEY ISSUES

10.1.1 The key issues to be considered in the coming reporting month include:

- i. Potential environmental impacts arising from the operation of SHWSTW are mainly associated with air quality, water quality, sediment quality, benthic ecology, waste management and distribution and abundance of CWDs.
- ii. Due to inadequacy of representative data collected between August 2017 and May 2018, current H₂S measurement and olfactometry analysis were considered as unsuitable method 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 ASRs, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR are not appropriate locations for the correlation study as the change of both odour level and H₂S concentrations at ASRs were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.
- iii. 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.

11. CONCLUSION

- 11.1.1 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.
- 11.1.2 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.
- 11.1.3 Water quality monitoring, sediment quality monitoring and benthic survey were conducted on 9 April 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 3 and Section 4. 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.
- 11.1.4 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 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.
- 11.1.5 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.
- 11.1.6 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to environmental impact during the report period.

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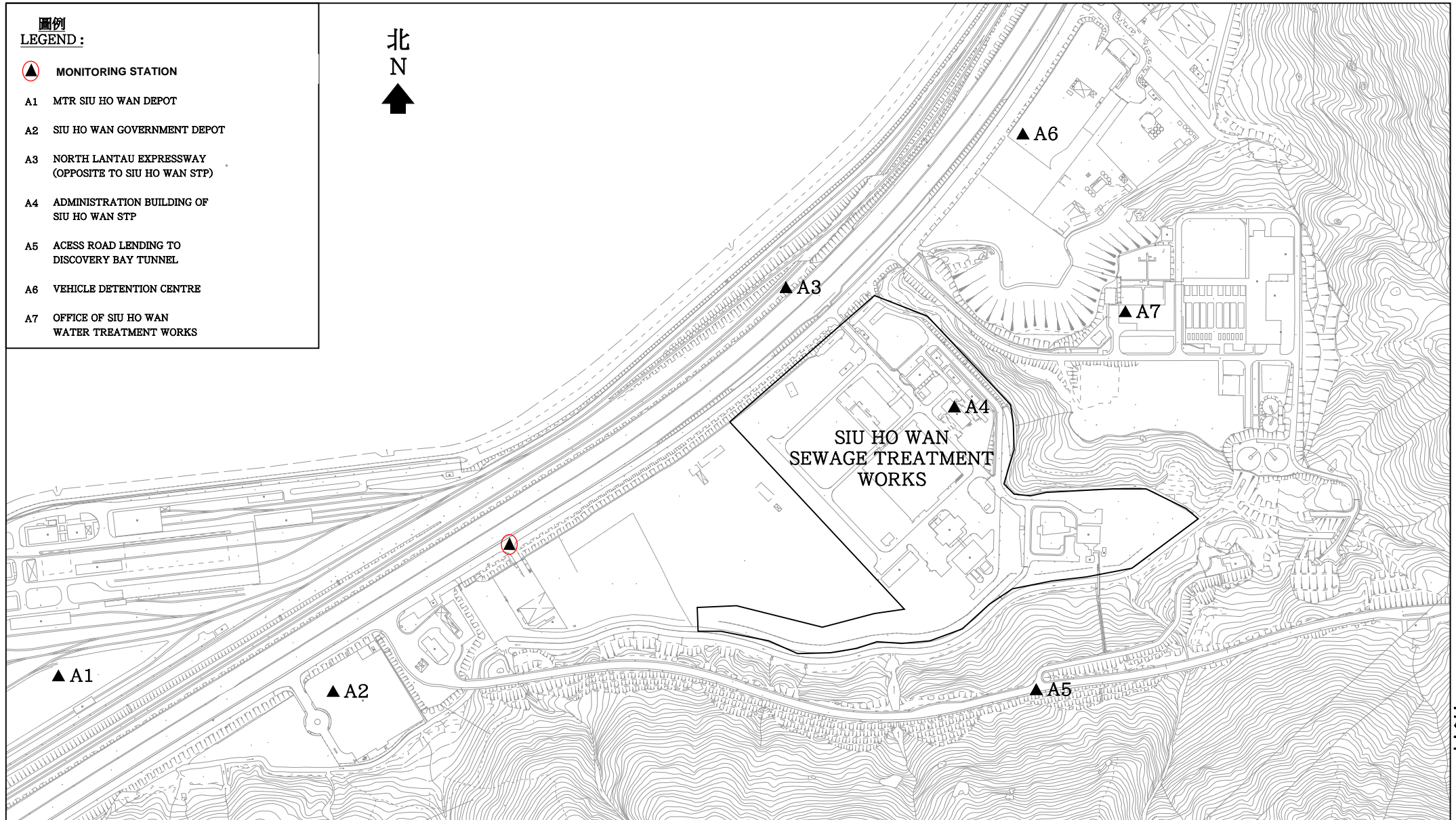
Report No.: 0041/17/ED/0442C

Figure 1

Monitoring Stations of Air Sensitive Receivers

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



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.

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Figure 2

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



816000E

818000E

820000E

822000E

822000N

大小磨刀
BROTHERS

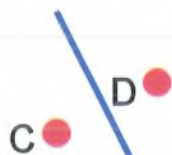
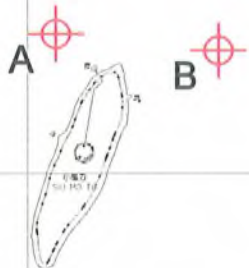
820000N




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

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DCM/2004/002

比例 scale

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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

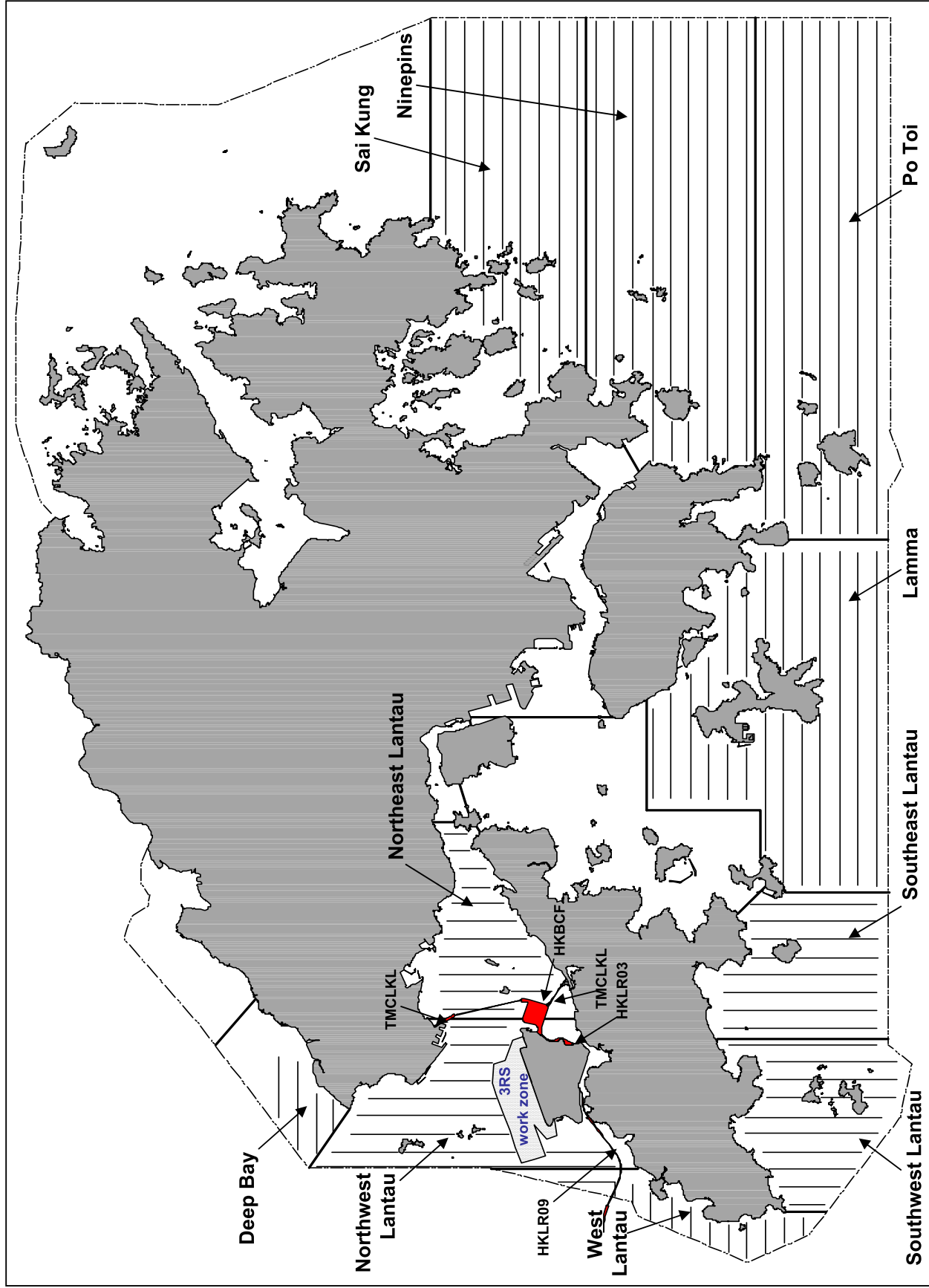


Figure 4. Ten Line-Transect Survey Areas within the Study Area for the 2017-18 Monitoring Study

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

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Appendix A Project Organization Chart

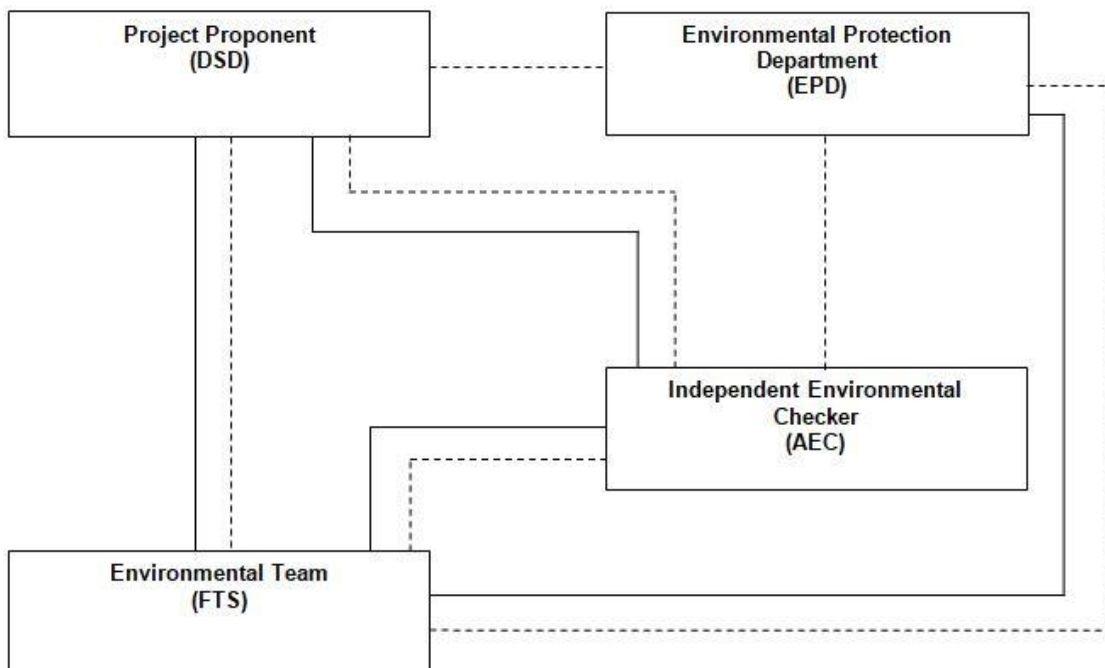
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Legend:
— Line of Reporting
- - - Line of Communication

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Appendix B

Monitoring Schedule for Present and Next Reporting Period

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Monitoring Schedule for the Present Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
	1 April	2	3	4	5	6
7	8	9 Water Quality Monitoring and Sediment Quality Monitoring and Benthic Survey Mid-Flood (08:25) Mid-Ebb (14:58)	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.

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Report No.: 0041/17/ED/0442C

Monitoring Schedule for the Next Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
			1 May	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.

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Appendix C

Event and Action Plan for Air Quality Monitoring

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EVENT	ACTION		
	ET	IEC	*Operator
Action Level			
One complaint received for specific odour event	<ol style="list-style-type: none"> 1. Check Operator's working methods; 2. Discuss with Operator on required remedial actions 	<ol style="list-style-type: none"> 1. Discuss with ET and Operator on the possible remedial actions; 2. Advise the Operator on the effectiveness of the proposed remedial measures; 3 Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Identify/ confirm source with ET; 2. Discuss with ET for remedial actions required; 3. Ensure remedial actions properly implemented 4. Rectify any unacceptable practice; 5. Amend operation methods if appropriate
Limit Level			
More than one complaint	<ol style="list-style-type: none"> 1. Investigated the causes of complaint; 2. Check Operator's working methods; 3. Carry out analysis of Operator's working procedures to determine possible mitigation to be implemented; 4. Arrange meeting with ET and EPD to discuss the remedial actions to be taken; 5. Discuss with EPD and the Operator on the required remedial actions; 6. Submit proposals for remedial actions within 3 working days of notification; 7. Assess effectiveness of Operator's remedial actions and keep EPD informed of the results; 8. Amend proposal if appropriate; 9. Resubmit proposal if problem still not under control 	<ol style="list-style-type: none"> 1. Discuss amongst ET and the Operator on the potential remedial actions; 2. Review the proposed remedial actions whenever necessary to assure their effectiveness and advise the Operator accordingly; 3. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Indentify/ confirm source with ET; 2. Confirm receipt of notification of failure in writing; 3. Inform ET, IEC and EPD; 4. Discuss with EPD and ET on the required remedial actions; 5. Ensure remedial actions properly implemented; 6. Take immediate action to avoid further exceedance; 7. Implement the agreed proposals

* The operator who is the constructor responsible for the operation during the maintenance period.

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Appendix D

Copy of the Calibration Certificates for Water Quality Monitoring Equipment

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MaterialLab

Report No. : 142626WA190690



Page 1 of 3

Report on Calibration of Aqua Troll 600 Multi-parameter Water Quality Meter

Information Supplied by Client

Client : Fugro Technical Services Limited (MCL)
Client's address : Rm. 723 - 726, 7/F, Profit Industrial Building, No. 1-15,
Kwai Fung Crescent, Kwai Chung, N.T.
Sample description : One Aqua Troll 600 Multi-parameter Water Quality Meter
Client sample ID : Serial No. 525120
Test required : Calibration of the Aqua Troll 600 Multi-parameter Water Quality
Meter

Laboratory Information

Lab. sample ID : WA190690/1
Date of calibration : 29/03/2019
Next calibration date : 28/06/2019
Test method used : In-house comparison method

Note : This report refers only to the sample(s) tested.

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E-mail : matlab@fugro.com
Website : www.fugro.com

MaterialLab

Report No. : 142626WA190690

Page 2 of 3

Results :

A. pH calibration

pH reading at 25°C for Q.C. solution(6.86) and at 25°C for Q.C. solution(9.18)		
Theoretical	Measured	Deviation
9.18	9.17	-0.01
6.86	6.85	-0.01


B. Salinity calibration

Salinity, ppt			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
10	10.04	+0.04	± 0.5
20	20.09	+0.09	± 1.0
30	29.86	-0.14	± 1.5
40	39.73	-0.27	± 2.0

C. Dissolved Oxygen calibration

Trial No.	Dissolved oxygen content, mg/L	
	By calibrated D.O. meter	By D.O. meter
1	7.33	7.32
2	7.32	7.31
3	7.33	7.33
Average	7.33	7.32

Differences of D.O. Content between calibrated D.O. meter and D.O. meter should be less than 0.4mg/L

Certified by : 
Approved Signatory : CHAN Hoi Yan, Winnie
Assistant Manager

Date : 29/13/2019

Note : This report refers only to the sample(s) tested.

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Report No. : 142626WA190690

Page 3 of 3


Results :

D. Temperature calibration

Thermometer reading, °C	Meter reading, °C
25.09	25.13

E. Turbidity calibration

Turbidity, N.T.U.			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
4	4.07	+0.07	± 0.4
8	8.09	+0.09	± 0.6
40	39.76	-0.24	± 3.0
80	79.54	-0.46	± 4.0

Certified by : 
Approved Signatory : CHAN Hoi Yan, Winnie
Assistant Manager

Date : 29/3/2018
** End of Report **

Note : This report refers only to the sample(s) tested.

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Website : www.fugro.com

MaterialLab

Report No. : 142626WA190690(1)



Page 1 of 3

Report on Calibration of Aqua Troll 600 Multi-parameter Water Quality Meter

Information Supplied by Client

Client : Fugro Technical Services Limited (MCL)
Client's address : Rm. 723 - 726, 7/F, Profit Industrial Building, No. 1-15,
Kwai Fung Crescent, Kwai Chung, N.T.
Sample description : One Aqua Troll 600 Multi-parameter Water Quality Meter
Client sample ID : Serial No. 584601
Test required : Calibration of the Aqua Troll 600 Multi-parameter Water Quality
Meter

Laboratory Information

Lab. sample ID : WA190690/2
Date of calibration : 29/03/2019
Next calibration date : 28/06/2019
Test method used : In-house comparison method

Note : This report refers only to the sample(s) tested.

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Report No. : 142626WA190690(1)

Page 2 of 3

Results :**A. pH calibration**

pH reading at 25°C for Q.C. solution(6.86) and at 25°C for Q.C. solution(9.18)		
Theoretical	Measured	Deviation
9.18	9.18	± 0.00
6.86	6.86	± 0.00


B. Salinity calibration

Salinity, ppt			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
10	10.04	+0.04	± 0.5
20	20.07	+0.07	± 1.0
30	29.88	-0.12	± 1.5
40	39.72	-0.28	± 2.0

C. Dissolved Oxygen calibration

Trial No.	Dissolved oxygen content, mg/L	
	By calibrated D.O. meter	By D.O. meter
1	7.34	7.33
2	7.33	7.31
3	7.35	7.34
Average	7.34	7.33

Differences of D.O. Content between calibrated D.O. meter and D.O. meter should be less than 0.4mg/L

Certified by : 
Approved Signatory : CHAN Hoi Yan, Winnie
Assistant Manager

Date : 29/3/2018

Note : This report refers only to the sample(s) tested.

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Report No. : 142626WA190690(1)

Page 3 of 3

Results :


D. Temperature calibration

Thermometer reading, °C	Meter reading, °C
25.10	25.15

E. Turbidity calibration

Turbidity, N.T.U.			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
4	4.07	+0.07	± 0.4
8	8.08	+0.08	± 0.6
40	39.79	-0.21	± 3.0
80	79.54	-0.46	± 4.0

Certified by :


Approved Signatory : CHAN Hoi Yan, Winnie
Assistant Manager

Date

: 29/3/2019

** End of Report **

Note : This report refers only to the sample(s) tested.



a xylem brand

9940 Summers Ridge Road
San Diego, CA 92121
Tel: (858) 546-8327
support@sontek.com

Certificate of Calibration

TEST REPORT

Serial Number	5906
System Type	M9
System Orientation	Down
Compass Type	Sontek
Compass Offset (degrees)	N/A
Communications Output	RS232
Recorder Size (GB)	14.9
Firmware Version	4.02
Date Tested	05/23/2017

POWER TEST

Command Mode (W):	0.17	Range : 0.00 – 0.30
Sleep Mode (W):	N/A	Range : N/A
Ping Mode - 18V (W):	2.67	Range : 1.50 – 3.50
Power Check		PASS

NOISE TEST

Beam 1 – 3.0 MHz (counts)	95
Beam 2 – 1.0 MHz (counts)	96
Beam 3 – 3.0 MHz (counts)	95
Beam 4 – 1.0 MHz (counts)	101
Beam 5 – 3.0 MHz (counts)	93
Beam 6 – 1.0 MHz (counts)	95
Beam 7 – 3.0 MHz (counts)	91
Beam 8 – 1.0 MHz (counts)	100
Beam Vertical – 500KHz (counts)	88
Noise Test	PASS

VERIFICATION

Velocity Check	PASS
Transmit Output	PASS
Sensitivity	PASS
Temperature Sensor	PASS
Compass Heading Check	PASS
Compass Level Check	PASS
Burn-in (24 hrs)	PASS
Load Default Parameters	DONE

OPTIONS

Bottom Track	Installed
SmartPulse HD TM	Enabled
Stationary	Disabled
GPS Compass Integration	Disabled
RiverSurveyor	Enabled
HydroSurveyor	Disabled

Verified by: **ainthasane**

This report was generated on 5/24/2017.

ATTENTION: New Warranty Terms as of March 4, 2013:

This system is covered under a two year limited warranty that extends to all parts and labor for any malfunction due to workmanship or errors in the manufacturing process. The warranty is valid only if you properly maintain and operate this system under normal use as outlined in the User's Manual. The warranty does not cover shortcomings that are due to the design, or any incidental damages as a result of errors in the measurements.

SonTek will repair and/or replace, at its sole option, any product established to be defective with a product of like type. CLAIMS FOR LABOR COSTS AND/OR OTHER CHARGES RESULTING FROM THE USE OF SonTek GOODS AND/OR PRODUCTS ARE NOT COVERED BY THIS LIMITED WARRANTY.

SonTek DISCLAIMS ALL EXPRESS WARRANTIES OTHER THAN THOSE CONTAINED ABOVE AND ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE. SonTek DISCLAIMS AND WILL NOT BE LIABLE, UNDER ANY CIRCUMSTANCE, IN CONTRACT, TORT OR WARRANTY, FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO LOST PROFITS, BUSINESS INTERRUPTION LOSSES, LOSS OF GOODWILL, OR LOSS OF BUSINESS OR CUSTOMER RELATIONSHIPS.

If your system is not functioning properly, first try to identify the source of the problem. If additional support is required, we encourage you to contact us immediately. We will work to resolve the problem as quickly as possible.

If the system needs to be returned to the factory, please contact SonTek to obtain a Service Request (SR) number. We reserve the right to refuse receipt of shipments without SRs. We require the system to be shipped back in the original shipping container using the original packing material with all delivery costs covered by the customer (including all taxes and duties). If the system is returned without appropriate packing, the customer will be required to cover the cost of a new packaging crate and material.

The warranty for repairs performed at an authorized SonTek Service Center is one year.

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Appendix E

Results and Graphical Presentation of Water Quality Monitoring

Water Quality Monitoring Data

Monitoring Location	Date	Tide Mode	Weather	Sea Condition	Time	Water Depth (m)	Monitoring Level	Monitoring Level (m)	Replicate	In-situ Measurement								Laboratory Analysis							
										pH	Salinity (ppt)	Temperature (degree C)	DO Saturation (%)	DO (mg/L)	Turbidity (NTU)	Current Speed (m/s)	Current Direction (degree magnetic)	Total Suspended Solids (mg/L)	Ammonia Nitrogen (mg/L-N)	Nitrite Nitrogen (mg/L-N)	Nitrate Nitrogen (mg/L-N)	Total Inorganic Nitrogen (mg/L-N)	E.coli (cfu/100mL)	Total phosphorus (soluble and particulate) (mg/L)	BOD ₅ (mg/L)
										Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
A	9/4/2019	Mid-Ebb	Fine	Moderate	16:25	17	S	1	1	8.29	24.40	25.56	110.9	7.65	6.4	0.26	181.4	3.6	0.057	0.042	0.694	0.793	8	0.03	1.8
A	9/4/2019	Mid-Ebb	Fine	Moderate	16:25	17	S	1	2	8.25	24.51	25.41	111.8	7.73	6.3	0.25	177.2	3.6	0.054	0.041	0.772	0.868	13	0.04	3.3
A	9/4/2019	Mid-Ebb	Fine	Moderate	16:25	17	M	8.5	1	8.19	24.64	25.14	110.1	7.63	6.4	0.23	152.5	3.9	0.066	0.042	0.741	0.849	ND	0.03	2.0
A	9/4/2019	Mid-Ebb	Fine	Moderate	16:25	17	M	8.5	2	8.15	25.06	24.79	106.7	7.44	6.8	0.21	137.4	4.1	0.059	0.040	0.697	0.796	1	0.03	1.3
A	9/4/2019	Mid-Ebb	Fine	Moderate	16:25	17	B	16	1	8.09	29.16	24.00	95.8	6.78	2.2	0.58	122.4	4.4	0.044	0.040	0.742	0.826	14	0.04	3.3
A	9/4/2019	Mid-Ebb	Fine	Moderate	16:25	17	B	16	2	8.10	29.14	23.87	93.4	6.62	2.5	0.49	127.8	4.1	0.050	0.042	0.705	0.797	10	0.03	2.0
B	9/4/2019	Mid-Ebb	Fine	Moderate	16:10	14	S	1	1	8.29	24.86	24.92	106.0	7.38	3.5	0.22	196.8	6.0	0.071	0.040	0.691	0.801	9	0.03	2.0
B	9/4/2019	Mid-Ebb	Fine	Moderate	16:10	14	S	1	2	8.27	24.86	24.88	106.7	7.43	3.9	0.23	198.0	6.0	0.071	0.042	0.684	0.797	11	0.03	2.1
B	9/4/2019	Mid-Ebb	Fine	Moderate	16:10	14	M	7	1	8.15	27.15	24.37	101.6	7.14	6.1	0.59	248.9	6.5	0.066	0.039	0.696	0.800	49	0.03	2.0
B	9/4/2019	Mid-Ebb	Fine	Moderate	16:10	14	M	7	2	8.16	27.19	24.23	98.7	6.95	7.4	0.51	232.3	6.7	0.071	0.04	0.64	0.751	62	0.03	1.4
B	9/4/2019	Mid-Ebb	Fine	Moderate	16:10	14	B	13	1	8.09	29.07	23.76	93.3	6.61	4.1	0.82	259.7	7.6	0.085	0.032	0.576	0.693	24	0.03	1.6
B	9/4/2019	Mid-Ebb	Fine	Moderate	16:10	14	B	13	2	8.08	29.11	23.80	92.3	6.55	3.1	0.71	244.4	7.9	0.069	0.041	0.708	0.818	26	0.03	1.9
C	9/4/2019	Mid-Ebb	Fine	Moderate	15:52	12	S	1	1	8.15	24.59	25.05	105.6	7.33	2.9	0.17	139.8	3.3	0.071	0.040	0.687	0.798	6	0.03	2.4
C	9/4/2019	Mid-Ebb	Fine	Moderate	15:52	12	S	1	2	8.15	24.65	24.96	105.9	7.36	3.3	0.23	148.2	3.3	0.064	0.040	0.687	0.792	1	0.03	2.3
C	9/4/2019	Mid-Ebb	Fine	Moderate	15:52	12	M	6	1	8.12	25.94	24.59	102.3	7.16	3.2	0.13	174.1	4.2	0.059	0.042	0.672	0.773	6	0.03	2.1
C	9/4/2019	Mid-Ebb	Fine	Moderate	15:52	12	M	6	2	8.12	25.93	24.54	101.4	7.10	3.2	0.11	169.2	4.4	0.061	0.038	0.678	0.777	5	0.03	2.0
C	9/4/2019	Mid-Ebb	Fine	Moderate	15:52	12	B	11	1	8.10	26.28	24.39	99.4	6.98	3.7	0.10	244.8	4.8	0.069	0.039	0.617	0.726	24	0.02	1.7
C	9/4/2019	Mid-Ebb	Fine	Moderate	15:52	12	B	11	2	8.10	26.21	24.38	99.3	6.97	4.0	0.12	231.2	4.6	0.075	0.039	0.610	0.725	32	0.03	2.3
D	9/4/2019	Mid-Ebb	Fine	Moderate	15:39	13	S	1	1	8.16	25.32	24.84	103.0	7.17	4.4	0.65	143.5	3.1	0.075	0.045	0.716	0.836	ND	0.03	2.1
D	9/4/2019	Mid-Ebb	Fine	Moderate	15:39	13	S	1	2	8.16	25.87	24.74	101.8	7.11	4.0	0.43	134.7	3.4	0.069	0.043	0.723	0.834	ND	0.03	1.8
D	9/4/2019	Mid-Ebb	Fine	Moderate	15:39	13	M	6.5	1	8.11	26.24	24.40	98.9	6.89	3.6	0.38	173.2	3.4	0.091	0.038	0.625	0.755	10	0.03	1.8
D	9/4/2019	Mid-Ebb	Fine	Moderate	15:39	13	M	6.5	2	8.12	26.21	24.39	98.2	6.87	3.5	0.45	164.9	3.6	0.076	0.036	0.608	0.720	16	0.02	<1.0
D	9/4/2019	Mid-Ebb	Fine	Moderate	15:39	13	B	12	1	8.13	26.23	24.31	97.2	6.84	3.4	0.29	210.4	3.7	0.078	0.040	0.609	0.728	20	0.02	1.1
D	9/4/2019	Mid-Ebb	Fine	Moderate	15:39	13	B	12	2	8.13	26.29	24.30	97.6	6.86	3.3	0.34	194.7	3.9	0.073	0.038	0.608	0.720	23	0.02	1.1
E	9/4/2019	Mid-Ebb	Fine	Moderate	15:10	16	S	1	1	9.09	25.69	25.37	100.3	6.93	2.3	0.27	193.8	2.2	0.090	0.038	0.596	0.723	3	0.03	2.0
E	9/4/2019	Mid-Ebb	Fine	Moderate	15:10	16	S	1	2	8.84	25.78	25.14	101.4	7.03	2.3	0.12	187.4	2.3	0.080	0.036	0.598	0.713	3	0.03	1.9
E	9/4/2019	Mid-Ebb	Fine	Moderate	15:10	16	M	8	1	8.59	25.92	24.86	102.0	7.11	2.4	0.16	91.1	2.2	0.070	0.038	0.601	0.709	3	0.02	1.4
E	9/4/2019	Mid-Ebb	Fine	Moderate	15:10	16	M	8	2	8.54	25.96	24.80	101.8	7.10	2.1	0.20	125.8	2.4	0.072	0.034	0.597	0.704	ND	0.03	1.7
E	9/4/2019	Mid-Ebb	Fine	Moderate	15:10	16	B	15	1	8.39	26.48	24.54	100.3	7.03	3.3	0.21	138.6	2.8	0.065	0.037	0.623	0.725	3	0.03	1.2
E	9/4/2019	Mid-Ebb	Fine	Moderate	15:10	16	B	15	2	8.38	26.44	24.53	100.4	7.03	3.4	0.28	126.4	3.0	0.065	0.038	0.627	0.730	1	0.03	1.4
F	9/4/2019	Mid-Ebb	Fine	Moderate	14:59	23	S	1	1	8.32	25.82	24.96	103.5	7.20	2.1	0.74	124.0	2.6	0.084	0.037	0.614	0.735	ND	0.03	1.8
F	9/4/2019	Mid-Ebb	Fine	Moderate	14:59	23	S	1	2	8.30	25.83	24.94	103.4	7.20	2.1	0.79	111.0	2.7	0.085	0.036	0.609	0.730	ND	0.03	1.7
F	9/4/2019	Mid-Ebb	Fine	Moderate	14:59	23	M	11.5	1	8.22	26.28	24.66	101.2	7.07	2.3	0.42	142.1	2.9	0.090	0.037	0.602	0.729	1	0.02	1.5
F	9/4/2019	Mid-Ebb	Fine	Moderate	14:59	23	M	11.5	2	8.22	26.44	24.60	100.1	7.00	2.3	0.49	118.1	2.7	0.081	0.034	0.611	0.726	3	0.03	1.6
F	9/4/2019	Mid-Ebb	Fine	Moderate	14:59	23	B	22	1	8.19	26.68	24.48	97.9	6.86	2.5	0.67	99.8	3.0	0.080	0.037	0.605	0.722	ND	0.03	1.5
F	9/4/2019	Mid-Ebb	Fine	Moderate	14:59	23	B	22	2	8.19	26.72	24.44	97.2	6.82	2.5	0.58	100.5	2.9	0.079	0.039	0.610	0.728	2	0.02	1.7
G	9/4/2019	Mid-Ebb	Fine	Moderate	14:32	22	S	1	1	8.70	26.67	24.88	105.2	7.33	0.8	0.20	184.0	1.7	0.070	0.034	0.578	0.682	ND	0.02	2.0
G	9/4/2019	Mid-Ebb	Fine	Moderate	14:32	22	S	1	2	8.60	26.42	24.91	106.5	7.41	1.0	0.15	166.2	1.9	0.073	0.038	0.569	0.680	ND	0.03	1.9
G	9/4/2019	Mid-Ebb	Fine	Moderate	14:32	22	M	11	1	8.38	27.57	24.42	102.9	7.22	1.1	0.24	218.2	3.1	0.066	0.032	0.579	0.678	1	0.02	1.6
G	9/4/2019	Mid-Ebb	Fine	Moderate	14:32	22	M	11	2	8.35	27.62	24.40	102.3	7.18	1.3	0.28	220.5	2.7	0.067	0.038	0.566	0.671	1	0.02	1.9
G	9/4/2019	Mid-Ebb	Fine	Moderate	14:32	22	B	21	1	8.29	27.91	24.24	99.2	6.98	2.9	0.27	209.6	4.4	0.077	0.038	0.571	0.686	ND	0.03	2.4
G	9/4/2019	Mid-Ebb	Fine	Moderate	14:32	22	B	21	2	8.28	27.94	24.21	98.8	6.96	2.5	0.33	211.5	4.1	0.070	0.029	0.583	0.682	ND	0.03	1.7
H	9/4/2019	Mid-Ebb	Fine	Moderate	14:23	19	S	1	1	8.50	27.10	24.85	105.8	7.37	1.2	0.57	173.0	2.9	0.064	0.039	0.566	0.669	ND	0.03	3.4
H	9/4/2019	Mid-Ebb	Fine	Moderate	14:23	19	S	1	2	8.49	27.42	24.65	103.9	7.26	1.3	0.55	166.1	3.1	0.070	0.033	0.571	0.674	ND	0.04	2.9
H	9/4/2019	Mid-Ebb	Fine	Moderate	14:23	19	M	9.5	1	8.40	27.58	24.49	102.9	7.21	1.4	0.54	128.4	3.8	0.062	0.038	0.568	0.668	ND	0.03	2.2
H	9/4/2019	Mid-Ebb	Fine	Moderate	14:23	19	M	9.5	2	8.37	27.60	24.47	102.3	7.18	1.7	0.64	123.2	3.9	0.061	0.031	0.578	0.669	1	0.03	2.4
H	9/4/2019	Mid-Ebb	Fine	Moderate	14:23	19	B	18	1	8.30	27.91	24.34	99.4	6.98	2.5	0.67	127.6	4.6	0.072	0.036	0.533	0.641	ND	0.03	1.5
H	9/4/2019	Mid-Ebb	Fine	Moderate	14:23	19	B	18	2	8.29	27.87	24.27	99.4	6.99	2.0	0.76	129.2	4.9	0.070	0.037	0.538	0.646	ND	0.03	1.8

Note: 1. ND: Not Detected

Water Quality Monitoring Data

Monitoring Location	Date	Tide Mode	Weather	Sea Condition	Time	Water Depth (m)	Monitoring Level	Monitoring Level (m)	Replicate	In-situ Measurement								Laboratory Analysis							
										pH	Salinity (ppt)	Temperature (degree C)	DO Saturation (%)	DO (mg/L)	Turbidity (NTU)	Current Speed (m/s)	Current Direction (degree magnetic)	Total Suspended Solids (mg/L)	Ammonia Nitrogen (mg/L-N)	Nitrite Nitrogen (mg/L-N)	Nitrate Nitrogen (mg/L-N)	Total Inorganic Nitrogen (mg/L-N)	E.coli (cfu/100mL)	Total phosphorus (soluble and particulate) (mg/L)	BOD ₅ (mg/L)
										Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
A	9/4/2019	Mid-Flood	Fine	Moderate	7:22	15	S	1	1	7.94	24.33	23.86	98.3	6.78	5.4	0.11	249.3	2.8	0.113	0.038	0.592	0.744	ND	0.02	1.8
A	9/4/2019	Mid-Flood	Fine	Moderate	7:22	15	S	1	2	7.95	24.32	23.82	97.7	6.76	5.3	0.13	243.5	2.6	0.111	0.036	0.602	0.749	ND	0.03	1.8
A	9/4/2019	Mid-Flood	Fine	Moderate	7:22	15	M	7.5	1	7.96	26.32	23.72	94.2	6.53	4.2	0.13	193.2	4.3	0.096	0.032	0.580	0.708	ND	0.03	1.2
A	9/4/2019	Mid-Flood	Fine	Moderate	7:22	15	M	7.5	2	7.94	26.51	23.75	93.9	6.55	4.3	0.15	189.7	4.2	0.098	0.036	0.552	0.686	ND	0.04	1.3
A	9/4/2019	Mid-Flood	Fine	Moderate	7:22	15	B	14	1	7.89	28.62	23.21	91.6	6.48	2.3	0.29	204.3	5.3	0.100	0.040	0.587	0.727	ND	0.03	1.2
A	9/4/2019	Mid-Flood	Fine	Moderate	7:22	15	B	14	2	7.90	28.66	23.22	91.2	6.46	2.3	0.21	217.3	5.0	0.100	0.034	0.600	0.734	ND	0.03	1.3
B	9/4/2019	Mid-Flood	Fine	Moderate	7:38	14	S	1	1	7.93	25.21	23.79	96.1	6.69	2.4	0.19	244.6	2.8	0.087	0.034	0.560	0.681	ND	0.03	1.5
B	9/4/2019	Mid-Flood	Fine	Moderate	7:38	14	S	1	2	7.94	25.23	23.82	96.5	6.72	2.4	0.16	249.7	3.1	0.100	0.040	0.572	0.713	ND	0.02	1.3
B	9/4/2019	Mid-Flood	Fine	Moderate	7:38	14	M	7	1	7.95	26.67	23.54	93.1	6.54	2.4	0.24	254.3	3.1	0.076	0.029	0.570	0.675	ND	0.02	1.4
B	9/4/2019	Mid-Flood	Fine	Moderate	7:38	14	M	7	2	7.95	26.60	23.56	92.8	6.54	2.5	0.29	268.3	2.9	0.09	0.04	0.594	0.725	ND	0.03	1.3
B	9/4/2019	Mid-Flood	Fine	Moderate	7:38	14	B	13	1	7.91	28.89	23.17	90.7	6.43	2.7	0.25	234.9	4.0	0.080	0.030	0.567	0.677	ND	0.03	1.1
B	9/4/2019	Mid-Flood	Fine	Moderate	7:38	14	B	13	2	7.92	28.92	23.18	90.8	6.45	2.6	0.23	237.1	3.8	0.094	0.038	0.600	0.733	ND	0.03	1.3
C	9/4/2019	Mid-Flood	Fine	Moderate	7:55	12	S	1	1	7.95	25.34	24.08	100.3	6.96	2.1	0.18	154.3	2.6	0.104	0.037	0.592	0.733	1	0.03	1.3
C	9/4/2019	Mid-Flood	Fine	Moderate	7:55	12	S	1	2	7.96	25.37	24.10	100.0	6.95	2.0	0.15	158.2	2.6	0.099	0.032	0.612	0.743	ND	0.03	1.2
C	9/4/2019	Mid-Flood	Fine	Moderate	7:55	12	M	6	1	7.95	25.43	23.73	97.7	6.84	2.3	0.21	163.7	2.7	0.103	0.034	0.604	0.742	1	0.03	1.2
C	9/4/2019	Mid-Flood	Fine	Moderate	7:55	12	M	6	2	7.95	25.46	23.69	97.4	6.82	2.3	0.26	164.2	2.8	0.112	0.039	0.547	0.698	3	0.03	1.2
C	9/4/2019	Mid-Flood	Fine	Moderate	7:55	12	B	11	1	7.95	25.97	23.52	94.8	6.66	2.8	0.17	204.3	3.1	0.104	0.042	0.592	0.738	2	0.03	1.3
C	9/4/2019	Mid-Flood	Fine	Moderate	7:55	12	B	11	2	7.96	25.98	23.52	94.4	6.63	3.0	0.15	198.8	2.9	0.102	0.032	0.608	0.741	ND	0.03	1.3
D	9/4/2019	Mid-Flood	Fine	Moderate	8:03	14	S	1	1	7.96	25.27	23.74	99.4	6.92	1.9	0.22	173.2	3.0	0.100	0.041	0.587	0.728	ND	0.03	1.1
D	9/4/2019	Mid-Flood	Fine	Moderate	8:03	14	S	1	2	7.95	25.24	23.74	99.2	6.93	1.9	0.28	145.7	2.6	0.106	0.035	0.572	0.713	ND	0.03	1.8
D	9/4/2019	Mid-Flood	Fine	Moderate	8:03	14	M	7	1	7.95	25.34	23.62	97.3	6.78	2.3	0.31	222.4	3.3	0.105	0.036	0.597	0.739	ND	0.03	1.2
D	9/4/2019	Mid-Flood	Fine	Moderate	8:03	14	M	7	2	7.94	25.38	23.67	97.1	6.79	2.3	0.35	197.3	2.8	0.108	0.034	0.617	0.759	ND	0.03	1.8
D	9/4/2019	Mid-Flood	Fine	Moderate	8:03	14	B	13	1	7.95	26.17	23.44	93.4	6.57	3.1	0.26	172.7	3.2	0.107	0.036	0.610	0.752	ND	0.03	1.1
D	9/4/2019	Mid-Flood	Fine	Moderate	8:03	14	B	13	2	7.94	26.13	23.45	93.7	6.59	3.2	0.13	186.4	3.4	0.110	0.039	0.606	0.754	ND	0.03	1.4
E	9/4/2019	Mid-Flood	Fine	Moderate	8:19	14	S	1	1	7.95	26.29	23.76	97.3	6.72	1.3	0.15	273.4	2.2	0.112	0.036	0.568	0.716	4	0.03	1.3
E	9/4/2019	Mid-Flood	Fine	Moderate	8:19	14	S	1	2	7.96	26.31	23.73	96.7	6.70	1.2	0.23	267.5	2.3	0.119	0.046	0.579	0.745	7	0.03	2.1
E	9/4/2019	Mid-Flood	Fine	Moderate	8:19	14	M	7	1	7.95	27.30	23.67	95.8	6.68	1.4	0.19	255.9	2.9	0.101	0.042	0.560	0.703	4	0.03	1.4
E	9/4/2019	Mid-Flood	Fine	Moderate	8:19	14	M	7	2	7.94	27.34	23.65	96.2	6.71	1.4	0.20	256.0	2.7	0.109	0.036	0.620	0.766	8	0.03	2.0
E	9/4/2019	Mid-Flood	Fine	Moderate	8:19	14	B	13	1	7.96	28.93	23.35	92.8	6.50	2.8	0.24	214.3	4.0	0.128	0.041	0.618	0.787	ND	0.03	2.6
E	9/4/2019	Mid-Flood	Fine	Moderate	8:19	14	B	13	2	7.94	28.92	23.31	92.2	6.46	2.8	0.34	218.5	3.7	0.108	0.048	0.593	0.749	ND	0.03	1.5
F	9/4/2019	Mid-Flood	Fine	Moderate	8:31	18	S	1	1	7.96	25.92	23.87	98.3	6.84	1.4	0.36	154.5	3.1	0.116	0.046	0.642	0.804	16	0.03	1.7
F	9/4/2019	Mid-Flood	Fine	Moderate	8:31	18	S	1	2	7.90	25.91	23.86	97.8	6.81	1.4	0.17	153.7	2.9	0.117	0.037	0.659	0.813	17	0.04	1.5
F	9/4/2019	Mid-Flood	Fine	Moderate	8:31	18	M	9	1	7.96	27.33	23.61	95.8	6.69	1.3	0.16	109.3	3.1	0.116	0.041	0.654	0.811	6	0.03	1.6
F	9/4/2019	Mid-Flood	Fine	Moderate	8:31	18	M	9	2	7.94	27.30	23.58	95.9	6.71	1.3	0.14	108.4	3.3	0.119	0.040	0.642	0.802	2	0.03	1.7
F	9/4/2019	Mid-Flood	Fine	Moderate	8:31	18	B	17	1	7.96	29.14	23.27	92.2	6.46	3.0	0.14	117.5	3.4	0.114	0.046	0.643	0.802	ND	0.03	2.0
F	9/4/2019	Mid-Flood	Fine	Moderate	8:31	18	B	17	2	7.94	29.10	23.25	91.4	6.41	3.0	0.15	119.3	3.3	0.095	0.038	0.658	0.791	2	0.03	1.3
G	9/4/2019	Mid-Flood	Fine	Moderate	8:48	13	S	1	1	7.94	24.69	24.05	100.1	6.97	1.4	0.17	90.3	3.7	0.235	0.042	0.664	0.941	3	0.04	4.4
G	9/4/2019	Mid-Flood	Fine	Moderate	8:48	13	S	1	2	7.93	24.67	24.07	100.1	6.97	1.4	0.15	107.3	3.5	0.214	0.045	0.660	0.919	1	0.04	4.3
G	9/4/2019	Mid-Flood	Fine	Moderate	8:48	13	M	6.5	1	7.94	26.12	23.72	95.8	6.72	1.5	0.17	249.2	3.6	0.103	0.041	0.662	0.806	3	0.04	3.6
G	9/4/2019	Mid-Flood	Fine	Moderate	8:48	13	M	6.5	2	7.95	26.23	23.73	96.0	6.74	1.5	0.13	281.6	3.8	0.102	0.037	0.666	0.804	6	0.04	2.9
G	9/4/2019	Mid-Flood	Fine	Moderate	8:48	13	B	12	1	7.94	27.20	23.57	94.5	6.65	2.2	0.14	108.3	3.9	0.104	0.035	0.660	0.799	3	0.03	2.0
G	9/4/2019	Mid-Flood	Fine	Moderate	8:48	13	B	12	2	7.95	27.20	23.57	94.4	6.65	2.2	0.18	104.8	4.1	0.105	0.039	0.650	0.794	1	0.04	2.5
H	9/4/2019	Mid-Flood	Fine	Moderate	9:01	19	S	1	1	7.90	24.83	24.03	99.5	6.93	1.6	0.36	273.3	2.8	0.151	0.042	0.661	0.854	1	0.03	3.5
H	9/4/2019	Mid-Flood	Fine	Moderate	9:01	19	S	1	2	7.88	24.79	24.06	98.7	6.90	1.5	0.38	288.2	3.1	0.147	0.046	0.658	0.851	4	0.04	3.4
H	9/4/2019	Mid-Flood	Fine	Moderate	9:01	19	M	9.5	1	7.93	25.70	25.70	97.0	6.80	1.8	0.42	190.8	3.4	0.132	0.044	0.667	0.843	11	0.04	3.4
H	9/4/2019	Mid-Flood	Fine	Moderate	9:01	19	M	9.5	2	7.89	25.66	25.66	96.6	6.78	1.6	0.45	228.3	3.3	0.140	0.039	0.697	0.876	24	0.04	4.1
H	9/4/2019	Mid-Flood	Fine	Moderate	9:01	19	B	18	1	7.94	26.88	26.88	93.9	6.60	1.9	0.34	138.9	3.9	0.156	0.047	0.703	0.906	4	0.04	4.0
H	9/4/2019	Mid-Flood	Fine	Moderate	9:01	19	B	18	2	7.90	26.80	26.80	93.4	6.57	1.8	0.33	149.2	4.3	0.165	0.045	0.661	0.870	ND	0.04	3.6

Note: 1. ND: Not Detected





CERTIFICATE OF ANALYSIS

Client	: FUGRO TECHNICAL SERVICES LIMITED	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 28
Contact	: MR CYRUS LAI	Contact	: Richard Fung	Work Order	: HK1914873
Address	: ROOM 723 & 725, 7/F, BLOCK B, PROFIT INDUSTRIAL BUILDING, 1-15 KWAI FONG CRESCENT, KWAI FONG, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
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Project	: CONTRACT NO. CM 14/2016 ENVIRONMENTAL TEAM FOR OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT PLANT			Date Samples Received	: 09-Apr-2019
Order number	: 0041/17	Quote number	: HKE/1654/2017_R1	Issue Date	: 26-Apr-2019
C-O-C number	: ---			No. of samples received	: 96
Site	: ---			No. of samples analysed	: 96

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This document has been signed by those names that appear on this report and are the authorised signatories.

