

Expansion of Hong Kong International Airport into a Three-Runway System

Baseline Water Quality Monitoring Report

August 2016

Airport Authority Hong Kong

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HKIA Tower, 1 Sky Plaza Road, Hong Kong International Airport, Lantau, Hong Kong

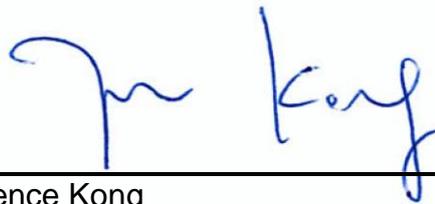
This Baseline Water Quality Monitoring Report

has been reviewed and certified by

the Environmental Team Leader (ETL) in accordance with

Condition 3.4 of Environmental Permit No. EP-489/2014.

Certified by:



Terence Kong
Environmental Team Leader (ETL)
Mott MacDonald Hong Kong Limited

Date

31 August 2016

Our Ref : 60440482/C/JCHL160831

By Email

Airport Authority Hong Kong
HKIA Tower, 1 Sky Plaza Road
Hong Kong International Airport
Lantau, Hong Kong

Attn: Mr. Lawrence Tsui, Senior Manager

31 August 2016

Dear Sir,

Contract No. 3102
3RS Independent Environmental Checker Consultancy Services

Baseline Water Quality Monitoring Report

Reference is made to the Environmental Team's submission of Baseline Water Quality Monitoring Report under Condition 3.4 of the Environmental Permit No. EP-489/2014 certified by the ET Leader on 31 August 2016.

We would like to inform you that we have no further comment on the captioned submission. Therefore we write to verify the captioned submission in accordance with the requirement stipulated in Condition 1.9 of EP-489/2014.

Should you have any query, please feel free to contact our Isabella Yeung at 3922 9348 or the undersigned at 3922 9376.

Yours faithfully,
AECOM Asia Co. Ltd.



Jackel Law
Independent Environmental Checker

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Executive Summary

An Environmental Permit (Permit No.: EP-489/2014) for the construction and operation of the “Expansion of Hong Kong International Airport into a Three-Runway System” (the project) was granted by the Environmental Protection Department (EPD) on 7 November 2014.

Mott MacDonald Hong Kong Limited (MMHK) was commissioned by the Airport Authority Hong Kong (AAHK) to undertake the role of Environmental Team (ET) for carrying out the environmental monitoring and audit (EM&A) works of the project.

On 29 April 2016, AAHK received the Chief Executive-in-Council’s approval for draft Chek Lap Kok Outline Zoning Plan, as well as the authorization of the reclamation under the Foreshore and Sea-bed (Reclamations) Ordinance for the expansion of HKIA into a three-runway system.

This Baseline Water Quality Monitoring Report is prepared for submission before the commencement of marine-based construction works to fulfil Condition 3.4 of the Environmental Permit No. EP-489/2014 issued pertaining to this designated project. The Baseline Water Quality Monitoring Report was submitted to EPD on 15 July 2016, which included recommendations for supplementary baseline monitoring to be undertaken in July 2016 (to take into account potential variations within a year due to natural fluctuations) before finalising the action and limit (AL) levels.

Baseline Water Quality Monitoring

Baseline water quality monitoring was conducted three days per week, at mid-flood and mid ebb tides. To account for potential variations within a year, the baseline was conducted in May (from 3 to 14 May 2016) and in July (from 19 to 30 July 2016) at 23 water quality monitoring stations. Monitoring of DO, DO%, pH, temperature, turbidity, salinity and SS as well as current speed and direction were undertaken at all monitoring stations. For monitoring of DCM works, baseline monitoring of total alkalinity, heavy metals and nutrients were conducted at designated DCM-specific monitoring stations.

Action and Limit Levels

The AL levels for water quality impact monitoring have been set based on the 3RS baseline water quality monitoring conducted in May and July 2016. The summary table of the AL levels for water quality are presented in **Table I** to **Table III**.

Table I: Action and Limit Levels for Impact Water Quality Monitoring (General and Regular DCM)

Parameters	Action Level		Limit Level	
DO in mg/L (Surface, Middle & Bottom)	<u>Surface and Middle</u> 4.8 mg/L		<u>Surface and Middle</u> 4.1 mg/L 5 mg/L for Fish Culture Zone (SR7) only	
	<u>Bottom</u> 3.1 mg/L		<u>Bottom</u> 2.3 mg/L	
Suspended Solids (SS) in mg/L	25	or 120% of upstream control station at the same tide of the same day, whichever is higher	36	or 130% of upstream control station at the same tide of the same day, whichever is higher
Turbidity in NTU	26.0		41.4	
Total Alkalinity in ppm	95		98	
Representative Heavy Metals for early regular DCM monitoring (Chromium and Nickel)	Same as for intensive DCM monitoring		Same as for intensive DCM monitoring	

Parameters	Action Level	Limit Level
Representative Heavy Metals for regular DCM monitoring after completion of initial intensive DCM monitoring (to be determined taking into account the findings of the initial intensive DCM monitoring)		

Note:

1. For DO measurement, non-compliance occurs when monitoring result is lower than the limits.
2. For parameters other than DO, non-compliance of water quality results when monitoring results is higher than the limits.
3. Depth-averaged results are used unless specified otherwise.
4. The action and limit levels specified in this table does not apply to SR1A and SR8 (see **Section 4.2**).
5. The action and limit levels for the two representative heavy metals chosen will be the same as that for the intensive DCM monitoring

Table II: Action and Limit Levels for Impact Water Quality Monitoring (Intensive DCM)

Parameters	Action Level	Limit Level
Temperature in °C	1.8°C above the temperature recorded at representative control stations at the same tide of the same day	2°C above the temperature recorded at representative control stations at the same tide of the same day
Total Alkalinity in ppm	95	98
Nutrient (mg/l)		
Ammonia (NH ₃)	0.18	0.20
Unionised ammonia (NH ₃) (with 0.021 mg/L as the upper limit)	0.01	0.01
Nitrite (NO ₂)	0.12	0.13
Nitrate (NO ₃)	1.05	1.18
TKN	0.6	0.7
Total Phosphorus	0.06	0.07
Reactive Phosphorus	0.04	0.04
Heavy Metals (µg/l)		
Cadmium (Cd)	0.1	0.1
Chromium (Cr)	0.2	0.2
Copper (Cu)	1.9	5.1
Nickel (Ni)	3.2	3.4
Lead (Pb)	0.2	0.2
Zinc (Zn)	6	8
Arsenic (As)	3	4
Silver (Ag)	0.1	0.1
Mercury (Hg)	0.05	0.05

Note:

1. Non-compliance of water quality results when monitoring results is higher than the limits.
2. Depth-averaged results are used unless specified otherwise.
3. For Cd, Cr, Pb, Ag and Hg, the percentile values are below detection limit, hence the AL levels represent detection limit.
4. Where the water quality results at control stations for individual parameters are below detection limit, the value of the detection limit will be adopted.

Table III: Action and Limit Level for SR1 and SR8

SS (mg/l)	Action Level	Limit Level
SR1	To be determined prior to its commissioning	To be determined prior to its commissioning
SR8	52	60

Should non-compliance of the water quality criteria occur, the Event and Action Plan as presented in **Section 4.3** of this report (for general water quality monitoring) and in the Detailed Plan on Deep Cement Mixing (for DCM monitoring) shall be followed.

1 Introduction

1.1 Background

On 7 November 2014, the Environment Impact Assessment (EIA) Report (Register No.: AEIAR-185/2014) for the “Expansion of Hong Kong International Airport into a Three-Runway System” (the project) was approved and an Environmental Permit (EP) (Permit No.: EP-489/2014) was issued for the construction and operation of the project.

On 29 April 2016, AAHK received the Chief Executive-in-Council’s approval for draft Chek Lap Kok Outline Zoning Plan, as well as the authorization of the reclamation under the Foreshore and Sea-bed (Reclamations) Ordinance for the expansion of HKIA into a three-runway system.

Mott MacDonald Hong Kong Limited (MMHK) was commissioned by the Airport Authority Hong Kong (AAHK) to serve as the project’s Environmental Team (ET) for carrying out the environmental monitoring and audit (EM&A) works of the project.

1.2 Project Description

The project covers the expansion of the existing airport into a three-runway system with key project components comprising land formation of about 650 ha and all associated facilities and infrastructure including taxiways, aprons, aircraft stands, a passenger concourse, an expanded Terminal 2, all related airside and landside works and associated ancillary and supporting facilities. The existing submarine aviation fuel pipelines and submarine power cables also require diversion as part of the works.

The construction of land-based works of diversion of the submarine aviation fuel pipelines was commenced on 28 December 2015. Other construction works are targeted to progressively commence from August 2016.

The updated construction programme for marine works is provided in **Appendix 1.1** and it has been prepared based on the best available information. Given the scale and complexity of the project and the fact that a number of key project components are still subject to detailed design prior to implementation with major Contractors yet to be procured, the details of the programme as presented is subject to further revision and update.

1.3 Purpose of this Report

This Baseline Water Quality Monitoring Report is prepared for submission before the commencement of marine-based construction works to fulfil Condition 3.4 of the EP. The baseline water quality monitoring has been undertaken based on the approach and methodology presented in the updated EM&A Manual. The Baseline Water Quality Monitoring Report was submitted to EPD on 15 July 2016, which included recommendations for supplementary baseline monitoring to be undertaken in July 2016 (to take into account potential variations within a year due to natural fluctuations) before finalising the action and limit (AL) levels.

This revised Baseline Water Quality Monitoring Report takes into account the supplementary baseline monitoring undertaken in July 2016 and presents the finalised AL levels.

1.4 Structure of the Report

The structure of the report is as follows:

- Section 1 Introduction – presents the project background, purpose and structure of this baseline water quality monitoring report;
- Section 2 Water Quality Monitoring Methodology – presents the monitoring requirements and methodology on baseline water quality monitoring;
- Section 3 Baseline Monitoring Results and Analysis – presents the baseline monitoring results and the findings of the statistical analysis;
- Section 4 Event and Action Plan – presents the action and limit levels as well as event and action plan for impact water quality monitoring.

2 Water Quality Monitoring Methodology

2.1 Monitoring Requirements

In accordance with the updated EM&A Manual, the baseline water quality monitoring was conducted to establish ambient conditions prior to the commencement of the marine works. The baseline conditions for water quality were established by measuring dissolved oxygen (DO), dissolved oxygen saturation (DO%), pH, temperature, turbidity, salinity, and suspended solids (SS) at all designated stationary monitoring stations before commencement of marine works for the project. To provide the baseline water quality for the DCM-specific monitoring, total alkalinity was measured at all the relevant stationary impact stations, plus nutrients and heavy metals at the “IM*” stations (which represent the contaminated mud pit locations) as presented in **Section 2.5**.

2.2 Monitoring Equipment and Methodology

Water samples for all monitoring parameters were collected, stored, preserved and analysis according to the Standard Methods, APHA 22nd ed. and/or other methods as agreed by the EPD. In-situ measurements at monitoring locations including temperature, pH, DO, turbidity, salinity and water depth were collected by equipment listed in the following **Table 2.1**. Water samples for nutrient, heavy metals and SS analysis were stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4 °C without being frozen), delivered to the laboratory within 24 hours of collection.

Table 2.1: Baseline Water Quality Monitoring Equipment

Equipment	Brand and Model	Quantity
Water Sampler	Van Dorn Water Sampler	4
Positioning Device (measurement of GPS)	Garmin eTrex Vista HCx	2
Water Depth Detector (measurement of water depth)	Lowrance Mark 5x	2
Multifunctional Meter (measurement of DO, pH, temperature, salinity and turbidity)	YSI 6920	2
Current Meter (measurement of current speed and direction)	Sontek HydroSurveyor	2
Digital Titrator (measurement of total alkalinity)	Titrette Digital Burette 50ml Class A	2

Calibration of In-situ instruments

All in-situ monitoring instrument were checked, calibrated and certified by a laboratory accredited under HOKLAS before use. Responses of sensors and electrodes were checked with certified standard solutions before each use.

Wet bulb calibration for a DO meter was carried out before commencement of monitoring and after completion of all measurements each day. Calibration was not conducted at each monitoring location as daily calibration is adequate for the type of DO meter employed. A zero check in distilled water was performed with the turbidity probe at least once per monitoring day. The probe should then be calibrated with a solution of known NTU. In addition, the turbidity probe was calibrated at least twice per month to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg/L). Accuracy check of the digital titrator was performed at least once per monitoring day.

Calibration certificates of the monitoring equipment used in the baseline monitoring are provided in **Appendix 2.1**.

2.3 Laboratory Measurement / Analysis

Analysis of SS, nutrient and heavy metals have been carried out by a HOKLAS accredited laboratory, ALS Technichem (HK) Pty Ltd (Reg. No. HOKLAS 066). Sufficient water samples were collected at all the monitoring stations for carrying out the laboratory SS, nutrient and heavy metals determination. The SS, nutrient and heavy metals determination works were started within 24 hours after collection of the water samples. The analysis of SS, nutrient and heavy metals have followed the standard methods summarised in **Table 2.2**.

Table 2.2: Laboratory analysis for SS, nutrient and heavy metals

Parameters	Instrumentation	Analytical Method	Reporting Limit
Suspended Solid (SS)	Analytical Balance	APHA 2540D	2 mg/L
Nutrient			
Ammonia as N	FIA	APHA 4500	0.01 mg/L
Unionised ammonia (NH ₃)*	By calculation	By calculation	By calculation
Nitrite as N	FIA	APHA 4500	0.01 mg/L
Nitrate as N	FIA	APHA 4500	0.01 mg/L
TKN as N	Titration	APHA 4500	0.1 mg/L
Total Phosphorus	Colorimetric	APHA 4500	0.01 mg/L
Reactive Phosphorus	FIA	APHA 4500	0.01 mg/L
Heavy Metals			
Cadmium (Cd)	ICP-MS	USEPA 6020A	0.1 µg/L
Chromium (Cr)	ICP-MS	USEPA 6020A	0.2 µg/L
Copper (Cu)	ICP-MS	USEPA 6020A	0.2 µg/L
Nickel (Ni)	ICP-MS	USEPA 6020A	0.2 µg/L
Lead (Pb)	ICP-MS	USEPA 6020A	0.2 µg/L
Zinc (Zn)	ICP-MS	USEPA 6020A	1 µg/L
Arsenic (As)	ICP-MS	USEPA 6020A	1 µg/L
Silver (Ag)	ICP-MS	USEPA 6020A	0.1 µg/L
Mercury (Hg)	ICP-MS	APHA 7470A	0.05 µg/L

*Note: Calculation based on the laboratory result of ammonia nitrogen (NH₄-N) and in-situ measured pH, salinity and temperature.

2.4 Monitoring Frequency and Duration

To account for potential variations within a year, the baseline was conducted in May (from 3 to 14 May 2016) and in July (from 19 to 30 July 2016).

The baseline water quality monitoring was conducted three days per week, at mid-flood and mid-ebb tides, at 23 water quality monitoring stations. Samples were taken at three depths (at 1m below surface, at mid-depth, and at 1m above bottom) for locations with water depth >6m. For locations with water depth between 3m and 6m, water samples were taken at two depths (surface and bottom). For locations with water depth <3m, only the surface depth was taken. Duplicate water samples were taken and analysed.

2.5 Monitoring Locations and Parameters

The baseline monitoring was conducted at a total of 23 water quality monitoring stations, comprising 12 impact stations, eight sensitive receiver stations and three control stations.

Monitoring of DO, DO%, pH, temperature, turbidity, salinity and SS as well as current speed and direction were undertaken at all monitoring stations. For monitoring of DCM works, baseline monitoring of total alkalinity, heavy metals and nutrients were conducted at designated DCM-specific monitoring stations as shown in **Table 2.3**.

Alternative Monitoring Locations

Based on the provisions and requirements set out in Section 5.1.5 of the Updated EM&A Manual, changes in monitoring locations were proposed for SR1, SR4 and SR5. Agreement from the IEC and approval from the EPD were sought for the changes. The locations of the alternative monitoring stations, including SR1A, SR4A and SR5A, are shown in **Figure 2.1**. **Table 2.3** summarises the updated coordinates of the alternative monitoring locations.

Temporary Alternative Monitoring Location for SR1

A temporary change of the monitoring location for SR1 was identified necessary as a silt curtain was installed at the waters blocking access to SR1. Therefore, the proposed temporary monitoring location (SR1A) is slightly shifted to around 159 m to the west of SR1. The temporary alternative monitoring station at SR1A is the closest accessible location to the future permanent SR1. Given the constraints identified, the change of location to SR1A is considered to be the best practicable and representative location for baseline water quality monitoring at this water sensitive receiver.