<i>Signatories</i>	<i>Position</i>	<i>Authorised results for</i>
		
Fung Lim Chee, Richard	General Manager	Inorganics
		
Ng Sin Kou, May	Assistant Laboratory Manager	Microbiology_ENV



General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. Testing period is from 09-Apr-2019 to 26-Apr-2019.

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

Specific Comments for Work Order: HK1914873

Sample(s) were received in chilled condition.

Water sample(s) analysed and reported on as received basis.

Sample(s) arrived in the laboratory at 17:45 Microbiological sample(s), in 125mL plastic bottle labelled sterile, with addition of sodium thiosulfate solution.

NOT DETECTED denotes result(s) is (are) less than the Limit of Report (LOR).

EK063A - Total Inorganic Nitrogen is the sum of the Total Oxidizable Nitrogen and Ammonical Nitrogen.

EP030 - The accredited LOR of Carbonaceous Biochemical Oxygen Demand is 2mg/L. Results reported below 2mg/L and the decimal value of the results were for reference only.



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				A/S/E	A/S/E/Dup	A/M/E	A/M/E/Dup	A/B/E
				09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-001	HK1914873-002	HK1914873-003	HK1914873-004	HK1914873-005
EA/ED: Physical and Aggregate Properties								
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.6	3.6	3.9	4.1	4.4
ED/EK: Inorganic Nonmetallic Parameters								
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.057	0.054	0.066	0.059	0.044
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.042	0.041	0.042	0.040	0.040
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.694	0.772	0.741	0.697	0.742
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.793	0.868	0.849	0.796	0.826
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.04	0.03	0.03	0.04
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.03	0.02
EP: Aggregate Organics								
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.8	3.3	2.0	1.3	3.3
EM: Microbiological Testing								
EM002: E. coli	----	1	CFU/100mL	8	13	NOT DETECTED	1	14



Sub-Matrix: WATER				Client sample ID	A/B/E/Dup	B/S/E	B/S/E/Dup	B/M/E	B/M/E/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-006	HK1914873-007	HK1914873-008	HK1914873-009	HK1914873-010	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	4.1	6.0	6.0	6.5	6.7	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.050	0.071	0.071	0.066	0.071	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.042	0.040	0.042	0.039	0.040	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.705	0.691	0.684	0.696	0.640	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.797	0.801	0.797	0.800	0.751	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.03	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	2.0	2.0	2.1	2.0	1.4	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	10	9	11	49	62	



Sub-Matrix: WATER				Client sample ID	B/B/E	B/B/E/Dup	C/S/E	C/S/E/Dup	C/M/E
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-011	HK1914873-012	HK1914873-013	HK1914873-014	HK1914873-015	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	7.6	7.9	3.3	3.3	4.2	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.085	0.069	0.071	0.064	0.059	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.032	0.041	0.040	0.040	0.042	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.576	0.708	0.687	0.687	0.672	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.693	0.818	0.798	0.792	0.773	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.6	1.9	2.4	2.3	2.1	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	24	26	6	1	6	



Sub-Matrix: WATER				Client sample ID	C/M/E/Dup	C/B/E	C/B/E/Dup	D/S/E	D/S/E/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-016	HK1914873-017	HK1914873-018	HK1914873-019	HK1914873-020	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	4.4	4.8	4.6	3.1	3.4	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.061	0.069	0.075	0.075	0.069	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.038	0.039	0.039	0.045	0.043	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.678	0.617	0.610	0.716	0.723	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.777	0.726	0.725	0.836	0.834	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.02	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.01	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	2.0	1.7	2.3	2.1	1.8	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	5	24	32	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	D/M/E	D/M/E/Dup	D/B/E	D/B/E/Dup	E/S/E
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-021	HK1914873-022	HK1914873-023	HK1914873-024	HK1914873-025	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.4	3.6	3.7	3.9	2.2	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.091	0.076	0.078	0.073	0.090	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.038	0.036	0.040	0.038	0.038	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.625	0.608	0.609	0.608	0.596	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.755	0.720	0.728	0.720	0.723	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.02	0.02	0.02	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.8	<1.0	1.1	1.1	2.0	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	10	16	20	23	3	



Sub-Matrix: WATER				Client sample ID	E/S/E/Dup	E/M/E	E/M/E/Dup	E/B/E	E/B/E/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-026	HK1914873-027	HK1914873-028	HK1914873-029	HK1914873-030	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	2.3	2.2	2.4	2.8	3.0	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.080	0.070	0.072	0.065	0.065	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.036	0.038	0.034	0.037	0.038	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.598	0.601	0.597	0.623	0.627	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.713	0.709	0.704	0.725	0.730	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.02	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.9	1.4	1.7	1.2	1.4	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	3	3	NOT DETECTED	3	1	



Sub-Matrix: WATER				Client sample ID	F/S/E	F/S/E/Dup	F/M/E	F/M/E/Dup	F/B/E
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-031	HK1914873-032	HK1914873-033	HK1914873-034	HK1914873-035	HK1914873-035
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	2.6	2.7	2.9	2.7	3.0	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.084	0.085	0.090	0.081	0.080	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.037	0.036	0.037	0.034	0.037	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.614	0.609	0.602	0.611	0.605	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.735	0.730	0.729	0.726	0.722	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.02	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.8	1.7	1.5	1.6	1.5	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	1	3	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	F/B/E/Dup	G/S/E	G/S/E/Dup	G/M/E	G/M/E/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-036	HK1914873-037	HK1914873-038	HK1914873-039	HK1914873-040	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	2.9	1.7	1.9	3.1	2.7	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.079	0.070	0.073	0.066	0.067	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.039	0.034	0.038	0.032	0.038	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.610	0.578	0.569	0.579	0.566	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.728	0.682	0.680	0.678	0.671	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.03	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.7	2.0	1.9	1.6	1.9	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	2	NOT DETECTED	NOT DETECTED	1	1	



Sub-Matrix: WATER				Client sample ID	G/B/E	G/B/E/Dup	H/S/E	H/S/E/Dup	H/M/E
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-041	HK1914873-042	HK1914873-043	HK1914873-044	HK1914873-045	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	4.4	4.1	2.9	3.1	3.8	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.077	0.070	0.064	0.070	0.062	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.038	0.029	0.039	0.033	0.038	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.571	0.583	0.566	0.571	0.568	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.686	0.682	0.669	0.674	0.668	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.04	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	<0.01	0.01	0.01	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	2.4	1.7	3.4	2.9	2.2	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	H/M/E/Dup	H/B/E	H/B/E/Dup	A/S/F	A/S/F/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-046	HK1914873-047	HK1914873-048	HK1914873-049	HK1914873-050	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.9	4.6	4.9	2.8	2.6	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.061	0.072	0.070	0.113	0.111	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.031	0.036	0.037	0.038	0.036	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.578	0.533	0.538	0.592	0.602	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.669	0.641	0.646	0.744	0.749	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.02	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.01	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	2.4	1.5	1.8	1.8	1.8	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	1	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	A/M/F	A/M/F/Dup	A/B/F	A/B/F/Dup	B/S/F
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-051	HK1914873-052	HK1914873-053	HK1914873-054	HK1914873-055	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	4.3	4.2	5.3	5.0	2.8	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.096	0.098	0.100	0.100	0.087	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.032	0.036	0.040	0.034	0.034	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.580	0.552	0.587	0.600	0.560	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.708	0.686	0.727	0.734	0.681	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.04	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.03	0.02	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.2	1.3	1.2	1.3	1.5	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	B/S/F/Dup	B/M/F	B/M/F/Dup	B/B/F	B/B/F/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-056	HK1914873-057	HK1914873-058	HK1914873-059	HK1914873-060	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.1	3.1	2.9	4.0	3.8	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.100	0.076	0.090	0.080	0.094	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.040	0.029	0.040	0.030	0.038	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.572	0.570	0.594	0.567	0.600	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.713	0.675	0.725	0.677	0.733	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.03	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.3	1.4	1.3	1.1	1.3	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	C/S/F	C/S/F/Dup	C/M/F	C/M/F/Dup	C/B/F
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-061	HK1914873-062	HK1914873-063	HK1914873-064	HK1914873-065	HK1914873-065
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	2.6	2.6	2.7	2.8	3.1	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.104	0.099	0.103	0.112	0.104	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.037	0.032	0.034	0.039	0.042	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.592	0.612	0.604	0.547	0.592	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.733	0.743	0.742	0.698	0.738	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.3	1.2	1.2	1.2	1.3	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	1	NOT DETECTED	1	3	2	



Sub-Matrix: WATER				Client sample ID	C/B/F/Dup	D/S/F	D/S/F/Dup	D/M/F	D/M/F/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-066	HK1914873-067	HK1914873-068	HK1914873-069	HK1914873-070	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	2.9	3.0	2.6	3.3	2.8	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.102	0.100	0.106	0.105	0.108	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.032	0.041	0.035	0.036	0.034	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.608	0.587	0.572	0.597	0.617	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.741	0.728	0.713	0.739	0.759	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.03	0.02	0.03	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.3	1.1	1.8	1.2	1.8	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	D/B/F	D/B/F/Dup	E/S/F	E/S/F/Dup	E/M/F
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-071	HK1914873-072	HK1914873-073	HK1914873-074	HK1914873-075	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.2	3.4	2.2	2.3	2.9	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.107	0.110	0.112	0.119	0.101	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.036	0.039	0.036	0.046	0.042	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.610	0.606	0.568	0.579	0.560	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.752	0.754	0.716	0.745	0.703	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.01	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.1	1.4	1.3	2.1	1.4	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	4	7	4	



Sub-Matrix: WATER				Client sample ID	E/M/F/Dup	E/B/F	E/B/F/Dup	F/S/F	F/S/F/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-076	HK1914873-077	HK1914873-078	HK1914873-079	HK1914873-080	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	2.7	4.0	3.7	3.1	2.9	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.109	0.128	0.108	0.116	0.117	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.036	0.041	0.048	0.046	0.037	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.620	0.618	0.593	0.642	0.659	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.766	0.787	0.749	0.804	0.813	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.04	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.01	0.01	0.02	0.02	0.02	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	2.0	2.6	1.5	1.7	1.5	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	8	NOT DETECTED	NOT DETECTED	16	17	



Sub-Matrix: WATER				Client sample ID	F/M/F	F/M/F/Dup	F/B/F	F/B/F/Dup	G/S/F
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-081	HK1914873-082	HK1914873-083	HK1914873-084	HK1914873-085	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.1	3.3	3.4	3.3	3.7	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.116	0.119	0.114	0.095	0.235	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.041	0.040	0.046	0.038	0.042	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.654	0.642	0.643	0.658	0.664	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.811	0.802	0.802	0.791	0.941	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.04	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.03	<0.01	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.6	1.7	2.0	1.3	4.4	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	6	2	NOT DETECTED	2	3	



Sub-Matrix: WATER				Client sample ID	G/S/F/Dup	G/M/F	G/M/F/Dup	G/B/F	G/B/F/Dup
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-086	HK1914873-087	HK1914873-088	HK1914873-089	HK1914873-090	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.5	3.6	3.8	3.9	4.1	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.214	0.103	0.102	0.104	0.105	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.045	0.041	0.037	0.035	0.039	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.660	0.662	0.666	0.660	0.650	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.919	0.806	0.804	0.799	0.794	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.04	0.04	0.04	0.03	0.04	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	<0.01	0.02	0.02	0.01	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	4.3	3.6	2.9	2.0	2.5	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	1	3	6	3	1	



Sub-Matrix: WATER				Client sample ID	H/S/F	H/S/F/Dup	H/M/F	H/M/F/Dup	H/B/F
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914873-091	HK1914873-092	HK1914873-093	HK1914873-094	HK1914873-095	
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	----	0.5	mg/L	2.8	3.1	3.4	3.3	3.9	
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.151	0.147	0.132	0.140	0.156	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.042	0.046	0.044	0.039	0.047	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.661	0.658	0.667	0.697	0.703	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.854	0.851	0.843	0.876	0.906	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.04	0.04	0.04	0.04	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	3.5	3.4	3.4	4.1	4.0	
EM: Microbiological Testing									
EM002: E. coli	----	1	CFU/100mL	1	4	11	24	4	



Sub-Matrix: WATER				Client sample ID	H/B/F/Dup	---	---	---	---
				Client sampling date / time	09-Apr-2019	---	---	---	---
Compound	CAS Number	LOR	Unit	HK1914873-096	---	---	---	---	---
EA/ED: Physical and Aggregate Properties									
EA025: Suspended Solids (SS)	---	0.5	mg/L	4.3	---	---	---	---	---
ED/EK: Inorganic Nonmetallic Parameters									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.165	---	---	---	---	---
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.045	---	---	---	---	---
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.661	---	---	---	---	---
EK063A: Inorganic Nitrogen as N	---	0.010	mg/L	0.870	---	---	---	---	---
EK067P: Total Phosphorus as P	---	0.01	mg/L	0.04	---	---	---	---	---
EK067P: Total Phosphorus - Filtered	---	0.01	mg/L	<0.01	---	---	---	---	---
EP: Aggregate Organics									
EP030: Biochemical Oxygen Demand	---	1.0	mg/L	3.6	---	---	---	---	---
EM: Microbiological Testing									
EM002: E. coli	---	1	CFU/100mL	NOT DETECTED	---	---	---	---	---



Laboratory Duplicate (DUP) Report

Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 2288525)								
HK1914873-001	A/S/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	3.6	3.9	5.98
HK1914873-011	B/B/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	7.6	7.7	0.00
EA/ED: Physical and Aggregate Properties (QC Lot: 2288526)								
HK1914873-021	D/M/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	3.4	3.0	12.4
HK1914873-031	F/S/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	2.6	3.0	12.4
EA/ED: Physical and Aggregate Properties (QC Lot: 2288527)								
HK1914873-041	G/B/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	4.4	4.1	6.45
HK1914873-051	A/M/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	4.3	4.0	5.99
EA/ED: Physical and Aggregate Properties (QC Lot: 2288528)								
HK1914873-061	C/S/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	2.6	2.8	9.17
HK1914873-071	D/B/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	3.2	3.1	3.98
EA/ED: Physical and Aggregate Properties (QC Lot: 2288529)								
HK1914873-081	F/M/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	3.1	3.4	11.5
HK1914873-091	H/S/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	2.8	2.6	4.61
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288485)								
HK1914873-020	D/S/E/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.043	0.043	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288488)								
HK1914873-040	G/M/E/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.038	0.030	25.4
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288490)								
HK1914873-060	B/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.038	0.040	4.82
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288492)								
HK1914873-080	F/S/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.037	0.043	16.3
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288494)								
HK1914873-096	H/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.045	0.038	16.9
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288559)								
HK1914873-010	B/M/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.03	0.03	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288560)								
HK1914873-010	B/M/E/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288561)								
HK1914873-030	E/B/E/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00



Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288562)								
HK1914873-030	E/B/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288563)								
HK1914873-050	A/S/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288564)								
HK1914873-050	A/S/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.01	0.02	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288565)								
HK1914873-070	D/M/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288566)								
HK1914873-070	D/M/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288567)								
HK1914873-090	G/B/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.04	0.04	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288568)								
HK1914873-090	G/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.01	0.01	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288793)								
HK1914873-020	D/S/E/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.069	0.066	4.28
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288794)								
HK1914873-040	G/M/E/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.067	0.069	2.88
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288795)								
HK1914873-060	B/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.094	0.093	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288796)								
HK1914873-080	F/S/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.117	0.120	2.56
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288797)								
HK1914873-096	H/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.165	0.167	1.45

Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: WATER				Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report					
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EA/ED: Physical and Aggregate Properties (QC Lot: 2288525)												
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	99.0	----	85	115	----	----	
EA/ED: Physical and Aggregate Properties (QC Lot: 2288526)												



Matrix: WATER		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
		LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
Method: Compound	CAS Number					LCS	DCS	Low	High	Value	Control Limit
EA/ED: Physical and Aggregate Properties (QC Lot: 2288526) - Continued											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	102	----	85	115	----	----
EA/ED: Physical and Aggregate Properties (QC Lot: 2288527)											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	101	----	85	115	----	----
EA/ED: Physical and Aggregate Properties (QC Lot: 2288528)											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	102	----	85	115	----	----
EA/ED: Physical and Aggregate Properties (QC Lot: 2288529)											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	99.0	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288485)											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	111	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288488)											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	102	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288490)											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	101	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288492)											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	109	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288494)											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	114	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288559)											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.4	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288560)											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	97.5	----	90	104	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288561)											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	97.3	----	90	104	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288562)											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.5	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288563)											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	97.2	----	90	104	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288564)											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	98.1	----	85	115	----	----



Matrix: WATER		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288565)											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	100	----	90	104	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288566)											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.2	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288567)											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	99.2	----	90	104	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288568)											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.1	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288793)											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	114	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288794)											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	111	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288795)											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	101	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288796)											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	102	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288797)											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	102	----	85	115	----	----
EP: Aggregate Organics (QC Lot: 2289740)											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	101	----	81	115	----	----
EP: Aggregate Organics (QC Lot: 2289741)											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	99.4	----	81	115	----	----
EP: Aggregate Organics (QC Lot: 2289742)											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	102	----	81	115	----	----
EP: Aggregate Organics (QC Lot: 2289743)											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	102	----	81	115	----	----
EP: Aggregate Organics (QC Lot: 2289744)											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	98.3	----	81	115	----	----



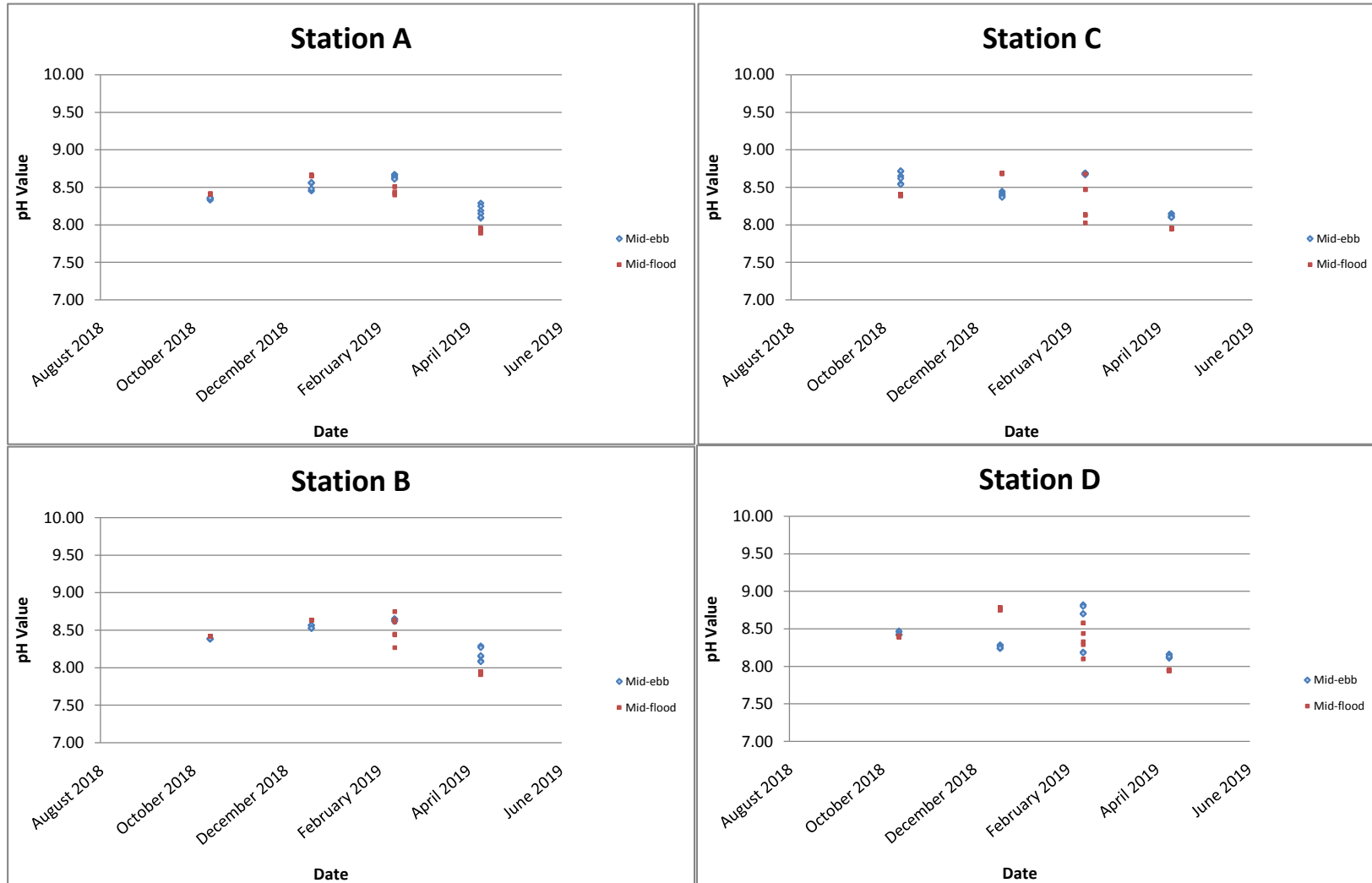
Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: WATER					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288485)										
HK1914873-020	D/S/E/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	104	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288488)										
HK1914873-040	G/M/E/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	104	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288490)										
HK1914873-060	B/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	106	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288492)										
HK1914873-080	F/S/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	107	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288494)										
HK1914873-096	H/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	102	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288559)										
HK1914873-010	B/M/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	94.0	----	75	125	----	25
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288560)										
HK1914873-010	B/M/E/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	95.8	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288561)										
HK1914873-030	E/B/E/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	96.4	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288562)										
HK1914873-030	E/B/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	100	----	75	125	----	25
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288563)										
HK1914873-050	A/S/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	96.0	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288564)										
HK1914873-050	A/S/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	101	----	75	125	----	25
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288565)										

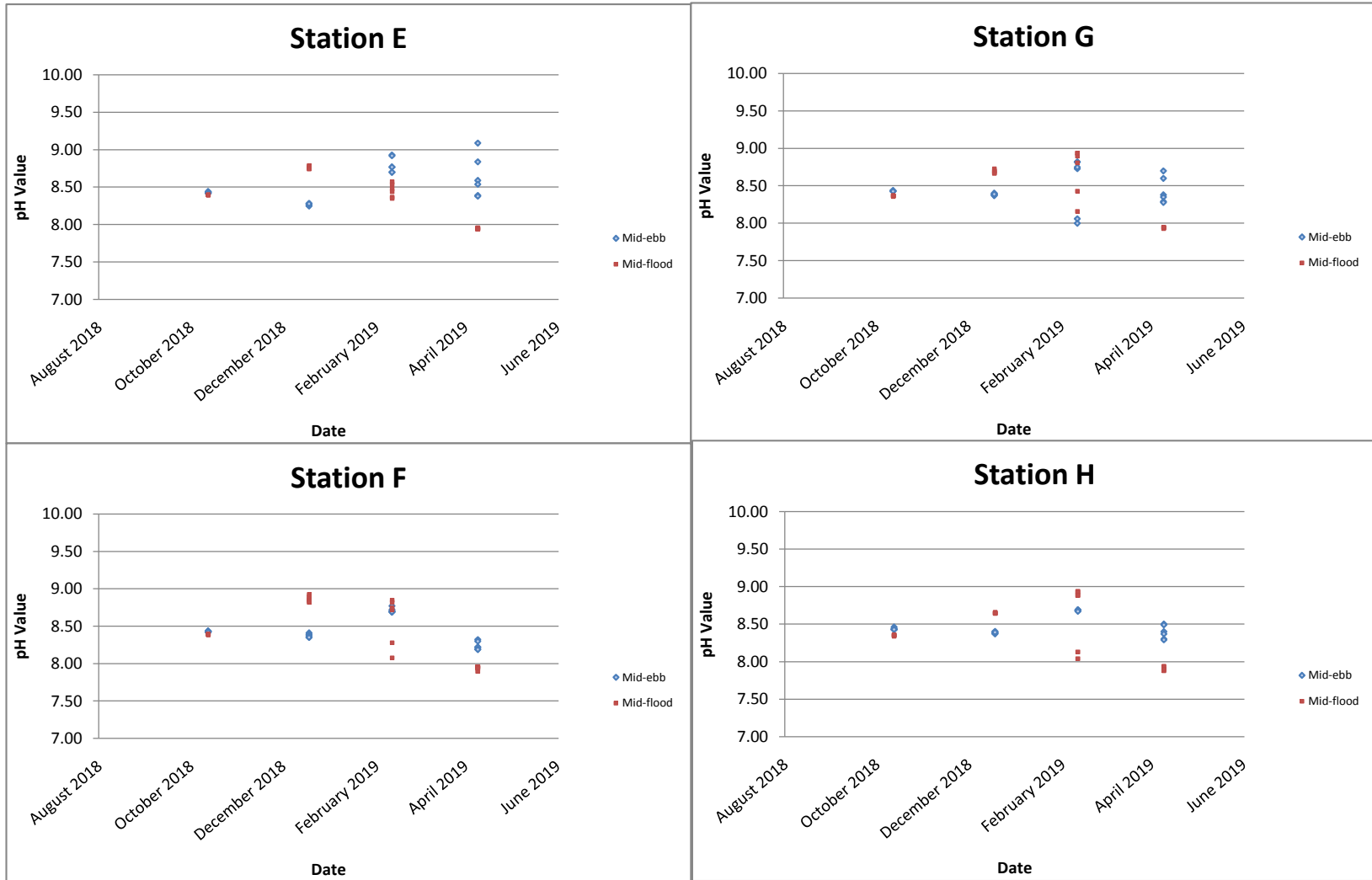


Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288565) - Continued										
HK1914873-070	D/M/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	96.3	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288566)										
HK1914873-070	D/M/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	98.0	----	75	125	----	25
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288567)										
HK1914873-090	G/B/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	95.2	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288568)										
HK1914873-090	G/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	100	----	75	125	----	25
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288793)										
HK1914873-020	D/S/E/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	88.8	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288794)										
HK1914873-040	G/M/E/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	89.2	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288795)										
HK1914873-060	B/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	90.2	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288796)										
HK1914873-080	F/S/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	88.6	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2288797)										
HK1914873-096	H/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	89.2	----	75	125	----	----

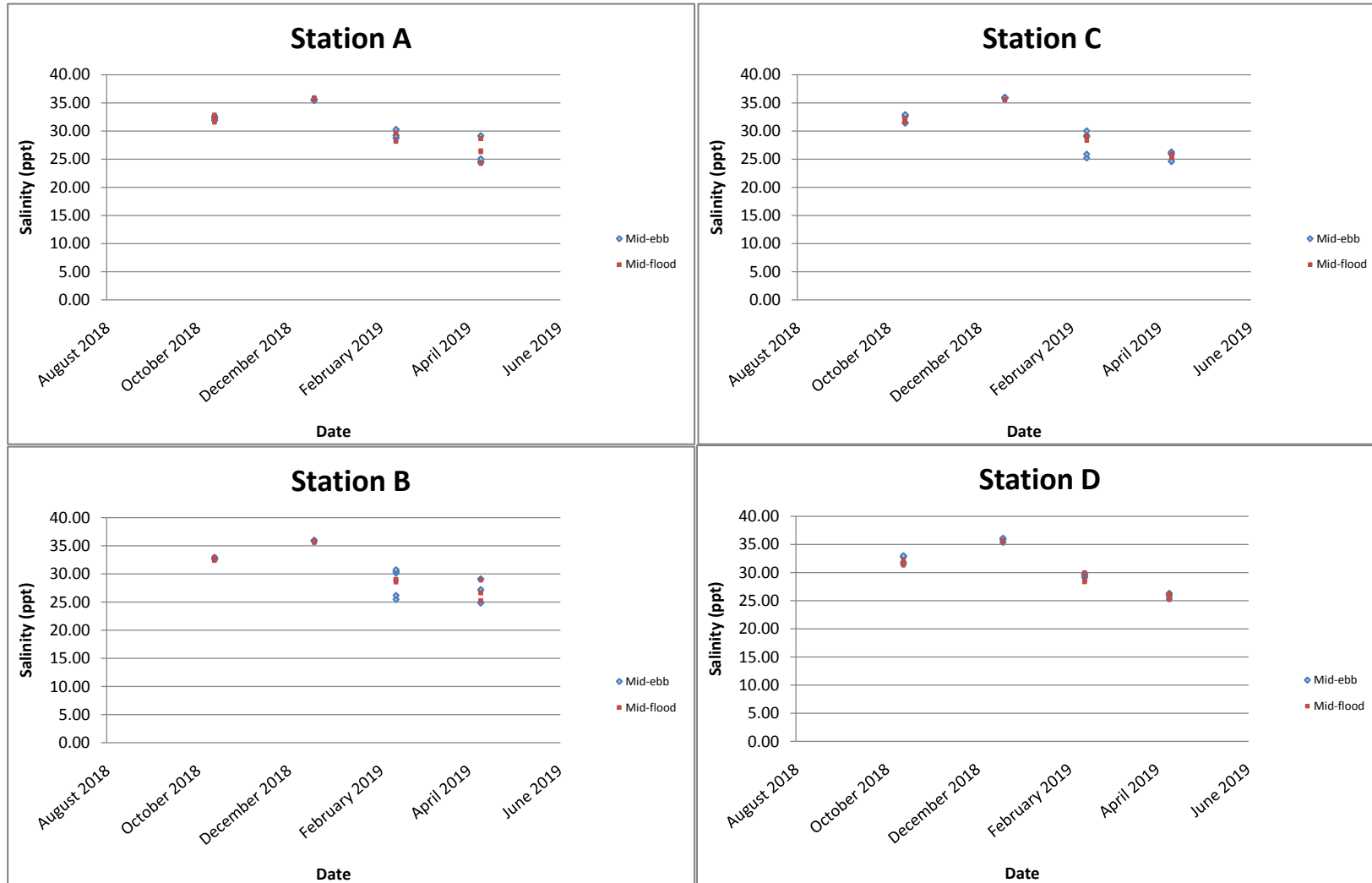
pH value



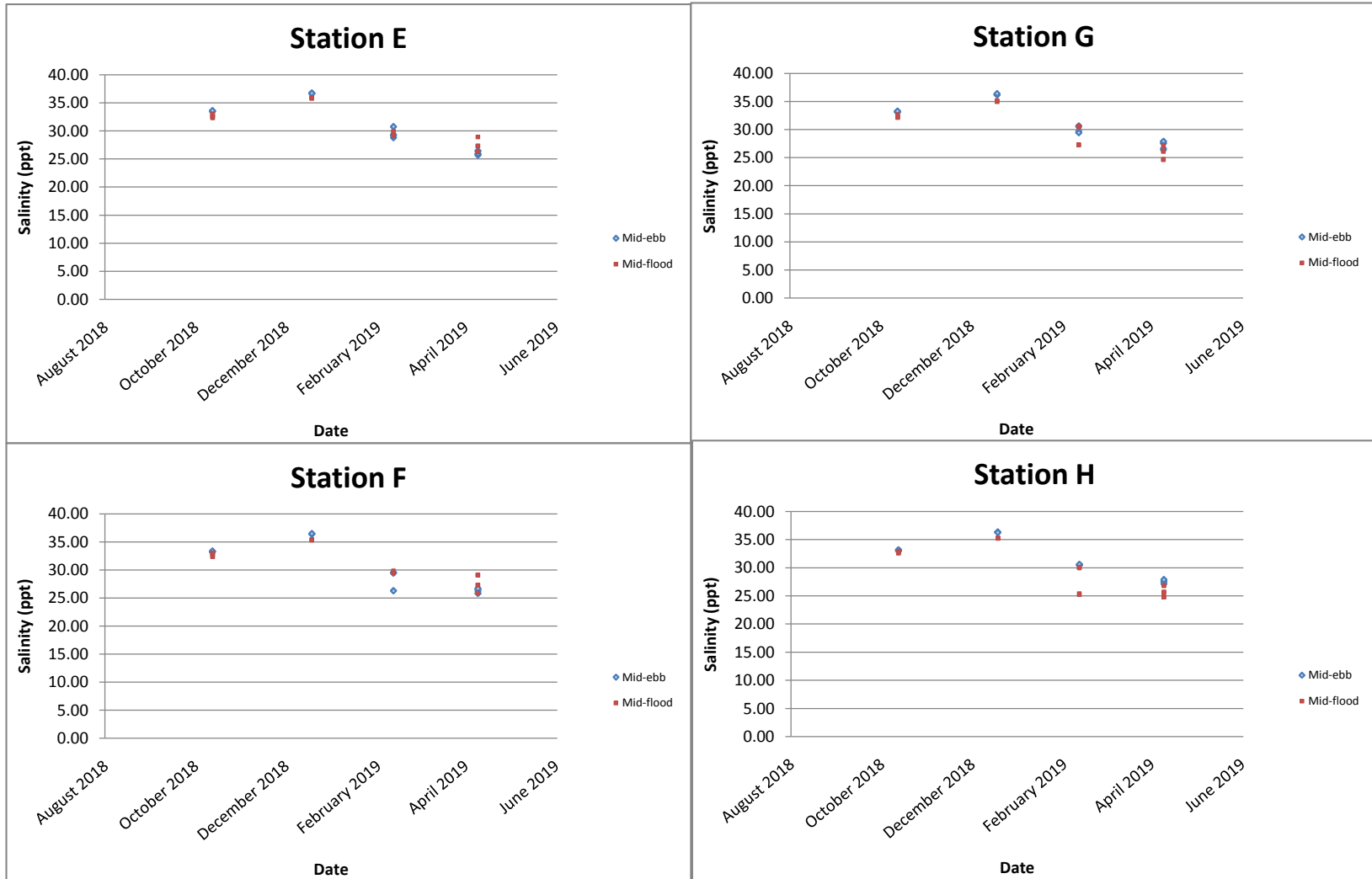
pH value



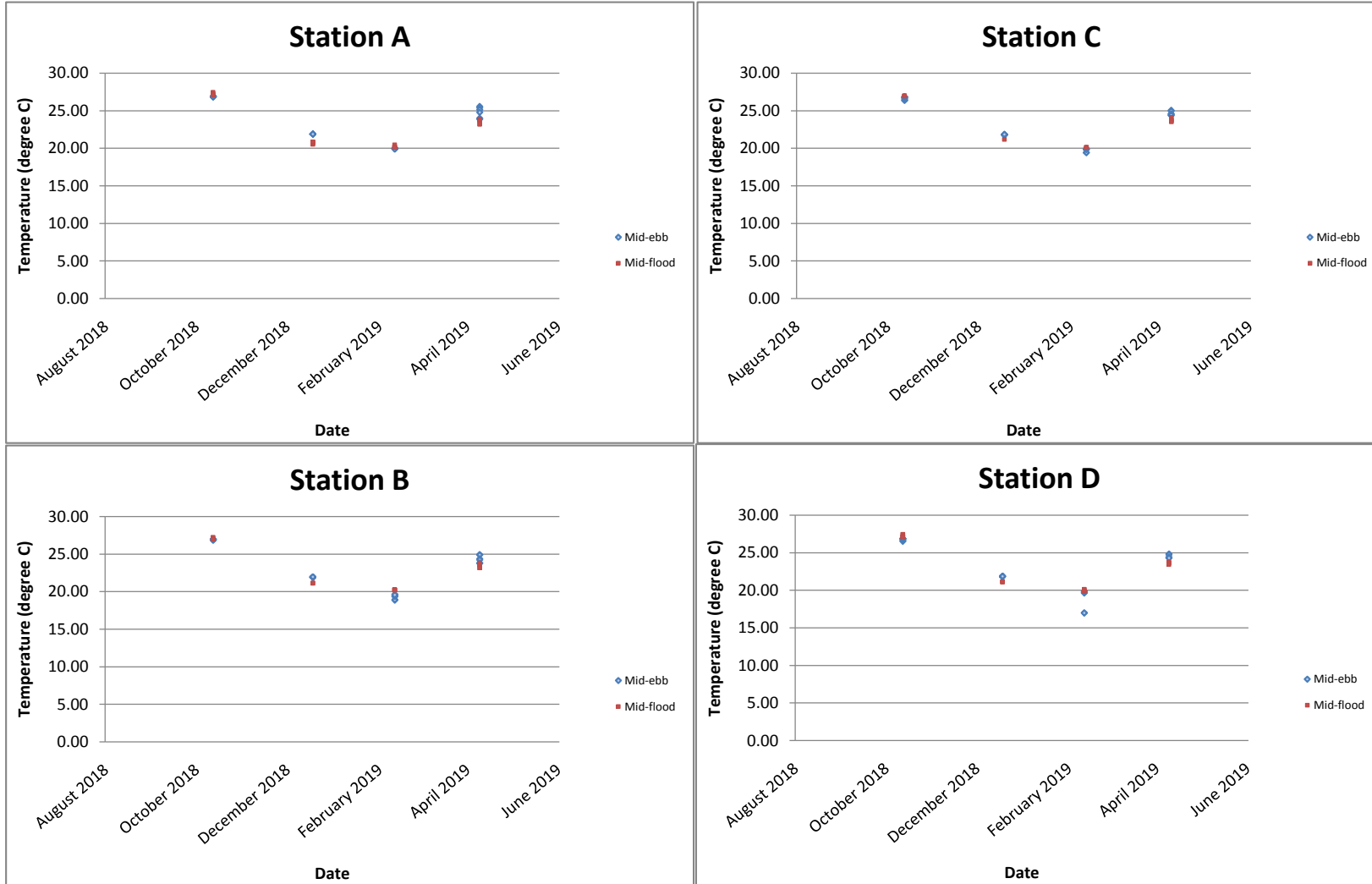
Salinity (ppt)



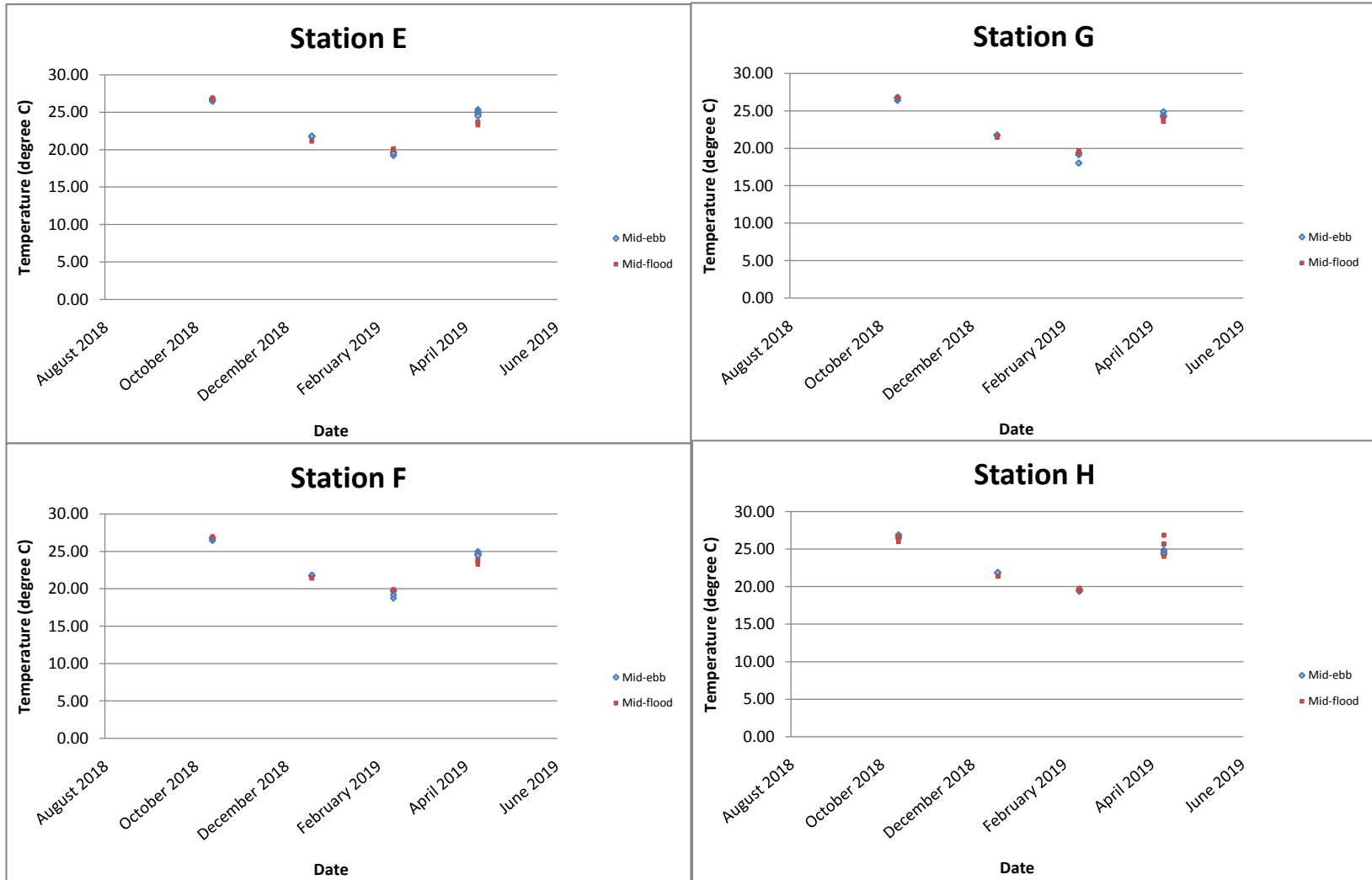
Salinity (ppt)



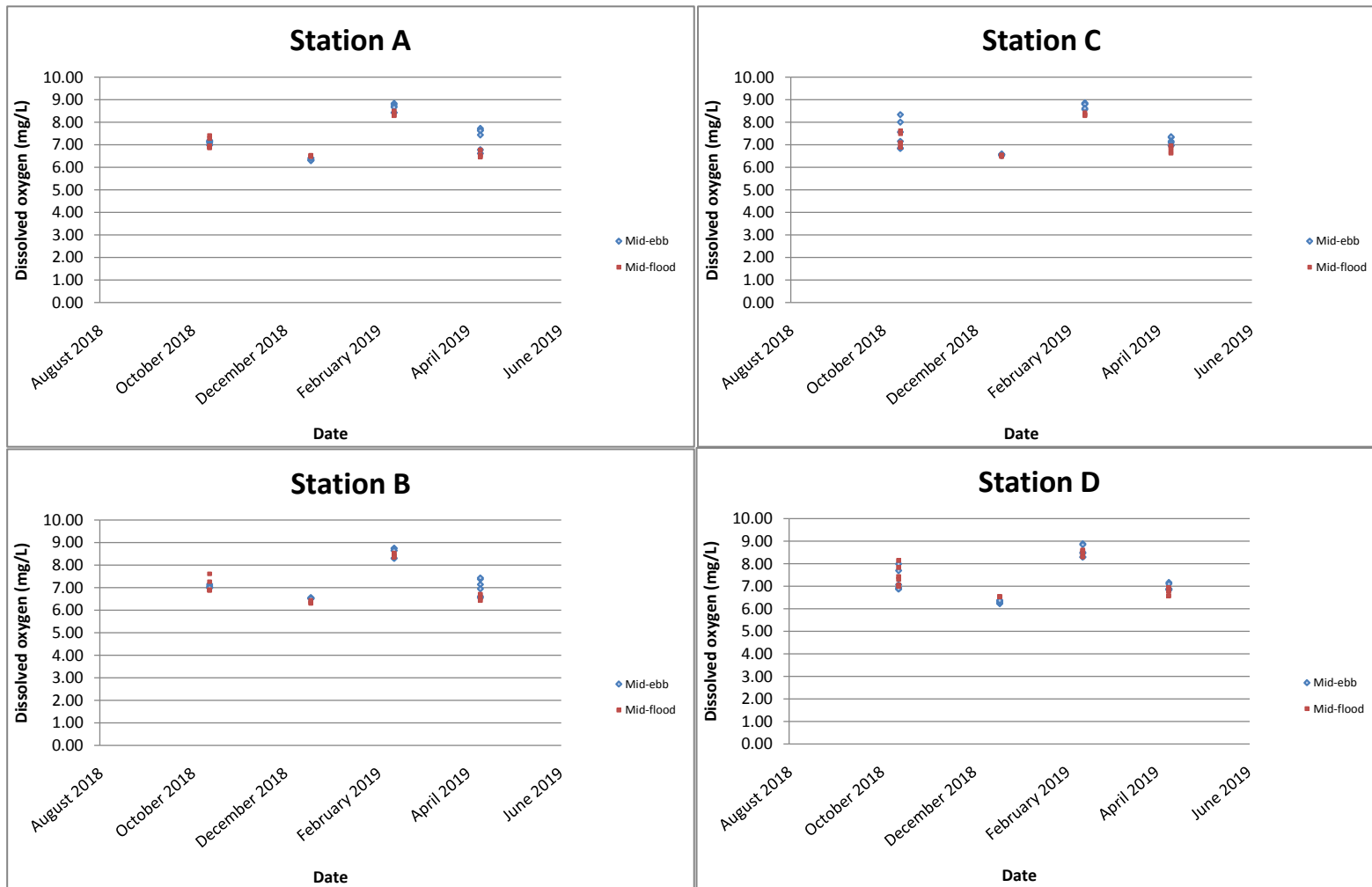
Temperature (degree C)



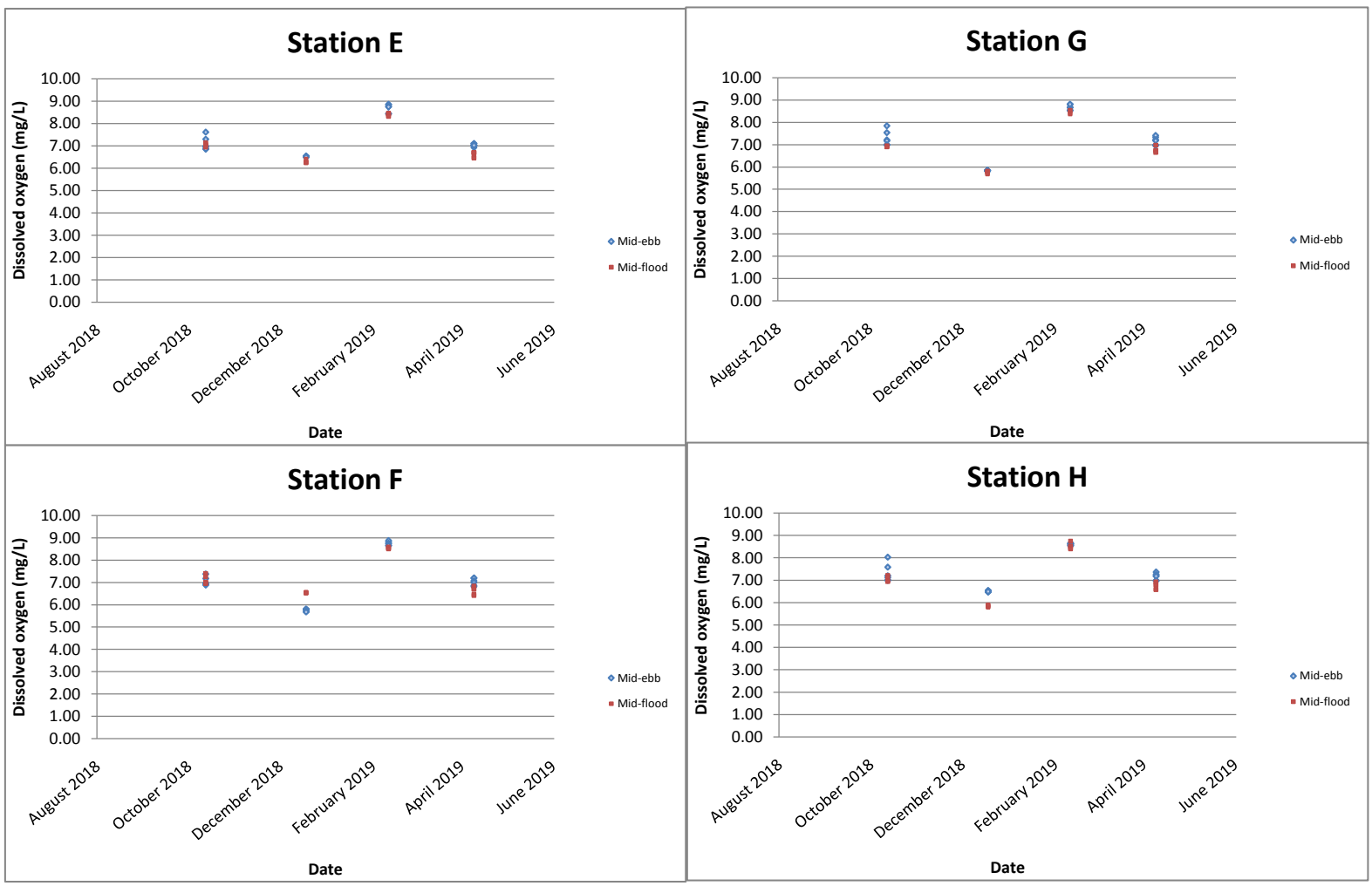
Temperature (degree C)



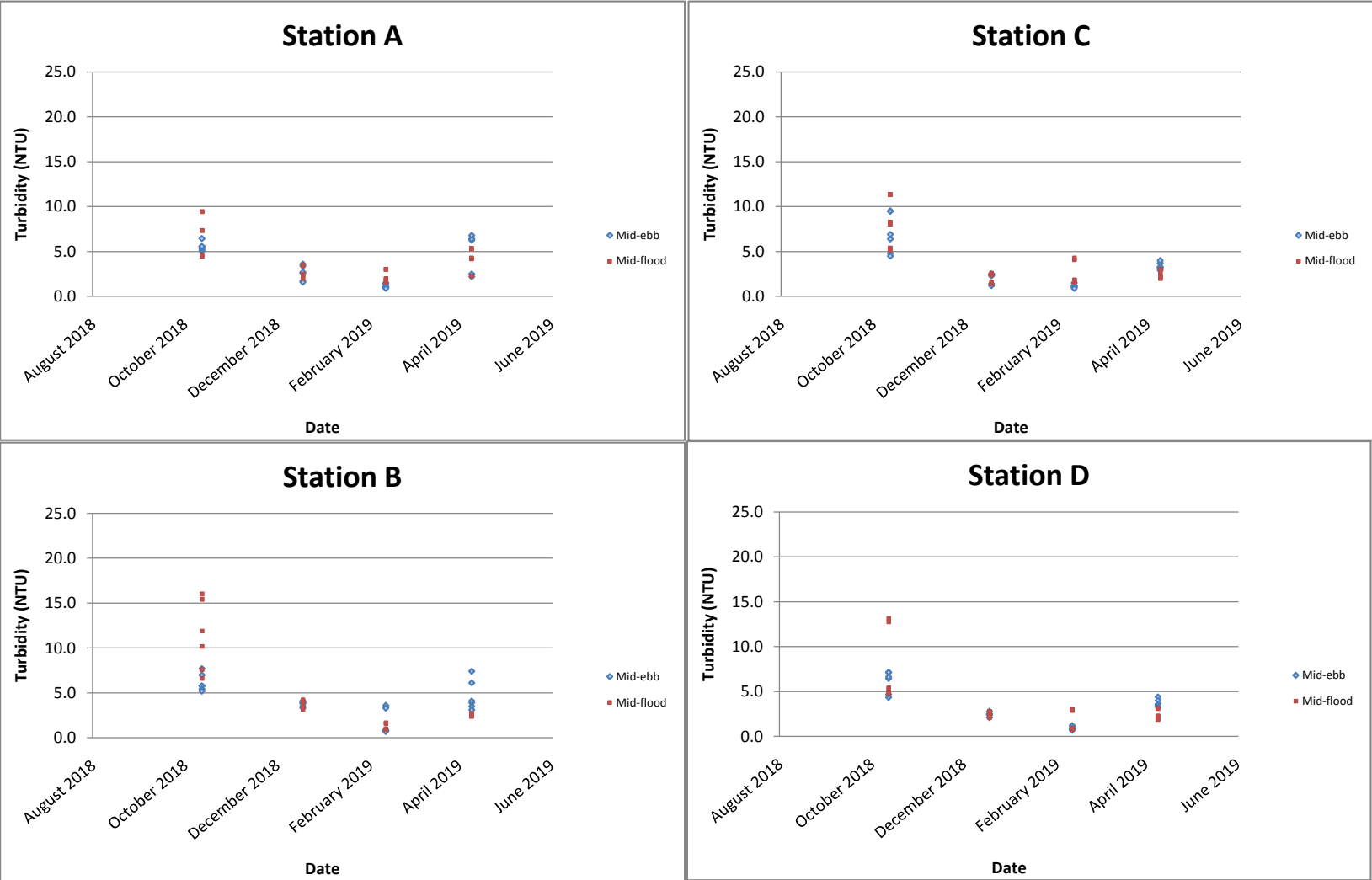
Dissolved oxygen (mg/L)



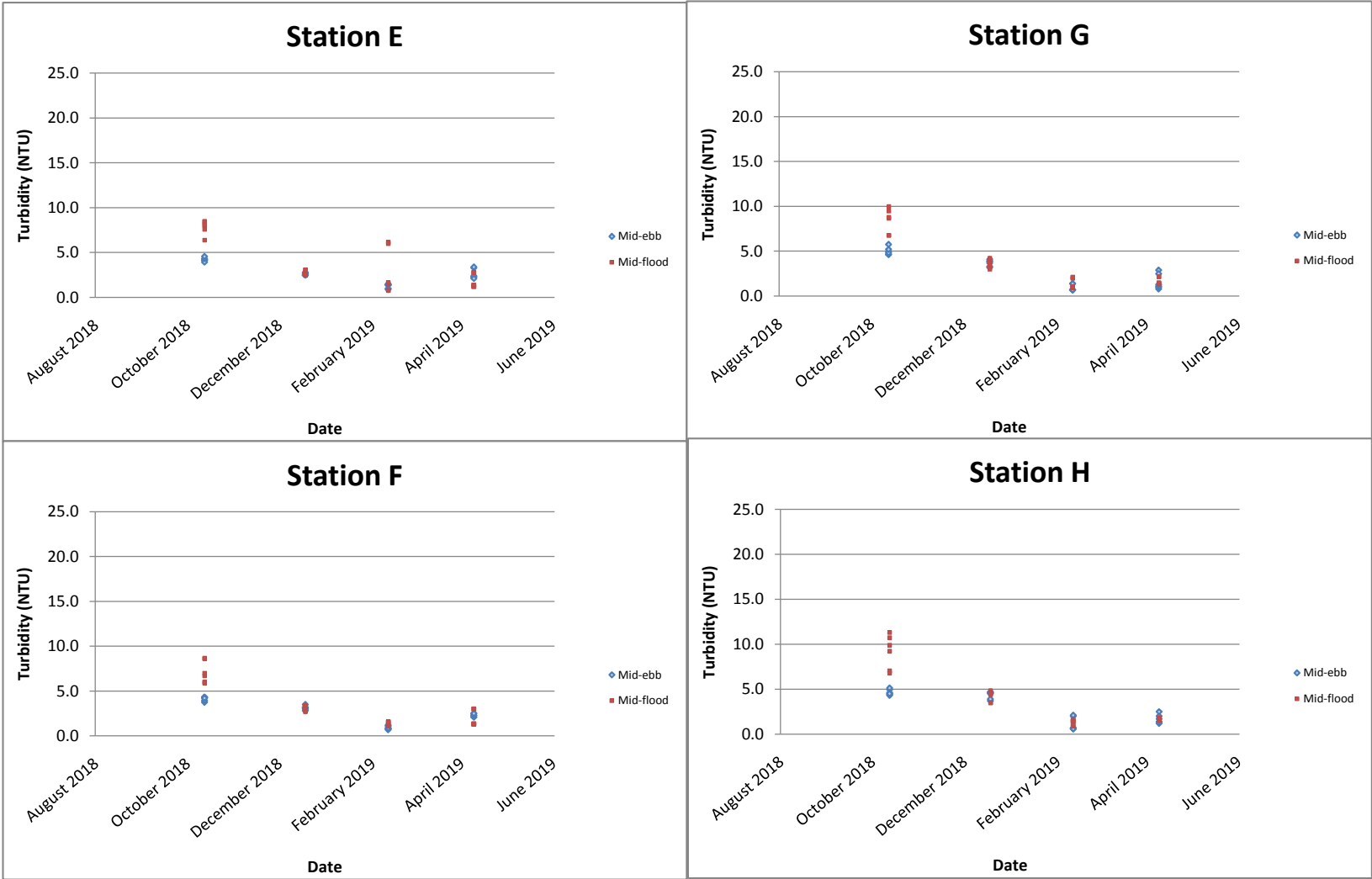
Dissolved oxygen (mg/L)



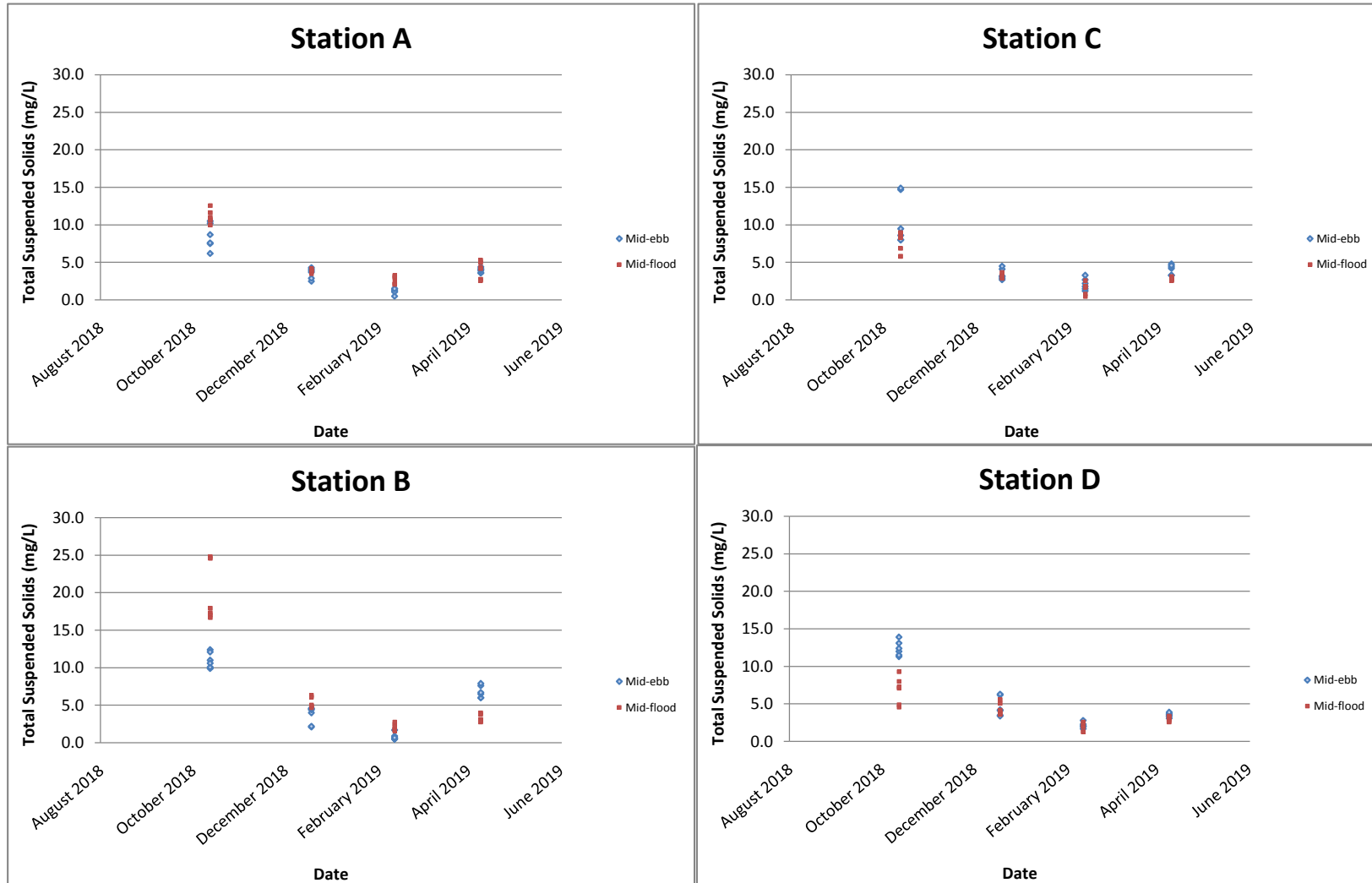
Turbidity (NTU)



Turbidity (NTU)

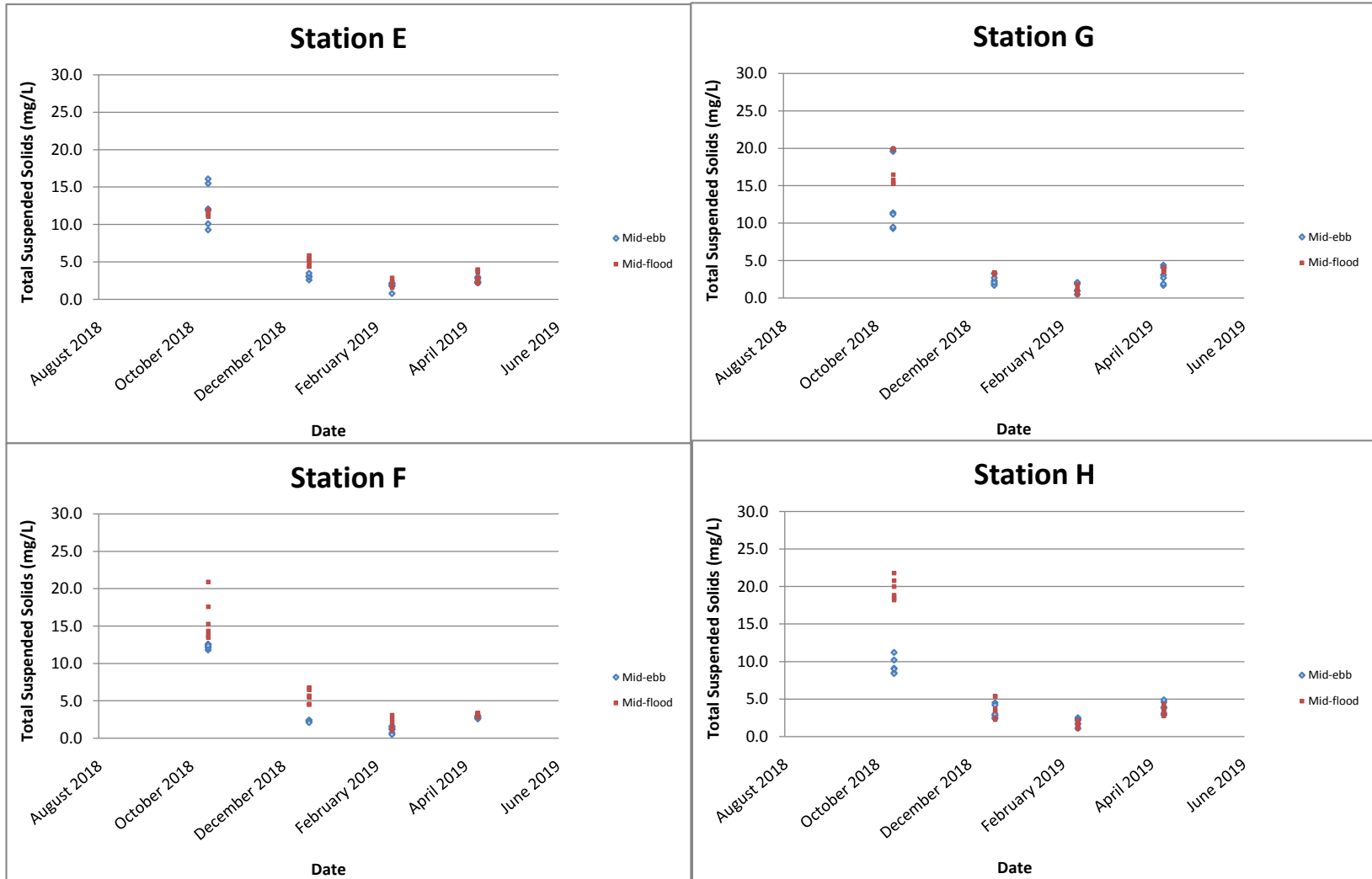


Total Suspended Solids (mg/L)



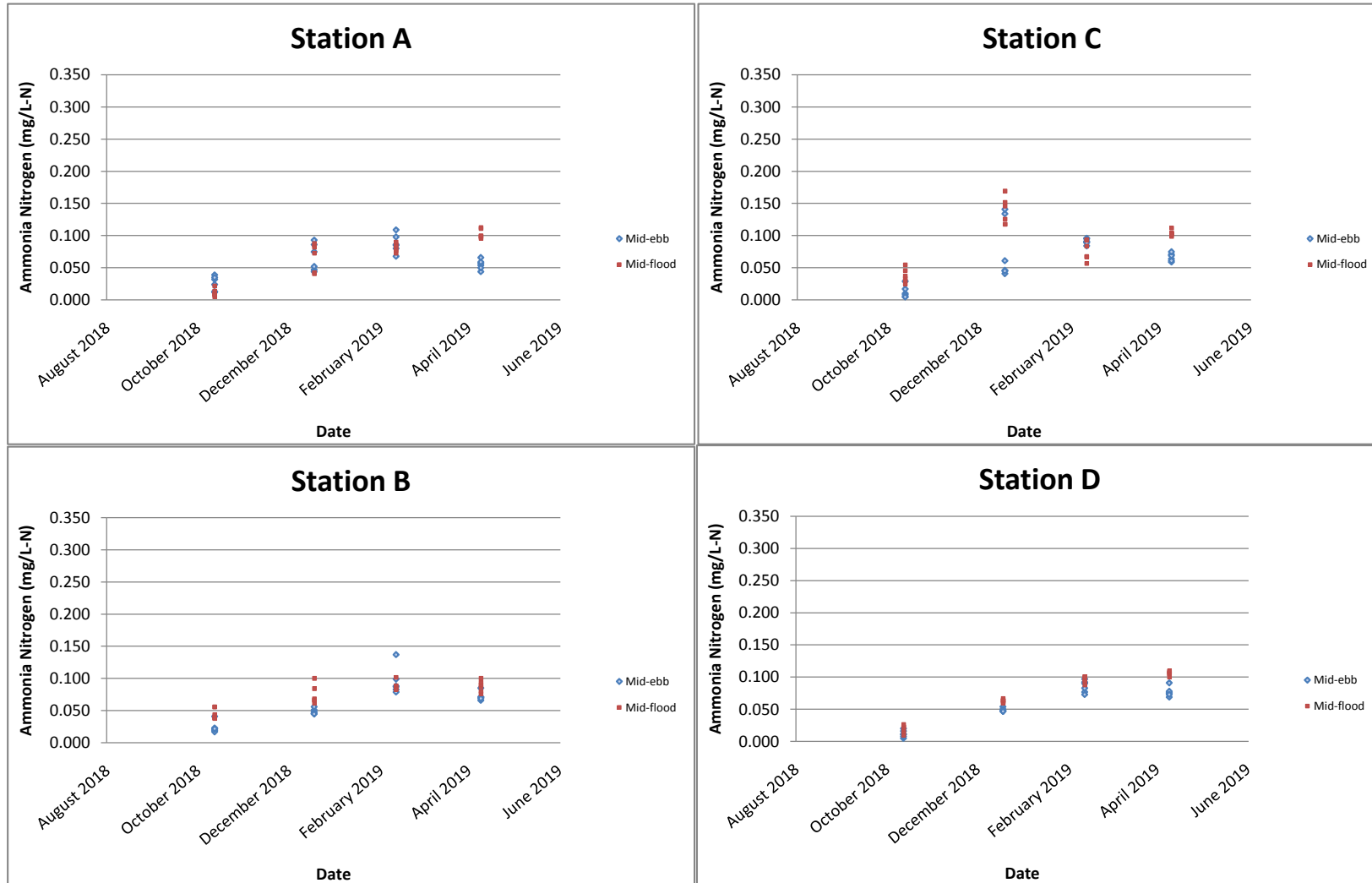
Remark: All below the Limit of Report sample results (<0.5 mg/L) for Total Suspended Solids is regarded as 0.5 mg/L in graphical presentation.

Total Suspended Solids (mg/L)



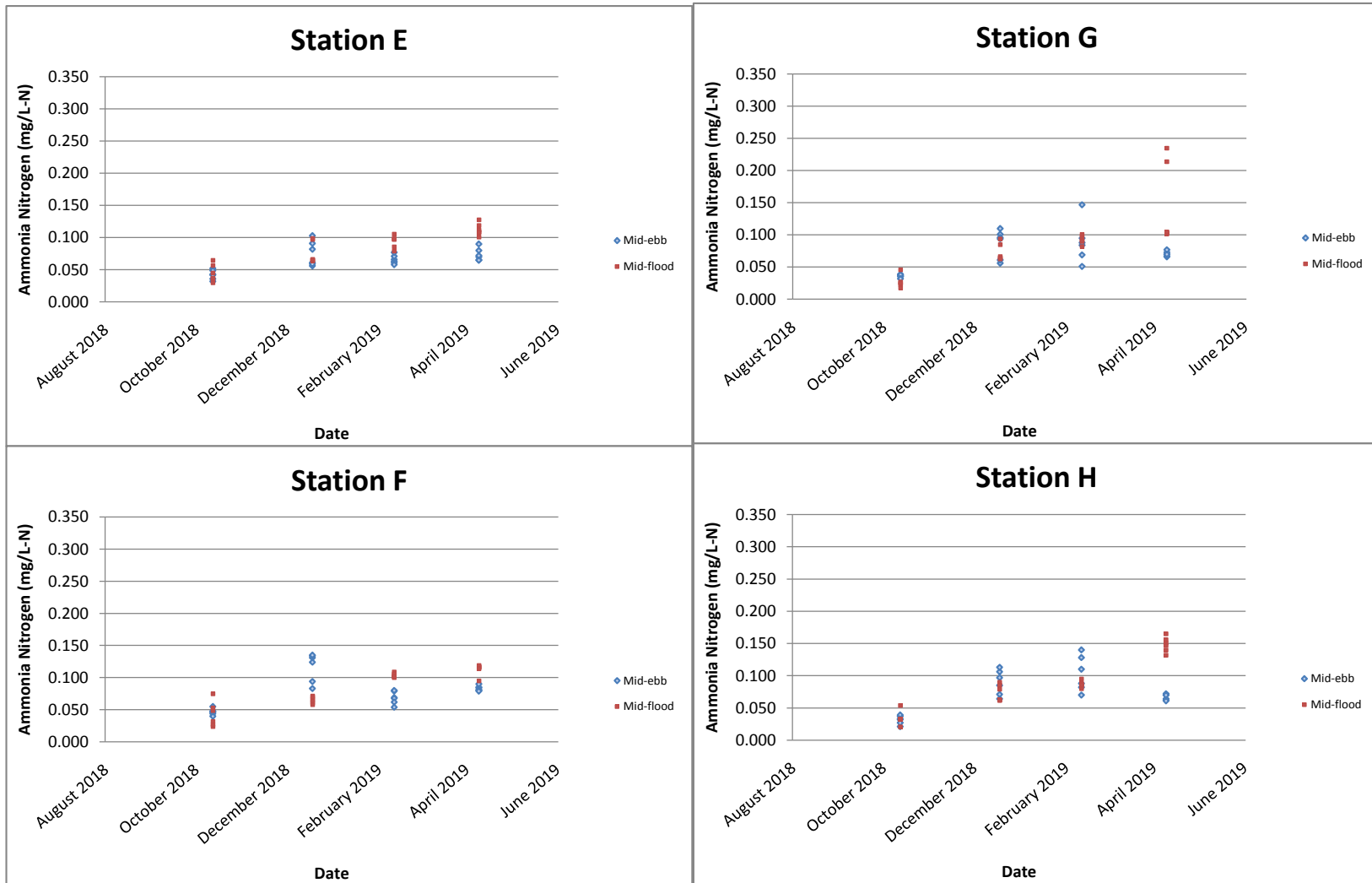
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Ammonia Nitrogen (mg/L-N)



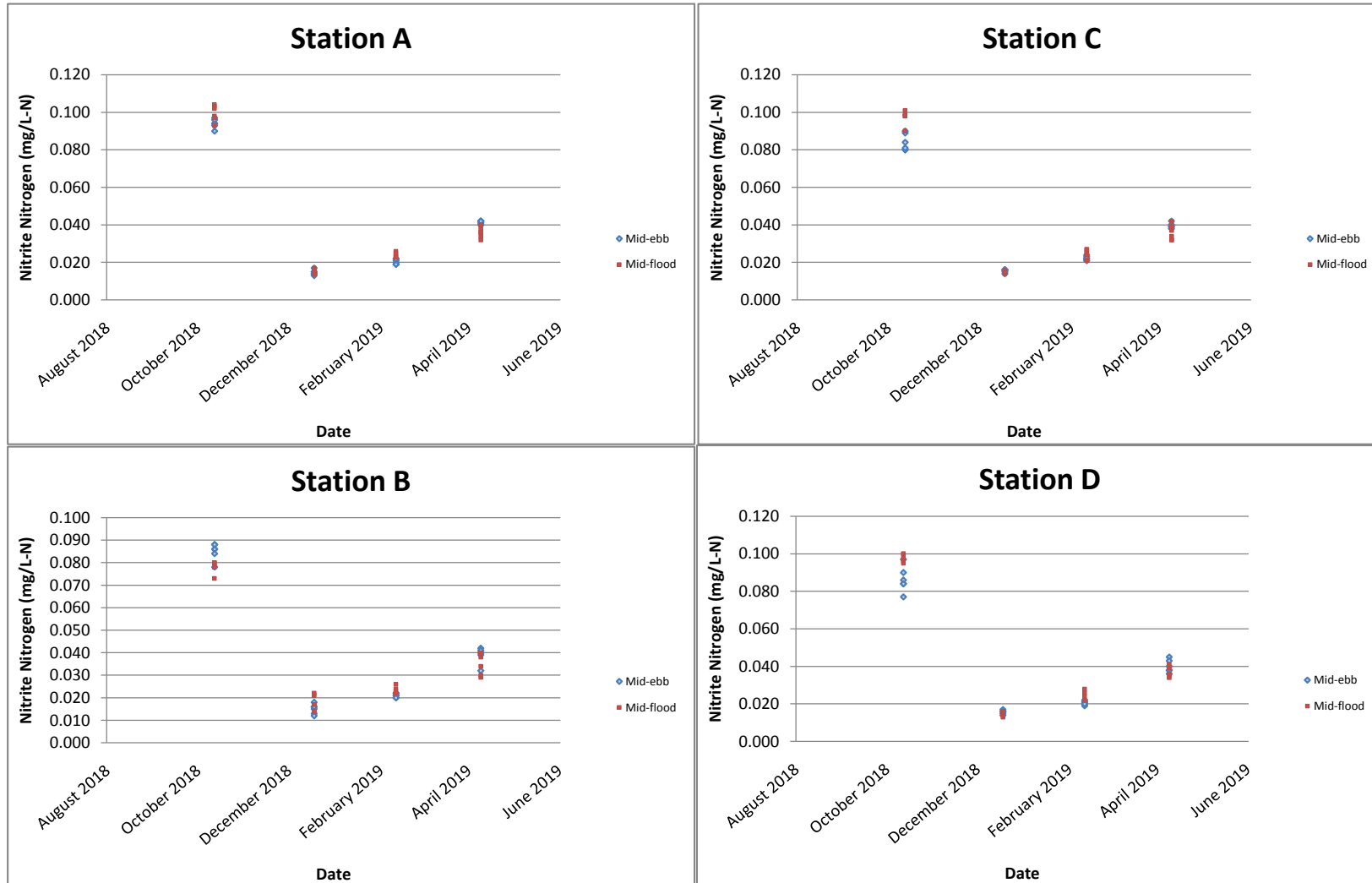
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Ammonia Nitrogen (mg/L-N)



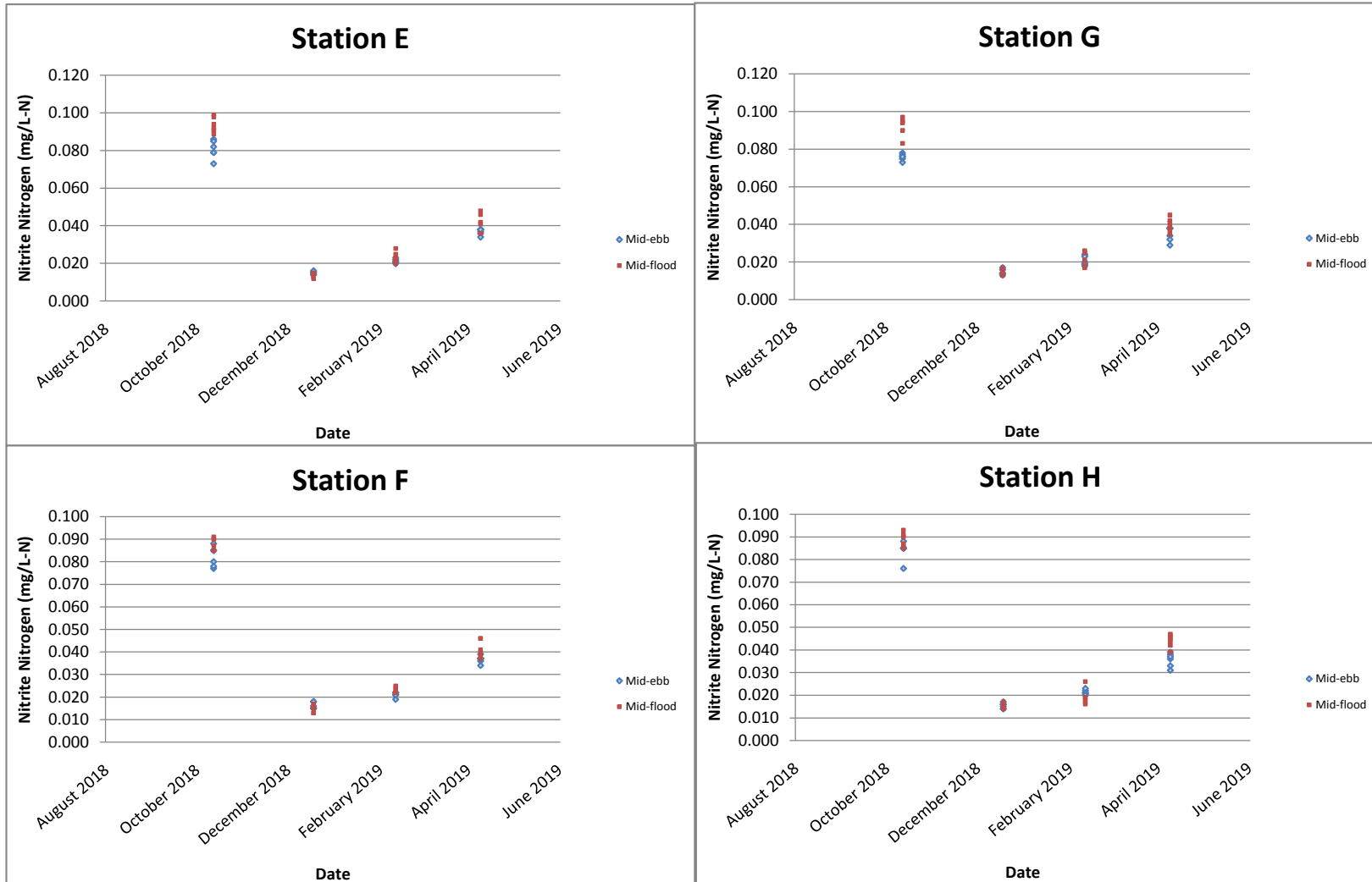
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Nitrite Nitrogen (mg/L-N)



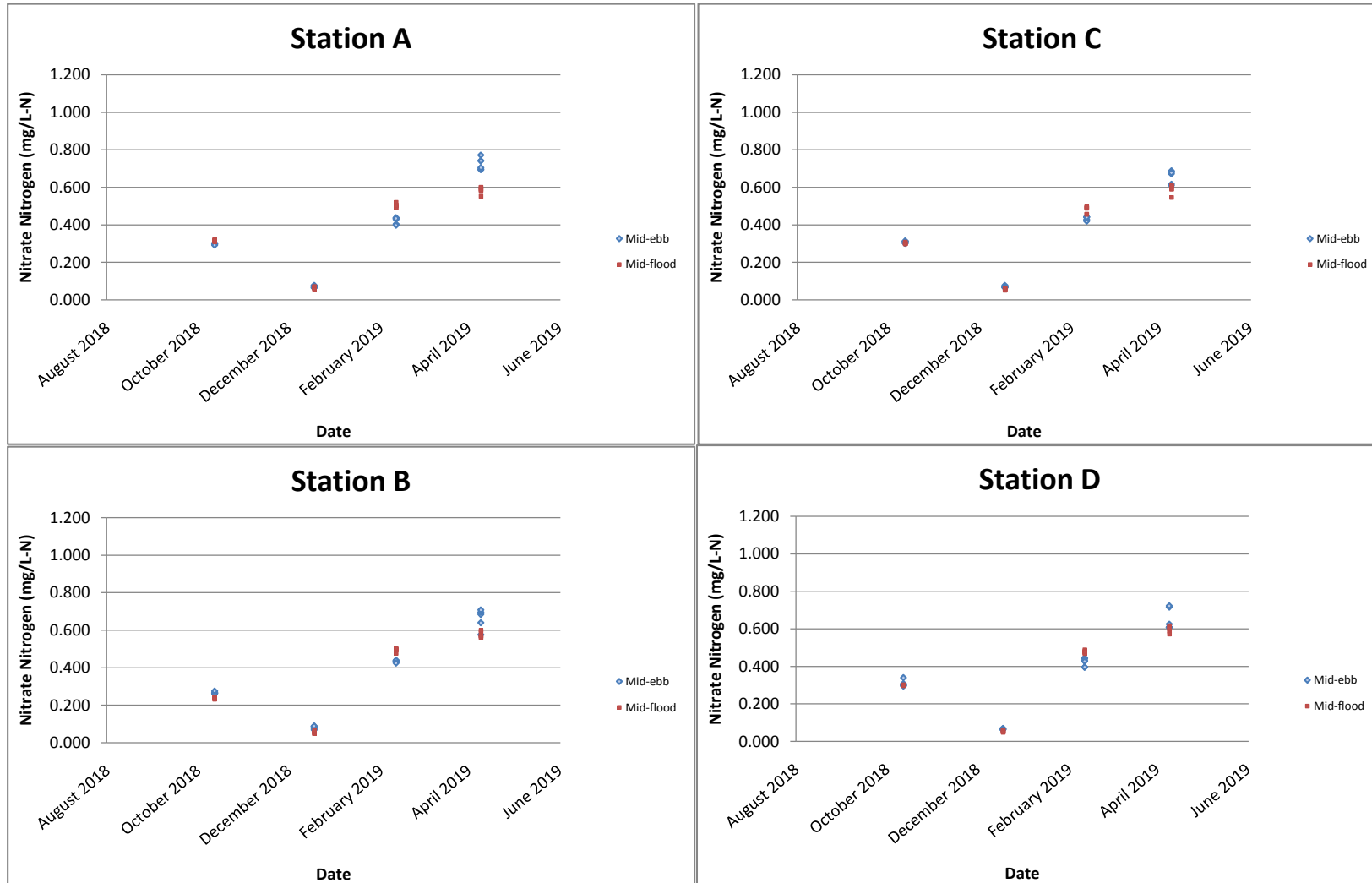
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Nitrite Nitrogen (mg/L-N)



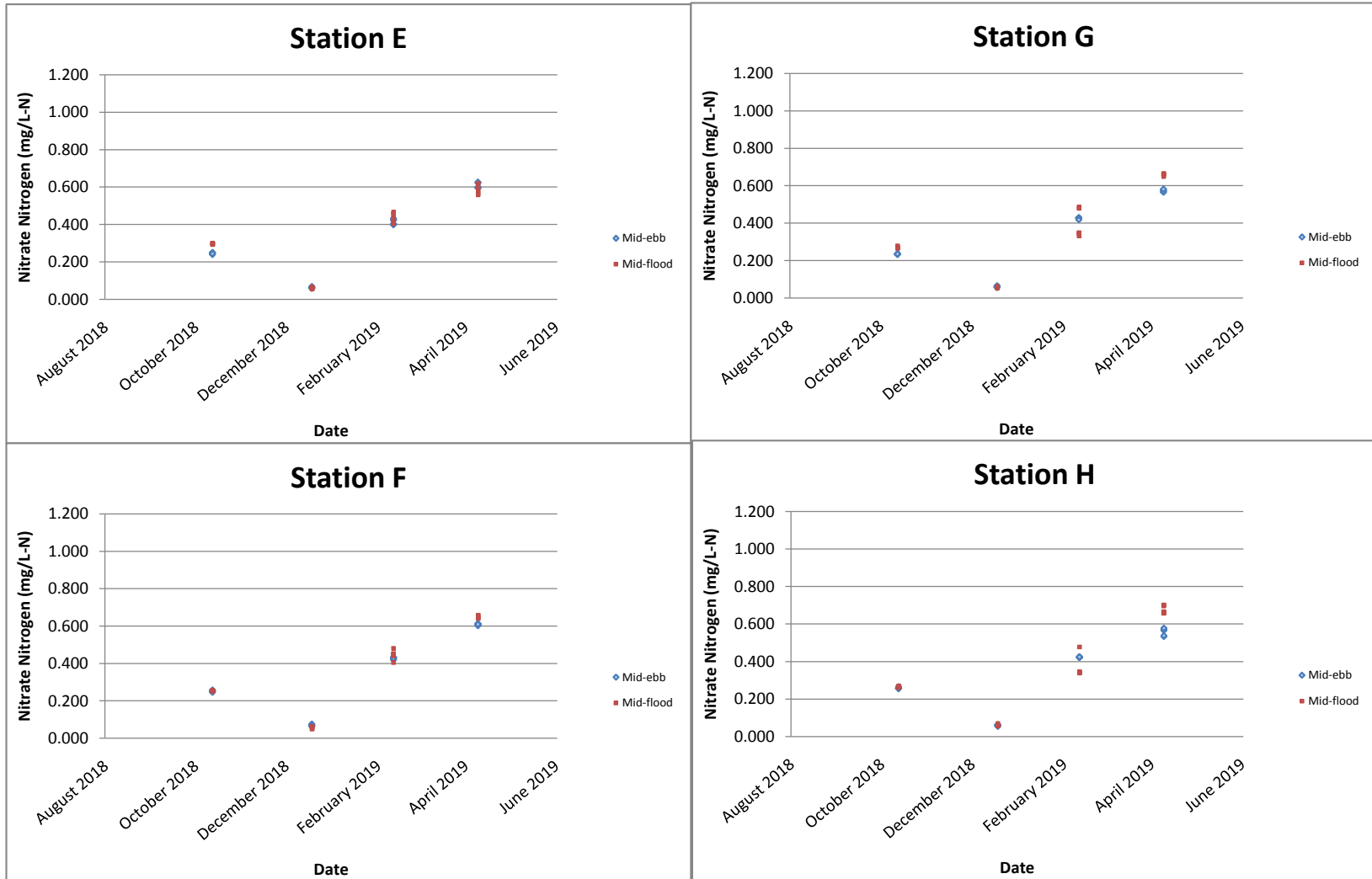
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Nitrite Nitrogen is regarded as 0.005 mg/L in graphical presentation.