It should be noted that SR1/SR1A is used to represent the seawater intake for the future HKBCF, however, this seawater intake is not yet in operation and therefore the future permanent location for SR1 during impact monitoring is subject to finalisation after the HKBCF seawater intake is commissioned.

Permanent Alternative Monitoring Locations for SR4 and SR5

Changes of the monitoring locations for SR4 and SR5 were required as the water depths around the original monitoring locations at SR4 and SR5 were found to be too shallow (less than 1.5m). The alternative monitoring locations at SR4A and SR5A are outside the shallow waters, i.e., with sufficient water depths for access by the sampling vessel (with a draft of about 2.5m). The alternative monitoring locations are the closest and accessible locations to the bay areas of the two WSRs. Hence, they are considered to be practicable and representative locations for monitoring the construction phase water quality impact at the WSRs.

The final coordinates of the monitoring stations for baseline monitoring are shown in **Table 2.3** and their locations are shown in **Figure 2.1**.

Table 2.3: Monitoring Locations and Parameters for Baseline Water Quality Monitoring

Monitoring Stations	Description	Coordinates		Parameters
		Easting	Northing	
C1	Control	804247	815620	DO, pH, Temperature,

Monitoring Stations	Description	Coordinates		Parameters
		Easting	Northing	
C2	Control	806945	825682	Salinity, Turbidity, SS
C3	Control	817803	822109	
IM1	Impact	806458	818351	DO, pH, Temperature, Salinity, Turbidity, SS *Total Alkalinity
IM2	Impact	806193	818852	
IM3	Impact	806019	819411	
IM4	Impact	805039	819570	
IM5	Impact	804924	820564	
IM6	Impact	805828	821060	
IM7	Impact	806835	821349	
IM8	Impact	807838	821695	
IM9*	Impact	808811	822094	DO, pH, Temperature, Salinity, Turbidity, SS, *Total Alkalinity, *Heavy metals and *Nutrients
IM10*	Impact	809838	822240	
IM11*	Impact	810545	821501	
IM12*	Impact	811519	821162	
SR1A ⁽¹⁾	Future Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) Seawater Intake for cooling	812586	820069	DO, pH, Temperature, Salinity, Turbidity, SS
SR2	Planned marine park / hard corals at The Brothers / Tai Mo To	814166	821463	
SR3	Sha Chau and Lung Kwu Chau Marine Park / fishing and spawning grounds in North Lantau	807571	822147	
SR4A ⁽¹⁾	Sha Lo Wan	807810	817189	
SR5A ⁽¹⁾	San Tau Beach SSSI	810696	816593	
SR6	Tai Ho Bay, Near Tai Ho Stream SSSI	814663	817899	
SR7	Ma Wan Fish Culture Zone (FCZ)	823742	823636	
SR8	Seawater Intake for cooling at Hong Kong International Airport (East)	811593	820417	

Notes:

* Denotes baseline monitoring stations and/or parameters for DCM-specific monitoring

(1) Alternative monitoring location

3 Baseline Monitoring Results and Analysis

3.1 Baseline Water Quality Monitoring

Detailed baseline water quality monitoring results are tabulated and presented in **Appendix 3.1**. Graphical presentations of the baseline monitoring results are provided in **Appendix 3.2**.

General weather conditions throughout the baseline water quality monitoring period were recorded. The collected data are presented in **Appendix 3.1**. The weather conditions were mainly fine and cloudy, and the sea conditions were mainly moderate throughout the baseline monitoring period.

As there was no project-related marine construction activities during the baseline water quality monitoring, the water quality monitoring results obtained are considered to be appropriate for adoption as part of the baseline water quality dataset for the project. Where outliers are identified as shown in **Appendix 3.1** and **Appendix 3.2**, these have been removed from the dataset used to determine AL levels.

3.2 Statistical Analysis of the Baseline Data

To analyse if there is any significant difference between control and impact stations, statistical analysis was conducted to compare the findings from the control station versus those from the impact / sensitive receiver stations. During baseline monitoring, DO, pH, temperature, salinity, turbidity and SS were monitored at the control stations, however, only turbidity and SS are linked to control station results during impact monitoring with respect to AL levels. As such, the statistical analysis was conducted for turbidity and SS only.

Statistical analysis using one-way analysis of variance (ANOVA) was conducted. Impact stations were grouped according to corresponding control stations under flood tide and ebb tide conditions. The results of the ANOVA test are presented in **Table 3.1**.

Table 3.1: Results of ANOVA test

ANOVA Test Groups		P-value (alpha = 0.05)	
Control Station	Impact Stations	SS	Turbidity
Flood Tide			
C1	IM1, IM2, IM3, IM4, IM5, IM6, IM7, IM8, SR3	0.02	0.16
C3	IM7, IM8, IM9, IM10, IM11, IM12, SR1A, SR2, SR3, SR4A, SR5A, SR6, SR8	0.08	0.01
Ebb Tide			
C1	SR4A, SR5A, SR6	0.42	0.87
C2	IM1, IM2, IM3, IM4, IM5, IM6, IM7, IM8, IM9, IM10, IM11, IM12, SR1A, SR2, SR3, SR7, SR8	0.11	0.73

Note: bold values show statistically significant difference between control and impact stations

As shown in **Table 3.1**, significant difference is identified between C1 and its corresponding impact stations for SS during flood tide, and between C3 and its corresponding impact stations for turbidity during flood tide. No significant difference was identified for the other combinations, hence only the significant differences affecting C1 and C3 during flood tide were further evaluated.

At C1, the depth-averaged SS results during flood tide range from 5 to 43 mg/l, while those of the impact stations range from 3 to 40 mg/l. On average, the SS results at C1 are higher than the impact stations, due primarily to the presence of several high SS results at C1. If the highest and lowest C1 results are excluded from the ANOVA test, then the resulting P-value would be 0.07 (no significant difference). This suggests that the significant difference identified in **Table 3.1** is a result of the extreme values rather than reflecting the majority of the C1 results. Extreme values can arise due to natural fluctuations in the marine environment, and given that in the absence of these extremes, the C1 results would show no significant difference with the impact stations, it is considered that overall, this control station is acceptable and representative for the purpose of impact monitoring.

At C3, the depth-averaged turbidity results during flood tide range from 3.2 to 12.6 mg/l, while those of the impact stations range from 3.9 to 51.7 mg/l. The results at C3 are significantly lower than the majority of the impact station results, suggesting that the location of C3 is unable to adequately represent the water quality at the impact stations under baseline conditions during flood tide. In this case, an alternative control station location to cover flood tide (for corresponding impact stations as shown in **Table 3.1**) is required. As shown in **Figure 2.1**, both C3 and SR2 are located upstream of the project during flood tides, and SR2 is located >2.7 km away from the marine works area of the project, hence is similar to C3 in that it is unaffected by marine works of the project during flood tide conditions. As SR2 is unaffected by the project during flood tide, it can effectively act as a control station during flood tide conditions. An ANOVA test using SR2 as control against the impact group (IM7, IM8, IM9, IM10, IM11, IM12, SR1A, SR3, SR4A, SR5A, SR6, SR8) was conducted and the resulting P-values are 0.58 and 0.89 for turbidity and SS respectively, which show that there is no significant difference. Hence, the SR2 location is able to represent the water quality at these impact stations during flood tide under baseline conditions.

Final Results

Based on the findings of the statistical analysis and further evaluation, the final arrangement for the control and impact station groups under flood tide and ebb tide conditions and the corresponding ANOVA test results are presented in **Table 3.2**.

Table 3.2: Final Arrangement of Control and Impact Stations, and ANOVA Test Results

ANOVA Test Groups		P-value (alpha = 0.05)	
Control Station	Impact Stations	SS	Turbidity
Flood Tide			
C1	IM1, IM2, IM3, IM4, IM5, IM6, IM7, IM8, SR3	0.07*	0.16
SR2	IM7, IM8, IM9, IM10, IM11, IM12, SR1A, SR3, SR4A, SR5A, SR6, SR8	0.89	0.58
Ebb Tide			
C1	SR4A, SR5A, SR6	0.42	0.87
C2	IM1, IM2, IM3, IM4, IM5, IM6, IM7, IM8, IM9, IM10, IM11, IM12, SR1A, SR2, SR3, SR7, SR8	0.11	0.73

Note: (*) excludes the highest and lowest values for SS at C1 during flood tide.

4 Event and Action Plan

4.1 Action and Limit Levels

The AL levels for water quality impact monitoring have been set based on the 3RS baseline water quality monitoring conducted in May and July 2016, and in accordance with the derivation criteria specified in the updated EM&A Manual. These AL levels for general water quality monitoring (excluding sensitive receiver stations representing seawater intakes) and regular DCM monitoring are presented in **Table 4.1**.