Nitrate Nitrogen (mg/L-N)



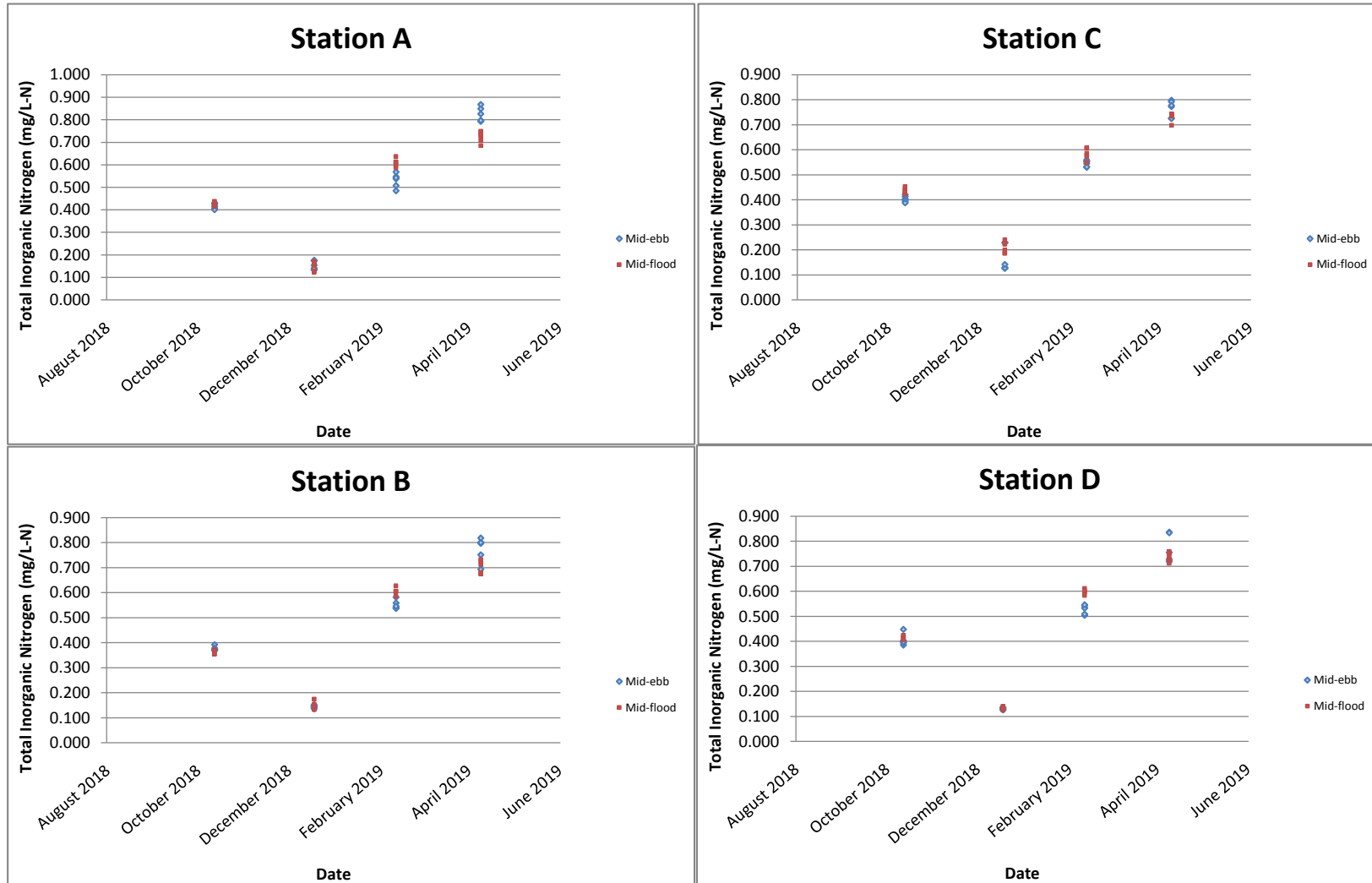
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Nitrate Nitrogen is regarded as 0.005 mg/L in graphical presentation.

Nitrate Nitrogen (mg/L-N)



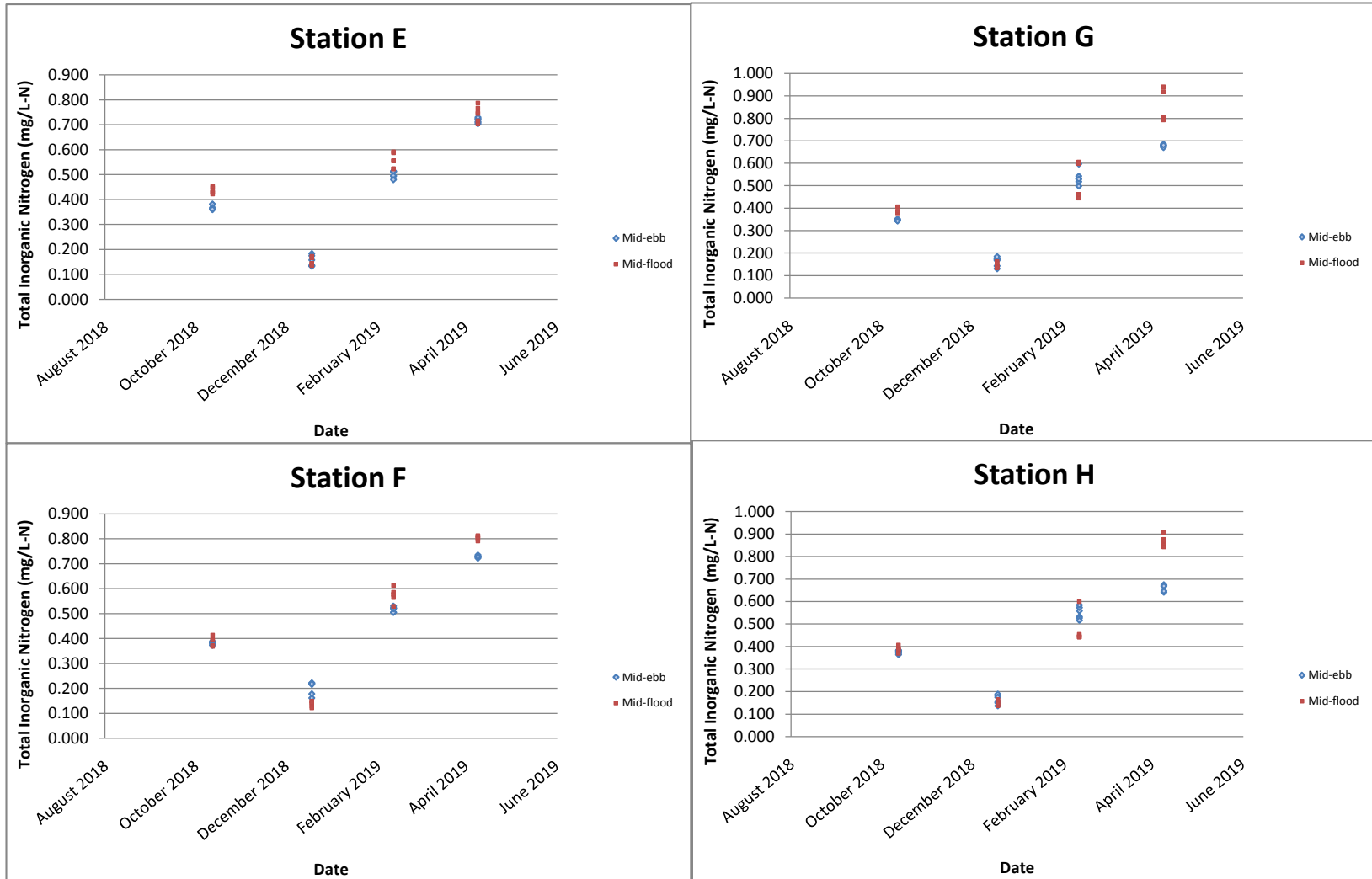
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Nitrate Nitrogen is regarded as 0.005 mg/L in graphical presentation.

Total Inorganic Nitrogen (mg/L-N)



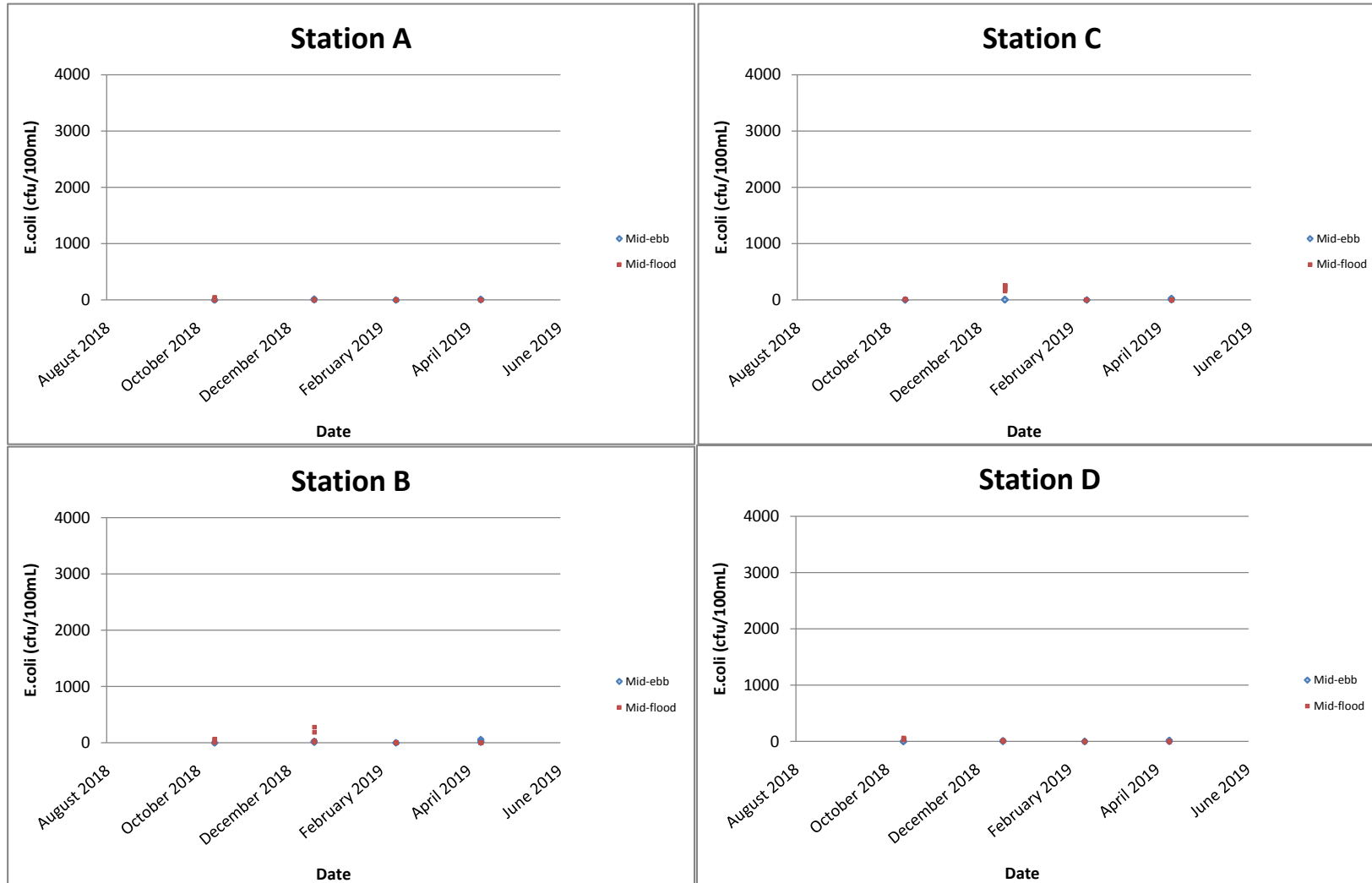
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Total Inorganic Nitrogen (mg/L-N)



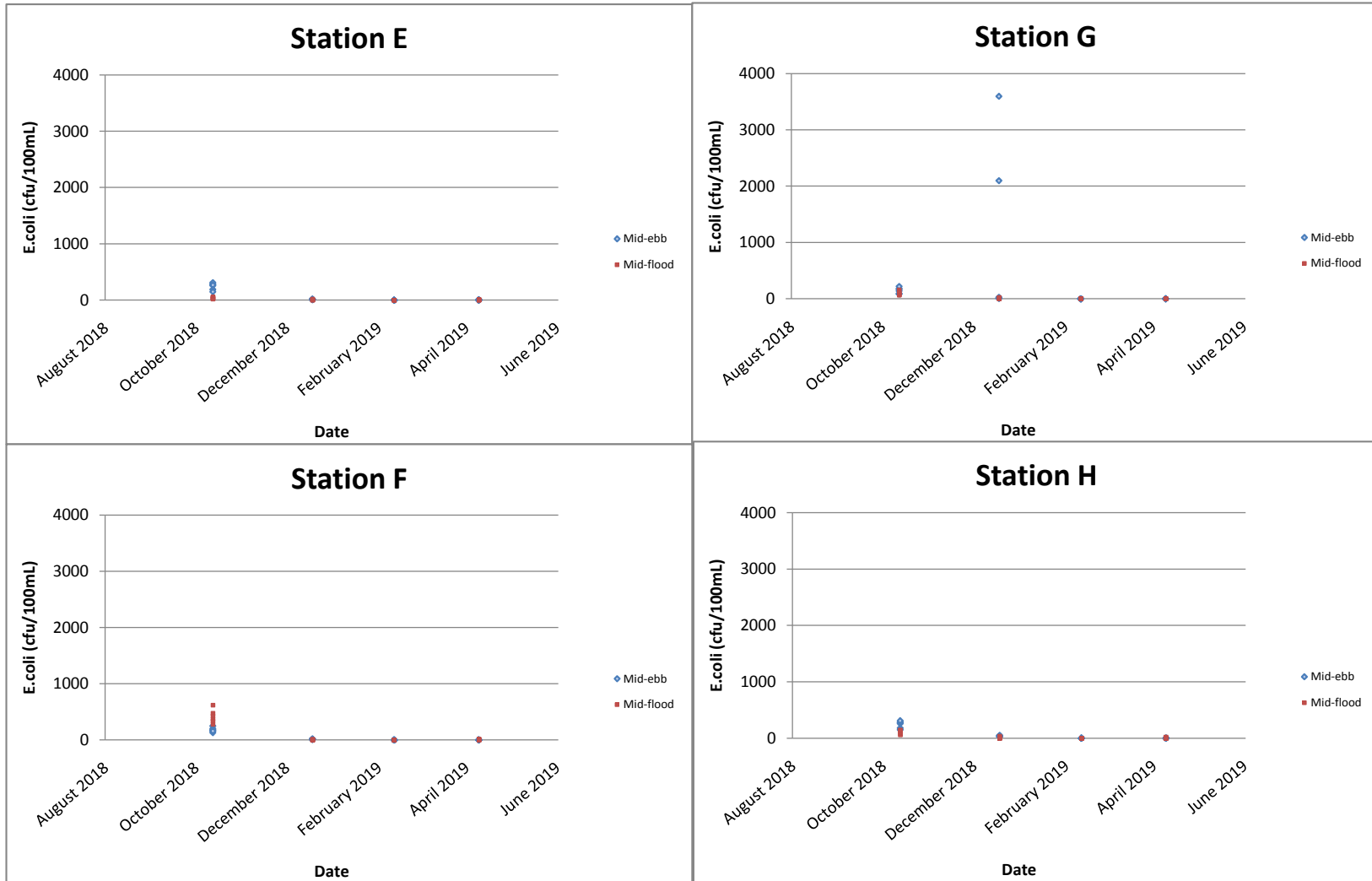
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E.coli (cfu/100mL)



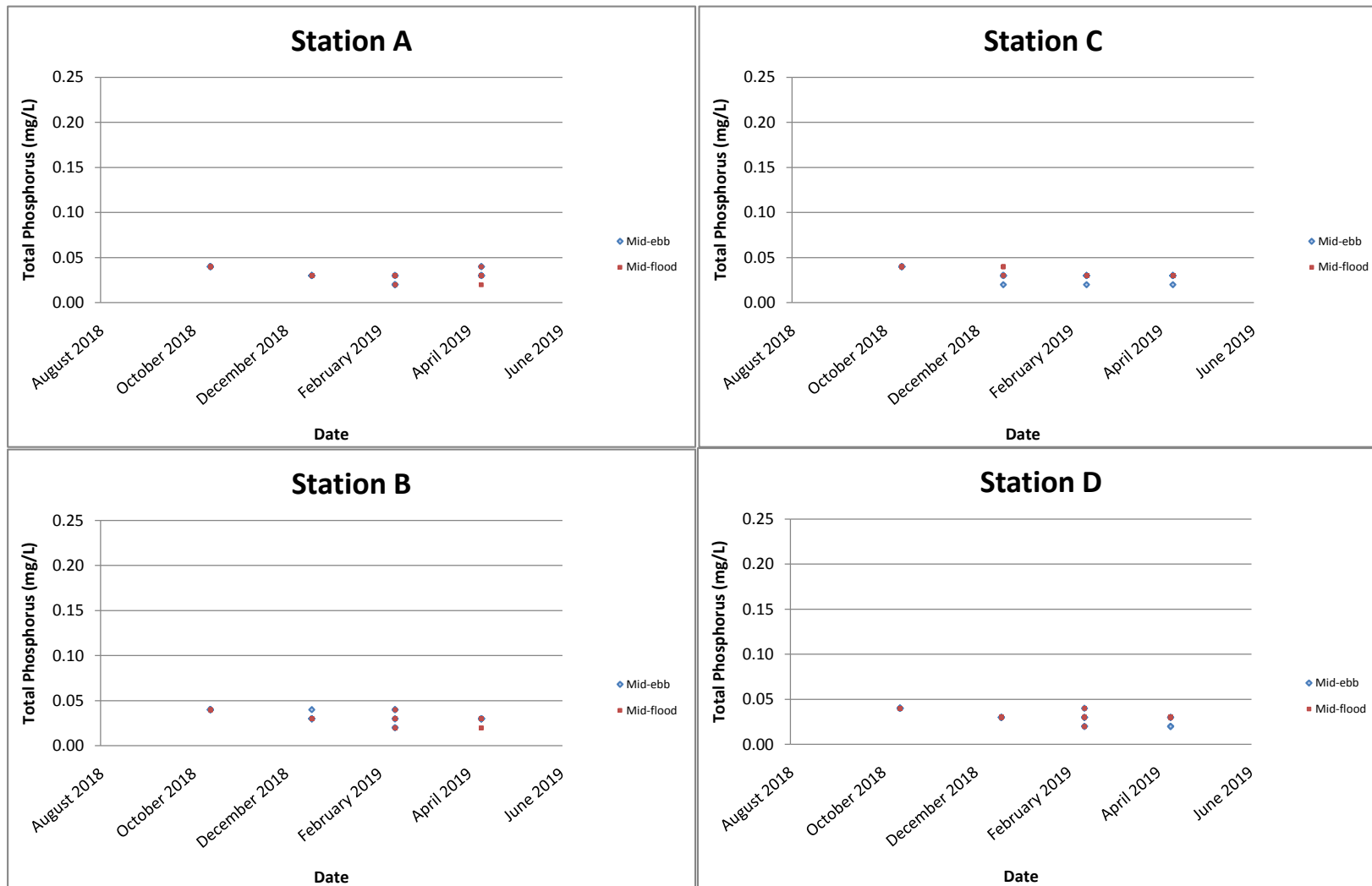
Remark: All below the Limit of Report sample results (<1 CFU/100mL) for E.coli is regarded as 0 CFU/100mL in graphical presentation.

E.coli (cfu/100mL)



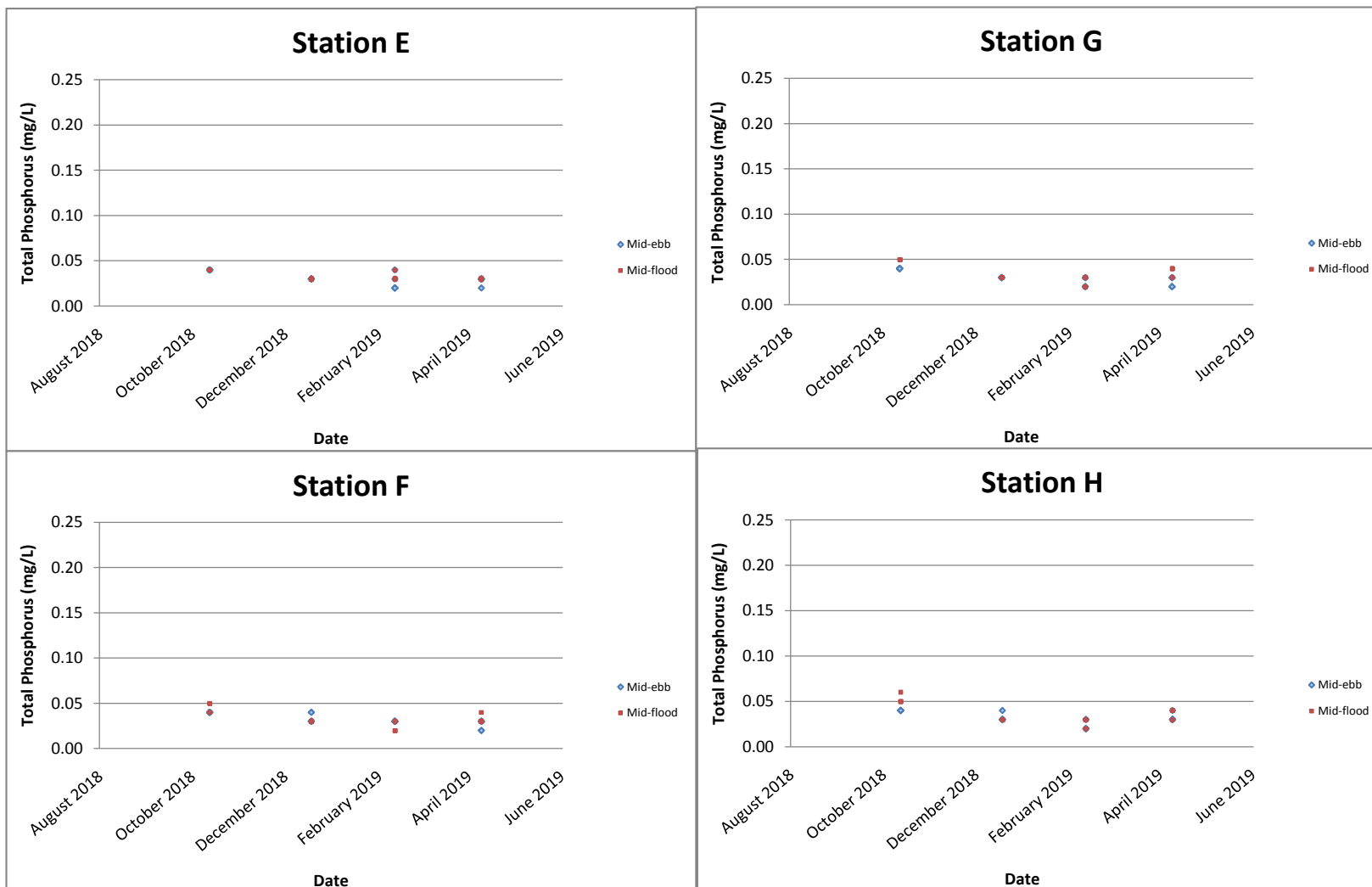
Remark: All below the Limit of Report sample results (<1 CFU/100mL) for E.coli is regarded as 0 CFU/100mL in graphical presentation.

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



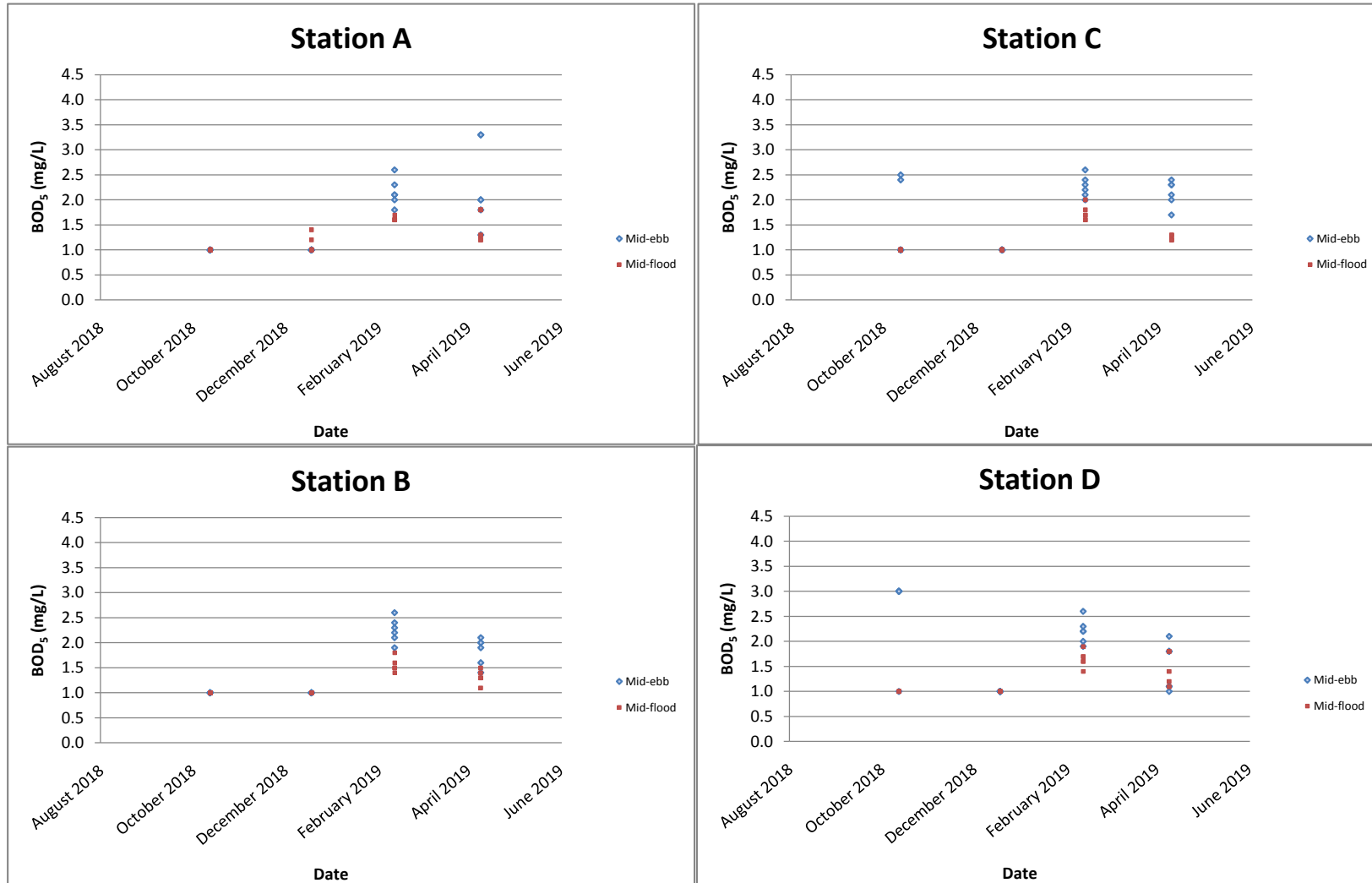
Remark: All below the Limit of Report sample results (<0.01 mg/L) for Total Phosphorus is regarded as 0.01 mg/L in graphical presentation.

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



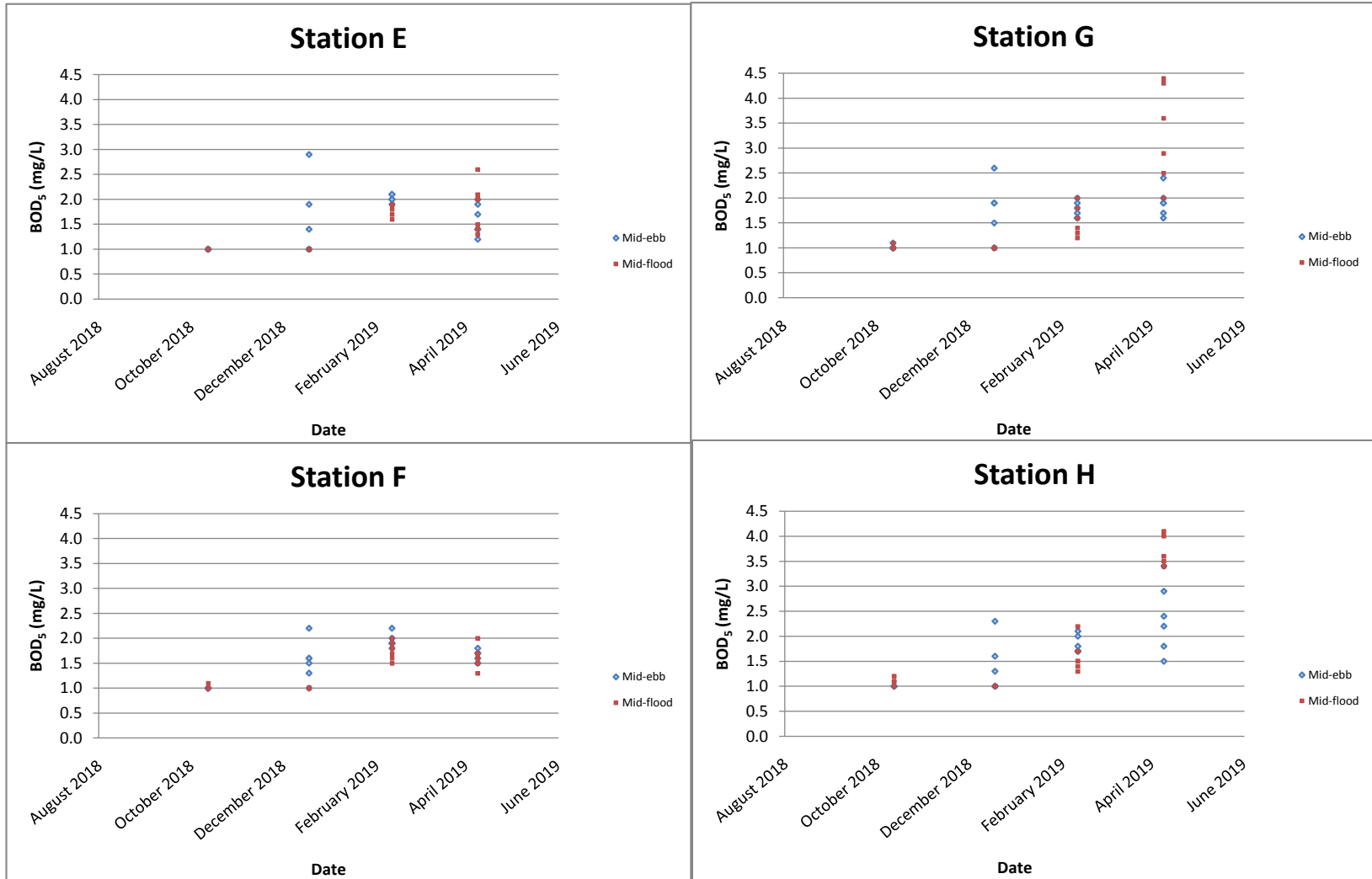
Remark: All below the Limit of Report sample results (<0.01 mg/L) for Total Phosphorus is regarded as 0.01 mg/L in graphical presentation.

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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Website : www.fugro.com



Report No.: 0041/17/ED/0442C

Appendix F

Predicted Tidal Data of Ma Wan Marine Traffic Station

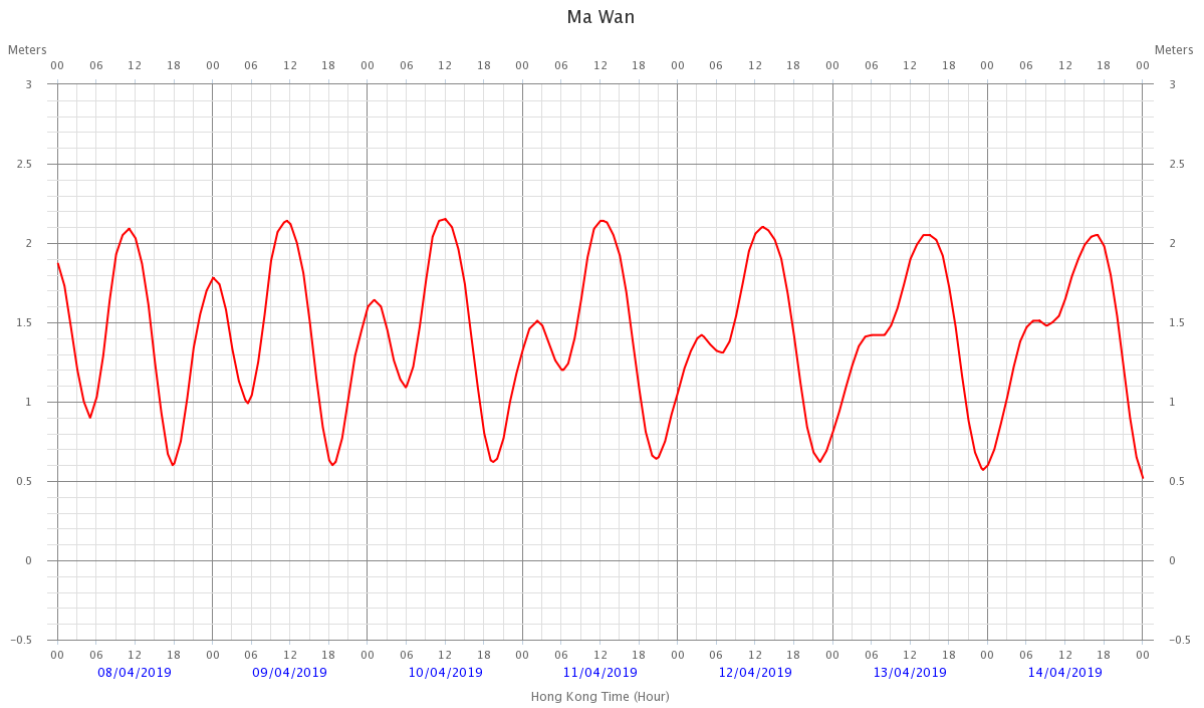
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Report No.: 0041/17/ED/0442C

Appendix G

Results and Graphical Presentation of Laboratory Analysis for Sediment Quality Monitoring and Benthic Survey

Monitoring Location	Date	Weather	Sea Condition	Time	Sediment Monitoring												
					pH	Ammonia as N (mg-N/kg)	Total Nitrogen (mg-N/kg)	Total Phosphorus (mg-P/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Arsenic (mg/kg)	Silver (mg/kg)
A	9/4/2019	Cloudy	Moderate	12:40	6.9	4.5	950	476	0.11	34.0	25.5	44.2	0.13	19.8	87.8	14.8	0.23
B	9/4/2019	Cloudy	Moderate	12:17	7.6	9.9	1220	513	<0.10	36.1	32.4	43.4	0.25	22.0	106	11.3	0.33
C	9/4/2019	Cloudy	Moderate	11:56	7.7	11.9	1290	595	0.10	39.0	32.8	47.3	0.12	23.8	112	11.2	0.31
D	9/4/2019	Cloudy	Moderate	11:36	7.7	4.4	480	259	<0.10	19.2	15.1	25.0	0.06	11.8	53.3	6.0	0.14
E	9/4/2019	Cloudy	Moderate	11:05	7.9	8.5	1450	594	<0.10	40.5	36.7	47.7	0.12	24.9	117	10.2	0.36
F	9/4/2019	Cloudy	Moderate	10:48	7.8	10.6	1490	594	<0.10	43.1	38.8	48.6	0.13	26.6	121	11.6	0.36
G	9/4/2019	Cloudy	Moderate	10:22	7.9	5.8	1080	522	0.12	39.7	60.6	45.1	0.19	23.8	109	11.0	0.34
H	9/4/2019	Cloudy	Moderate	10:00	7.7	6.2	970	478	0.11	40.0	52.1	48.9	0.17	23.8	153	12.3	0.46

Monitoring Location	Date	Weather	Sea Condition	Time	Benthic Survey				
					Total Organic Carbon (%)	Particle Size Distribution			
						Gravel (%)	Sand (%)	Silt (%)	Clay (%)
A	9/4/2019	Cloudy	Moderate	12:40	0.58	15	39	28	18
B	9/4/2019	Cloudy	Moderate	12:17	1.00	1	16	54	29
C	9/4/2019	Cloudy	Moderate	11:56	0.93	0	3	68	29
D	9/4/2019	Cloudy	Moderate	11:36	0.79	0	17	53	30
E	9/4/2019	Cloudy	Moderate	11:05	0.99	0	6	61	33
F	9/4/2019	Cloudy	Moderate	10:48	1.04	0	3	61	36
G	9/4/2019	Cloudy	Moderate	10:22	0.92	1	12	55	32
H	9/4/2019	Cloudy	Moderate	10:00	0.90	6	18	47	29

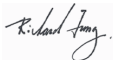



CERTIFICATE OF ANALYSIS

Client	: FUGRO TECHNICAL SERVICES LIMITED	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 13
Contact	: MR CYRUS LAI	Contact	: Richard Fung	Work Order	: HK1914877
Address	: ROOM 723 & 725, 7/F, BLOCK B, PROFIT INDUSTRIAL BUILDING, 1-15 KWAI FONG CRESCENT, KWAI FONG, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: c.lai@fugro.com	E-mail	: richard.fung@alsglobal.com		
Telephone	: +852 3565 4374	Telephone	: +852 2610 1044		
Facsimile	: ---	Facsimile	: +852 2610 2021		
Project	: CONTRACT NO. CM 14/2016 ENVIRONMENTAL TEAM FOR OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT PLANT			Date Samples Received	: 09-Apr-2019
Order number	: 0041/17	Quote number	: HKE/1654/2017_R1	Issue Date	: 26-Apr-2019
C-O-C number	: ---			No. of samples received	: 24
Site	: ---			No. of samples analysed	: 24

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This document has been signed by those names that appear on this report and are the authorised signatories.

<u>Signatories</u>	<u>Position</u>	<u>Authorised results for</u>
		
Fung Lim Chee, Richard	General Manager	Inorganics
		
Fung Lim Chee, Richard	General Manager	Metals_ENV



General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. Testing period is from 09-Apr-2019 to 26-Apr-2019.

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

Specific Comments for Work Order: HK1914877

Sample(s) were received in chilled condition.

Water sample(s) analysed and reported on as received basis.

Sediment sample(s) analysed on an as received basis. Result(s) reported on dry weight basis.

pH determined and reported on a 1:5 soil / water extract.

Particle Size Distribution was subcontracted to and analysed by Gammon Construction Limited.

Sample digested by In-house method E-3005 prior to the determination of total metals. The In-house method is developed based on USEPA method 3005.

Calibration range of pH value is 4.0 - 10.0. Results exceeding this range is for reference only.

pH value is reported as at 25°C.

EK059A - Nitrate and Nitrite were determined and reported on a 1:5 soil / 1M KCl solution extract.

Sample(s) as received, digested by In-house method E-3051A prior to the determination of metals. The In-house method is developed based on USEPA method 3051A.

EK062A - Total Nitrogen is the sum of Total Oxidizable (NOx) and Total Kjeldahl Nitrogen.



Analytical Results

Sub-Matrix: SEDIMENT

Client sample ID

Client sampling date / time

				A/Sediment	B/Sediment	C/Sediment	D/Sediment	E/Sediment
				09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914877-001	HK1914877-002	HK1914877-003	HK1914877-004	HK1914877-005
EA/ED: Physical and Aggregate Properties								
EA002: pH Value	----	0.1	pH Unit	6.9	7.6	7.7	7.7	7.9
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	51.6	54.8	62.4	36.0	59.2
ED/EK: Inorganic Nonmetallic Parameters								
EK055: Ammonia as N	7664-41-7	0.5	mg/kg	4.5	9.9	11.9	4.4	8.5
EK062A: Total Nitrogen as N	----	10	mg/kg	950	1220	1290	480	1450
EK067A: Total Phosphorus as P	----	10	mg/kg	476	513	595	259	594
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	0.5	mg/kg	14.8	11.3	11.2	6.0	10.2
EG020: Cadmium	7440-43-9	0.10	mg/kg	0.11	<0.10	0.10	<0.10	<0.10
EG020: Chromium	7440-47-3	0.5	mg/kg	34.0	36.1	39.0	19.2	40.5
EG020: Copper	7440-50-8	0.20	mg/kg	25.5	32.4	32.8	15.1	36.7
EG020: Lead	7439-92-1	0.20	mg/kg	44.2	43.4	47.3	25.0	47.7
EG020: Mercury	7439-97-6	0.05	mg/kg	0.13	0.25	0.12	0.06	0.12
EG020: Nickel	7440-02-0	0.20	mg/kg	19.8	22.0	23.8	11.8	24.9
EG020: Silver	7440-22-4	0.10	mg/kg	0.23	0.33	0.31	0.14	0.36
EG020: Zinc	7440-66-6	0.5	mg/kg	87.8	106	112	53.3	117



Sub-Matrix: SEDIMENT				Client sample ID		F/Sediment	G/Sediment	H/Sediment	A/Benthic Survey	B/Benthic Survey
				Client sampling date / time		09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914877-006	HK1914877-007	HK1914877-008	HK1914877-009	HK1914877-010		
EA/ED: Physical and Aggregate Properties										
EA002: pH Value	----	0.1	pH Unit	7.8	7.9	7.7	---	---		
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	63.6	54.4	56.5	42.4	55.5		
ED/EK: Inorganic Nonmetallic Parameters										
EK055: Ammonia as N	7664-41-7	0.5	mg/kg	10.6	5.8	6.2	---	---		
EK062A: Total Nitrogen as N	----	10	mg/kg	1490	1080	970	---	---		
EK067A: Total Phosphorus as P	----	10	mg/kg	594	522	478	---	---		
EG: Metals and Major Cations										
EG020: Arsenic	7440-38-2	0.5	mg/kg	11.6	11.0	12.3	---	---		
EG020: Cadmium	7440-43-9	0.10	mg/kg	<0.10	0.12	0.11	---	---		
EG020: Chromium	7440-47-3	0.5	mg/kg	43.1	39.7	40.0	---	---		
EG020: Copper	7440-50-8	0.20	mg/kg	38.8	60.6	52.1	---	---		
EG020: Lead	7439-92-1	0.20	mg/kg	48.6	45.1	48.9	---	---		
EG020: Mercury	7439-97-6	0.05	mg/kg	0.13	0.19	0.17	---	---		
EG020: Nickel	7440-02-0	0.20	mg/kg	26.6	23.8	23.8	---	---		
EG020: Silver	7440-22-4	0.10	mg/kg	0.36	0.34	0.46	---	---		
EG020: Zinc	7440-66-6	0.5	mg/kg	121	109	153	---	---		
EP: Aggregate Organics										
EP005: Total Organic Carbon	----	0.05	%	---	---	---	0.58	1.00		



Sub-Matrix: SEDIMENT				Client sample ID	C/Benthic Survey	D/Benthic Survey	E/Benthic Survey	F/Benthic Survey	G/Benthic Survey
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914877-011	HK1914877-012	HK1914877-013	HK1914877-014	HK1914877-015	
EA/ED: Physical and Aggregate Properties									
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	62.3	56.7	57.4	59.0	58.1	
EP: Aggregate Organics									
EP005: Total Organic Carbon	----	0.05	%	0.93	0.79	0.99	1.04	0.92	



Sub-Matrix: SEDIMENT				Client sample ID	H/Benthic Survey	---	---	---	---
				Client sampling date / time	09-Apr-2019	---	---	---	---
Compound	CAS Number	LOR	Unit	HK1914877-016	---	---	---	---	---
EA/ED: Physical and Aggregate Properties									
EA055: Moisture Content (dried @ 103°C)	---	0.1	%	56.3	---	---	---	---	---
EP: Aggregate Organics									
EP005: Total Organic Carbon	---	0.05	%	0.90	---	---	---	---	---



Sub-Matrix: WATER				Client sample ID	A/Rinsate Blank	B/Rinsate Blank	C/Rinsate Blank	D/Rinsate Blank	E/Rinsate Blank
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
Compound	CAS Number	LOR	Unit	HK1914877-017	HK1914877-018	HK1914877-019	HK1914877-020	HK1914877-021	
EG: Metals and Major Cations - Total									
EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	<10	<10	<10	<10
EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
EG020: Chromium	7440-47-3	1	µg/L	<1	<1	<1	3	1	
EG020: Copper	7440-50-8	1	µg/L	1	1	2	4	2	
EG020: Lead	7439-92-1	1	µg/L	<1	<1	<1	3	<1	
EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
EG020: Nickel	7440-02-0	1	µg/L	2	2	2	4	2	
EG020: Silver	7440-22-4	1	µg/L	<1	<1	<1	<1	<1	
EG020: Zinc	7440-66-6	10	µg/L	<10	<10	<10	10	<10	



Sub-Matrix: WATER				Client sample ID	F/Rinsate Blank	G/Rinsate Blank	H/Rinsate Blank	---	---
				Client sampling date / time	09-Apr-2019	09-Apr-2019	09-Apr-2019	---	---
Compound	CAS Number	LOR	Unit	HK1914877-022	HK1914877-023	HK1914877-024	---	---	
EG: Metals and Major Cations - Total									
EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	<10	---	---	
EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	---	---	
EG020: Chromium	7440-47-3	1	µg/L	1	<1	<1	---	---	
EG020: Copper	7440-50-8	1	µg/L	2	2	1	---	---	
EG020: Lead	7439-92-1	1	µg/L	1	<1	<1	---	---	
EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	<0.5	<0.5	---	---	
EG020: Nickel	7440-02-0	1	µg/L	3	2	2	---	---	
EG020: Silver	7440-22-4	1	µg/L	<1	<1	<1	---	---	
EG020: Zinc	7440-66-6	10	µg/L	<10	<10	<10	---	---	



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 2293853)								
HK1914428-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	16.6	16.6	0.00
HK1914877-003	C/Sediment	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	62.4	60.7	2.67
EA/ED: Physical and Aggregate Properties (QC Lot: 2293854)								
HK1914877-013	E/Benthic Survey	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	57.4	59.1	2.96
HK1914974-006	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.2	15.5	2.31
EA/ED: Physical and Aggregate Properties (QC Lot: 2293902)								
HK1914877-001	A/Sediment	EA002: pH Value	----	0.1	pH Unit	6.9	6.8	1.46
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2300113)								
HK1914877-001	A/Sediment	EK055: Ammonia as N	7664-41-7	1	mg/kg	4.5	4	0.00
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2300382)								
HK1914877-001	A/Sediment	EK067A: Total Phosphorus as P	----	10	mg/kg	476	505	5.91
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2312513)								
HK1914877-008	H/Sediment	EK067A: Total Phosphorus as P	----	10	mg/kg	478	482	0.957
EG: Metals and Major Cations (QC Lot: 2287767)								
HK1914877-002	B/Sediment	EG020: Cadmium	7440-43-9	0.01	mg/kg	<0.10	0.11	0.00
		EG020: Mercury	7439-97-6	0.02	mg/kg	0.25	0.27	6.31
		EG020: Copper	7440-50-8	0.05	mg/kg	32.4	32.4	0.0346
		EG020: Lead	7439-92-1	0.05	mg/kg	43.4	42.6	1.94
		EG020: Nickel	7440-02-0	0.05	mg/kg	22.0	22.0	0.318
		EG020: Silver	7440-22-4	0.05	mg/kg	0.33	0.32	4.73
		EG020: Arsenic	7440-38-2	0.5	mg/kg	11.3	11.1	1.80
		EG020: Chromium	7440-47-3	0.5	mg/kg	36.1	35.8	0.743
		EG020: Zinc	7440-66-6	0.5	mg/kg	106	104	1.42
EP: Aggregate Organics (QC Lot: 2303565)								
HK1914428-002	Anonymous	EP005: Total Organic Carbon	----	0.05	%	0.31	0.35	12.2
HK1914877-015	G/Benthic Survey	EP005: Total Organic Carbon	----	0.05	%	0.92	0.85	8.53
Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations - Total (QC Lot: 2302134)								



Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations - Total (QC Lot: 2302134) - Continued								
HK1914877-018	B/Rinsate Blank	EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.00
		EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	<0.5	0.00
		EG020: Chromium	7440-47-3	1	µg/L	<1	<1	0.00
		EG020: Copper	7440-50-8	1	µg/L	1	1	0.00
		EG020: Lead	7439-92-1	1	µg/L	<1	<1	0.00
		EG020: Nickel	7440-02-0	1	µg/L	2	2	0.00
		EG020: Silver	7440-22-4	1	µg/L	<1	<1	0.00
		EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	0.00
		EG020: Zinc	7440-66-6	10	µg/L	<10	<10	0.00

Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2300113)											
EK055: Ammonia as N	7664-41-7	1	mg/kg	<1	10 mg/kg	98.1	----	85	119	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2300382)											
EK067A: Total Phosphorus as P	----	10	mg/kg	<10	695 mg/kg	90.5	----	85	115	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2312513)											
EK067A: Total Phosphorus as P	----	10	mg/kg	<10	695 mg/kg	90.6	----	85	115	----	----
EG: Metals and Major Cations (QC Lot: 2287767)											
EG020: Arsenic	7440-38-2	0.5	mg/kg	<0.5	5 mg/kg	98.6	----	85	110	----	----
EG020: Cadmium	7440-43-9	0.01	mg/kg	<0.01	5 mg/kg	95.2	----	85	115	----	----
EG020: Chromium	7440-47-3	0.5	mg/kg	<0.5	5 mg/kg	101	----	85	115	----	----
EG020: Copper	7440-50-8	0.05	mg/kg	<0.05	5 mg/kg	103	----	85	114	----	----
EG020: Lead	7439-92-1	0.05	mg/kg	<0.05	5 mg/kg	100	----	87	115	----	----
EG020: Mercury	7439-97-6	0.02	mg/kg	<0.02	0.1 mg/kg	98.4	----	85	115	----	----
EG020: Nickel	7440-02-0	0.05	mg/kg	<0.05	5 mg/kg	101	----	85	115	----	----
EG020: Silver	7440-22-4	0.05	mg/kg	<0.05	5 mg/kg	99.6	----	85	115	----	----
EG020: Zinc	7440-66-6	0.5	mg/kg	<0.5	5 mg/kg	106	----	85	115	----	----



Matrix: SOIL		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EP: Aggregate Organics (QC Lot: 2303565)											
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	98.9	----	91	106	----	----
Matrix: WATER		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations - Total (QC Lot: 2302134)											
EG020: Arsenic	7440-38-2	10	µg/L	<10	100 µg/L	88.3	----	85	110	----	----
EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	100 µg/L	94.5	----	85	109	----	----
EG020: Chromium	7440-47-3	1	µg/L	<1	100 µg/L	99.2	----	86	111	----	----
EG020: Copper	7440-50-8	1	µg/L	<1	100 µg/L	95.4	----	90	111	----	----
EG020: Lead	7439-92-1	1	µg/L	<1	100 µg/L	98.4	----	89	111	----	----
EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	2 µg/L	92.0	----	85	115	----	----
EG020: Nickel	7440-02-0	1	µg/L	<1	100 µg/L	94.5	----	87	110	----	----
EG020: Silver	7440-22-4	1	µg/L	<1	100 µg/L	97.3	----	85	114	----	----
EG020: Zinc	7440-66-6	10	µg/L	<10	100 µg/L	94.2	----	86	114	----	----



Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL

					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2300382)										
HK1914877-001	A/Sediment	EK067A: Total Phosphorus as P	----	100 mg/kg	87.6	----	75	125	----	----
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2312513)										
HK1914877-008	H/Sediment	EK067A: Total Phosphorus as P	----	100 mg/kg	106	----	75	125	----	----
EG: Metals and Major Cations (QC Lot: 2287767)										
HK1914877-001	A/Sediment	EG020: Arsenic	7440-38-2	5 mg/kg	82.5	----	75	125	----	----
		EG020: Cadmium	7440-43-9	5 mg/kg	97.2	----	75	125	----	----
		EG020: Chromium	7440-47-3	5 mg/kg	83.2	----	75	125	----	----
		EG020: Copper	7440-50-8	5 mg/kg	78.1	----	75	125	----	----
		EG020: Lead	7439-92-1	5 mg/kg	# Not Determined	----	75	125	----	----
		EG020: Mercury	7439-97-6	0.1 mg/kg	88.3	----	75	125	----	----
		EG020: Nickel	7440-02-0	5 mg/kg	80.9	----	75	125	----	----
		EG020: Silver	7440-22-4	5 mg/kg	98.3	----	75	125	----	----
EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	----	75	125	----	----		
EP: Aggregate Organics (QC Lot: 2303565)										
HK1914428-001	Anonymous	EP005: Total Organic Carbon	----	40 %	84.3	----	75	125	----	----

Matrix: WATER

					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations - Total (QC Lot: 2302134)										
HK1914877-017	A/Rinsate Blank	EG020: Arsenic	7440-38-2	100 µg/L	109	----	75	125	----	----
		EG020: Cadmium	7440-43-9	100 µg/L	94.0	----	75	125	----	----
		EG020: Chromium	7440-47-3	100 µg/L	86.7	----	75	125	----	----
		EG020: Copper	7440-50-8	100 µg/L	98.0	----	75	125	----	----
		EG020: Lead	7439-92-1	100 µg/L	87.0	----	75	125	----	----
EG020: Mercury	7439-97-6	2 µg/L	76.0	----	75	125	----	----		



Matrix: WATER

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations - Total (QC Lot: 2302134) - Continued										
HK1914877-017	A/Rinsate Blank	EG020: Nickel	7440-02-0	100 µg/L	100	----	75	125	----	----
		EG020: Silver	7440-22-4	100 µg/L	83.1	----	75	125	----	----
		EG020: Zinc	7440-66-6	100 µg/L	97.0	----	75	125	----	----



ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

SUB-CONTRACTING REPORT

CONTACT	: MR CYRUS LAI	WORK ORDER	: HK1914877
CLIENT	: FUGRO TECHNICAL SERVICES LIMITED		
ADDRESS	: ROOM 723 & 725, 7/F, BLOCK B, PROFIT INDUSTRIAL BUILDING, 1-15 KWAI FONG CRESCENT, KWAI FONG, HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 9-APR-2019
		DATE OF ISSUE	: 26-APR-2019
PROJECT	: CONTRACT NO. CM 14/2016 ENVIRONMENTAL TEAM FOR OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT PLANT	NO. OF SAMPLES	: 24
		CLIENT ORDER	: 0041/17

General Comments

- Sample(s) were received in chilled condition.
- Water sample(s) analysed and reported on as received basis.
- Sediment sample(s) analysed on an as received basis. Result(s) reported on dry weight basis.
- pH determined and reported on a 1:5 soil / water extract.
- Particle Size Distribution was subcontracted to and analysed by Gammon Construction Limited.
- Sample digested by In-house method E-3005 prior to the determination of total metals. The In-house method is developed based on USEPA method 3005.
- Calibration range of pH value is 4.0 - 10.0. Results exceeding this range is for reference only.
- pH value is reported as at 25°C.
- EK059A - Nitrate and Nitrite were determined and reported on a 1:5 soil / 1M KCl solution extract.
- Sample(s) as received, digested by In-house method E-3051A prior to the determination of metals. The In-house method is developed based on USEPA method 3051A.
- EK062A - Total Nitrogen is the sum of Total Oxidizable (NOx) and Total Kjeldahl Nitrogen.

Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories

Position

Richard Fung

General Manager

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the ALS Laboratory Group

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Tel. +852 2610 1044 Fax. +852 2610 2021 www.alsglobal.com

WORK ORDER : HK1914877
 SUB-BATCH : 1
 CLIENT : FUGRO TECHNICAL SERVICES LIMITED
 PROJECT : CONTRACT NO. CM 14/2016 ENVIRONMENTAL TEAM FOR OPERATIONAL
 ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE
 TREATMENT PLANT



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK1914877-001	A/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-002	B/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-003	C/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-004	D/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-005	E/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-006	F/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-007	G/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-008	H/Sediment	SEDIMENT	09-Apr-2019	
HK1914877-009	A/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-010	B/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-011	C/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-012	D/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-013	E/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-014	F/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-015	G/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-016	H/Benthic Survey	SEDIMENT	09-Apr-2019	J2999-272.44
HK1914877-017	A/Rinsate Blank	WATER	09-Apr-2019	
HK1914877-018	B/Rinsate Blank	WATER	09-Apr-2019	
HK1914877-019	C/Rinsate Blank	WATER	09-Apr-2019	
HK1914877-020	D/Rinsate Blank	WATER	09-Apr-2019	
HK1914877-021	E/Rinsate Blank	WATER	09-Apr-2019	
HK1914877-022	F/Rinsate Blank	WATER	09-Apr-2019	
HK1914877-023	G/Rinsate Blank	WATER	09-Apr-2019	
HK1914877-024	H/Rinsate Blank	WATER	09-Apr-2019	

**TEST CERTIFICATE
SUMMARY OF SOIL CLASSIFICATION TEST RESULT
GEOSPEC 3 : 2001**



Report No : J2999-272.44

Customer : ALS Technichem (HK) Pty Ltd

Job No. : J2999

Works Order No. : 272

Project : -

Contract No.:

Date : 11/04/2019

Sample ID No.	Sample		Δ Moisture Content (%)	Test 6.1 Liquid Limit (%)	Test 6.1 Plastic Limit (%)	Test 6.1 Plasticity Index (%)	Test 6.2 Liquidity Index	Passing 425µm Sieve (%)	Preparation Method	Particle Size Distribution				Description	Sample Origin		
	No.	Type								Depth (m)	# Test Method	Gravel (%)	Sand (%)			Silt (%)	Clay (%)
HK1914877-009	A/Benthic Survey	D									1,5,7	15	39	28	18	Dark grey, slightly gravelly, sandy SILT/CLAY with shell fragments	- †
HK1914877-010	B/Benthic Survey	D									1,5,7	1	16	54	29	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments	- †
HK1914877-011	C/Benthic Survey	D									1,5,7	0	3	68	29	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK1914877-012	D/Benthic Survey	D									1,5,7	0	17	53	30	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK1914877-013	E/Benthic Survey	D									1,5,7	0	6	61	33	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †

Legend : Δ = Test Method in accordance with GEOSPEC 3 : 2001 Test 5.1 Moisture Content at 45°C ± 5°C (A), Test 5.2 Moisture Content at 105°C ± 5°C (B), Test 5.3 Comparative Moisture Content 45/105°C ± 5°C (C)
= Test Method in accordance with GEOSPEC3 : 2001 Test 8.1 (1), 8.2 (2), 8.3 (3), 8.4 (4), 8.5 (5), 8.6 (6), 8.7 (7).

Symbols : U - Undisturbed Sample; P - Piston Sample; N.P. - Non Plastic; A.D. - Air Dried; IB - Large Disturbed Sample; M - Mazier Sample; A.R. - As Received; O.D. - Oven Dried; BLK - Block Sample; D - Small Disturbed Sample; H.P. - Hand Picked; W.S. - Wet Sieved; SPTL - SPT Split-Barrel Sample; PT - Portable triple tube Sample; - - Moisture Content for A.L. Test.

Notes: IS - Insufficient Sample; Tf - To Follow on supplementary Report.

Checked by : T K Lam

Approved By : Chung Hei Wing
Principal Laboratory Officer

Date : 25/04/2019

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**TEST CERTIFICATE
SUMMARY OF SOIL CLASSIFICATION TEST RESULT
GEOSPEC 3 : 2001**



Report No : J2999-272.44

Works Order No. : 272

Job No. : J2999

Customer : ALS Technichem (HK) Pty Ltd

Date : 11/04/2019

Contract No.:

Project : -

Sample ID	Sample		Δ Moisture Content (%)	Test 6.1 Liquid Limit (%)	Test 6.1 Plastic Limit (%)	Test 6.1 Plasticity Index (%)	Test 6.2 Liquidity Index	Passing 425µm Sieve (%)	Preparation Method	Particle Size Distribution				Description	Sample Origin		
	No.	Type								Depth (m)	# Test Method	Gravel (%)	Sand (%)			Silt (%)	Clay (%)
HK1914877-014	F/Benthic Survey	D									1,5,7	0	3	61	36	Dark grey, slightly sandy SILT/CLAY	- †
HK1914877-015	G/Benthic Survey	D									1,5,7	1	12	55	32	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments	- †
HK1914877-016	H/Benthic Survey	D									1,5,7	6	18	47	29	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments	- †

Legend : Δ = Test Method in accordance with GEOSPEC 3 : 2001 Test 5.1 Moisture Content at 45°C ± 5°C (A), Test 5.2 Moisture Content at 105°C ± 5°C (B), Test 5.3 Comparative Moisture Content 45/105°C ± 5°C (C)
= Test Method in accordance with GEOSPEC3 : 2001 Test 8.1 (1), 8.2 (2), 8.3 (3), 8.4 (4), 8.5 (5), 8.6 (6), 8.7 (7).

Symbols : U - Undisturbed Sample; P - Piston Sample; N.P. - Non Plastic; A.D. - Air Dried; LB - Large Disturbed Sample; M - Mazier Sample; A.R. - As Received; O.D. - Oven Dried; BLK - Block Sample; D - Small Disturbed Sample; H.P. - Hand Picked; W.S. - Wet Sieved; SPTL - SPT Split-Barrel Sample; PT - Portable triple tube Sample; PT - Moisture Content for A.L. Test.

Notes : IS - Insufficient Sample; Tf - To Follow on supplementary Report.
Checked by : T K Lam
Approved By : Chung Hei Wing
Principal Laboratory Officer

Date : 25/04/2019

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Technology Centre
21 Chun Wang Street, Tseung Kwan O Industrial Estate,
Tseung Kwan O, N.T. Tel.: 26991980, Fax.: 26917547

TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Job No. : J2999 Contract No. :
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Report No. : J2999-272.44

Works Order No. : 272
 Sample ID No. : HK1914877-009
 Sample No. : A/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : †

Date Received : 11/04/2019
 Tested Date : 17/04/2019

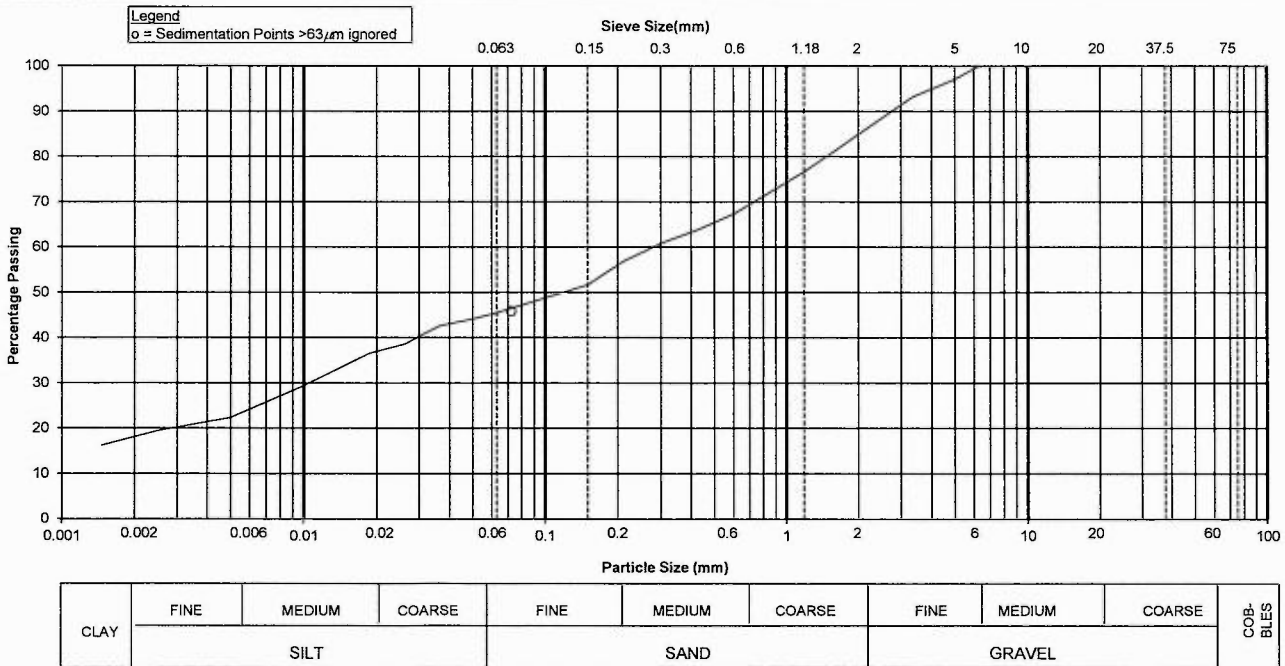
Description : Dark grey, slightly gravelly, sandy SILT/CLAY with shell fragments
 Sieve Method : Method A † Upon request * Delete as appropriate

† Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-				
75.0 mm	100	-	-				
63.0 mm	100	-	-				
50.0 mm	100	-	-				
37.5 mm	100	-	-				
28.0 mm	100	-	-				
20.0 mm	100	-	-	0.0721	-	46	-
14.0 mm	100	-	-	0.0512	-	44	-
10.0 mm	100	-	-	0.0364	-	43	-
6.30 mm	100	-	-	0.0261	-	39	-
5.00 mm	97	-	-	0.0186	-	37	-
3.35 mm	93	-	-	0.0098	-	29	-
2.00 mm	85	-	-	0.0050	-	22	-
1.18 mm	77	-	-	0.0025	-	19	-
600 µm	67	-	-	0.0015	-	16	-
425 µm	64	-	-				
300 µm	61	-	-				
212 µm	57	-	-				
150 µm	52	-	-				
63 µm	46	-	-				
0 µm	0	-	-				

Specific Gravity (# if assumed) : 2.65 #
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate
 Sampling History : As received
 The presence of any visible organic matter in the soil : None

SUMMARY :
 Gravel (%) : 15
 Sand (%) : 39
 Silt (%) : 28
 Clay (%) : 18



Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

Technician : Chris Chan
 Date : 17/04/2019

Checked By : TK Lam
 Name : TK Lam
 Date : 24/04/2019

Approved By : Chung Hei Wing
 Signatory : Chung Hei Wing
 Date : 24/04/2019

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TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Job No. : J2999 Contract No. :
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Report No. : J2999-272.44

Works Order No. : 272
 Sample ID No. : HK1914877-010
 Sample No. : B/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : -†

Date Received : 11/04/2019
 Tested Date : 17/04/2019

Description : Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments

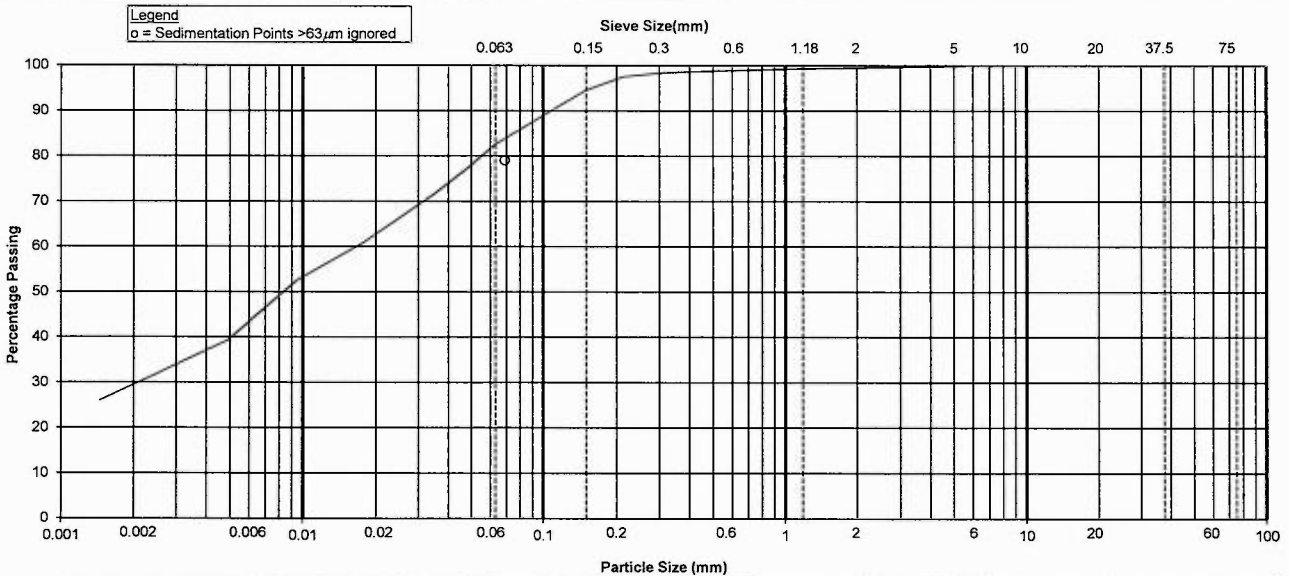
Sieve Method : Method A

^ Upon request

* Delete as appropriate

† Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :			
100.0 mm	100	-	-	2.65 #			
75.0 mm	100	-	-	Dispersant Details :	Sodium hexametaphosphate, Sodium carbonate		
63.0 mm	100	-	-	Sampling History :	As received		
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None			
37.5 mm	100	-	-	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
28.0 mm	100	-	-	0.0686	-	79	-
20.0 mm	100	-	-	0.0487	-	78	-
14.0 mm	100	-	-	0.0350	-	72	-
10.0 mm	100	-	-	0.0251	-	66	-
6.30 mm	100	-	-	0.0180	-	61	-
5.00 mm	100	-	-	0.0095	-	53	-
3.35 mm	100	-	-	0.0049	-	39	-
2.00 mm	99	-	-	0.0025	-	32	-
1.18 mm	99	-	-	0.0015	-	26	-
600 µm	99	-	-	SUMMARY :			
425 µm	99	-	-	Gravel (%) :	1		
300 µm	98	-	-	Sand (%) :	16		
212 µm	98	-	-	Silt (%) :	54		
150 µm	95	-	-	Clay (%) :	29		
63 µm	83	-	-				
0 µm	0	-	-				



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

Technician : Chris Chan
 Date : 17/04/2019

Checked By :
 Name : T.K. Lam
 Date : 24/04/2019

Approved By :
 Signatory : Chung Hei Wing
 Date : 24/04/2019

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TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Job No. : J2999 Contract No. :
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Report No. : J2999-272.44

Works Order No. : 272
 Sample ID No. : HK1914877-011
 Sample No. : C/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : -[‡]

Date Received : 11/04/2019
 Tested Date : 17/04/2019

Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A

[^]Upon request

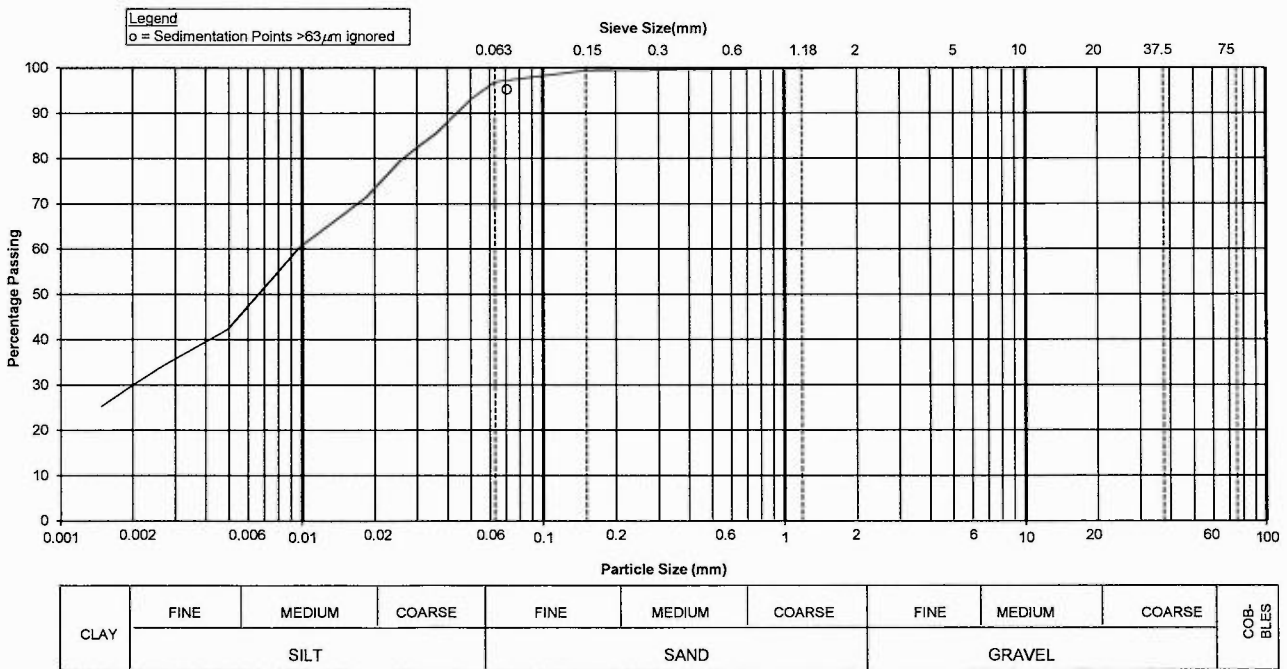
* Delete as appropriate

[‡]Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	[^] Expanded Uncertainty of the Percent Passing (%)	[^] Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	[^] Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	[^] Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-	0.0707	-	95	-
75.0 mm	100	-	-	0.0502	-	93	-
63.0 mm	100	-	-	0.0359	-	86	-
50.0 mm	100	-	-	0.0257	-	80	-
37.5 mm	100	-	-	0.0184	-	71	-
28.0 mm	100	-	-	0.0097	-	60	-
20.0 mm	100	-	-	0.0050	-	42	-
14.0 mm	100	-	-	0.0025	-	34	-
10.0 mm	100	-	-	0.0015	-	25	-
6.30 mm	100	-	-				
5.00 mm	100	-	-				
3.35 mm	100	-	-				
2.00 mm	100	-	-				
1.18 mm	100	-	-				
600 μm	100	-	-				
425 μm	100	-	-				
300 μm	100	-	-				
212 μm	99	-	-				
150 μm	99	-	-				
63 μm	97	-	-				
0 μm	0	-	-				

Specific Gravity (# if assumed) : 2.65 #
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate
 Sampling History : As received
 The presence of any visible organic matter in the soil : None

SUMMARY :
 Gravel (%) : 0
 Sand (%) : 3
 Silt (%) : 68
 Clay (%) : 29



Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

Technician : Chris Chan
 Date : 17/04/2019

Checked By : TK Lam
 Date : 24/04/2019

Approved By : Chung Her Wing
 Date : 24/04/2019

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TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Job No. : J2999 Contract No. :
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Report No. : J2999-272.44

Date Received : 11/04/2019
 Tested Date : 17/04/2019

Works Order No. : 272
 Sample ID No. : HK1914877-012
 Sample No. : D/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : -†

Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

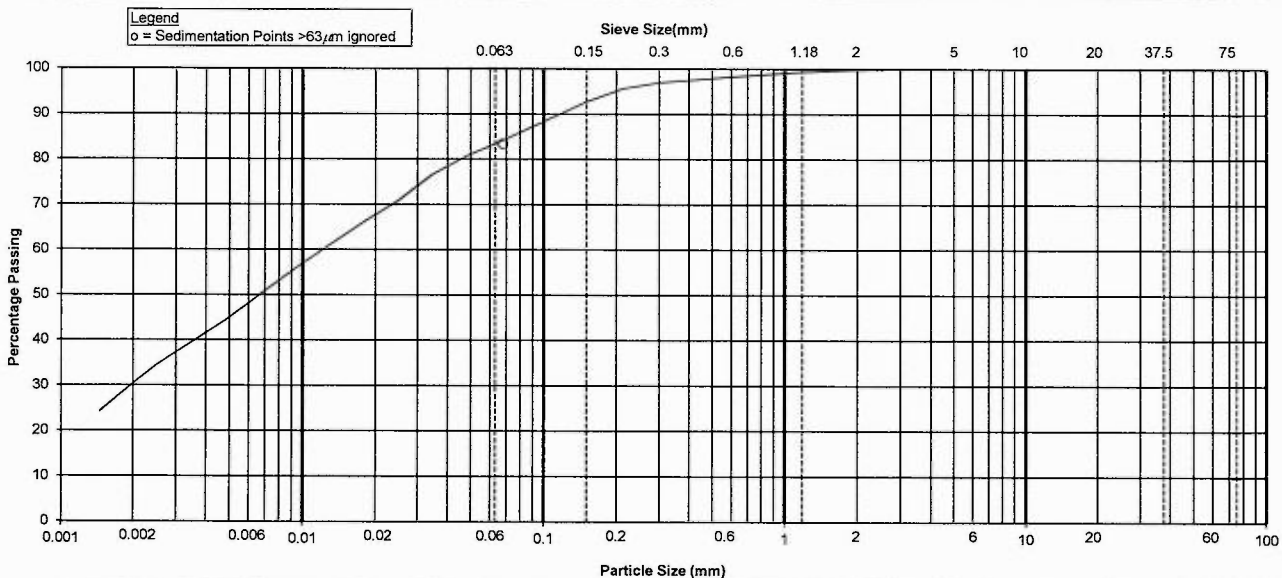
Sieve Method : Method A

^ Upon request

* Delete as appropriate

† Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :			
100.0 mm	100	-	-	2.65 #			
75.0 mm	100	-	-	Dispersant Details :	Sodium hexametaphosphate, Sodium carbonate		
63.0 mm	100	-	-	Sampling History :	As received		
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None			
37.5 mm	100	-	-	Particle Diameter	^Expanded Uncertainty of the Particle Diameter	% Finer than D K	^Expanded Uncertainty of % finer than D
28.0 mm	100	-	-	(mm)	(mm)	(%)	(%)
20.0 mm	100	-	-	0.0677	-	83	-
14.0 mm	100	-	-	0.0482	-	81	-
10.0 mm	100	-	-	0.0345	-	77	-
6.30 mm	100	-	-	0.0248	-	71	-
5.00 mm	100	-	-	0.0177	-	66	-
3.35 mm	100	-	-	0.0094	-	56	-
2.00 mm	100	-	-	0.0048	-	44	-
1.18 mm	99	-	-	0.0025	-	34	-
600 µm	98	-	-	0.0015	-	24	-
425 µm	98	-	-	SUMMARY :			
300 µm	97	-	-	Gravel (%) :	0		
212 µm	96	-	-	Sand (%) :	17		
150 µm	93	-	-	Silt (%) :	53		
63 µm	83	-	-	Clay (%) :	30		
0 µm	0	-	-				



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Technician : Chris Chan
 Date : 17/04/2019

Checked By : TK Lam
 Name : TK Lam
 Date : 24/04/2019

Approved By : Chung Hai Wing
 Signatory : Chung Hai Wing
 Date : 24/04/2019

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TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Job No. : J2999 Contract No. :
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Report No. : J2999-272.44

Works Order No. : 272
 Sample ID No. : HK1914877-013
 Sample No. : E/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : -[‡]

Date Received : 11/04/2019
 Tested Date : 17/04/2019

Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

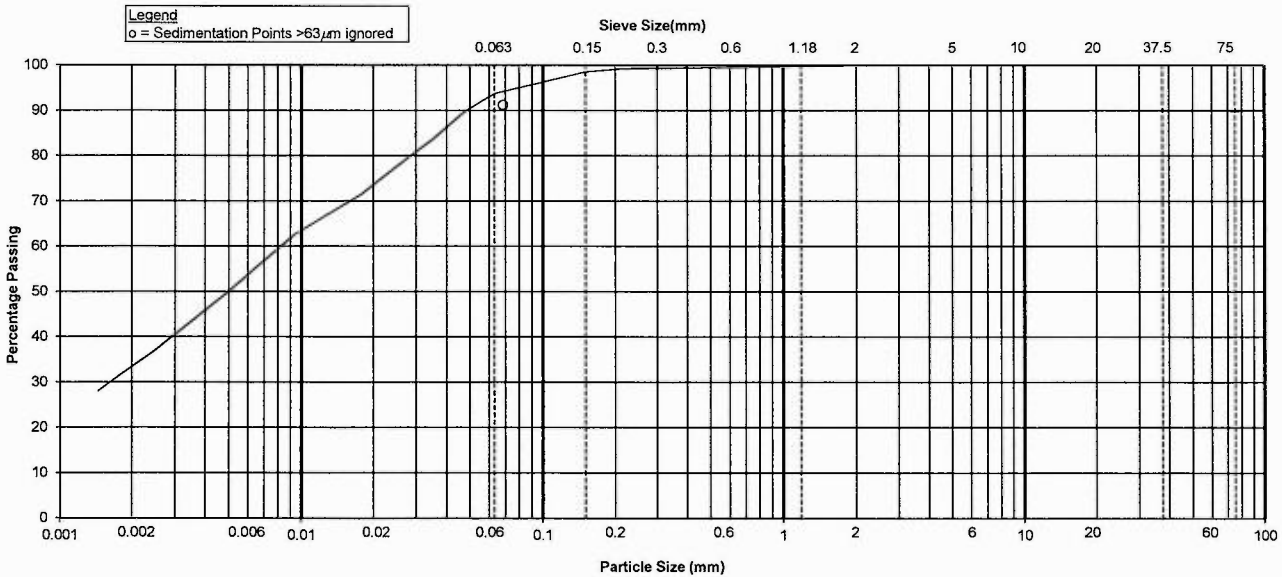
Sieve Method : Method A [^]Upon request * Delete as appropriate

[‡] Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	[^] Expanded Uncertainty of the Percent Passing (%)	[^] Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	[^] Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	[^] Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-	100	-	-	-
75.0 mm	100	-	-	75	-	-	-
63.0 mm	100	-	-	63	-	-	-
50.0 mm	100	-	-	50	-	-	-
37.5 mm	100	-	-	37.5	-	-	-
28.0 mm	100	-	-	28	-	-	-
20.0 mm	100	-	-	20	-	-	-
14.0 mm	100	-	-	14	-	-	-
10.0 mm	100	-	-	10	-	-	-
6.30 mm	100	-	-	6.3	-	-	-
5.00 mm	100	-	-	5	-	-	-
3.35 mm	100	-	-	3.35	-	-	-
2.00 mm	100	-	-	2	-	-	-
1.18 mm	100	-	-	1.18	-	-	-
600 μm	100	-	-	0.6	-	-	-
425 μm	99	-	-	0.425	-	-	-
300 μm	99	-	-	0.3	-	-	-
212 μm	99	-	-	0.212	-	-	-
150 μm	99	-	-	0.15	-	-	-
63 μm	94	-	-	0.063	-	-	-
0 μm	0	-	-	0	-	-	-

Specific Gravity (# if assumed) : 2.65 #
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate
 Sampling History : As received
 The presence of any visible organic matter in the soil : None

SUMMARY :
 Gravel (%) : 0
 Sand (%) : 6
 Silt (%) : 61
 Clay (%) : 33



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Technician : Chris Chan

Checked By : *[Signature]*

Approved By : *[Signature]*

Date : 17/04/2019

Name : T K Lam
 Date : 24/04/2019

Signatory : Chung Hei Wing
 Date : 24/04/2019

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TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Job No. : J2999 Contract No. :
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Report No. : J2999-272.44

Date Received : 11/04/2019
 Tested Date : 17/04/2019

Works Order No. : 272
 Sample ID No. : HK1914877-014
 Sample No. : F/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : -

Description : Dark grey, slightly sandy SILT/CLAY

Sieve Method : Method A

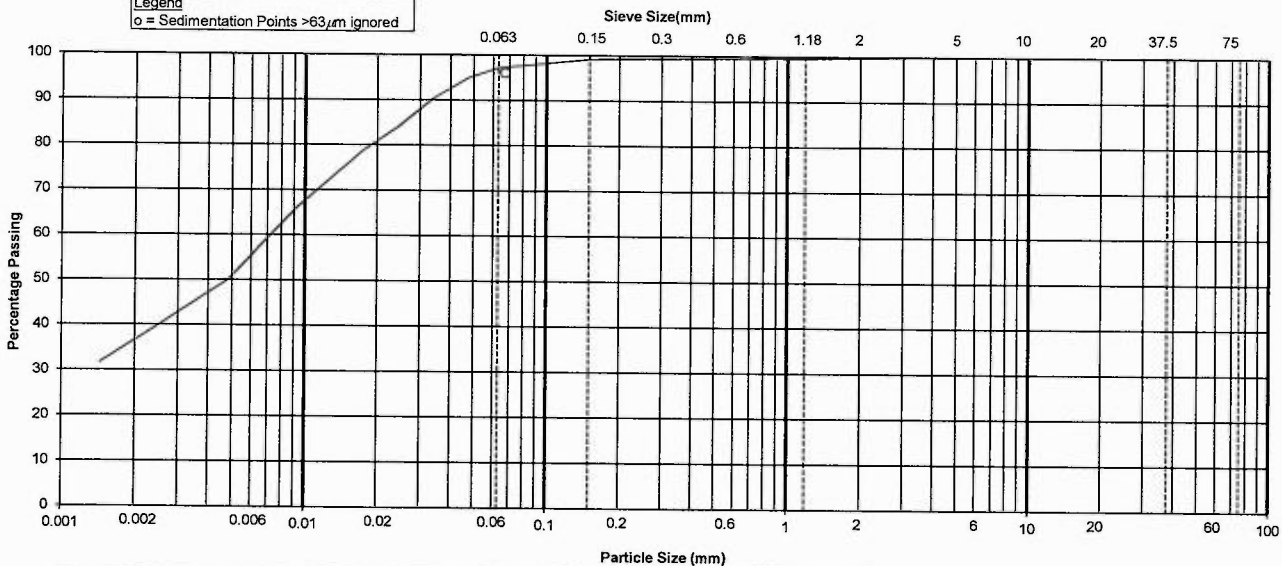
^ Upon request

* Delete as appropriate

† Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :			
100.0 mm	100	-	-	2.65 #			
75.0 mm	100	-	-	Dispersant Details : Sodium hexametaphosphate, Sodium carbonate			
63.0 mm	100	-	-	Sampling History : As received			
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None			
37.5 mm	100	-	-	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
28.0 mm	100	-	-	0.0668	-	96	-
20.0 mm	100	-	-	0.0474	-	95	-
14.0 mm	100	-	-	0.0339	-	90	-
10.0 mm	100	-	-	0.0244	-	84	-
6.30 mm	100	-	-	0.0174	-	79	-
5.00 mm	100	-	-	0.0093	-	66	-
3.35 mm	100	-	-	0.0048	-	50	-
2.00 mm	100	-	-	0.0025	-	40	-
1.18 mm	100	-	-	0.0014	-	32	-
600 µm	99	-	-	SUMMARY :			
425 µm	99	-	-	Gravel (%)	:	0	
300 µm	99	-	-	Sand (%)	:	3	
212 µm	99	-	-	Silt (%)	:	61	
150 µm	99	-	-	Clay (%)	:	36	
63 µm	97	-	-				
0 µm	0	-	-				

Legend
 o = Sedimentation Points >63µm ignored



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Technician : Chris Chan
 Date : 17/04/2019

Checked By : TK Lam
 Name : TK Lam
 Date : 24/04/2019

Approved By : Chung Hei Wing
 Signatory : Chung Hei Wing
 Date : 24/04/2019

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Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Job No. : J2999
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Contract No. :

Report No. : J2999-272.44

Works Order No. : 272
 Sample ID No. : HK1914877-015
 Sample No. : G/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : -[‡]

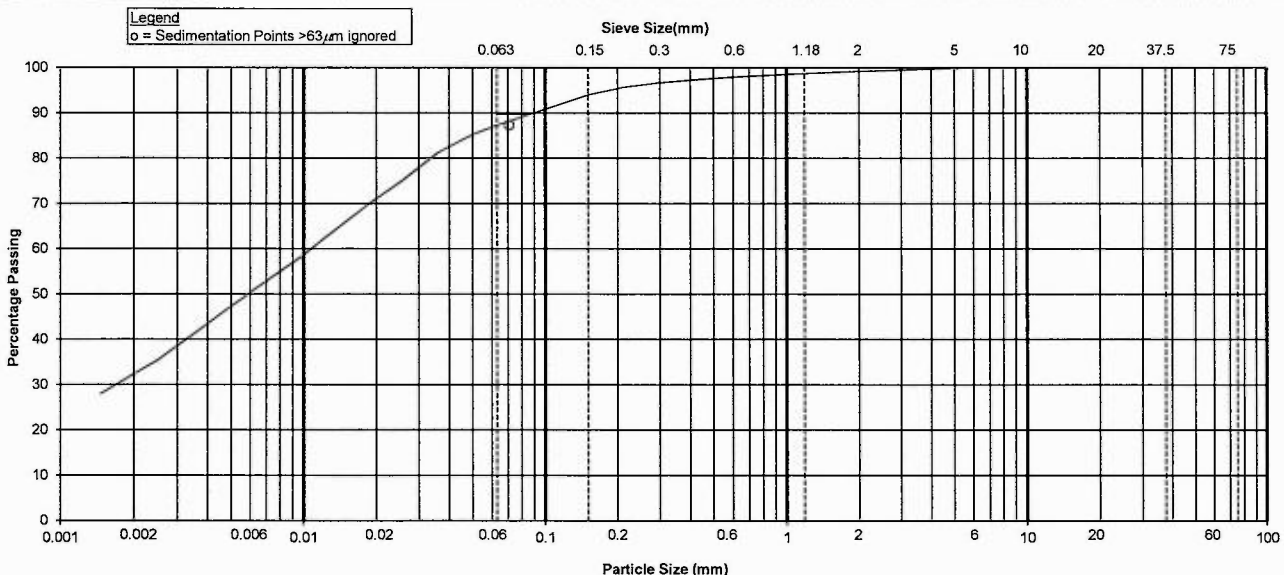
Date Received : 11/04/2019
 Tested Date : 17/04/2019

Description : Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A [^]Upon request * Delete as appropriate

[‡] Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	[^] Expanded Uncertainty of the Percent Passing (%)	[^] Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :			
100.0 mm	100	-	-	2.65 #			
75.0 mm	100	-	-	Dispersant Details :	Sodium hexametaphosphate, Sodium carbonate		
63.0 mm	100	-	-	Sampling History :	As received		
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None			
37.5 mm	100	-	-	Particle Diameter	[^] Expanded Uncertainty of the Particle Diameter	% Finer than D K	[^] Expanded Uncertainty of % finer than D
28.0 mm	100	-	-	(mm)	(mm)	(%)	(%)
20.0 mm	100	-	-	0.0707	-	87	-
14.0 mm	100	-	-	0.0502	-	85	-
10.0 mm	100	-	-	0.0358	-	81	-
6.30 mm	100	-	-	0.0256	-	75	-
5.00 mm	100	-	-	0.0183	-	70	-
3.35 mm	100	-	-	0.0096	-	58	-
2.00 mm	99	-	-	0.0049	-	47	-
1.18 mm	99	-	-	0.0025	-	35	-
600 µm	98	-	-	0.0015	-	28	-
425 µm	97	-	-	SUMMARY :			
300 µm	97	-	-	Gravel (%) :	1		
212 µm	96	-	-	Sand (%) :	12		
150 µm	94	-	-	Silt (%) :	55		
63 µm	87	-	-	Clay (%) :	32		
0 µm	0	-	-				



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COB- BLES
	SILT			SAND			GRAVEL			

Technician : Chris Chan
 Date : 17/04/2019

Checked By : TK Lam
 Name : TK Lam
 Date : 24/04/2019

Approved By : Chung Hei Wing
 Signatory : Chung Hei Wing
 Date : 24/04/2019

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Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

TEST REPORT
DETERMINATION OF
PARTICLE SIZE DISTRIBUTION
GEOSPEC 3 : 2001 Test Method 8.1 / 8.2*, 8.5 / 8.6* and 8.7
(Wet Sieve and Hydrometer Method)



Report No. : J2999-272.44

Job No. : J2999 Contract No. :
 Customer : ALS Technichem (HK) Pty Ltd
 Project : -

Works Order No. : 272
 Sample ID No. : HK1914877-016
 Sample No. : H/Benthic Survey
 Sample Depth (m) :
 Specimen Depth (m) :
 Sample Type : Small Disturbed
 Sample Origin : -[‡]