Table 4.1: Action and Limit Levels for Impact Water Quality Monitoring (General and Regular DCM)

Parameters	Action Level		Limit Level	
DO in mg/L (Surface, Middle & Bottom)	<u>Surface and Middle</u>		<u>Surface and Middle</u>	
	4.8 mg/L		4.1 mg/L 5 mg/L for Fish Culture Zone (SR7) only	
	<u>Bottom</u>		<u>Bottom</u>	
	3.1 mg/L		2.3 mg/L	
Suspended Solids (SS) in mg/L	25	or 120% of upstream control station at the same tide of the same day, whichever is higher	36	or 130% of upstream control station at the same tide of the same day, whichever is higher
Turbidity in NTU	26.0		41.4	
Total Alkalinity in ppm	95		98	
Representative Heavy Metals for early regular DCM monitoring (Chromium and Nickel)	Same as for intensive DCM monitoring		Same as for intensive DCM monitoring	
Representative Heavy Metals for regular DCM monitoring after completion of initial intensive DCM monitoring (to be determined taking into account the findings of the initial intensive DCM monitoring)				

Note:

1. For DO measurement, non-compliance occurs when monitoring result is lower than the limits.
2. For parameters other than DO, non-compliance of water quality results when monitoring results is higher than the limits.
3. Depth-averaged results are used unless specified otherwise.
4. The action and limit levels specified in this table does not apply to SR1A and SR8 (see **Section 4.2**).
5. Details of selection criteria for the two heavy metals for early regular DCM monitoring refer to the Detailed Plan on Deep Cement Mixing available on the dedicated 3RS website <http://env.threerunwaysystem.com/en/ep-submissions.html>
6. The action and limit levels for the two representative heavy metals chosen will be the same as that for the intensive DCM monitoring

For intensive DCM monitoring, the AL levels to be adopted at the intensive DCM monitoring stations are presented in **Table 4.2**.

Table 4.2: Action and Limit Levels for Impact Water Quality Monitoring (Intensive DCM)

Parameters	Action Level		Limit Level		
Temperature in °C	1.8°C above the temperature recorded at representative control stations at the same tide of the same day		2°C above the temperature recorded at representative control stations at the same tide of the same day		
Total Alkalinity in ppm	95	or 120% of upstream control station at the same tide of the same day, whichever is higher	98	or 130% of upstream control station at the same tide of the same day, whichever is higher	
Nutrient (mg/l)					
Ammonia (NH ₃)	0.18		0.20		
Unionised ammonia (NH ₃) (with 0.021 mg/L as the upper limit)	0.01		0.01		
Nitrite (NO ₂)	0.12		0.13		
Nitrate (NO ₃)	1.05		1.18		
TKN	0.6		0.7		
Total Phosphorus	0.06		0.07		
Reactive Phosphorus	0.04		0.04		
Heavy Metals (µg/l)					
Cadmium (Cd)	0.1		0.1		
Chromium (Cr)	0.2		0.2		
Copper (Cu)	1.9		5.1		
Nickel (Ni)	3.2		3.4		
Lead (Pb)	0.2		0.2		
Zinc (Zn)	6		8		
Arsenic (As)	3		4		
Silver (Ag)	0.1	0.1			
Mercury (Hg)	0.05	0.05			

Note:

1. Non-compliance of water quality results when monitoring results is higher than the limits.
2. Depth-averaged results are used unless specified otherwise.
3. For Cd, Cr, Pb, Ag and Hg, the percentile values are below detection limit, hence the AL levels represent detection limit.
4. Where the water quality results at control stations for individual parameters are below detection limit, the value of the detection limit will be adopted.

4.2 Action and Limit Levels for Seawater Intakes

According to the updated EM&A Manual, sensitive receiver stations representing seawater intakes for cooling are affected by SS only, and hence only the AL levels for SS parameter would be applicable. The AL levels at these intakes would be determined and agreed with the respective operators of the intakes prior to commencement of construction activities or commencement of operation of the seawater intake (whichever is later).

For the 3RS project, the status of the two seawater intakes for cooling (i.e. SR1 and SR8) at the time of preparation of this report are summarised below:

SR1 – to be constructed / commissioned. Programme of commissioning has been delayed (compared to original programme assumed at the time of approval of 3RS EIA report). Based on latest information from the project proponent of HKBCF, the earliest commissioning date for this intake is mid-2017. Operational tolerance for SS is subject to further liaison with the project proponent of HKBCF.

SR8 – in operation by AAHK. Appropriate AL levels have been proposed taking into account the operational tolerance of the intake and agreed with the operator and IEC.

The AL levels to be adopted for these seawater intakes are summarised in **Table 4.3**.

Table 4.3: Action and Limit Level for SR1 and SR8

SS (mg/l)	Action Level	Limit Level
SR1	To be determined prior to its commissioning	To be determined prior to its commissioning
SR8	52	60

For SR1, the AL levels to be adopted are subject to further liaison and agreement with the project proponent of HKBCF. Meanwhile, it is recognised that SR1 is yet to be commissioned, hence it is not yet an existing sensitive receiver and consequently, would not be impacted by the 3RS project before it is commissioned. Given these circumstances, there is no need for conducting impact monitoring at this SR1 location prior to its commissioning date.

Separately, the future permanent monitoring location of SR1 is subject to further confirmation once the exact location of SR1 is determined, taking into account the need for silt curtains to be deployed around this SR1 location as part of the mitigation measures for 3RS project.

Given the aforementioned issues and programme mismatch, the final details for SR1 including its monitoring location, commissioning date and AL levels will be submitted to EPD prior to commissioning of the seawater intake at SR1 and documented in the monthly EM&A Report.

For SR8, it is noted that silt curtains are to be deployed around this SR8 location as part of the mitigation measures for 3RS project, while the intake itself is located within the works boundary of the 3RS project and will need to be relocated during construction phase. As such, the impact monitoring location for SR8 will be subject to further changes. Where the monitoring location needs to be updated, the updated location shall be notified to IEC and EPD and documented in the monthly EM&A Report.

4.3 Event and Action Plan

For general water quality monitoring, should non-compliance of the water quality criteria occur, the Event and Action Plan as presented in **Table 4-4** shall be followed. For DCM monitoring, the Event and Action Plan shall follow the Detailed Plan on Deep Cement Mixing, which can be accessed from <http://env.threerunwaysystem.com/en/ep-submissions.html>. The Event and Action Plan for the initial intensive DCM monitoring presented in the Detailed Plan on Deep Cement Mixing submitted under EP condition 2.17 shall be followed during the initial intensive DCM monitoring stage.

Table 4-4: Event and Action Plan for General Water Quality Monitoring

Event	ET	IEC	Action	
			AAHK / PM	Contractor
Action level being exceeded by one sampling day	1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact;	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted	1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented;	1. Inform AAHK / PM and confirm receipt of ET's notification of the non-compliance in writing; 2. Rectify

Event	ET	IEC	Action	
			AAHK / PM	Contractor
	<ol style="list-style-type: none"> 3. Inform IEC and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; 6. Repeat in-situ monitoring on the day after the exceedance. 	<p>by Contractor and advise AAHK / PM accordingly;</p> <ol style="list-style-type: none"> 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 3. Assess the effectiveness of the implemented mitigation measures. 	<p>unacceptable practice;</p> <ol style="list-style-type: none"> 3. Check all plant and equipment; 4. Provide report of the status and condition of plant, equipment and mitigation measures to ET 5. Consider changes of working methods; 6. Discuss with ET and IEC and propose mitigation measures.
<p>Action Level being exceeded by more than two consecutive sampling days</p>	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact; 3. Inform IEC and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; 6. Ensure mitigation measures are implemented; 7. Repeat in-situ monitoring on the day after the exceedance and prepare to increase the monitoring frequency to daily. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise AAHK / PM accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform AAHK / PM and confirm receipt of ET's notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Provide report of the status and condition of plant, equipment and mitigation measures to ET 5. Consider changes of working methods; 6. Discuss with ET and IEC and propose mitigation measures to IEC and AAHK / PM within three working days; 7. Implement the agreed mitigation measures.
<p>Limit Level being exceeded by one sampling day</p>	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact; 3. Inform IEC, Contractor and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, AAHK / PM and 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise AAHK / PM accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform AAHK / PM and confirm receipt of ET's notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Provide report of the status and condition of plant, equipment and mitigation measures to ET 5. Consider changes

Event	Action			
	ET	IEC	AAHK / PM	Contractor
	Contractor; 6. Ensure mitigation measures are implemented; 7. Repeat in-situ monitoring on the day after the exceedance and prepare to increase the monitoring frequency to daily			of working methods; 6. Discuss with ET, IEC and AAHK / PM and propose mitigation measures to IEC and AAHK / PM within three working days; 7. Implement the agreed mitigation measures.
Limit Level being exceeded by more than one consecutive sampling days	1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact; 3. Inform IEC, Contractor and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, AAHK / PM and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the in-situ monitoring frequency to daily until no exceedance of limit level for two consecutive days.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise AAHK / PM accordingly; 3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures; 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of limit level.	1. Inform AAHK / PM and confirm receipt of ET's notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Provide daily report of the status and condition of plant, equipment and mitigation measures to ET until no further exceedance; 5. Consider changes of working methods; 6. Discuss with ET, IEC and AAHK / PM and propose mitigation measures to IEC and AAHK / PM within three working days; 7. Implement the agreed mitigation measures; 8. As directed by AAHK / PM, to slow down or to stop all or part of the construction activities.

Note: Where the action level is the same as the limit level, the actions specified for limit level exceedances shall apply.

5 Revisions to Updated EM&A Manual

As part of the baseline water quality monitoring conducted for the 3RS project and its subsequent findings and recommendations, the following revisions to the Updated EM&A Manual are recommended.

Table 5.1: Recommended Revisions to Updated EM&A Manual

Relevant Section in Updated EM&A Manual	Original Requirement	Revisions Recommended
Section 5.1.3.14	Wet bulb calibration for a DO meter should be carried out before measurement at each monitoring location	Wet bulb calibration for a DO meter should be carried out before commencement of monitoring and after completion of all measurements each day
Table 5-2	Water Quality Monitoring Stations (construction and post construction phases)	<p>Location of SR1 subject to finalisation after the HKBCF seawater intake is commissioned. The final location shall be documented in the monthly EM&A Report</p> <p>As SR1 is yet to be commissioned, no impact monitoring will be conducted at SR1 prior to its commissioning date. The final commissioning date, once determined, shall be documented in the monthly EM&A Report</p> <p>Alternative locations for SR4 and SR5 according to Table 2-3 of this Baseline Report</p>
Table 5-4	Event and Action Plan for Water Quality	Supplementary and updated actions in the Event and Action Plan for Water Quality as per Table 4-4 of this Baseline Report

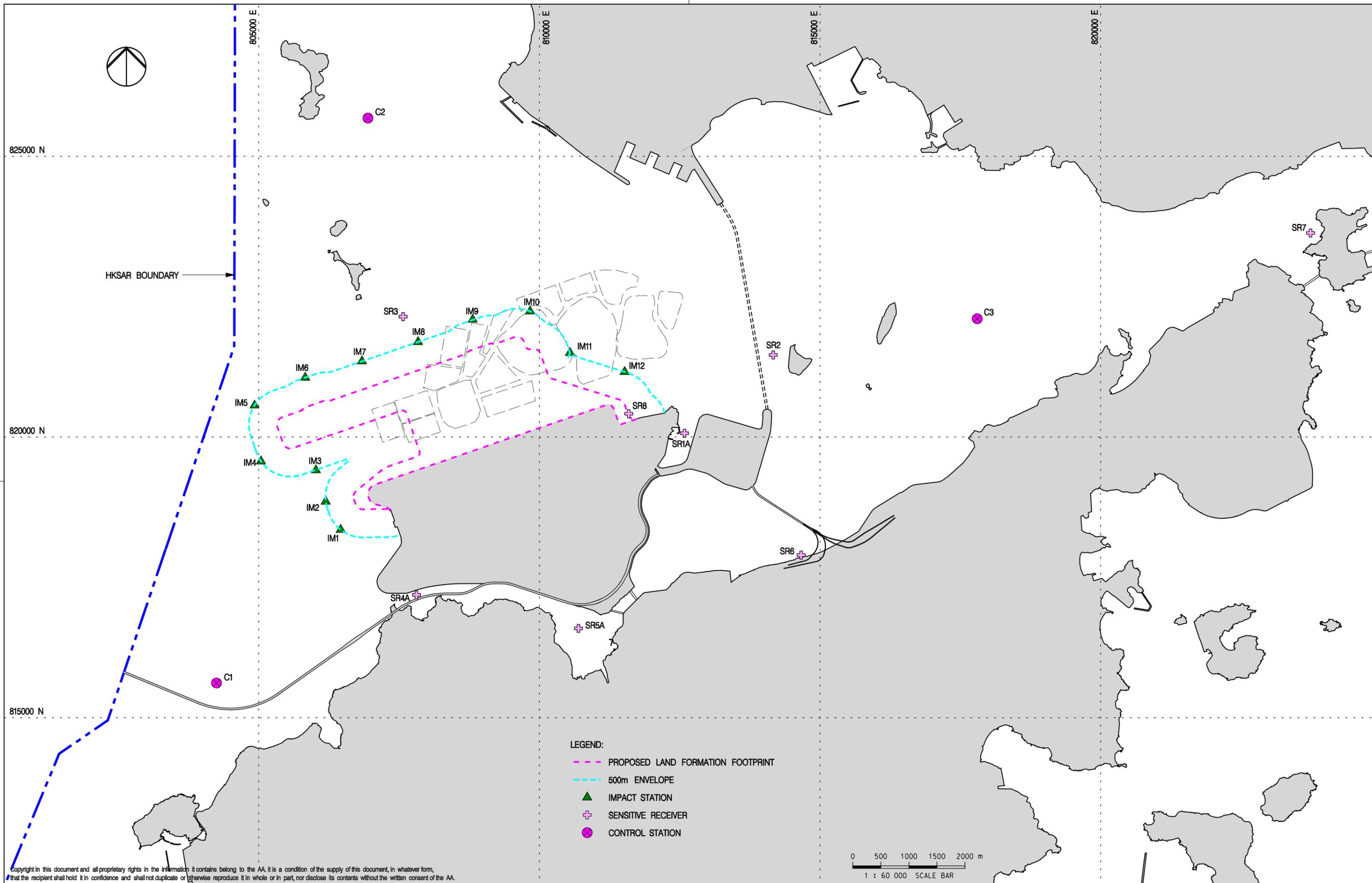
Aside from the revisions specified in **Table 5.1**, other revisions to the Updated EM&A Manual (e.g. due to other related 3RS submissions such as the Detailed Plan on Deep Cement Mixing) may also apply.

6 Conclusion

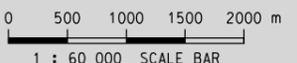
Baseline water quality monitoring was undertaken prior to the commencement of marine-based construction works of the project in accordance with the requirements set out in the EP and recommended in the updated EM&A Manual. All monitoring equipment used were properly calibrated and valid calibration certificates are included in this report.

To account for potential variations within a year, the baseline was conducted in May (from 3 to 14 May 2016) and in July (from 19 to 30 July 2016). The baseline water quality monitoring was carried out for three days per week at mid-flood and mid ebb tides, at a total of 23 water quality monitoring stations. The weather conditions were mainly fine and cloudy, and the sea conditions were mainly moderate throughout the baseline monitoring period. The results of baseline monitoring were provided in tables and graphical presentations in this report. As there were no project-related marine construction activities when the baseline water quality monitoring was carried out, the baseline water quality monitoring results obtained are considered to be appropriate for adoption as part of the baseline water quality dataset for the 3RS project. Where applicable, revisions to the Updated EM&A Manual are recommended.

Figures



- LEGEND:
- PROPOSED LAND FORMATION FOOTPRINT
 - - - 500m ENVELOPE
 - ▲ IMPACT STATION
 - ⊕ SENSITIVE RECEIVER
 - ⊗ CONTROL STATION



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Rev.	Date	Description	Checked
A	02DEC15	FIRST ISSUE	DC
B	04MAY16	GENERAL REVISION	RO
C	06JUN16	GENERAL REVISION	LC



Title
WATER QUALITY MONITORING STATION FOR BASELINE MONITORING

Consultant's Signatures for Approval		Date
Design	DC	06JUN16
Checkers	DC / TK	06JUN16
Approver	EC	06JUN16

EXPANSION OF HONG KONG INTERNATIONAL AIRPORT INTO A THREE-RUNWAY SYSTEM	
Drawing No.	Scale at A3 1 : 60000
FIGURE 2.1	Rev. C

Appendix 1.1 Construction Programme for Marine Works

Relevant construction activities highlighted in yellow box.