Date Received : 11/04/2019
 Tested Date : 17/04/2019

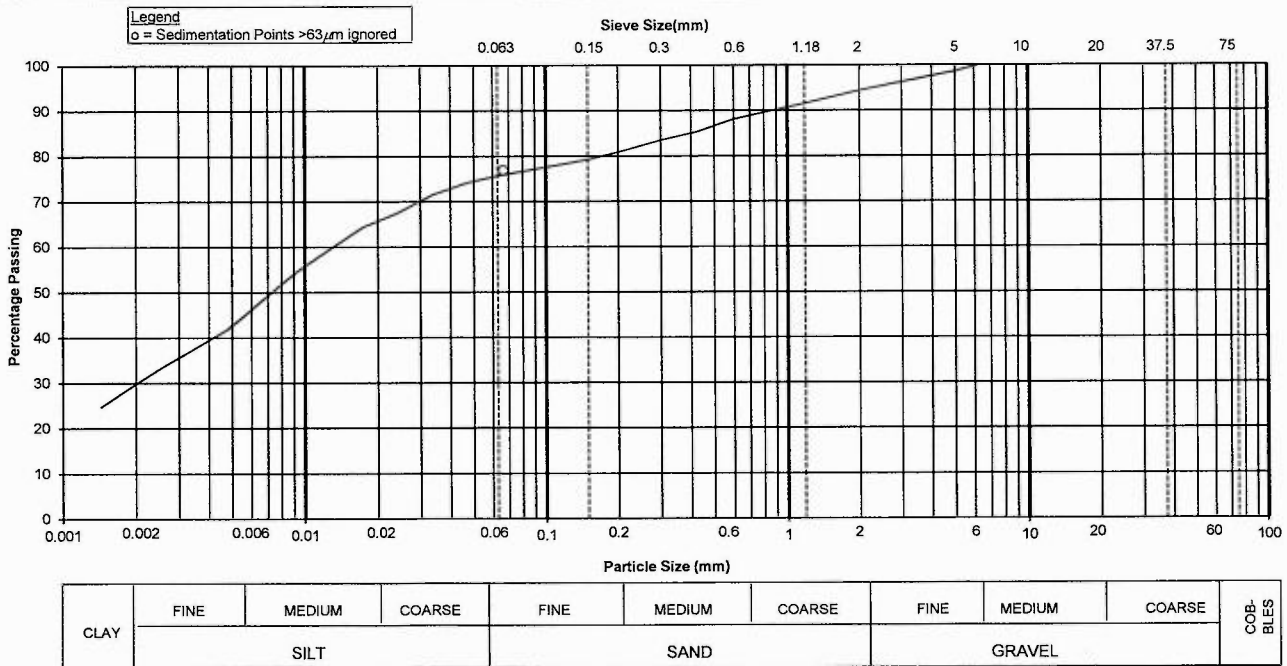
Description : Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
 Sieve Method : Method A [^]Upon request * Delete as appropriate

[‡] Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	[^] Expanded Uncertainty of the Percent Passing (%)	[^] Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	[^] Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	[^] Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-				
75.0 mm	100	-	-				
63.0 mm	100	-	-				
50.0 mm	100	-	-				
37.5 mm	100	-	-				
28.0 mm	100	-	-				
20.0 mm	100	-	-	0.0664	-	77	-
14.0 mm	100	-	-	0.0474	-	74	-
10.0 mm	100	-	-	0.0338	-	72	-
6.30 mm	100	-	-	0.0242	-	68	-
5.00 mm	99	-	-	0.0173	-	64	-
3.35 mm	97	-	-	0.0092	-	54	-
2.00 mm	94	-	-	0.0048	-	42	-
1.18 mm	92	-	-	0.0024	-	33	-
600 µm	88	-	-	0.0014	-	25	-
425 µm	85	-	-				
300 µm	83	-	-				
212 µm	81	-	-				
150 µm	79	-	-				
63 µm	76	-	-				
0 µm	0	-	-				

Specific Gravity (# if assumed) : 2.65 #
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate
 Sampling History : As received
 The presence of any visible organic matter in the soil : None

SUMMARY :
 Gravel (%) : 6
 Sand (%) : 18
 Silt (%) : 47
 Clay (%) : 29



Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

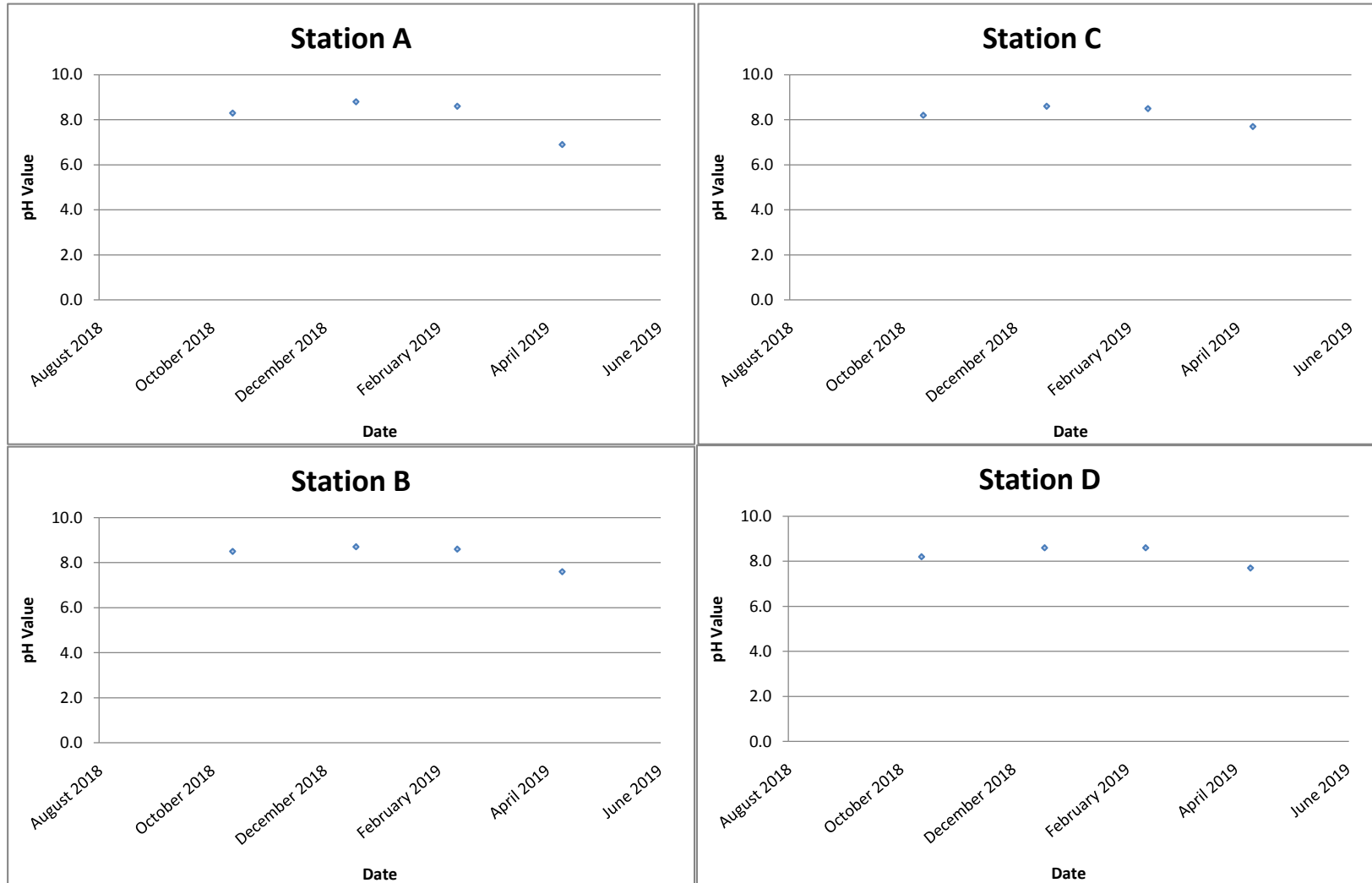
Technician : Chris Chan
 Date : 17/04/2019

Checked By : T K Lam
 Date : 24/04/2019

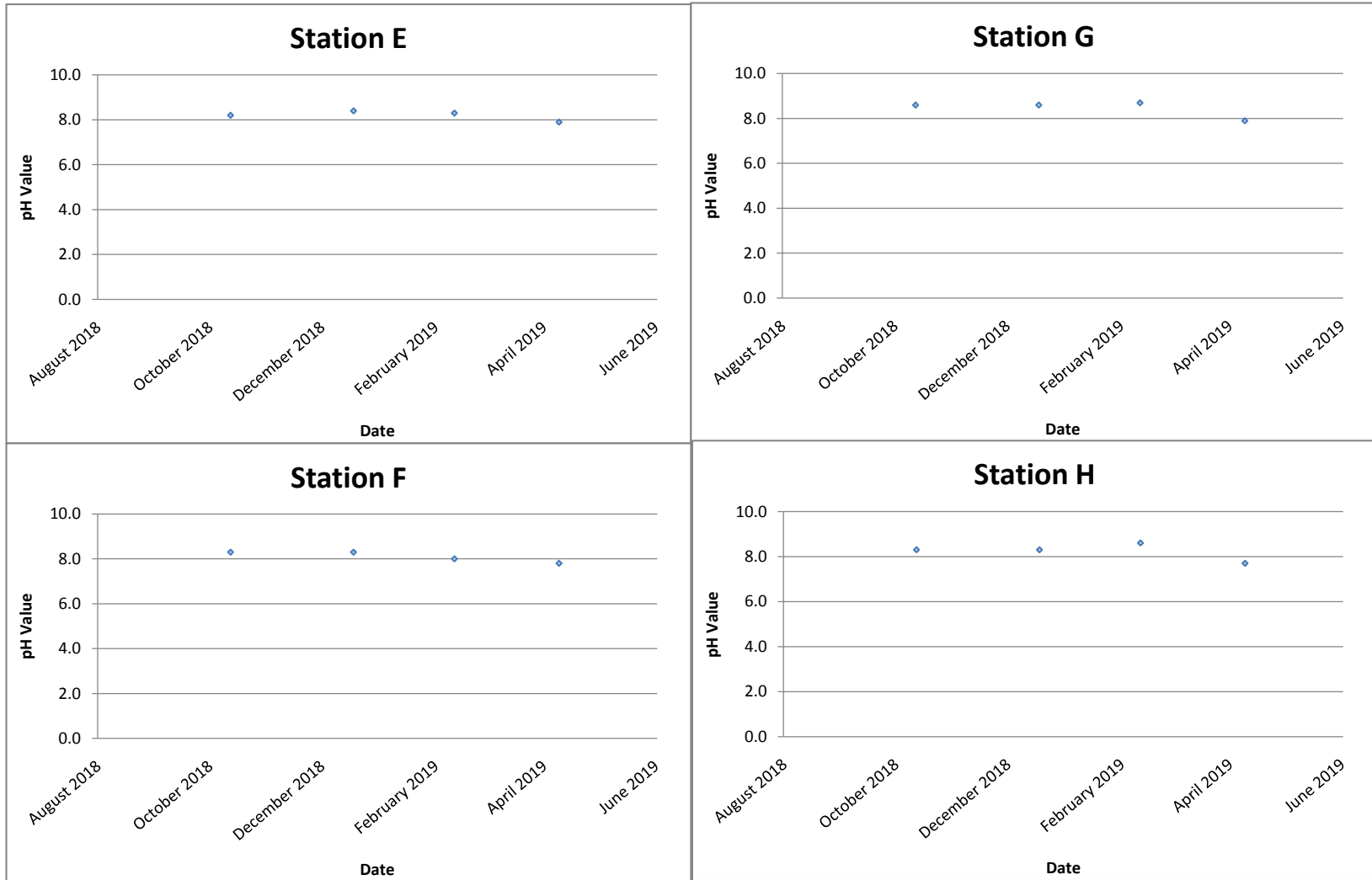
Approved By : Chung Hei Wing
 Date : 24/04/2019

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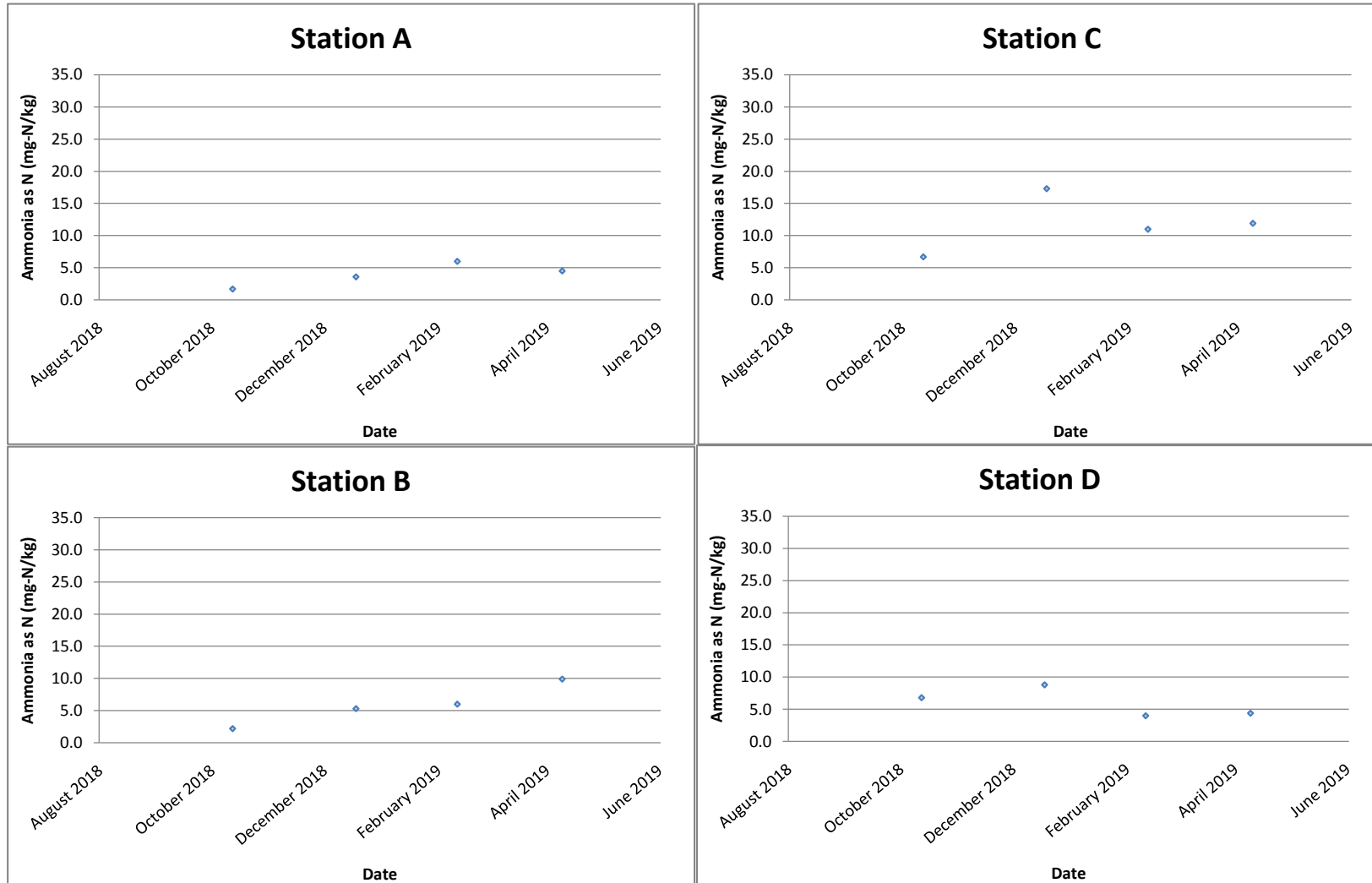
pH value



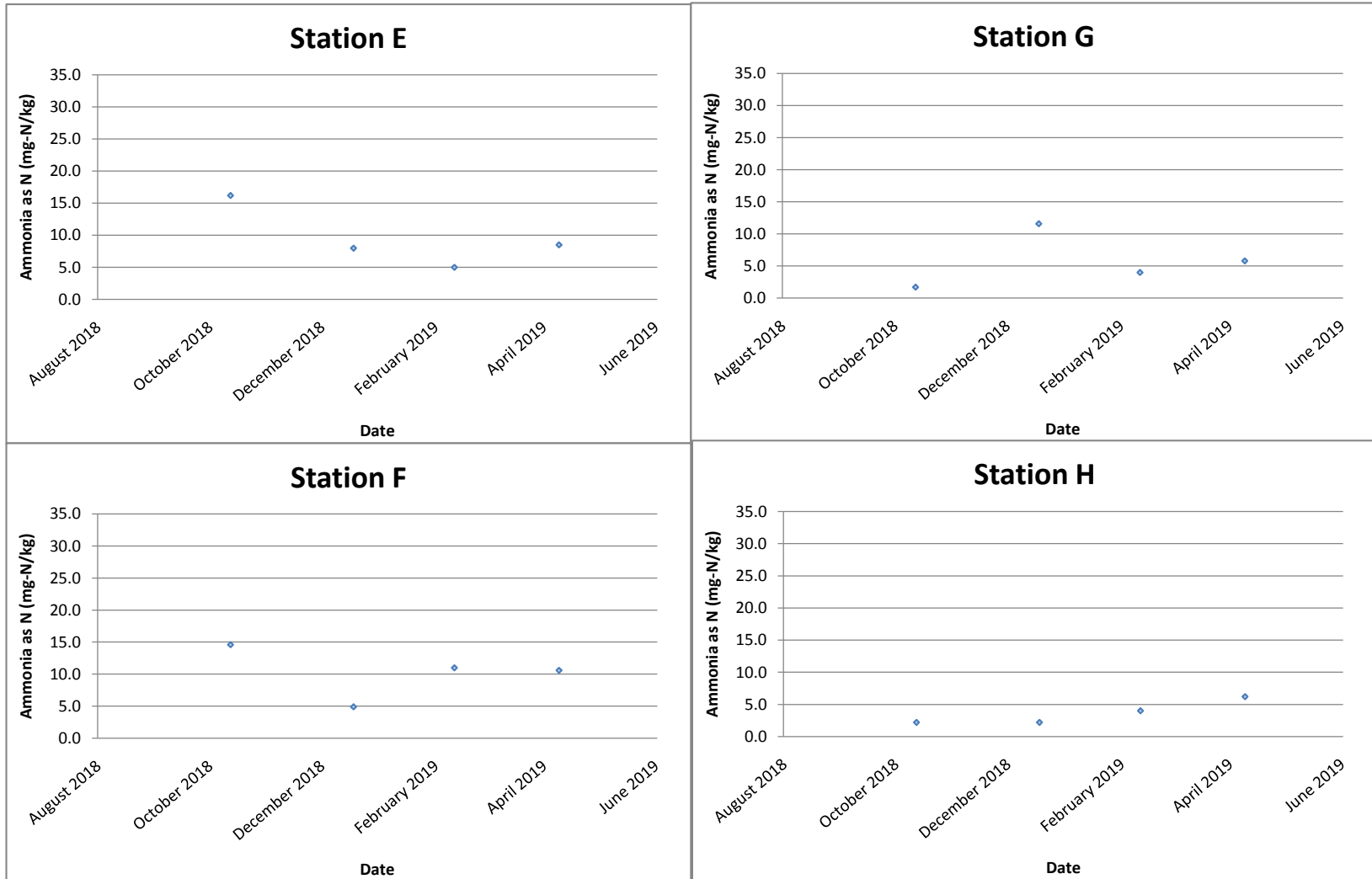
pH value



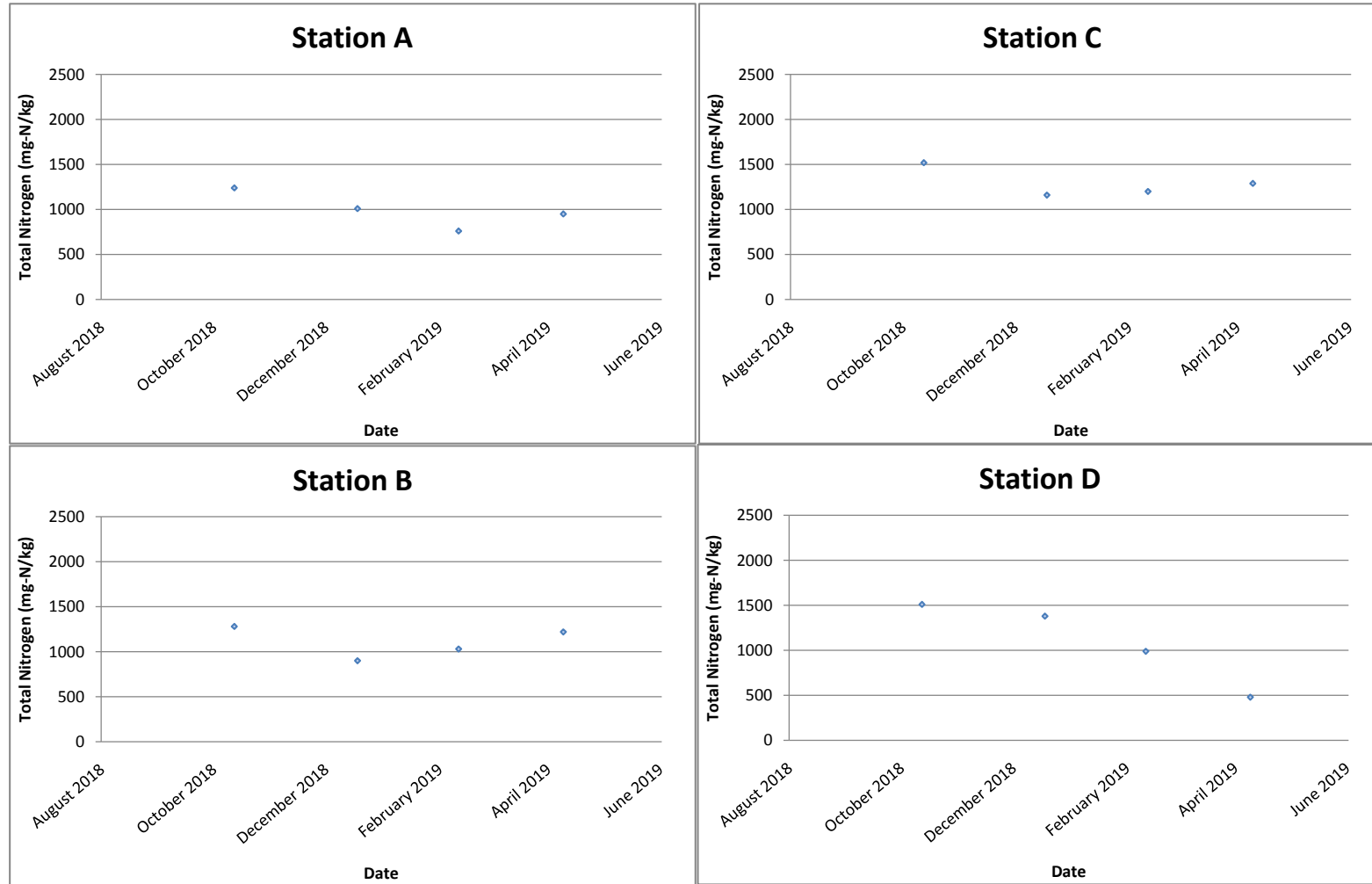
Ammonia Nitrogen (mg-N/kg)



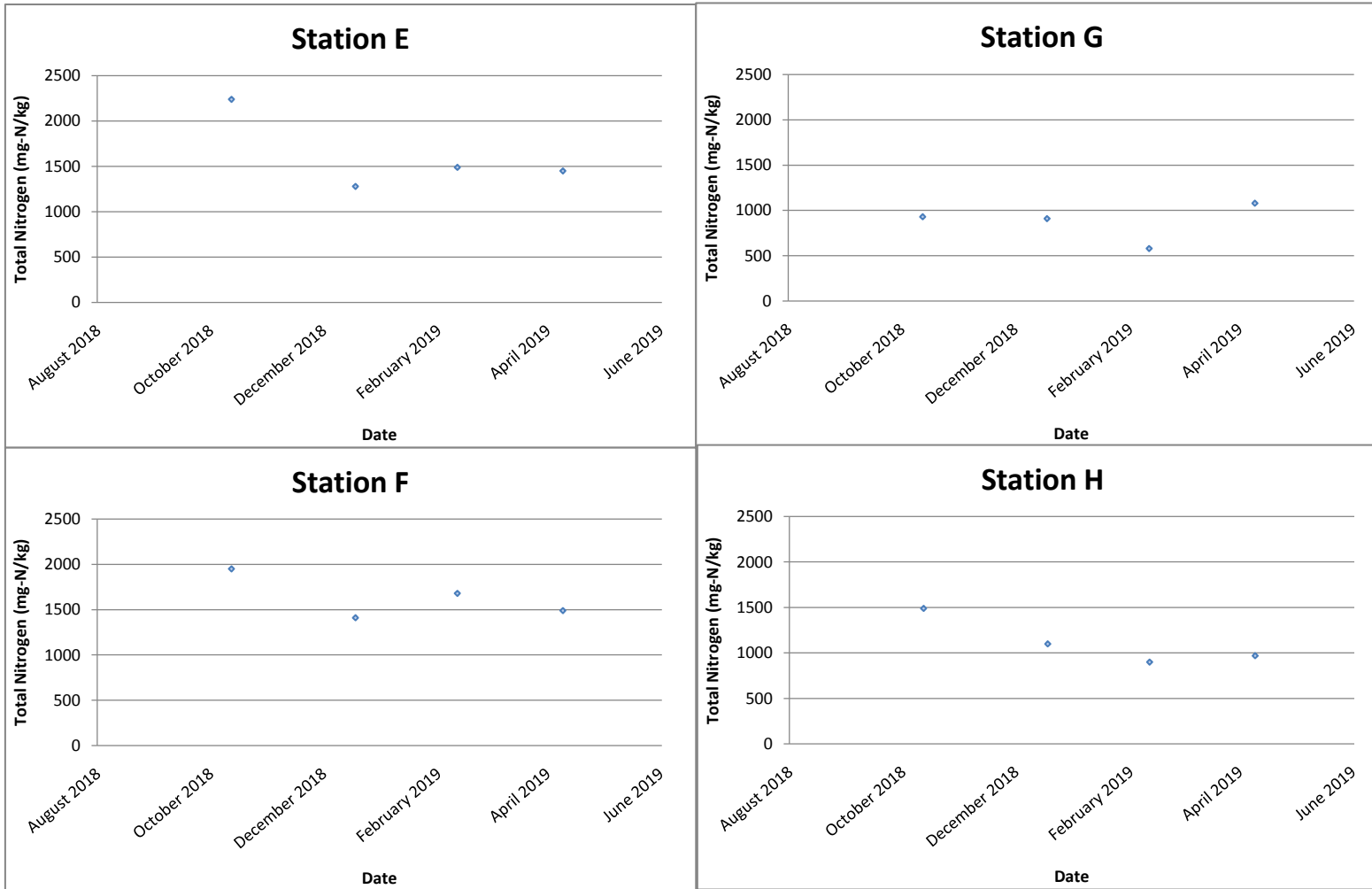
Ammonia Nitrogen (mg-N/kg)



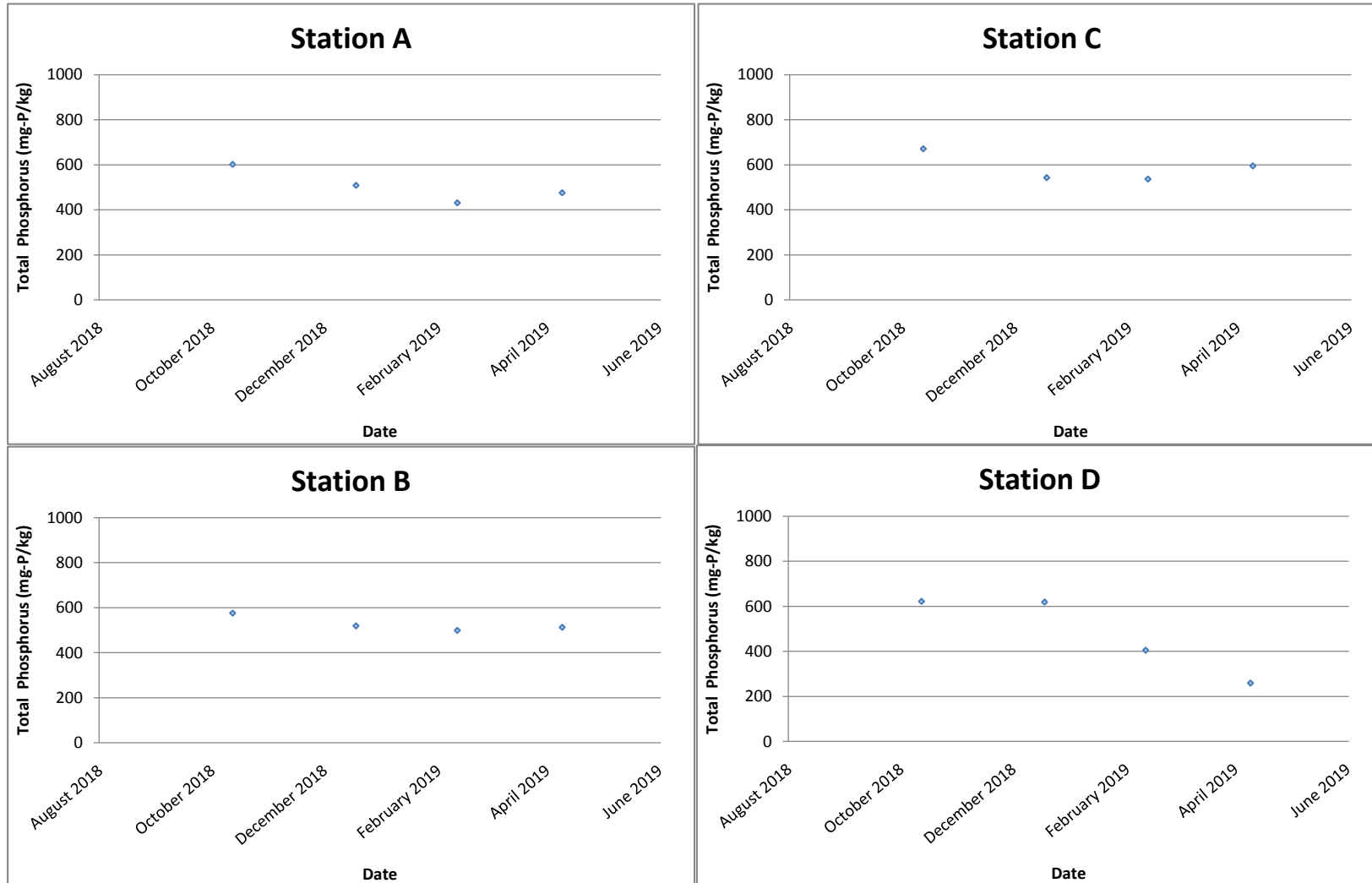
Total Nitrogen (mg-N/kg)



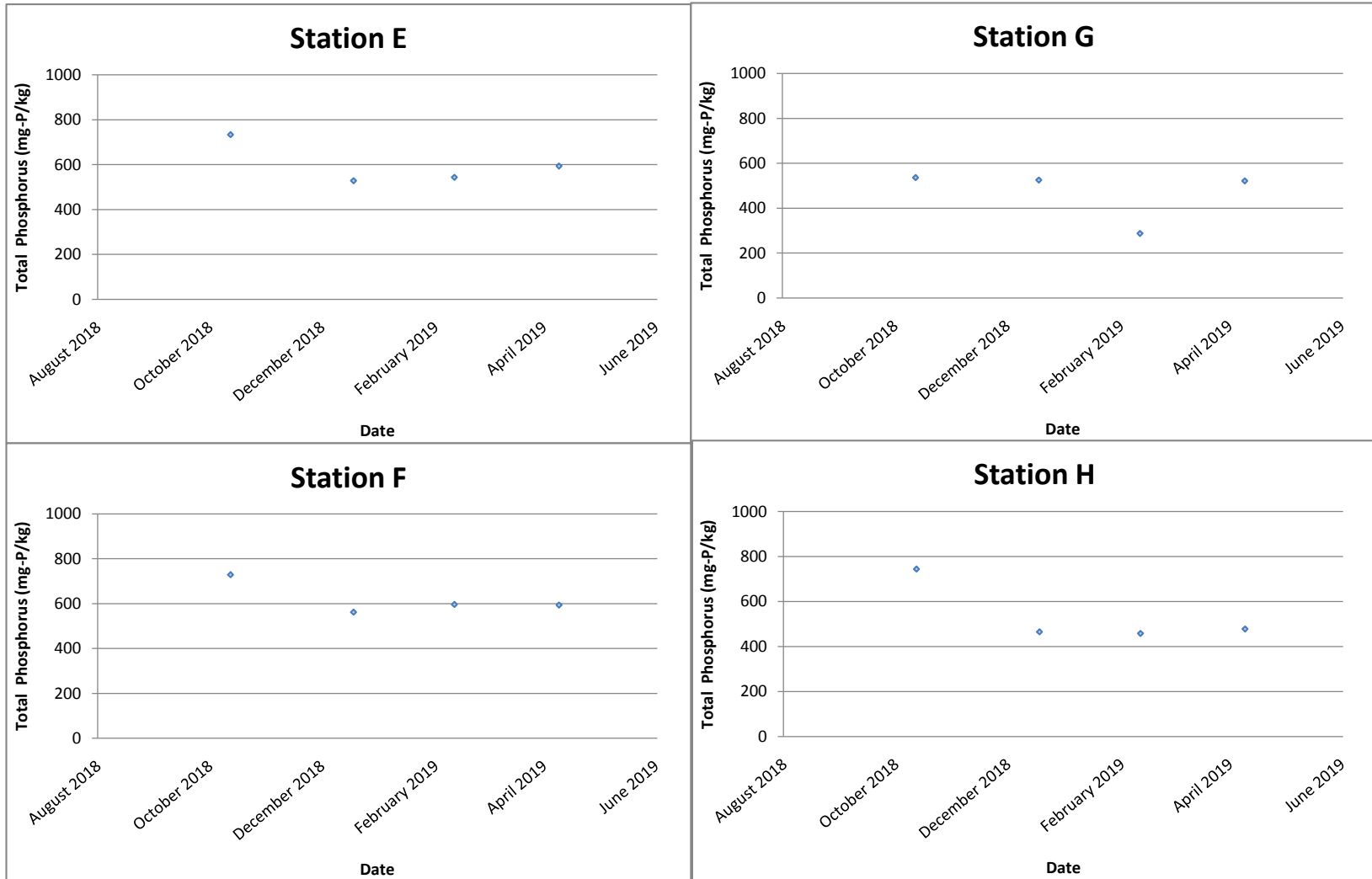
Total Nitrogen (mg-N/kg)



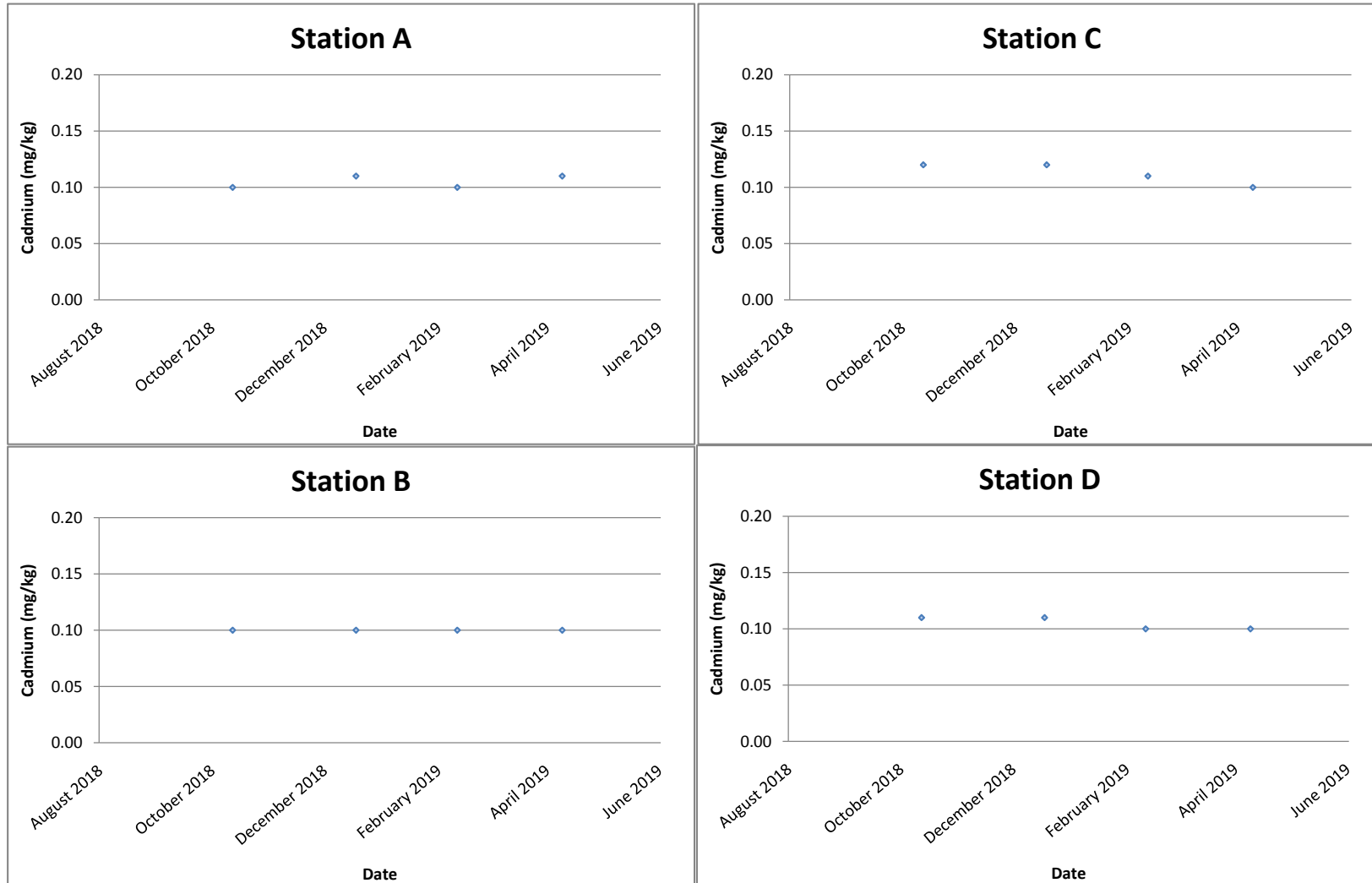
Total Phosphorus (mg-P/kg)



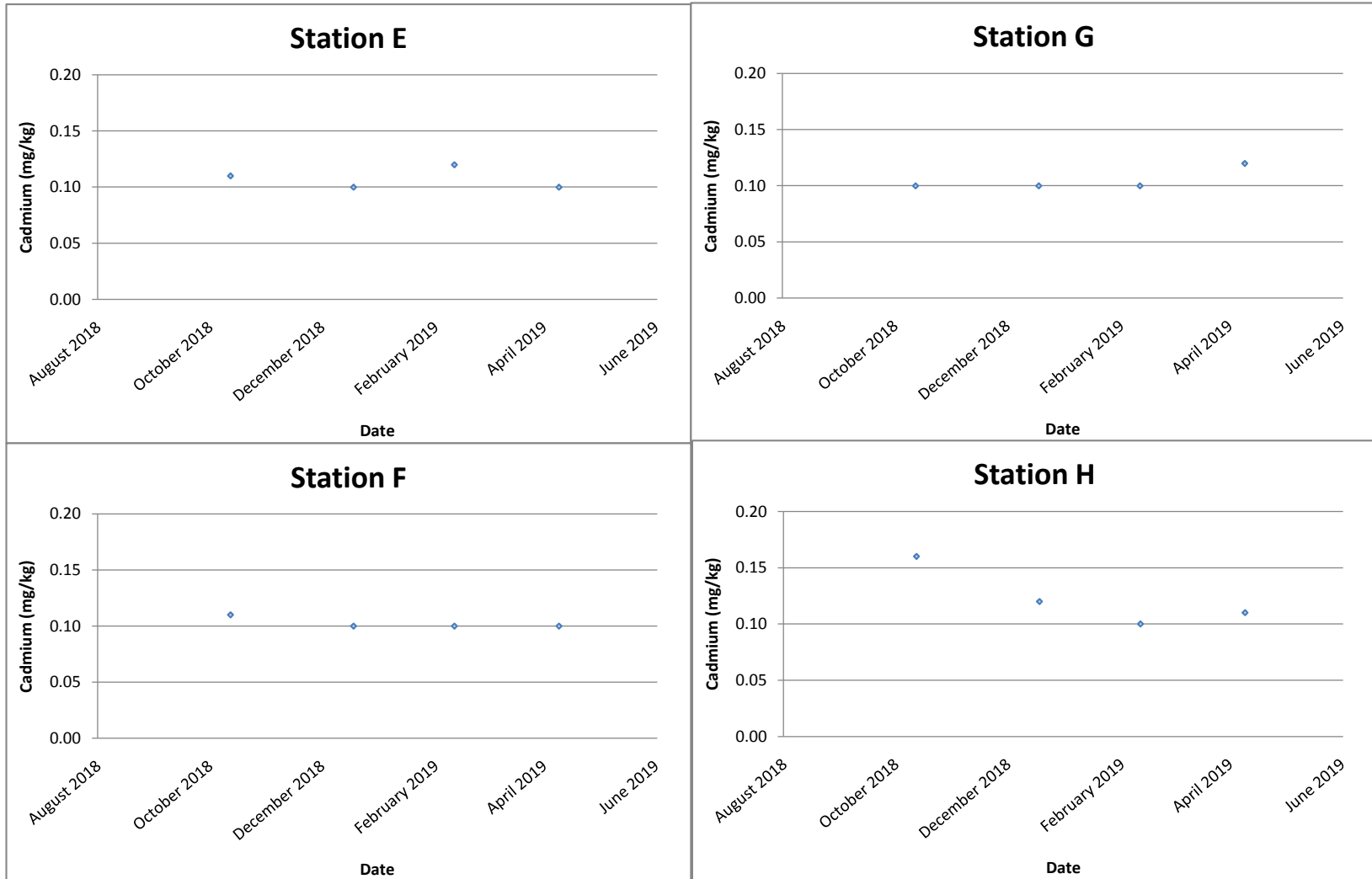
Total Phosphorus (mg-P/kg)



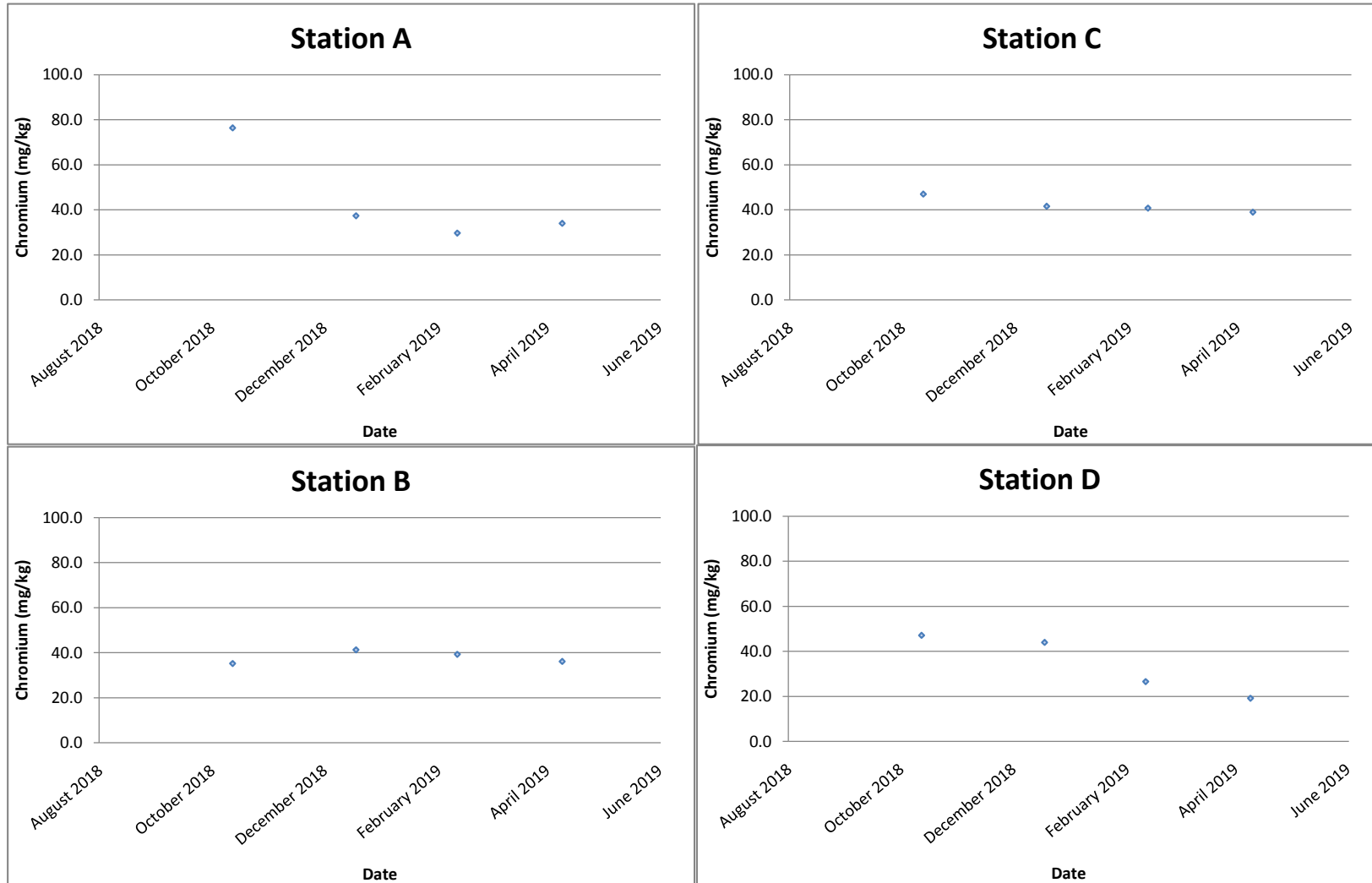
Cadmium (mg/kg)