Line	Name	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Advanced Works											
1	Aviation Fuel Pipeline Diversion	1									
2	Power Cable Diversion	2									
Land Formation											
4	Mobilization	4									
5	Sand Blanket Laying	5									
6	Ground Improvement Works	6									
7	Construction of Seawall	7									
8	Marine Filling	8									
9	Land Filling	9									
10	Surcharge	10									
11	Works After Closure of Existing North Runway							11			
12	North Runway (New)				12						
13	Centre Runway Modification		13								
14	TRC/ Apron					14					
15	T2 Expansion (Advance Works)		15								
16	T2 Expansion (Main Works)				16						
17	Underground Tunnel (APM/ BHS)		17								
18	APM System			18							
19	BHS						19				
20	Operation Trials									20	
Programme No. 3-AAP-EPP-0-A0		3RS Phasing Programme									
Revision/Date A/(12-Jul-16)											
Prepared VT											
Checked PY											

Appendix 2.1 Calibration Certificates



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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

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1-3 WING YIP STREET,
KWAI CHUNG,
N.T., HONG KONG

WORK ORDER: HK1612311
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 31/03/2016
DATE OF ISSUE: 06/04/2016

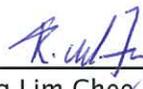
COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.
The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.
The "Next Calibration Date" is recommended according to best practice principals as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Conductivity, Dissolved Oxygen, pH, Salinity, Turbidity and Temperature
Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920
Serial No.: 000109DF
Equipment No.: --
Date of Calibration: 31 March, 2016

NOTES

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.


Mr. Fung Lim Chee, Richard
General Manager
Greater China & Hong Kong

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Page 1 of 3

REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION



Work Order: HK1612311
Sub-Batch: 0
Client: ALS TECHNICHEM (HK) PTY LTD
Date of Issue: 06/04/2016

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920
Serial No.: 000109DF
Equipment No.: --
Date of Calibration: 31 March, 2016

Date of next Calibration: 30 June, 2016

Parameters:

Conductivity

Method Ref: APHA (21st edition), 2510B

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	141.9	-3.4
6667	6704	+0.6
12890	12956	+0.5
58670	58196	-0.8
Tolerance Limit (%)		±10.0

Dissolved Oxygen

Method Ref: APHA (21st edition), 4500-O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
1.50	1.44	-0.06
5.02	4.96	-0.06
9.04	9.00	-0.04
Tolerance Limit (mg/L)		±0.20

pH Value

Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.05	+0.05
7.0	7.02	+0.02
10.0	9.98	-0.02
Tolerance Limit (pH unit)		±0.20

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Mr. Fung Lim Chee, Richard
 General Manager
 Greater China & Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



Work Order: HK1612311
Sub-Batch: 0
Client: ALS TECHNICHEM (HK) PTY LTD
Date of Issue: 06/04/2016

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920
Serial No.: 000109DF
Equipment No.: --

Date of Calibration: 31 March, 2016 **Date of next Calibration:** 30 June, 2016

Parameters:

Salinity

Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
10	9.94	-0.6
20	19.78	-1.1
30	29.81	-0.6
Tolerance Limit (%)		±10.0

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
13	13.1	+0.1
21	20.9	-0.1
31	30.6	-0.4
Tolerance Limit (°C)		±2.0

Turbidity

Method Ref: APHA 21st Ed. 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
4	3.9	-2.5
40	39.4	-1.5
80	78.1	-2.4
400	386.5	-3.4
800	788.2	-1.5
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.



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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

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HIN KENG ESTATE,
TAI WAI,
N.T., HONG KONG

WORK ORDER: HK1628802
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 16/07/2016
DATE OF ISSUE: 25/07/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

The "Next Calibration Date" is recommended according to best practice principals as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Conductivity, Dissolved Oxygen, pH, Salinity, Temperature and Turbidity
Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920V2
Serial No.: 000109DF
Equipment No.: --
Date of Calibration: 16 July, 2016

NOTES

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.


Mr. Fung Lim Chee, Richard
General Manager -
Greater China & Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Work Order: HK1628802
Sub-Batch: 0
Date of Issue: 25/07/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Multifunctional Meter
Brand Name: YSI
Model No.: 6920V2
Serial No.: 000109DF
Equipment No.: --
Date of Calibration: 16 July, 2016

Date of next Calibration: 16 October, 2016

Parameters:

Conductivity

Method Ref: APHA (21st edition), 2510B

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	146	-0.6
6667	6022	-9.7
12890	12910	+0.2
58670	56608	-3.5
Tolerance Limit (%)		±10.0

Dissolved Oxygen

Method Ref: APHA (21st edition), 4500O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
2.30	2.43	+0.13
5.18	5.30	+0.12
7.41	7.52	+0.11
Tolerance Limit (mg/L)		±0.20

pH Value

Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.03	+0.03
7.0	7.09	+0.09
10.0	9.93	-0.07
Tolerance Limit (pH unit)		±0.20

Salinity

Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.00	--
10	10.01	+0.1
20	19.65	-1.8
30	28.38	-5.4
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.



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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Work Order: HK1628802
Sub-Batch: 0
Date of Issue: 25/07/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Multifunctional Meter
Brand Name: YSI
Model No.: 6920V2
Serial No.: 000109DF
Equipment No.: --
Date of Calibration: 16 July, 2016

Date of next Calibration: 16 October, 2016

Parameters:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
15.0	14.0	-1.0
25.5	24.5	-1.0
39.0	38.3	-0.7
Tolerance Limit (°C)		±2.0

Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.4	--
4	4.2	+5.0
40	41.6	+4.0
80	82.2	+2.8
400	411	+2.8
800	824	+3.0
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.


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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

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WORK ORDER: HK1612309
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 31/03/2016
DATE OF ISSUE: 06/04/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

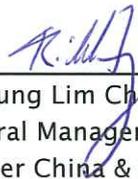
The "Next Calibration Date" is recommended according to best practice principals as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Conductivity, Dissolved Oxygen, pH, Salinity, Temperature and Turbidity
Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920 V2
Serial No.: 00019CB2
Equipment No.: --
Date of Calibration: 31 March, 2016

NOTES

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.


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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1612309
Sub-Batch: 0
Date of Issue: 06/04/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Multifunctional Meter
Brand Name: YSI
Model No.: 6920 V2
Serial No.: 00019CB2
Equipment No.: --
Date of Calibration: 31 March, 2016

Date of next Calibration: 30 June, 2016

Parameters:

Conductivity

Method Ref: APHA (21st edition), 2510B

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	149.2	+1.6
6667	6689	+0.3
12890	12920	+0.2
58670	58062	-1.0
Tolerance Limit (%)		±10.0

Dissolved Oxygen

Method Ref: APHA (21st edition), 4500O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
1.50	1.54	+0.04
5.02	5.09	+0.07
9.04	8.96	-0.08
Tolerance Limit (mg/L)		±0.20

pH Value

Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.06	+0.06
7.0	7.06	+0.06
10.0	9.94	-0.06
Tolerance Limit (pH unit)		±0.20

Salinity

Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
10	9.92	-0.8
20	19.82	-0.9
30	29.88	-0.4
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.


 Mr. Fung Lim Chee, Richard
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 Greater China & Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1612309
Sub-Batch: 0
Date of Issue: 06/04/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Multifunctional Meter
Brand Name: YSI
Model No.: 6920 V2
Serial No.: 00019CB2
Equipment No.: --
Date of Calibration: 31 March, 2016

Date of next Calibration: 30 June, 2016

Parameters:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
13	13.2	+0.2
21	21.1	+0.1
31	30.6	-0.4
	Tolerance Limit (°C)	±2.0

Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
4	4.2	+5.0
40	40.5	+1.3
80	78.9	-1.4
400	384.1	-4.0
800	786.7	-1.7
	Tolerance Limit (%)	±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.


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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: MR THOMAS WONG
CLIENT: ENOVATIVE ENVIRONMENTAL SERVICE LTD
ADDRESS: RM811, HIN PUI HOUSE,
HIN KENG ESTATE,
TAI WAI,
N.T., HONG KONG

WORK ORDER: HK1628798
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 16/07/2016
DATE OF ISSUE: 25/07/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

The "Next Calibration Date" is recommended according to best practice principals as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Conductivity, Dissolved Oxygen, pH, Salinity, Temperature and Turbidity
Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920V2
Serial No.: 00019CB2
Equipment No.: --
Date of Calibration: 16 July, 2016

NOTES

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.