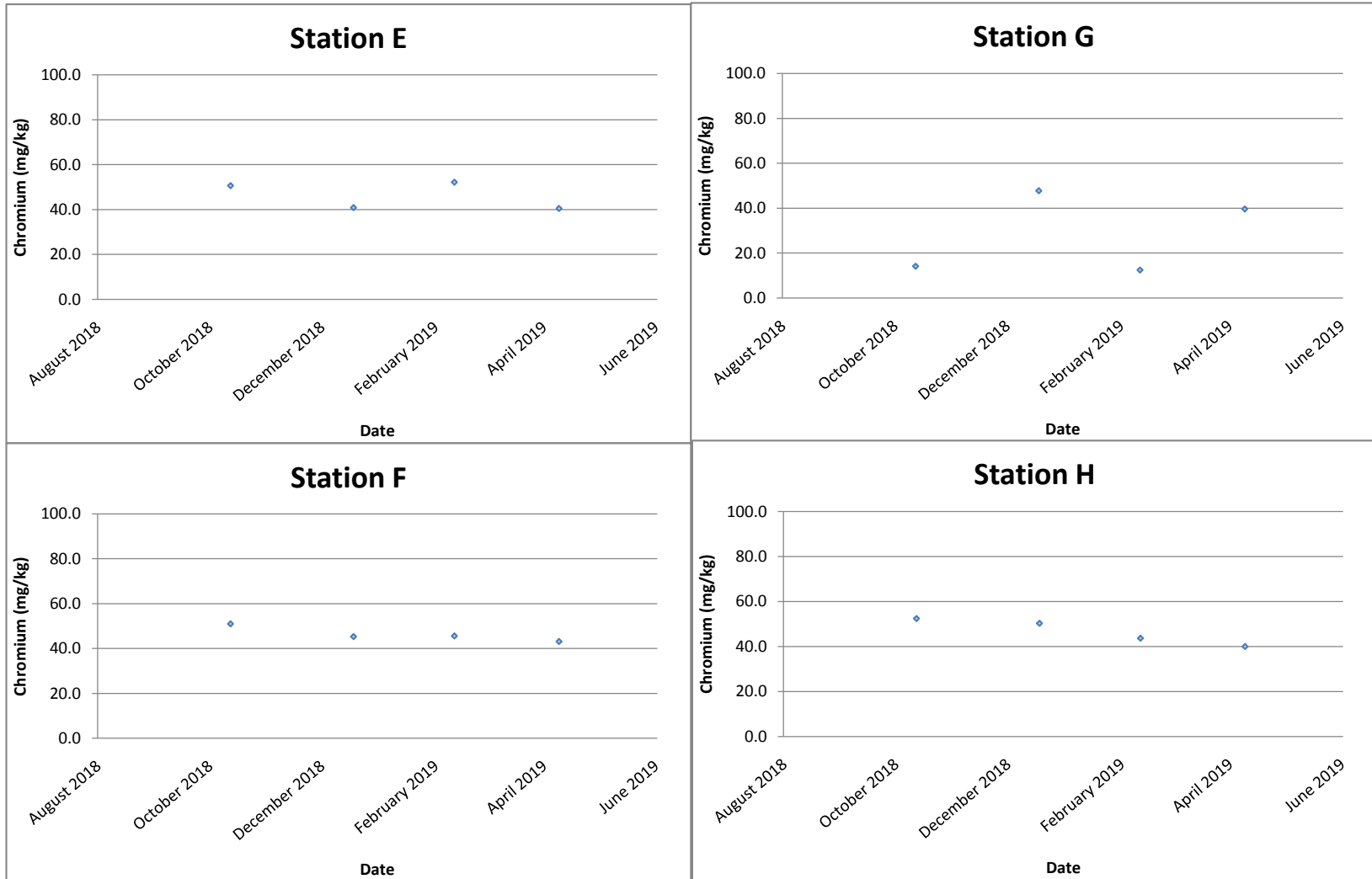
Cadmium (mg/kg)



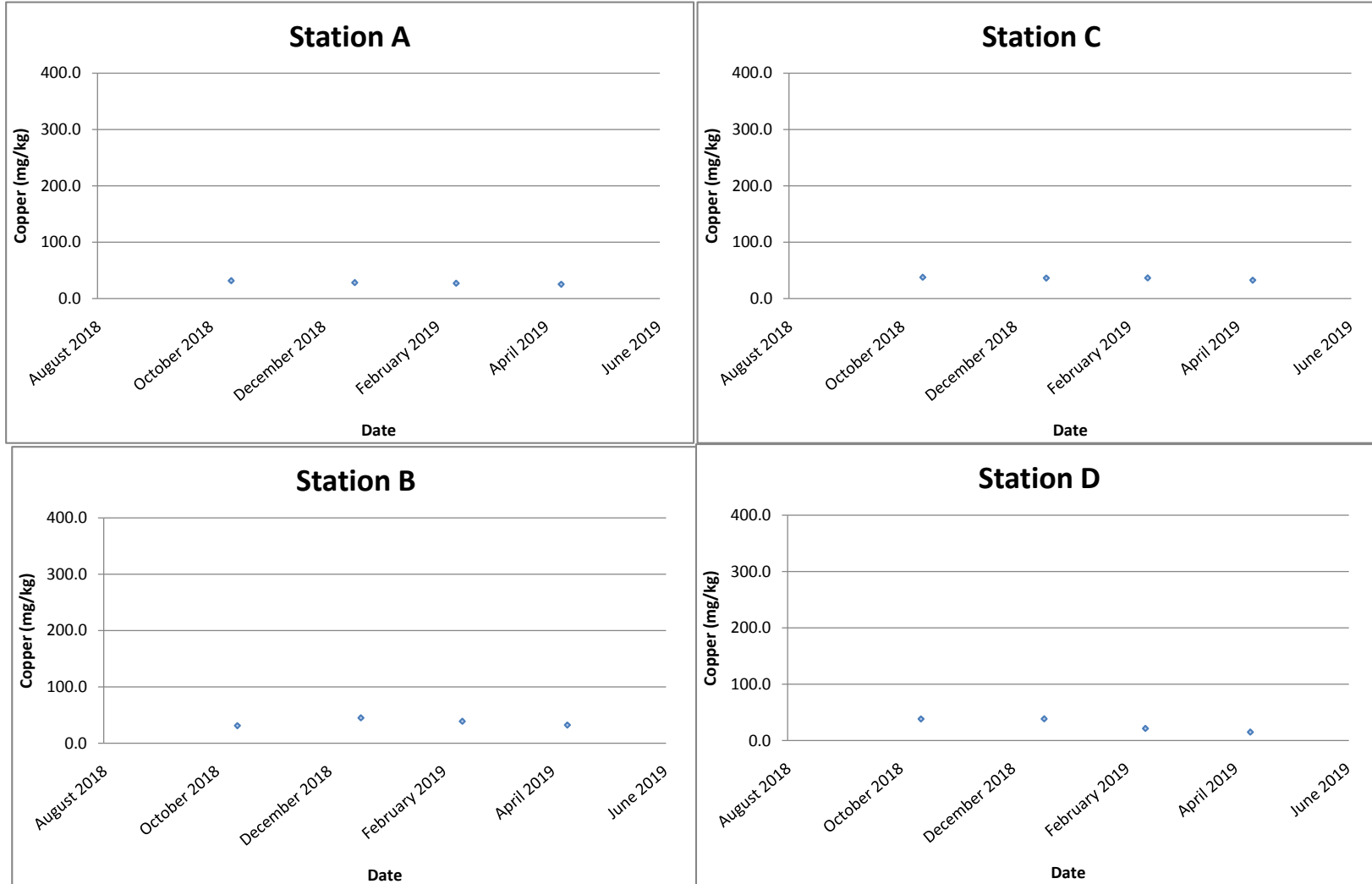
Chromium (mg/kg)



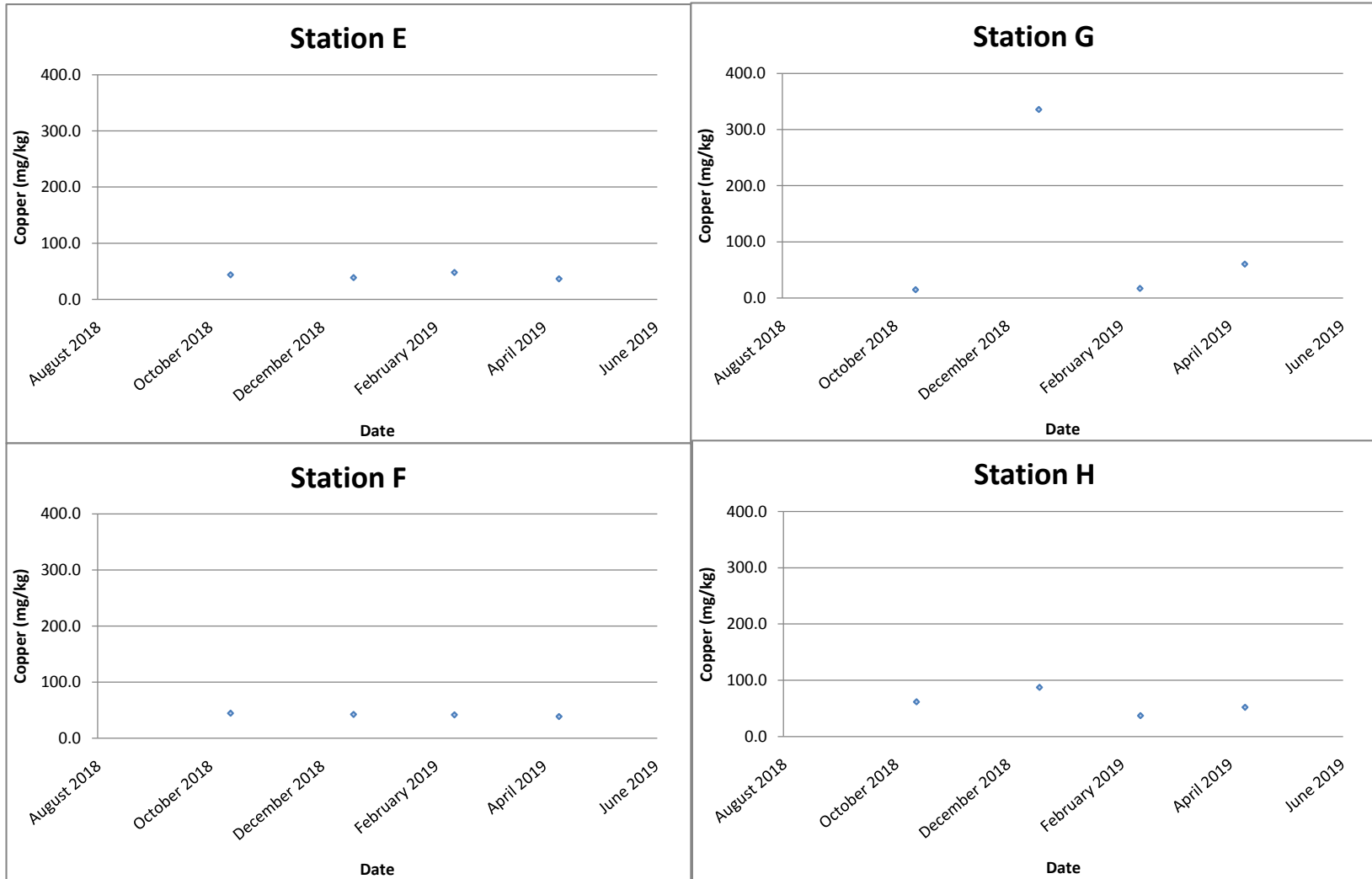
Chromium (mg/kg)



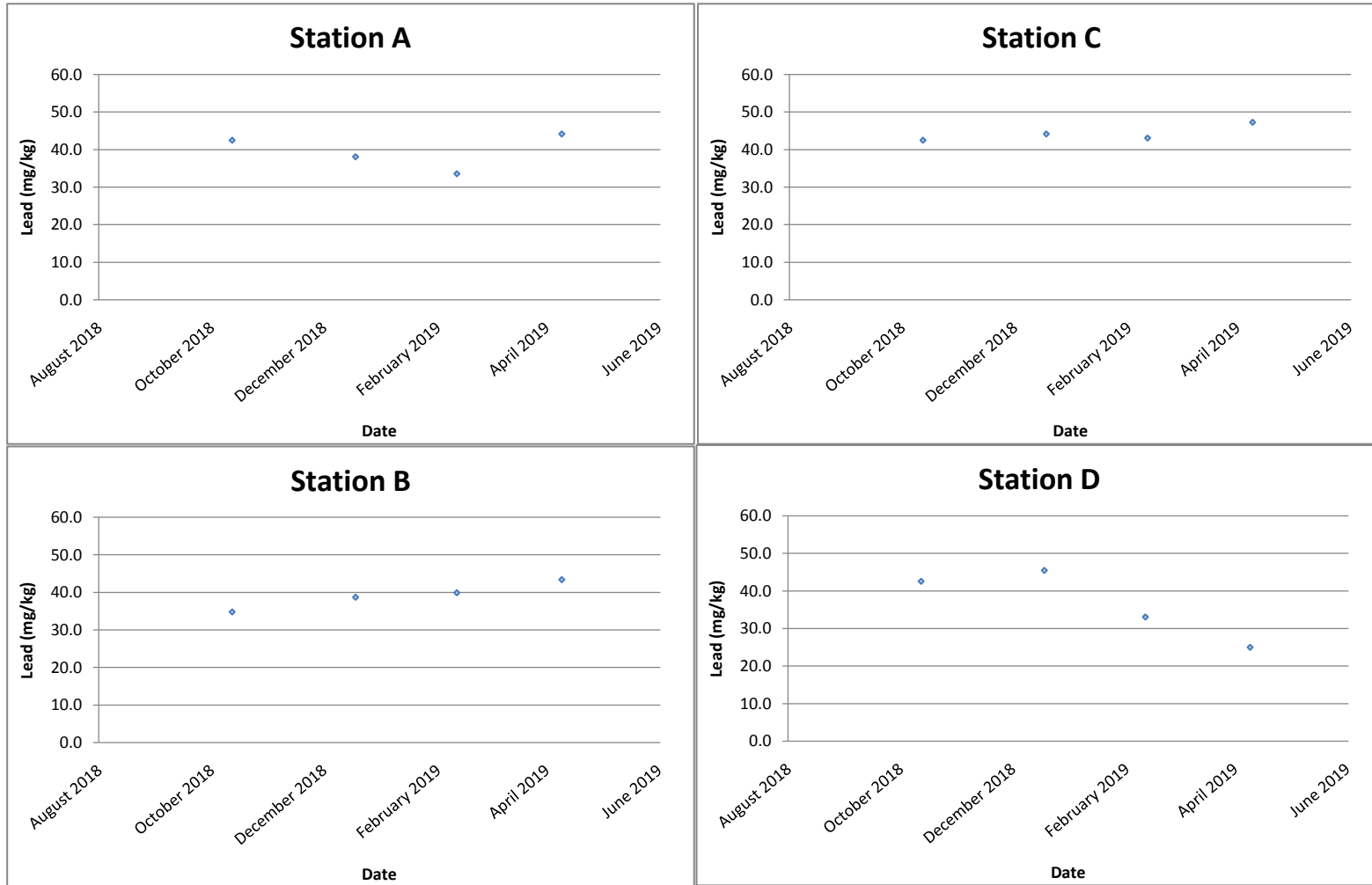
Copper (mg/kg)



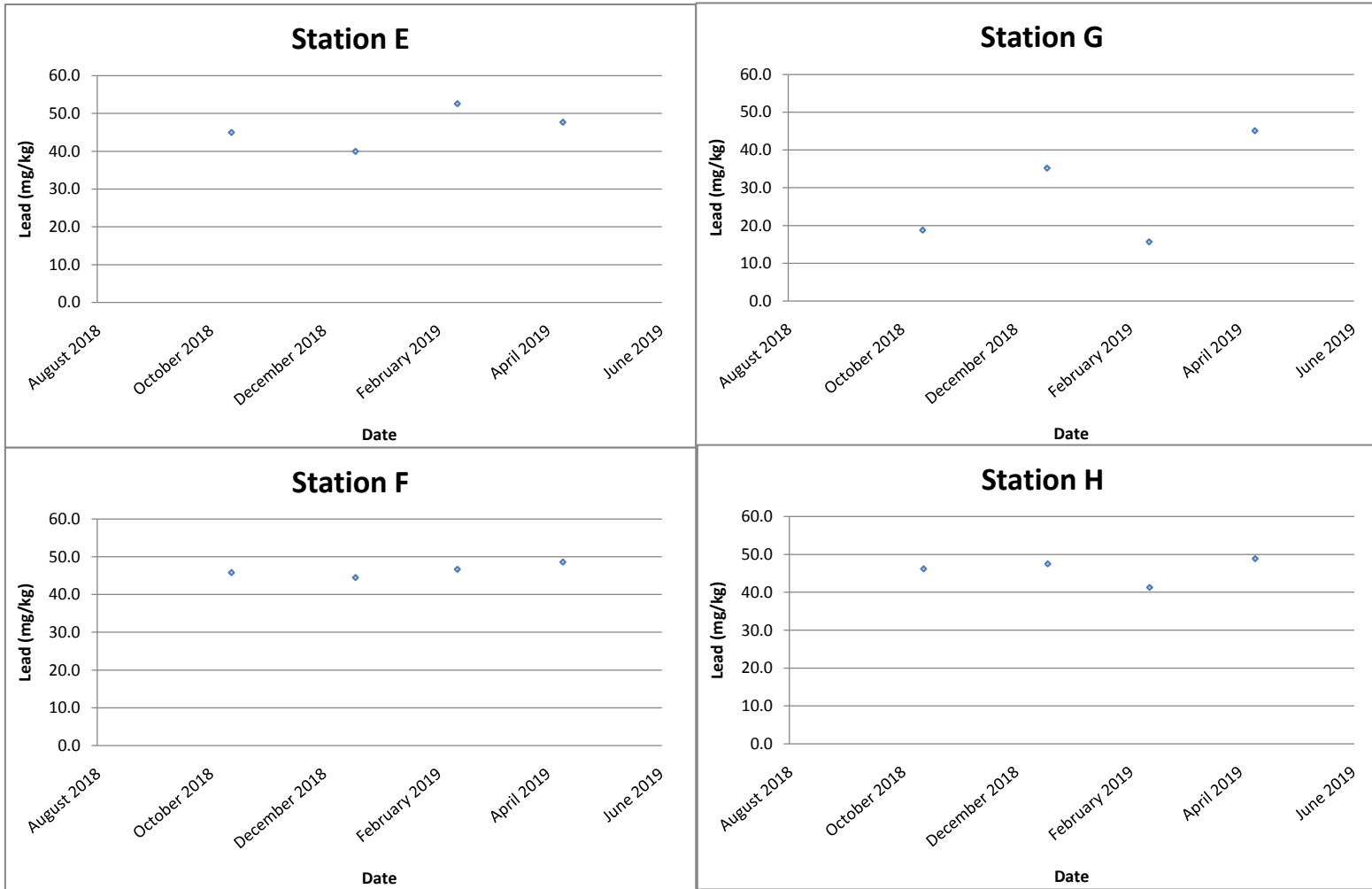
Copper (mg/kg)



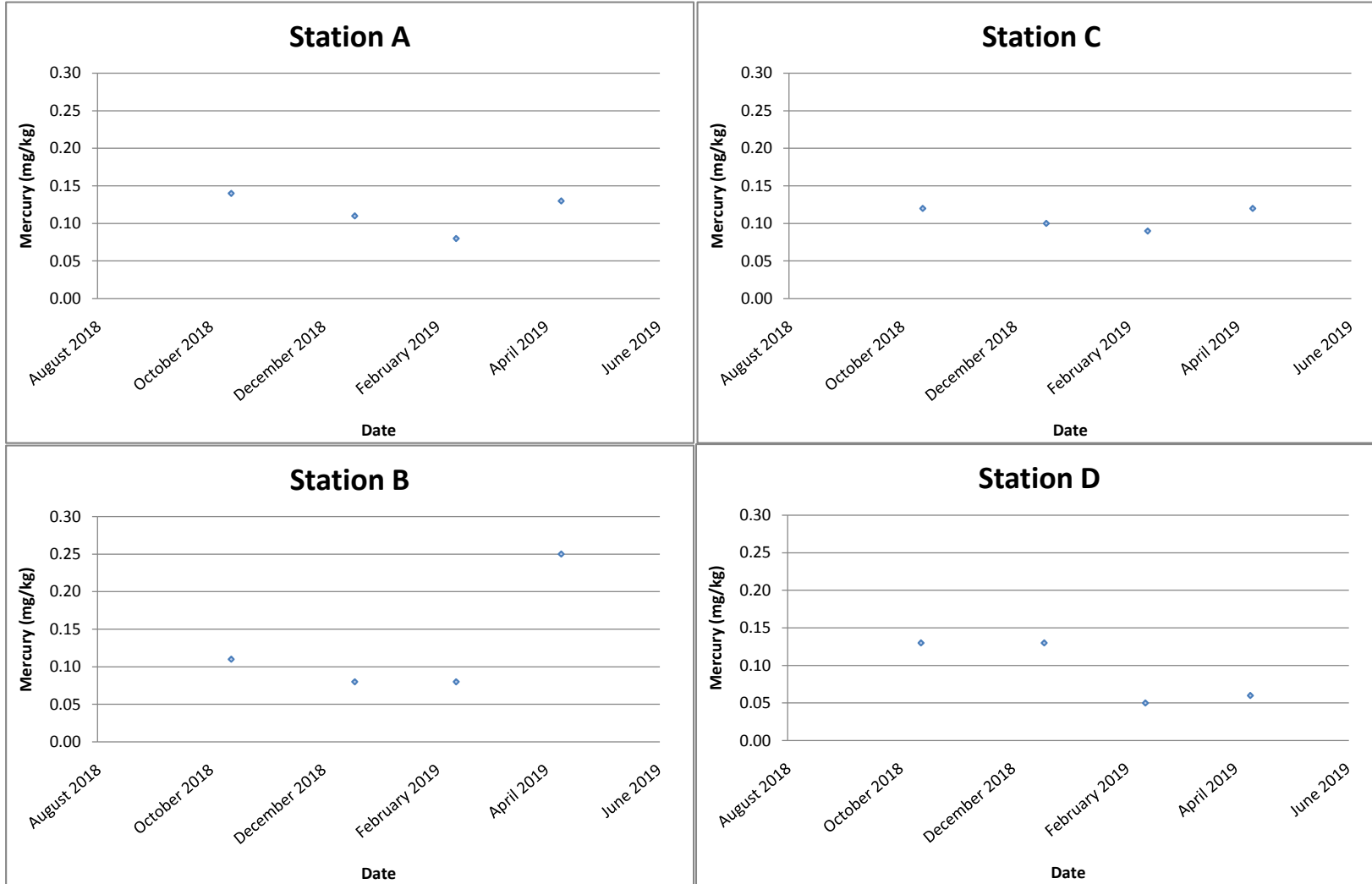
Lead (mg/kg)



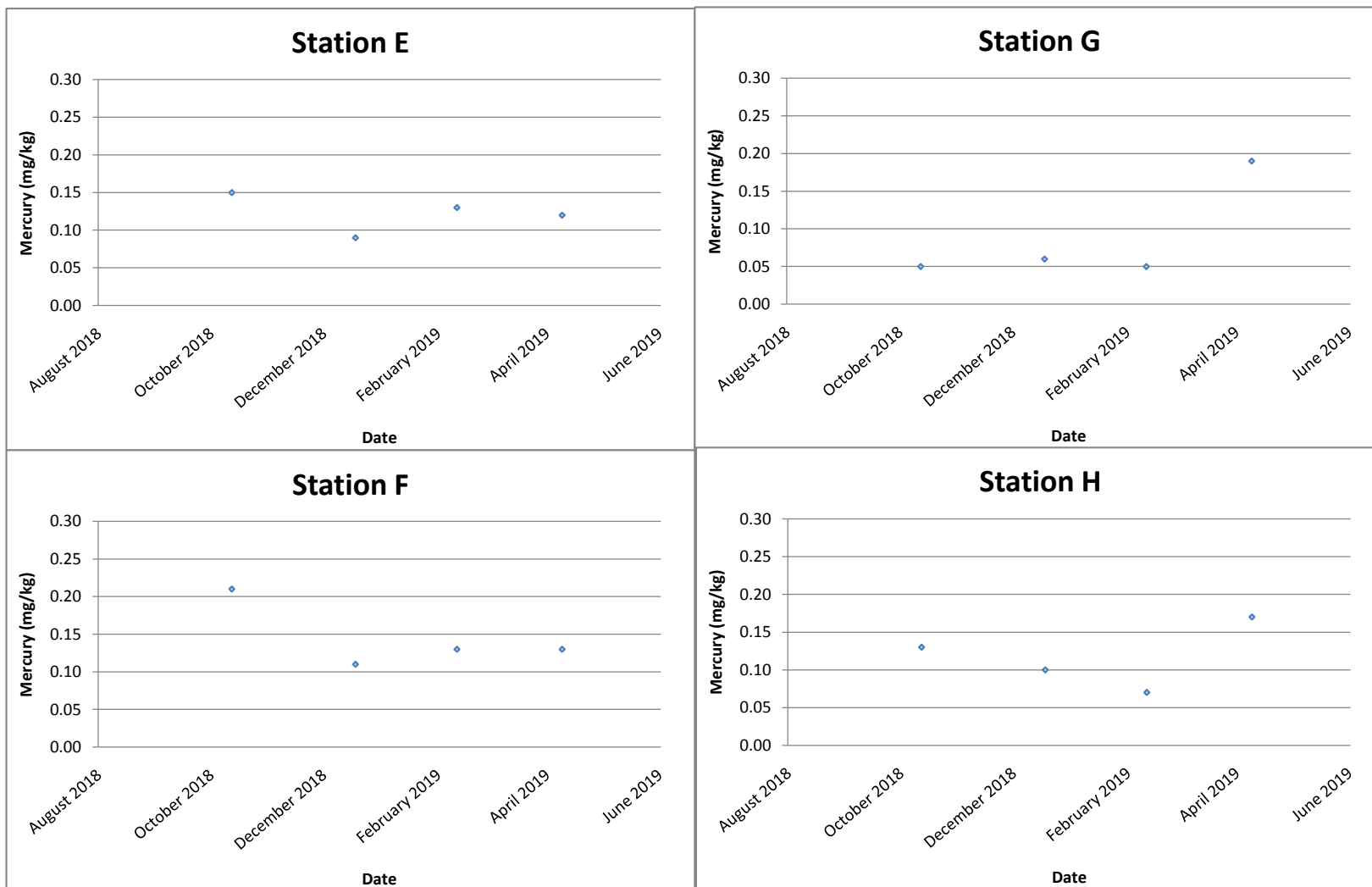
Lead (mg/kg)



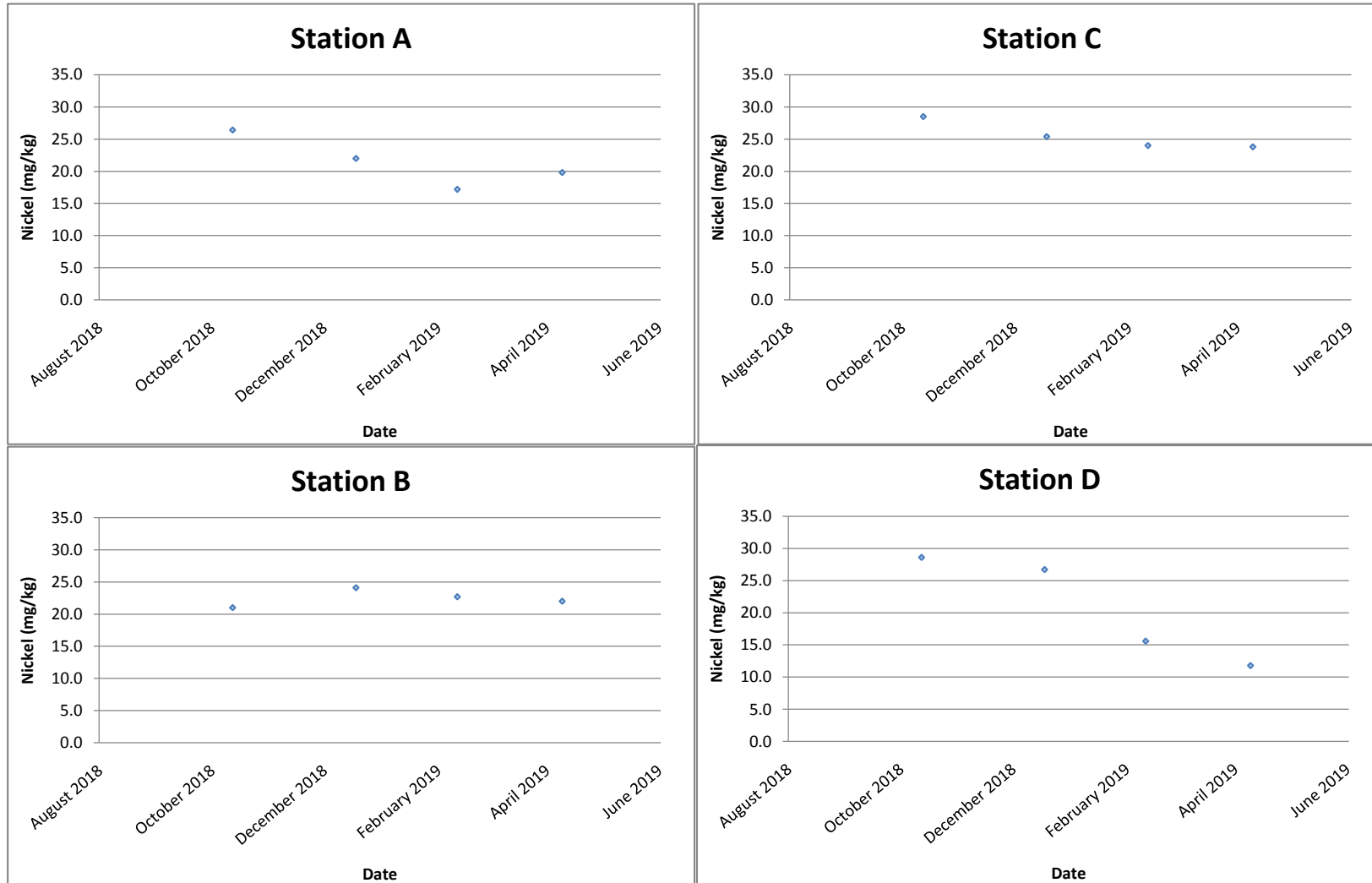
Mercury (mg/kg)



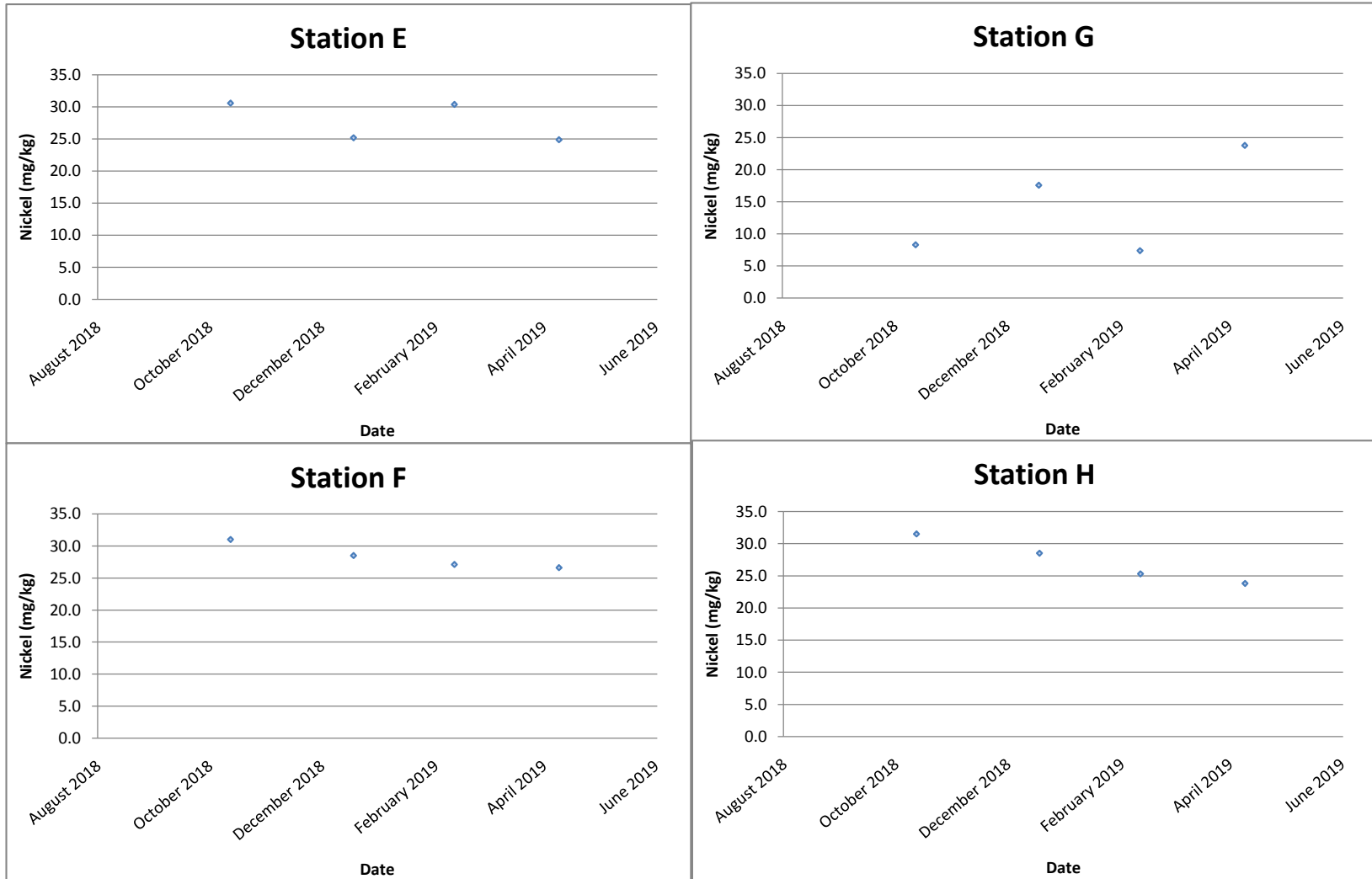
Mercury (mg/kg)



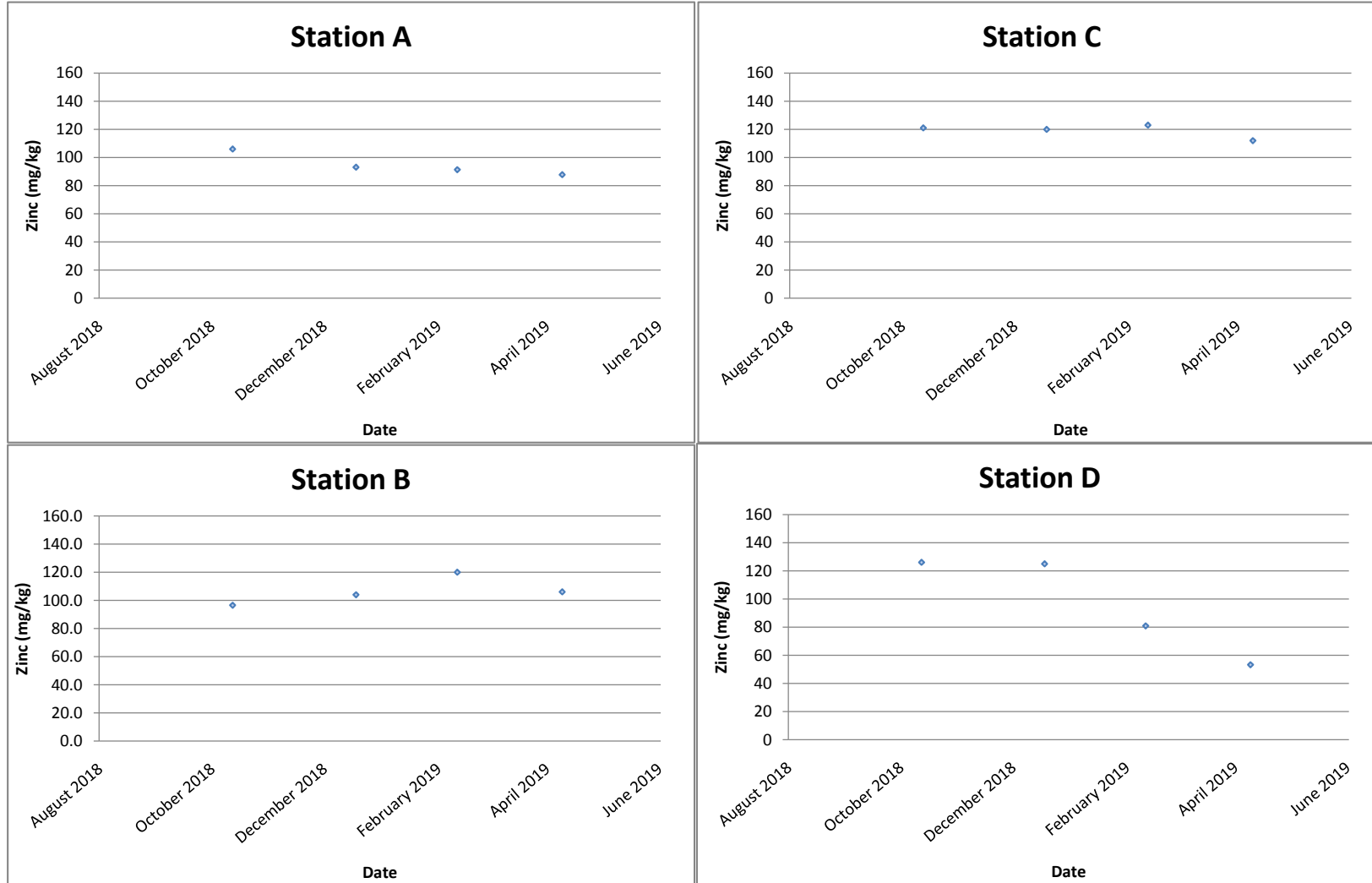
Nickel (mg/kg)



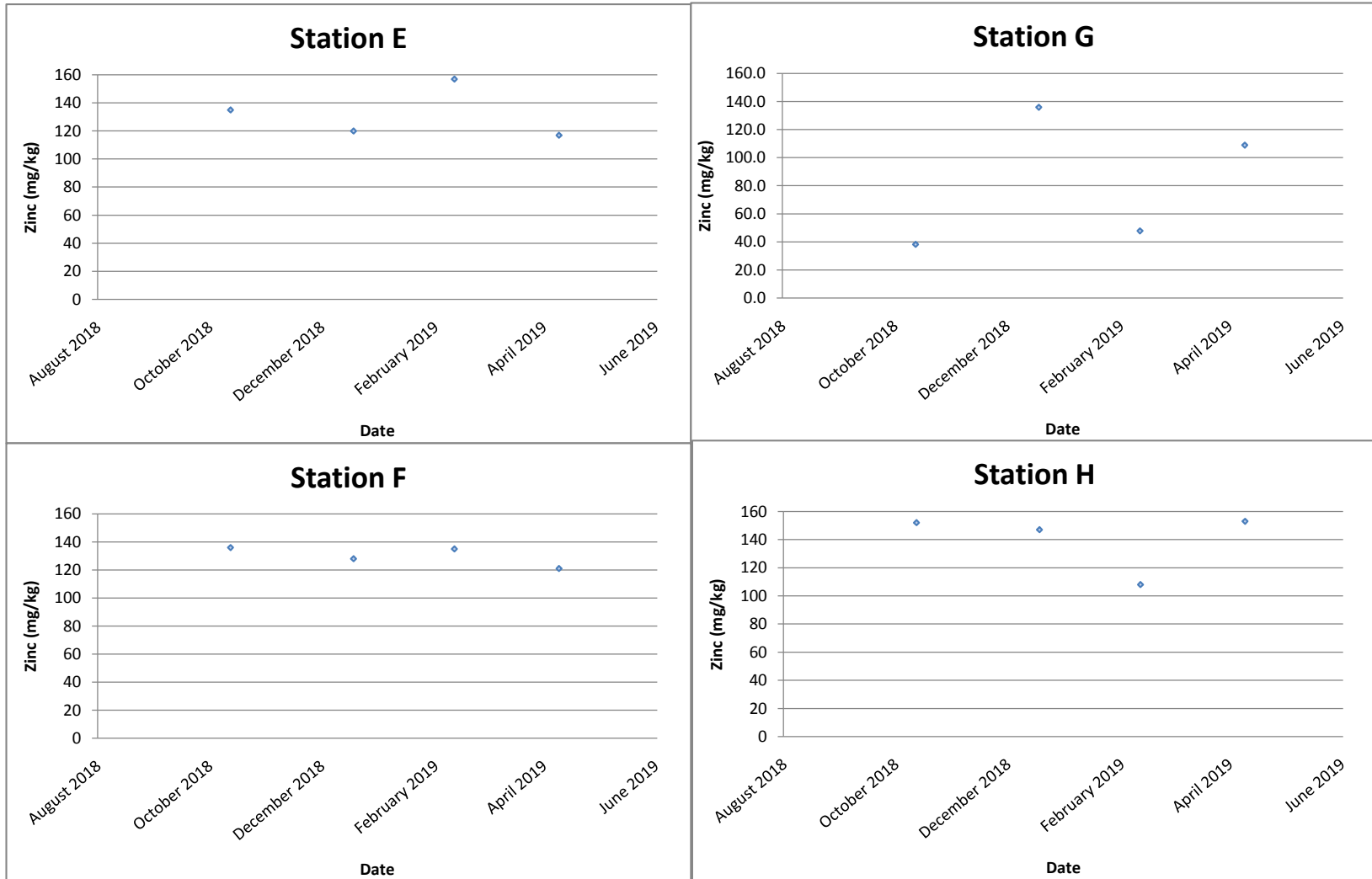
Nickel (mg/kg)



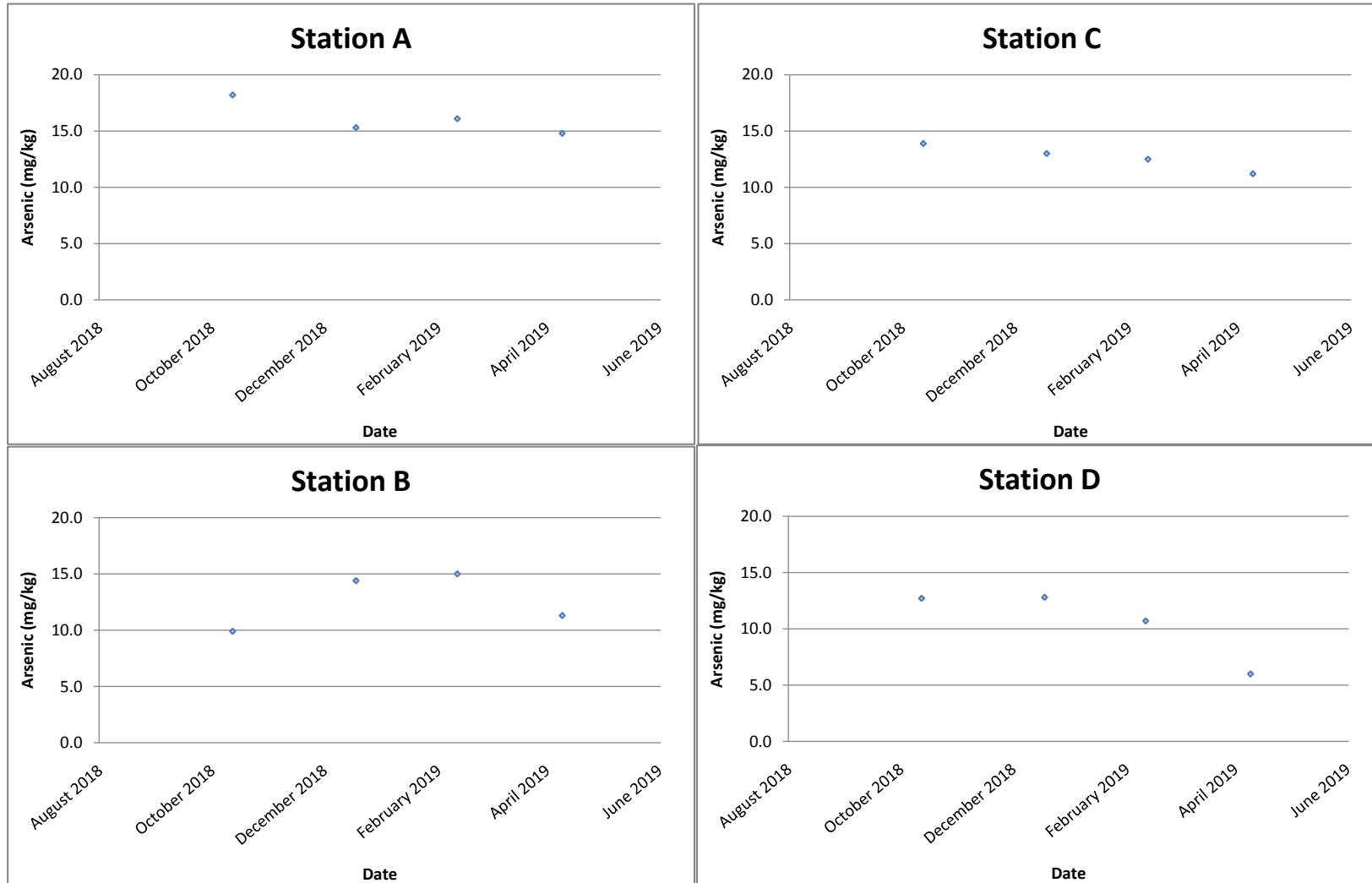
Zinc (mg/kg)



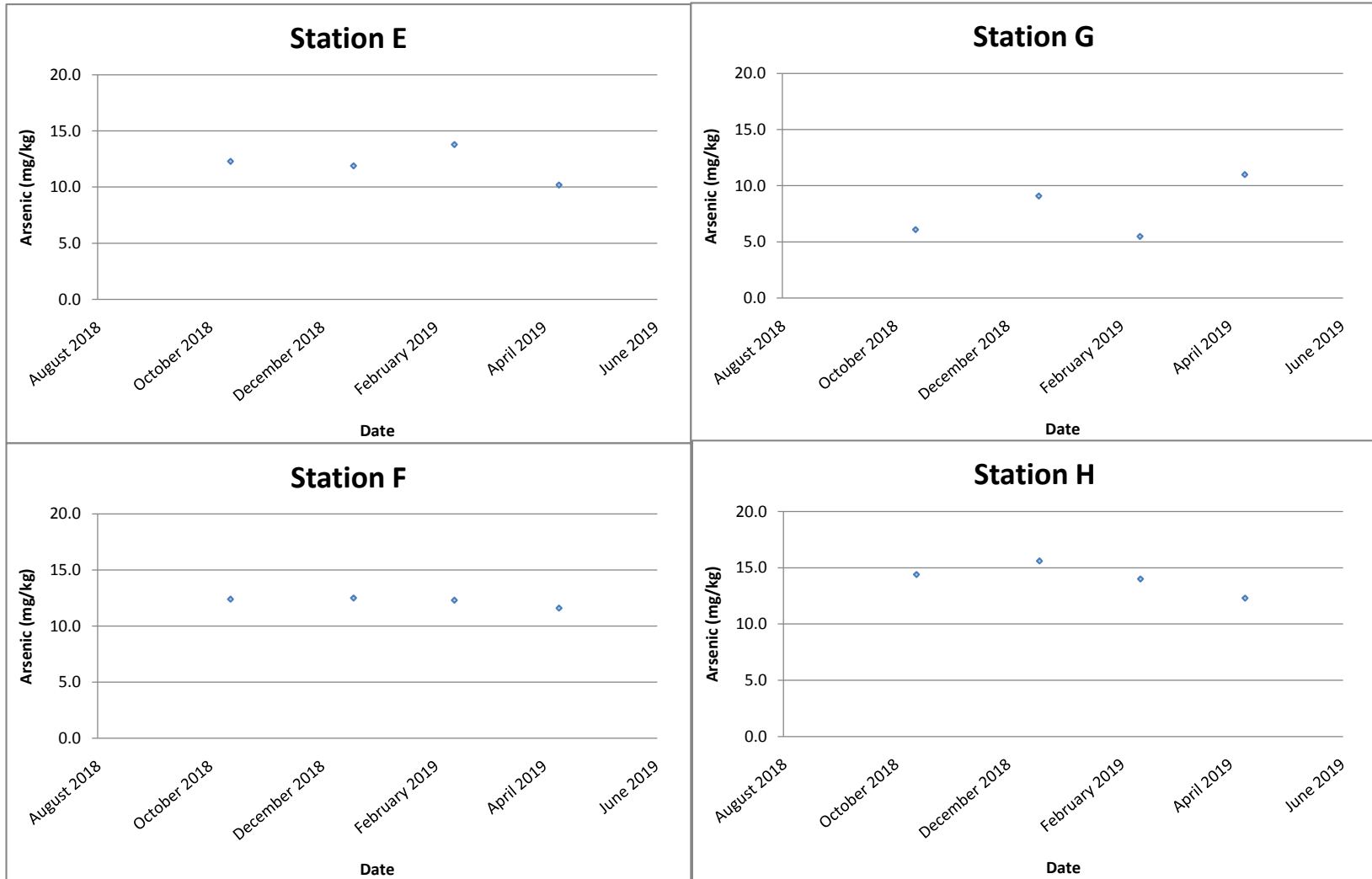
Zinc (mg/kg)



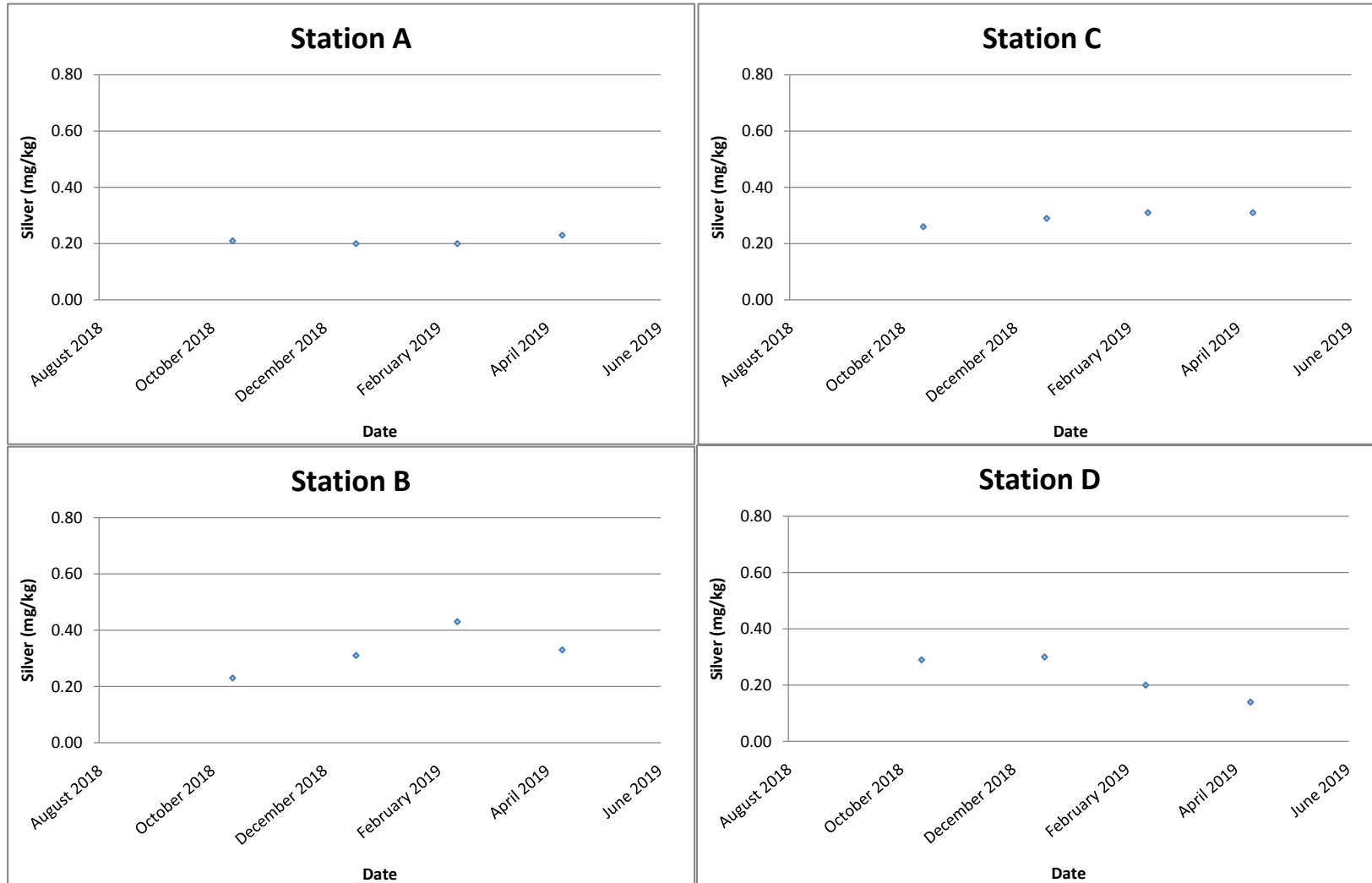
Arsenic (mg/kg)



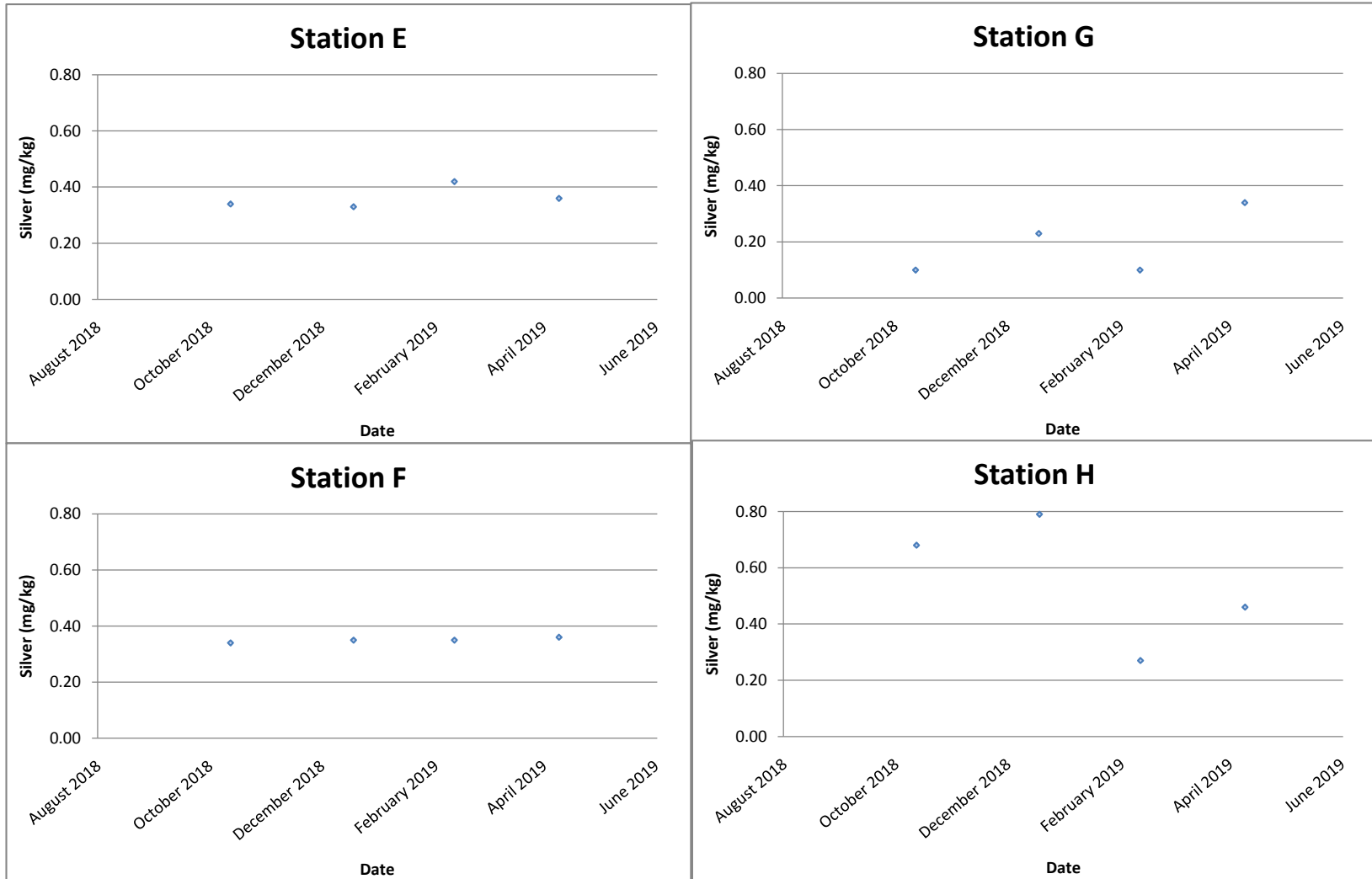
Arsenic (mg/kg)



Silver (mg/kg)



Silver (mg/kg)



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Report No.: 0041/17/ED/0442C

Appendix H Benthic Survey Report



Benthic Faunal Monitoring

Conducted in April 2019

Summary Report

Abundance

A total of 360 macrobenthic organisms were recorded from the eight monitoring stations during the April 2019 monitoring period. Figure 1 shows the abundance distribution across monitoring periods and stations. Results of the present monitoring period remained to be lower compared to the baseline data [March 2004 (dry season) and August 2004 (wet season)]. Increasing abundance, however, was observed since December 2018, which can be attributed to calmer weather conditions during these monitoring periods. Previous results also showed that decreasing trend in the abundance was observed during wet season monitoring periods. However, this observed seasonal difference is not statistically significant ($F = 1.26$, $F_{crit} = 2.09$, $p\text{-value} = 0.28$, $\alpha = 0.05$).

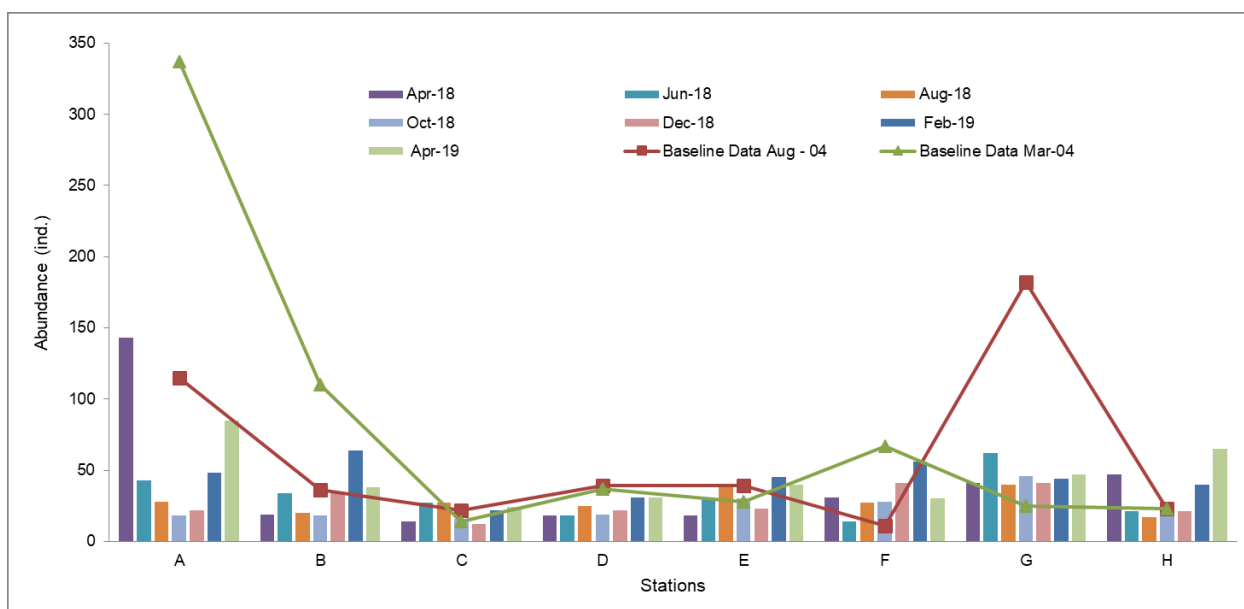


Figure 1. Total abundance (ind.) of benthic organisms collected in the eight monitoring stations, August 2004, April, June, August, October and December in 2018, and February & April in 2019

Similar to the previous monitoring periods, however, a more apparent variation ($F = 2.84$, $F_{crit} = 2.16$, $p\text{-value} = 0.01$, $\alpha = 0.05$ across monitoring stations was observed. The lowest abundance with 24 individuals (ind.) was recorded in the impact Station C and the highest (85 ind.) in the reference



Station A. As previously reported, macrobenthic abundance showed correlation with particle size distribution. Relatively higher abundances were recorded in stations with moderately sorted sediments such as Stations A (85 ind.) and H (65 ind.) while lower abundances in stations with well-sorted sediments Stations C (24 ind.) and F (30 ind.). 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.

Biomass

The total wet biomass from eight monitoring stations during the present monitoring period is 119.27g, which is lower compared to the biomass recorded during the previous monitoring period (227.02g). The decrease in total wet biomass might be attributed to the decrease in the number of larger bivalves and increase in the number of smaller annelids. The highest total biomass observed in Station E (38.39g) and the lowest biomass in Station C (0.15g). The relatively higher biomass observed in Station E is contributed by the higher biomass of the bivalve species (*Paphia undulata*). The average biomass (8.51g) of the impact Stations (C and D) was lower compared to the average biomass (17.04g) of the reference stations.

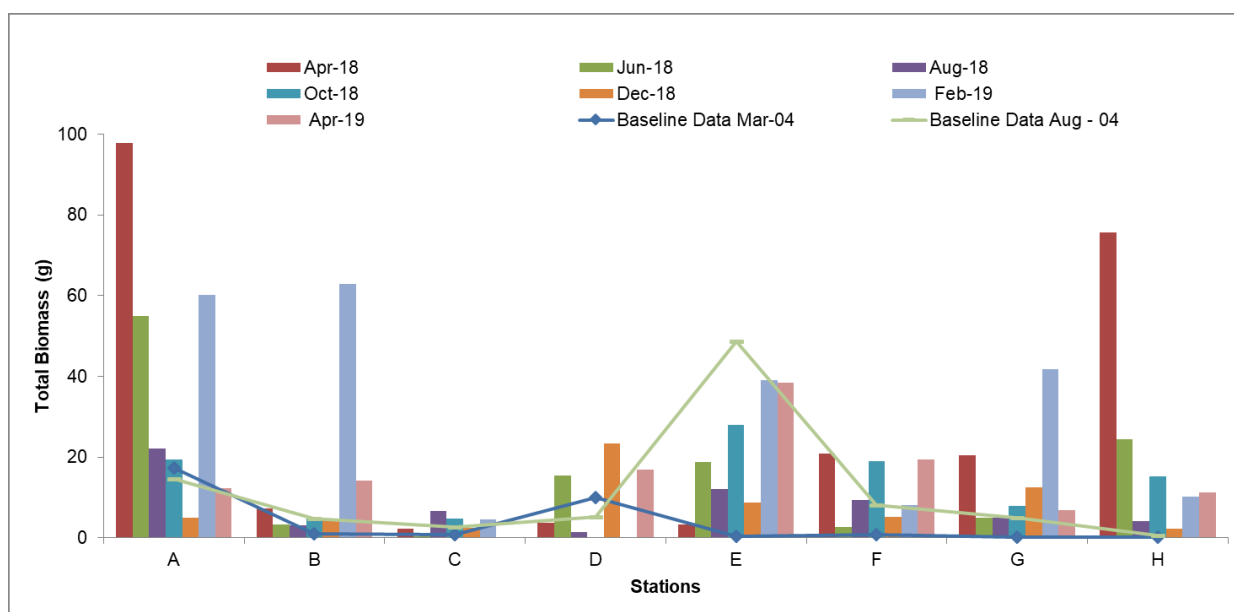


Figure 2. Total biomass (g) of benthic organisms collected in the eight monitoring stations, August 2004, April, June August, October and December in 2018, and February & April in 2019

Taxonomic Composition

A total of six phyla comprised of 42 families and 58 taxa was identified during the April 2019 monitoring period. Figure 3 shows the percent composition of the benthic organisms identified. With the continuous increase in the number of annelid species and abundance, annelids remained to

dominate benthic assemblages comprising 70.28% of the identified population. The current benthic assemblage is observed to be similar with the baseline population, which was dominated by polychaetes, particularly of the capitellids. Capitellids are typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

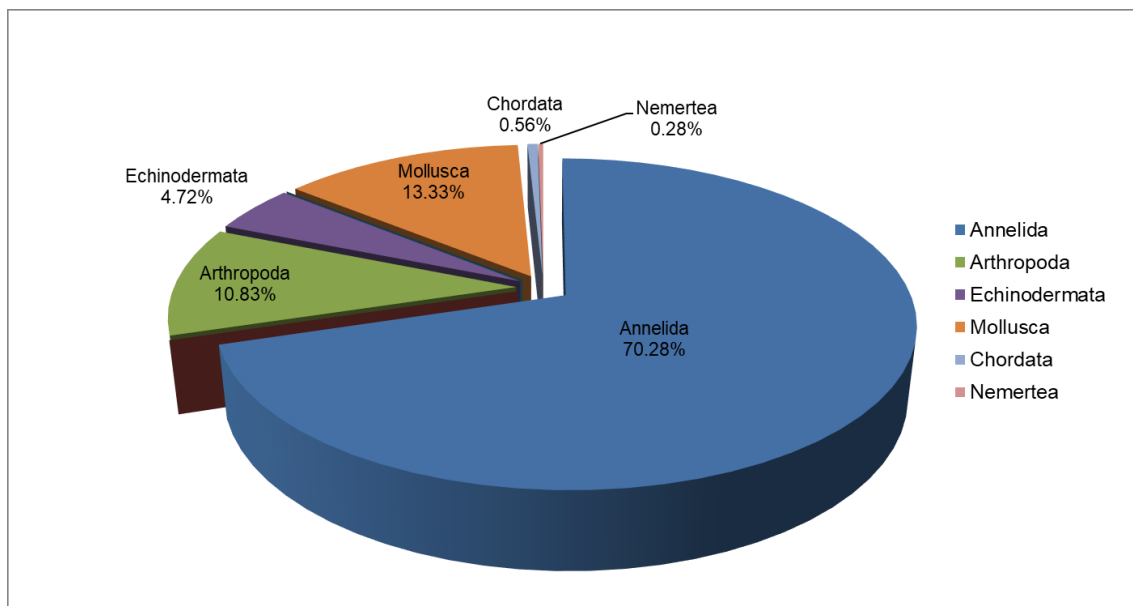


Figure 3. Percent composition of benthic organisms collected in the eight monitoring stations, in April 2019

The most dominant species (abundance >10) was the Polychaeta, *Paraprionospio sp.*, with the abundance of 20 ind. and *Capitella capitata* with the abundance of 11 ind. in Station A. In addition, *C. capitata*, with the abundance of 13 ind. was recorded Station G.

Highest number of genera was recorded in Station A (33) and the lowest in Station C (11). Similar to abundance and biomass, relatively lower number of taxa was observed at impact stations compared to the reference stations.

Diversity

Benthic diversity index (H') and evenness index (J) ranged from 2.20-2.65 and 0.92 – 0.93 in impact Stations, and 2.52-3.00 and 0.83-0.95 among the reference stations as shown in Appendix A, 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 periods. Apparent increase in diversity and evenness indices was observed compared with the baseline data.

Data summaries are shown in Appendix A and representatives of taxa identified are in Appendix B.

References:

- Borja, A., Franco, J. and Perez, V. (2000). A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. *Marine Pollution Bulletin*, 40, 1100-1114.
- Fauchald K. (1977) *The Polychaete Worms Definitions And Keys To Orders, Families And Genera*. Natural History Museum of Los Angeles County. Science Series 28: 1 – 190.
- Huang Z.G. (1994). *Marine Species and Their Distributions in China's Seas*. China Ocean Press, Beijing.
- Pearson, T. and Rosenberg, R. (1978). Macrobenthic succession in relation to organic enrichment and pollution of the marine environment. *Oceanography and Marine Biology Annual Review*, 16, 229-311.
- Rouse G. W. & Pleijel F. (2001) *Polychaetes*. Oxford University Press. United Kingdom.
- Xu F. S. & Zhang S. P. (2008) *An Illustrated Bivalvia Mollusca Fauna of China Seas*. Science Press (China), Beijing.

Approved by Supervisor

Name of Consultant : China Hong Kong Ecology Consultants Ltd.

Signature of Supervisor : 

Name and Position of Supervisor: Dr. Mark Shea, Senior Ecology Consultant

Date: April 27, 2019



Appendix A: Data Summaries

Table 1. Composition, abundance, and percent Composition of benthic communities in the eight monitoring stations, April 2019

Phylum	Class	Order	Family	Genus	Abundance								Total	% Composition
					Monitoring Stations									
					A	B	C	D	E	F	G	H		
Annelida	Polychaeta	Aciculata	Glyceridae	<i>Glycera</i>	5	0	0	0	0	2	0	3	10	2.78
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella(C.capitata)</i>	11	3	2	0	0	2	13	4	35	9.72
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella</i>	0	0	0	1	2	2	1	2	8	2.22
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Mediomastus</i>	7	2	5	0	3	3	3	5	28	7.78
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Notomastus</i>	5	2	1	2	2	0	2	4	18	5.00
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice</i>	2	2	0	2	8	3	2	1	20	5.56
Annelida	Polychaeta	-	Cossuridae	<i>Cossurella(C. aciculata)</i>	0	0	0	0	0	0	0	1	1	0.28
Annelida	Polychaeta	Phyllodocida	Hesionidae	<i>Hesione(H. intertexta)</i>	1	1	0	0	0	0	0	0	2	0.56
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Neanthes</i>	1	2	0	0	1	0	1	0	5	1.39
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis</i>	1	0	0	1	0	1	1	0	4	1.11
Annelida	Polychaeta	Phyllodocida	Pilargidae	<i>Sigambra</i>	1	0	0	0	0	0	0	1	2	0.56
Annelida	Polychaeta	Phyllodocida	Paralacydoniidae	<i>Paralacydonia</i>	2	1	0	0	0	0	0	3	6	1.67
Annelida	Polychaeta	Phyllodocida	Polynoidae	<i>Gattyana</i>	1	0	0	0	0	0	0	0	1	0.28
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	<i>Eteone</i>	2	1	0	0	0	0	0	0	3	0.83
Annelida	Polychaeta	Phyllodocida	Acoetidae	<i>c.f. Acoetes</i>	0	1	0	0	0	0	0	0	1	0.28
Annelida	Polychaeta	Phyllodocimorpha	Goniadidae	<i>Glycinde</i>	0	0	0	0	1	0	0	0	1	0.28
Annelida	Polychaeta	-	Maldanidae	<i>Maldanella</i>	1	0	0	0	0	0	0	0	1	0.28
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i>	1	0	1	0	0	0	0	0	2	0.56
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i>	0	0	0	1	0	0	1	1	3	0.83
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys(N.</i>	0	1	0	0	3	0	4	4	12	3.33
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys1</i>	1	0	3	4	0	4	0	1	13	3.61
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys2</i>	0	0	0	0	0	0	0	1	1	0.28
Annelida	Polychaeta	Sabellida	Oweniidae	<i>Owenia</i>	0	0	0	0	0	0	0	1	1	0.28
Annelida	Polychaeta	Scolecida	Opheliidae	<i>Ophelia</i>	0	1	0	0	1	0	0	0	2	0.56



Phylum	Class	Order	Family	Genus	Abundance								Total	% Composition
					Monitoring Stations									
					A	B	C	D	E	F	G	H		
Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus</i>	0	4	0	1	0	0	4	0	9	2.50
Annelida	Polychaeta	Spionida	Spionidae	<i>Paraprionospio</i>	20	0	2	0	1	0	1	5	29	8.06
Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio</i>	3	0	0	1	1	1	1	6	13	3.61
Annelida	Polychaeta	Sternaspida	Sternaspidae	<i>Sternaspis(S. scutata)</i>	1	3	0	0	1	0	2	1	8	2.22
Annelida	Polychaeta	Terebellida	Pectinariidae	<i>Lagis</i>	1	0	0	0	0	0	0	0	1	0.28
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Amaeana</i>	0	0	0	1	1	0	0	0	2	0.56
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Loimia(L.loimia)</i>	1	0	0	0	0	1	0	0	2	0.56
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella</i>	1	0	0	0	1	0	0	0	2	0.56
Annelida	Polychaeta	Terebellida	Trichobranchidae	<i>Terebellides(T.</i>	1	0	1	0	0	0	0	0	2	0.56
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	<i>Lumbriculus sp.1</i>	0	1	0	1	2	0	0	1	5	1.39
Annelida Total					70	25	15	15	28	19	36	45	253	70.28
Arthropoda	Crustacea	Decapoda	Majidae	<i>Doclea</i>	0	1	0	0	1	0	0	0	2	0.56
Arthropoda	Crustacea	Decapoda	Penaeidae	Shrimp juvenile	2	1	0	1	1	0	2	0	7	1.94
Arthropoda	Crustacea	Decapoda	Pilumnidae	<i>Typhlocarcinus</i>	1	0	0	0	0	0	0	0	1	0.28
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.1</i>	3	0	5	2	1	0	0	4	15	4.17
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.2</i>	0	0	0	3	0	0	5	6	14	3.89
Arthropoda Total					6	2	5	6	3	0	7	10	39	10.83
Echinodermata	Ophiuroidea	Ophiurida	Amphiuridae	<i>Amphioplus</i>	2	4	1	3	1	3	0	3	17	4.72
Echinodermata Total					2	4	1	3	1	3	0	3	17	4.72
Mollusca	Bivalvia	Cardiida	Cardiidae	<i>Cardium</i>	0	0	0	0	0	0	1	0	1	0.28
Mollusca	Bivalvia	Myoidea	Corbulidae	<i>Aloididae</i>	0	0	0	0	0	1	0	0	1	0.28
Mollusca	Bivalvia	Ostreoida	Ostreidae	<i>Talonostrea(T. talonata)</i>	1	0	0	0	0	0	0	0	1	0.28
Mollusca	Bivalvia	Veneroidea	Dreissenidae	<i>Mytilopsis</i>	1	0	0	0	0	0	0	0	1	0.28
Mollusca	Bivalvia	Veneroidea	Psammobiidae	<i>c.f. Soletellina chinensis</i>	0	0	0	0	0	1	0	0	1	0.28
Mollusca	Bivalvia	Veneroidea	Solenidae	<i>Solen</i>	1	0	0	0	0	0	0	0	1	0.28
Mollusca	Bivalvia	Veneroidea	Tellinidae	<i>c.f. Angulus</i>	0	0	0	1	0	0	0	0	1	0.28
Mollusca	Bivalvia	Veneroidea	Veneridae	<i>Placamen(P. isabellina)</i>	1	0	0	0	0	0	0	0	1	0.28



Phylum	Class	Order	Family	Genus	Abundance								Total	% Composition
					Monitoring Stations									
					A	B	C	D	E	F	G	H		
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Paphia (P. undulata)</i>	1	6	0	5	7	4	2	4	29	8.06
Mollusca	Bivalvia	Veneroida	Veneridae	<i>c.f. Phylloda foliacea</i>	0	1	1	0	1	0	0	0	3	0.83
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Ruditapes</i>	0	0	0	0	0	1	0	0	1	0.28
Mollusca	Bivalvia	Veneroida	Veneridae	Bivalve juvenile	1	0	2	0	0	0	0	1	4	1.11
Mollusca	Gastropoda	Littorinimorpha	Calyptraeidae	<i>Calyptraea</i>	0	0	0	0	0	0	0	1	1	0.28
Mollusca	Gastropoda	Lottioidea	Lottiidae	<i>Notoacmea</i>	0	0	0	0	0	0	0	1	1	0.28
Mollusca	Scaphopoda	-	Dentaliidae	-	0	0	0	0	0	0	1	0	1	0.28
Mollusca Total					6	7	3	6	8	7	4	7	48	13.33
Chordata	Actinopterygii	Pleuronectiformes	Bothidae	<i>Bothidae juvenile</i>	1	0	0	0	0	0	0	0	1	0.28
Chordata	Actinopterygii	Anquilliformes	Ophichthidae	<i>Pisodonophis</i>	0	0	0	0	0	1	0	0	1	0.28
Chordata Total					1	0	0	0	0	1	0	0	2	0.56
Nemertea	Enopla	-	-	UNID 1	0	0	0	1	0	0	0	0	1	0.28
Nemertea Total					0	0	0	1	0	0	0	0	1	0.28
Grand Total					85	38	24	31	40	30	47	65	360	



Table 1. Biomass of benthic communities in the eight monitoring stations, April 2019

Phylum	Class	Order	Family	Genus	Biomass (g)							
					Monitoring Stations							
					A	B	C	D	E	F	G	H
Annelida	Polychaeta	Aciculata	Glyceridae	<i>Glycera</i>	0.011	0	0	0	0	0.003	0	0.006
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella(C.capitata)</i>	0.009	0.003	0.001	0	0	0.002	0.012	0.003
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella</i>	0	0	0	0.001	0.001	0.001	0.001	0.002
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Mediomastus</i>	0.008	0.002	0.006	0	0.002	0.001	0.007	0.006
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Notomastus</i>	0.006	0.004	0.001	0.002	0.001	0	0.003	0.005
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice</i>	0.005	0.004	0	0.009	0.017	0.008	0.004	0.005
Annelida	Polychaeta	-	Cossuridae	<i>Cossurella(C. aciculata)</i>	0	0	0	0	0	0	0	0.003
Annelida	Polychaeta	Phyllodocida	Hesionidae	<i>Hesione(H. intertexta)</i>	0.001	0.001	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Neanthes</i>	0.003	0.003	0	0	0.003	0	0.001	0
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis</i>	0	0	0	0.001	0	0.001	0.001	0
Annelida	Polychaeta	Phyllodocida	Pilargidae	<i>Sigambra</i>	0.003	0	0	0	0	0	0	0.001
Annelida	Polychaeta	Phyllodocida	Paralacydoniidae	<i>Paralacydonia</i>	0.003	0.001	0	0	0	0	0	0.005
Annelida	Polychaeta	Phyllodocida	Polynoidae	<i>Gattyana</i>	0.001	0	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	<i>Eteone</i>	0.004	0.002	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocida	Acoetidae	<i>c.f. Acoetes</i>	0	1.618	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocimorpha	Goniadidae	<i>Glycinde</i>	0	0	0	0	0.001	0	0	0
Annelida	Polychaeta	-	Maldanidae	<i>Maldanella</i>	0.002	0	0	0	0	0	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i>	0.004	0	0.003	0	0	0	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i>	0	0	0	0.003	0	0	0.009	0.011
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys(N. polybranchia)</i>	0	0.003	0	0	0.002	0	0.015	0.013
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys1</i>	0.002	0	0.005	0.006	0	0.009	0	0.002
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys2</i>	0	0	0	0	0	0	0	0.003
Annelida	Polychaeta	Sabellida	Oweniidae	<i>Owenia</i>	0	0	0	0	0	0	0	0.003
Annelida	Polychaeta	Scolecida	Opheliidae	<i>Ophelia</i>	0	0.005	0	0	0.004	0	0	0



Phylum	Class	Order	Family	Genus	Biomass (g)							
					Monitoring Stations							
					A	B	C	D	E	F	G	H
Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus</i>	0	0.005	0	0.002	0	0	0.01	0
Annelida	Polychaeta	Spionida	Spionidae	<i>Paraprionospio</i>	0.022	0	0.004	0	0.002	0	0.001	0.006
Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio</i>	0.003	0	0	0.001	0.002	0.001	0.002	0.004
Annelida	Polychaeta	Sternaspida	Sternaspidae	<i>Sternaspis(S. scutata)</i>	0.022	0.004	0	0	0.011	0	0.005	0.002
Annelida	Polychaeta	Terebellida	Pectinariidae	<i>Lagis</i>	0.003	0	0	0	0	0	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Amaeana</i>	0	0	0	0.001	0.002	0	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Loimia(L.loimia)</i>	0.004	0	0	0	0	0.001	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella</i>	0.002	0	0	0	1.785	0	0	0
Annelida	Polychaeta	Terebellida	Trichobranchidae	<i>Terebellides(T. stroemii)</i>	0.002	0	0.002	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	<i>Lumbriculus sp.1</i>	0	0.006	0	0.004	0.001	0	0	0.002
Annelida Total					0.12	1.661	0.022	0.03	1.834	0.027	0.071	0.082
Arthropoda	Crustacea	Decapoda	Majidae	<i>Doclea</i>	0	5.8	0	0	6.379	0	0	0
Arthropoda	Crustacea	Decapoda	Penaeidae	Shrimp juvenile	0.042	1.378	0	0.001	0.367	0	0.009	0
Arthropoda	Crustacea	Decapoda	Pilumnidae	<i>Typhlocarcinus</i>	1.855	0	0	0	0	0	0	0
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.1</i>	0.001	0	0.001	0.001	0.001	0	0	0.001
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.2</i>	0	0	0	0.001	0	0	0.001	0.002
Arthropoda Total					1.898	7.178	0.001	0.002	6.747	0	0.01	0.003
Echinodermata	Ophiuroidea	Ophiurida	Amphiuridae	<i>Amphioplus</i>	1.345	0.041	0.121	2.223	0.008	3.145	0	0.034
Echinodermata Total					1.345	0.041	0.121	2.223	0.008	3.145	0	0.034
Mollusca	Bivalvia	Cardiida	Cardiidae	<i>Cardium</i>	0	0	0	0	0	0	1.465	0
Mollusca	Bivalvia	Myoida	Corbulidae	<i>Aloididae</i>	0	0	0	0	0	0.906	0	0
Mollusca	Bivalvia	Ostreoida	Ostreidae	<i>Talonostrea(T. talonata)</i>	0.8	0	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Dreissenidae	<i>Mytilopsis</i>	1.673	0	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Psammobiidae	<i>c.f. Soletellina chinensis</i>	0	0	0	0	0	1.955	0	0
Mollusca	Bivalvia	Veneroida	Solenidae	<i>Solen</i>	1.019	0	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Tellibidae	<i>c.f. Angulus</i>	0	0	0	0.005	0	0	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Placamen(P. isabellina)</i>	5.432	0	0	0	0	0	0	0



Phylum	Class	Order	Family	Genus	Biomass (g)							
					Monitoring Stations							
					A	B	C	D	E	F	G	H
Mollusca	Bivalvia	Veneroidea	Veneridae	<i>Paphia (P. undulata)</i>	0.021	5.3	0	14.6	29.8	8.978	5.216	10.8
Mollusca	Bivalvia	Veneroidea	Veneridae	<i>c.f. Phylloda foliacea</i>	0	0.012	0.004	0	0.005	0	0	0
Mollusca	Bivalvia	Veneroidea	Veneridae	<i>Ruditapes</i>	0	0	0	0	0	2.365	0	0
Mollusca	Bivalvia	Veneroidea	Veneridae	Bivalve juvenile	0.036	0	0.003	0	0	0	0	0.017
Mollusca	Gastropoda	Littorinimorpha	Calyptraeidae	<i>Calyptraea</i>	0	0	0	0	0	0	0	0.2
Mollusca	Gastropoda	Lottioidea	Lottiidae	<i>Notoacmea</i>	0	0	0	0	0	0	0	0.028
Mollusca	Scaphopoda	-	Dentaliidae	-	0	0	0	0	0	0	0.012	0
Mollusca Total					8.981	5.312	0.007	14.605	29.805	14.204	6.693	11.045
Chordata	Actinopterygii	Pleuronectiformes	Bothidae	<i>Bothidae juvenile</i>	0.013	0	0	0	0	0	0	0
Chordata	Actinopterygii	Annguilliformes	Ophichthidae	<i>Pisodonophis</i>	0	0	0	0	0	1.998	0	0
Chordata Total					0.013	0	0	0	0	1.998	0	0
Nemertea	Enopla	-	-	UNID 1	0	0	0	0.003	0	0	0	0
Nemertea Total					0	0	0	0.003	0	0	0	0
Grand Total					12.3	14.19	0.15	16.86	38.39	19.37	6.77	11.16



Table 3. Summary of Benthic Survey Data, April 2019

Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	85	12.35	33	2.92	0.83
B	38	14.19	19	2.74	0.93
C*	24	0.15	11	2.20	0.92
D*	31	16.86	17	2.65	0.93
E	40	38.39	20	2.66	0.89
F	30	19.37	15	2.56	0.95
G	47	6.77	18	2.52	0.87
H	65	11.16	25	3.00	0.93
TOTAL	360	119.27			

*Impact Sites

Table 4. Summary of Benthic Survey Baseline Data, August 2004

Stations	Abundance	Total Biomass	Number of Taxa	Diversity (H')	Evenness (J)
A	115	14.56	24	0.93	0.29
B	36	4.76	14	0.89	0.34
C*	22	2.66	13	0.80	0.31
D*	39	5.07	11	0.62	0.26
E	39	48.69	16	0.89	0.32
F	11	8.07	9	0.68	0.31
G	182	4.91	31	1.10	0.32
H	23	0.49	11	0.81	0.34

*Impact Sites

Table 5. Summary of Benthic Survey Baseline Data, March 2004

Stations	Abundance	Total Biomass	Number of Taxa	Diversity (H')	Evenness (J)
A	337	17.39	38	0.78	0.21
B	110	0.9	21	0.82	0.27
C*	14	0.7	10	0.69	0.30
D*	37	10.07	20	1.01	0.34
E	28	0.44	11	0.76	0.32
F	67	0.78	16	0.85	0.31
G	25	0.09	9	0.64	0.29
H	23	0.15	11	0.44	0.18



Table 5. Taxonomic Composition (%) of Benthic Survey, Baseline (August 2004), April, June, August, October and December 2018, and February & April in 2019

Taxonomic Composition	Aug-04	Apr-18	Jun-18	Aug-18	Oct-18	Dec-18	Feb-19	Apr-19
Annelida	73.29	31.12	53.01	65.02	65.35	69.44	54.99	70.28
Sipuncula	0.21	0.30	0.80	0.45	0	0.93	0	0
Arthropoda	18.80	13.60	15.66	12.11	13.86	10.19	20.23	10.83
Echinodermata	3.63	15.11	4.82	5.38	2.97	2.78	3.42	4.72
Cnidaria	0.43	0.60	0.40	0	0	0.93	0.85	0
Mollusca	3.42	50.45	21.29	15.69	16.83	12.96	19.94	13.33
Chordata	0.21	2.11	0.80	0.45	0	0.93	0.28	0.56
Nemertea	0	0.30	3.22	0.90	0.99	1.85	0.28	0.28

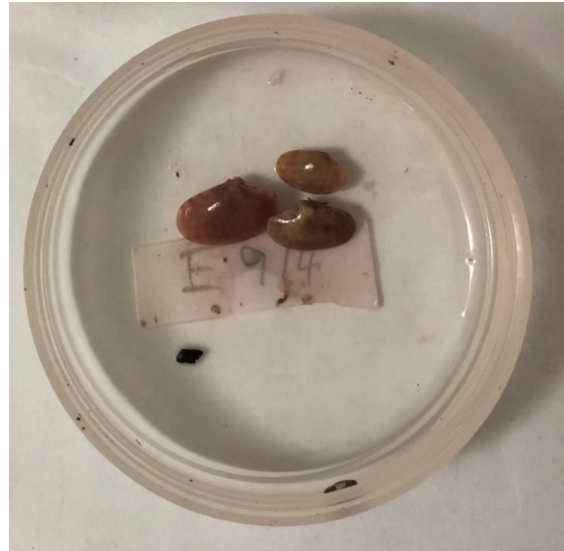
Table 6. Taxonomic Composition (abundance) of Benthic Survey, Baseline (August 2004) and April, June, August, October and December 2018, and February & April in 2019

Taxonomic Composition	Aug-04	Apr-18	Jun-18	Aug-18	Oct-18	Dec-18	Feb-19	Apr-19
Annelida	343	103	132	145	132	150	193	253
Sipuncula	1	1	2	1	0	2	0	0
Arthropoda	88	45	39	27	28	22	71	39
Echinodermata	17	5	12	12	6	6	12	17
Cnidaria	2	2	1	0	0	2	3	0
Mollusca	16	167	53	35	34	28	70	48
Chordata	1	7	2	1	0	2	1	2
Nemertea	-	1	8	2	2	4	1	1
Grand total	468	331	249	223	202	216	351	360

Appendix B: Representative Taxa Identified



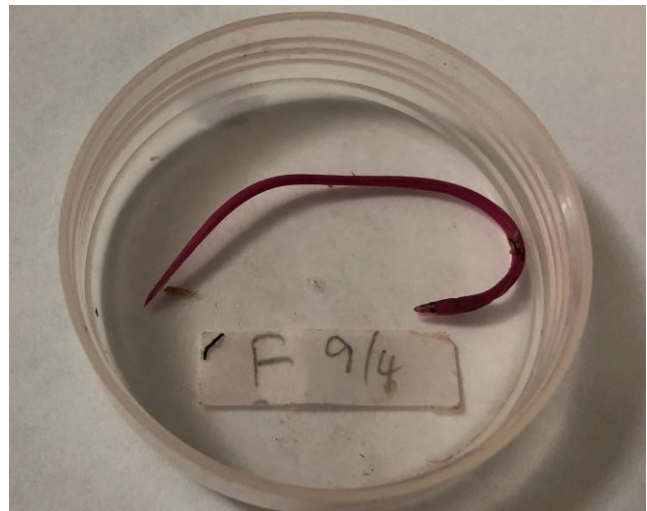
A) The species of Echinodermata, *Amphioplus* sp.



B) The species of Mollusca, *Paphia undulata*



C) The species of Polychaeta, *c.f. Acoetes* sp.



D) The species of Chordata, *Pisodonophis* sp.

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Report No.: 0041/17/ED/0442C

Appendix I

Photos of Grab Samplers

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Photo 1. A ponar grab sampler



Photo 2. Grab dimension 1



Photo3. Grab dimension 2



Photo4. Grab dimension 3

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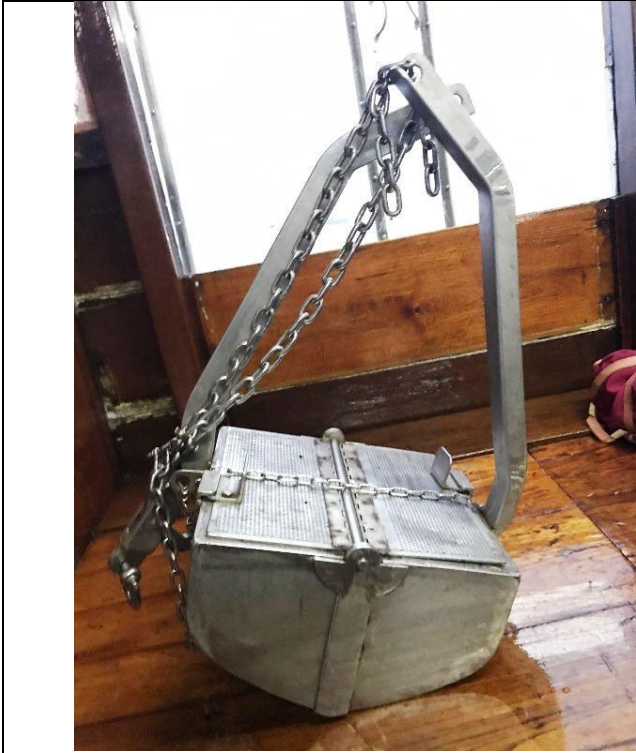


Photo 1. A modified Van Veen grab sampler



Photo 2. Grab dimension 1



Photo3. Grab dimension 2



Photo4. Grab dimension 3

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Appendix J

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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Report No.: 0041/17/ED/0442C

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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Report No.: 0041/17/ED/0442C

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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