Mr. Fung Lim Chee, Richard
General Manager -
Greater China & Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Work Order: HK1628798
Sub-Batch: 0
Date of Issue: 25/07/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Multifunctional Meter
Brand Name: YSI
Model No.: 6920V2
Serial No.: 00019CB2
Equipment No.: --
Date of Calibration: 16 July, 2016 **Date of next Calibration:** 16 October, 2016

Parameters:

Conductivity

Method Ref: APHA (21st edition), 2510B

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	147	+0.1
6667	6548	-1.8
12890	13168	+2.2
58670	57511	-2.0
Tolerance Limit (%)		±10.0

Dissolved Oxygen

Method Ref: APHA (21st edition), 45000: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
2.30	2.44	+0.14
5.18	5.26	+0.08
7.41	7.51	+0.10
Tolerance Limit (mg/L)		±0.20

pH Value

Method Ref: APHA 21st Ed. 4500H:B

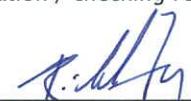
Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.05	+0.05
7.0	7.03	+0.03
10.0	10.06	+0.06
Tolerance Limit (pH unit)		±0.20

Salinity

Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.01	--
10	9.92	-0.8
20	19.31	-3.5
30	27.95	-6.8
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.


 Mr. Fung Lim Chee, Richard
 General Manager -
 Greater China & Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Work Order: HK1628798
Sub-Batch: 0
Date of Issue: 25/07/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Multifunctional Meter
Brand Name: YSI
Model No.: 6920V2
Serial No.: 00019CB2
Equipment No.: --

Date of Calibration: 16 July, 2016 **Date of next Calibration:** 16 October, 2016

Parameters:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
13.5	13.9	+0.4
26.5	26.7	+0.2
37.0	37.3	+0.3
Tolerance Limit (°C)		±2.0

Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.4	--
4	4.2	+5.0
40	40.7	+1.8
80	81.6	+2.0
400	397	-0.8
800	807	+0.9
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.



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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

CONTACT: MR THOMAS WONG
CLIENT: ENOVATIVE ENVIRONMENTAL SERVICE LTD
ADDRESS: RM811, HIN PUI HOUSE,
HIN KENG ESTATE,
TAI WAI,
N.T., HONG KONG

WORK ORDER: HK1612385
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 30/03/2016
DATE OF ISSUE: 12/04/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.
The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Volume
Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N64701
Equipment No.: --
Date of Calibration: 01 April, 2016

NOTES

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.


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General Manager
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Page 1 of 2

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1612385
Sub-Batch: 0
Date of Issue: 12/04/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N64701
Equipment No.: --
Date of Calibration: 01 April, 2016

Parameters:

Volume **Method Reference: In House Method – Titrette and Digital Burette**
Testing Instuction (SOP) May 2014

Trial	Nominal vol (ml)				
	5	10	25	35	50
Weight (g)					
1	4.9703	9.9659	24.9114	34.8627	49.8305
2	4.9889	9.9596	24.9083	34.8780	49.8208
3	4.9726	9.9660	24.9039	34.8787	49.8232
4	4.9859	9.9623	24.9120	34.8706	49.8300
5	4.9820	9.9663	24.9064	34.8746	49.8278
6	4.9818	9.9570	24.9176	34.8787	49.8210
7	4.9806	9.9573	24.9094	34.8718	49.8197
8	4.9795	9.9608	24.9157	34.8728	49.8230
9	4.9829	9.9654	24.9229	34.8763	49.8281
10	4.9869	9.9634	24.9124	34.8743	49.8233
Average	4.9811	9.9624	24.9120	34.8739	49.8247
Standard deviation	0.0059	0.0036	0.0056	0.0048	0.0040
Calculate volume (mL)	4.9980	9.9963	24.9967	34.9925	49.9941
Error (%)	-0.04%	-0.04%	-0.01%	-0.02%	-0.01%
RSD (%)	0.12%	0.04%	0.02%	0.01%	0.01%

Acceptance Criteria:

Accuaracy (% Error)	< ± 1%	< ± 1%	< ± 0.5%	< ± 0.5%	< ± 0.5%
Precision (%RSD)	<1%	<1%	<1%	<1%	<1%


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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: MR THOMAS WONG
CLIENT: ENOVATIVE ENVIRONMENTAL SERVICE LTD
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WORK ORDER: HK1628456
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 14/07/2016
DATE OF ISSUE: 18/07/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Volume
Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N64701
Equipment No.: --
Date of Calibration: 15 July, 2016

NOTES

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.

PP 
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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Work Order: HK1628456
Sub-Batch: 0
Date of Issue: 18/07/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N64701
Equipment No.: --
Date of Calibration: 15 July, 2016

Parameters:

Volume **Method Reference: In House Method - Titrette and Digital Burette**
Testing Instruction (SOP) May 2014

Trial	Nominal vol (ml) (at interval)				
	3 (1-4)	3 (16-19)	3 (23-26)	3 (34-37)	3 (42-45)
	Weight (g)				
1	2.9903	2.9954	2.9877	2.9800	2.9874
2	2.9888	2.9865	2.9899	2.9852	2.9855
3	2.9787	2.9873	2.9853	2.9844	2.9853
4	2.9929	2.9873	2.9895	2.9893	2.9881
5	2.9763	2.9872	2.9884	2.9824	2.9813
6	2.9929	2.9870	2.9857	2.9761	2.9812
7	2.9900	2.9887	2.9856	2.9854	2.9867
8	2.9894	2.9889	2.9880	2.9824	2.9899
9	2.9876	2.9893	2.9835	2.9882	2.9936
10	2.9899	2.9880	2.9918	2.9787	2.9789
Average	2.9877	2.9886	2.9875	2.9832	2.9858
Standard deviation	0.0056	0.0026	0.0025	0.0041	0.0044
Calculate volume (mL)	2.9975	2.9984	2.9974	2.9931	2.9956
Error (%)	-0.08%	-0.05%	-0.09%	-0.23%	-0.15%
RSD (%)	0.19%	0.09%	0.08%	0.14%	0.15%

Acceptance Criteria:

Accuracy (% Error)	< ± 1%	< ± 1%	< ± 1%	< ± 1%	< ± 1%
Precision (%RSD)	<1%	<1%	<1%	<1%	<1%

PP 
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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

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WORK ORDER: HK1612384
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 30/03/2016
DATE OF ISSUE: 12/04/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Volume
Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N60623
Equipment No.: --
Date of Calibration: 01 April, 2016

NOTES

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.


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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1612384
Sub-Batch: 0
Date of Issue: 12/04/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N60623
Equipment No.: --
Date of Calibration: 01 April, 2016

Parameters:

Volume **Method Reference: In House Method – Titrette and Digital Burette**
Testing Instuction (SOP) May 2014

Trial	Nominal vol (ml)				
	5	10	25	35	50
	Weight (g)				
1	4.9721	9.9553	24.9020	34.8598	49.8184
2	4.9668	9.9518	24.9013	34.8754	49.8262
3	4.9697	9.9544	24.9056	34.8677	49.8176
4	4.9719	9.9590	24.8995	34.8698	49.8224
5	4.9689	9.9626	24.9018	34.8675	49.8302
6	4.9640	9.9495	24.9042	34.8728	49.8287
7	4.9675	9.9625	24.9119	34.8670	49.8216
8	4.9670	9.9510	24.9116	34.8659	49.8222
9	4.9746	9.9539	24.9102	34.8765	49.8284
10	4.9733	9.9535	24.9041	34.8701	49.8252
Average	4.9696	9.9554	24.9052	34.8693	49.8241
Standard deviation	0.0034	0.0046	0.0045	0.0049	0.0043
Calculate volume (mL)	4.9865	9.9892	24.9899	34.9879	49.9935
Error (%)	-0.27%	-0.11%	-0.04%	-0.03%	-0.01%
RSD (%)	0.07%	0.05%	0.02%	0.01%	0.01%

Acceptance Criteria:

Accuracy (% Error)	< ± 1%	< ± 1%	< ± 0.5%	< ± 0.5%	< ± 0.5%
Precision (%RSD)	<1%	<1%	<1%	<1%	<1%


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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

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CLIENT: ENOVATIVE ENVIRONMENTAL SERVICE LTD
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WORK ORDER: HK1628461
SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 14/07/2016
DATE OF ISSUE: 18/07/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Volume
Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N60623
Equipment No.: --
Date of Calibration: 15 July, 2016

NOTES

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.

PP 
Mr. Fung Lim Chee, Richard
General Manager -
Greater China & Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Work Order: HK1628461
Sub-Batch: 0
Date of Issue: 18/07/2016
Client: ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description: Digital Burette
Brand Name: Titrette
Model No.: Digital Burette 50ml Class A
Serial No.: 10N60623
Equipment No.: --
Date of Calibration: 15 July, 2016

Parameters:

Volume **Method Reference: In House Method - Titrette and Digital Burette**
Testing Instruction (SOP) May 2014

Trial	Nominal vol (ml) (at interval)				
	3 (4-7)	3 (12-15)	3 (25-28)	3 (32-35)	3 (46-49)
	Weight (g)				
1	2.9862	2.9787	2.9784	2.9805	2.9807
2	2.9795	2.9827	2.9814	2.9823	2.9741
3	2.9832	2.9844	2.9778	2.9864	2.9832
4	2.9865	2.9859	2.9831	2.9855	2.9865
5	2.9837	2.9980	2.9795	2.9859	2.9845
6	2.9833	2.9872	2.9819	2.9897	2.9773
7	2.9826	2.9840	2.9859	2.9893	2.9826
8	2.9826	2.9868	2.9761	2.9869	2.9809
9	2.9842	2.9909	2.9817	2.9900	2.9867
10	2.9839	2.9884	2.9875	2.9900	2.9866
Average	2.9836	2.9867	2.9813	2.9867	2.9823
Standard deviation	0.0020	0.0052	0.0036	0.0033	0.0042
Calculate volume (mL)	2.9934	2.9966	2.9912	2.9965	2.9922
Error (%)	-0.22%	-0.11%	-0.29%	-0.12%	-0.26%
RSD (%)	0.07%	0.17%	0.12%	0.11%	0.14%

Acceptance Criteria:

Accuracy (% Error)	< ± 1%	< ± 1%	< ± 1%	< ± 1%	< ± 1%
Precision (%RSD)	<1%	<1%	<1%	<1%	<1%


 PP _____
 Mr. Fung Lim Chee, Richard
 General Manager -
 Greater China & Hong Kong

Appendix 3.1 Baseline Water Quality Monitoring Results

Expansion of Hong Kong International Airport into a Three-Runway System

Baseline Water Quality Monitoring

Water Quality Monitoring Results at C1 during Mid-Flood Tide

Date	Weather Condition	Sea Condition	Sampling Time	Water Depth (m)	Sampling Depth (m)	Current Speed (m/s)	Current Direction	Water Temperature (°C)		pH		Salinity (ppt)		DO Saturation (%)		Dissolved Oxygen (mg/L)			Turbidity(NTU)			Suspended Solids (mg/L)			Observed construction activities		Other Observations				
								Value	Average	Value	Average	Value	Average	Value	Average	Value	Average	DA	Value	Average	DA	Value	Average	DA	<100m from location	>100m from location					
3-May-16	Cloudy	Moderate	16:15	7.7	Surface	1.0	0.4	246	24.9	24.9	8.2	8.2	22.4	22.4	111.5	111.5	8.1	8.1	7.5	5.0	5.0	6.5	7	8	10	N/A	N/A	N/A			
						1.0	0.4	268	24.9	24.9	8.2	8.2	22.4	22.4	111.5	111.5	8.1	8.1		5.1	5.0		8								
					Middle	3.9	0.4	252	23.6	23.6	8.1	8.1	25.3	25.3	93.4	93.3	6.9	6.8	6.5	6.5	6.5	6.5	6.5	6.5	6.5	11	11	6.5	N/A	N/A	N/A
						3.9	0.4	254	23.6	23.6	8.1	8.1	25.3	25.3	93.2	93.3	6.8	6.8		6.5	6.5		10								
					Bottom	6.7	0.2	170	22.9	22.9	8.1	8.1	28.1	28.1	89.0	89.0	6.5	6.5	6.5	6.5	6.5	6.5	7.9	7.9	6.5	12	12	6.5	N/A	N/A	N/A
						6.7	0.3	174	22.9	22.9	8.1	8.1	28.1	28.1	89.1	89.0	6.5	6.5		8.0	7.9		11								

Remarks: DA: Depth-Averaged

Calm: Small or no wave; Moderate: Between calm and rough; Rough : White capped or rougher

Expansion of Hong Kong International Airport into a Three-Runway System
Baseline Water Quality Monitoring
Water Quality Monitoring Results at IM9 during Mid-Flood Tide

Date	Weather Condition	Sea Condition	Sampling Time	Water Depth (m)	Sampling Depth (m)	Ammonia as N (mg/L)			Unionized Ammonia as N			Nitrite as N (mg/L)			Nitrate as N (mg/L)			Total Kjeldahl Nitrogen as N (mg/L)			Total Phosphorus as P (mg/L)			Reactive Phosphorus as P (mg/L)			Arsenic (µg/L)			Cadmium (µg/L)			Chromium (µg/L)			Copper (µg/L)			Lead (µg/L)			Nickel (µg/L)			Silver (µg/L)			Zinc (µg/L)			Mercury (µg/L)					
						Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA
						3-May-16	Cloudy	Moderate	15:12	7.0	Surface 1.0 0.14 0.15	0.15	0.15	<0.01	<0.01	<0.01	0.10	0.1	0.1	1.15	1.1	0.9	0.60	0.6	0.5	0.05	0.05	0.05	0.03	0.04	0.03	0.03	3	3	3	<0.1	<0.1	<0.1	<0.2	<0.2	1.0	1.0	<0.2	<0.2	1.7	1.7	<0.1	<0.1	<1	1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
30-Jul-16	Cloudy	Moderate	16:19	6.3	Surface 1.0 0.08 0.07	0.08	0.07	<0.01	<0.01	<0.01	0.05	0.1	0.1	0.77	0.8	0.8	0.60	0.6	0.6	0.06	0.05	0.05	0.02	0.02	0.03	0.03	2	2	2	<0.1	<0.1	<0.1	<0.2	<0.2	1.2	1.1	<0.2	<0.2	2.9	2.8	<0.1	<0.1	<1	3.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05						

Remarks: DA: Depth-Averaged
 Calm: Small or no wave; Moderate: Between calm and rough; Rough: White capped or rougher

Expansion of Hong Kong International Airport into a Three-Runway System

Baseline Water Quality Monitoring

Water Quality Monitoring Results at IM10 during Mid-Ebb Tide

Table with 46 main columns: Date, Weather, Sea, Sampling, Water, Ammonia as N (mg/L), Unionized Ammonia as N, Nitrite as N (mg/L), Nitrate as N (mg/L), Total Kjeldahl Nitrogen as N (mg/L), Total Phosphorus as P (mg/L), Reactive Phosphorus as P (mg/L), Arsenic (µg/L), Cadmium (µg/L), Chromium (µg/L), Copper (µg/L), Lead (µg/L), Nickel (µg/L), Silver (µg/L), Zinc (µg/L), Mercury (µg/L). Each column contains data for three dates (3-May-16, 5-May-16, 7-May-16, etc.) across three depths (Surface, Middle, Bottom).

Remarks: DA: Depth-Averaged
Calm: Small or no wave; Moderate: Between calm and rough; Rough : White capped or rougher

**Expansion of Hong Kong International Airport into a Three-Runway System
Baseline Water Quality Monitoring
Water Quality Monitoring Results at IM10 during Mid-Flood Tide**

Date	Weather Condition	Sea Condition	Sampling Time	Water Depth (m)	Sampling Depth (m)	Ammonia as N (mg/L)			Unionized Ammonia as N			Nitrite as N (mg/L)			Nitrate as N (mg/L)			Total Kjeldahl Nitrogen as N (mg/L)			Total Phosphorus as P (mg/L)			Reactive Phosphorus as P (mg/L)			Arsenic (µg/L)			Cadmium (µg/L)			Chromium (µg/L)			Copper (µg/L)			Lead (µg/L)			Nickel (µg/L)			Silver (µg/L)			Zinc (µg/L)			Mercury (µg/L)		
						Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA
						3-May-16	Cloudy	Moderate	15:24	7.7	Surface 1.0 1.0 3.9 3.9 6.7 6.7	0.15 0.15 0.13 0.14 0.14 0.14	0.15 0.14 0.14	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	0.11 0.11 0.09 0.09 0.07 0.07	0.1 0.1 0.1 0.1 0.1 0.1	0.1 0.1 0.1 0.1 0.1 0.1	1.23 1.22 1.08 1.08 0.84 0.84	1.2 1.1 1.1 1.1 0.9 0.9	0.60 0.60 0.70 0.60 0.50 0.40	0.6 0.6 0.7 0.7 0.5 0.5	0.04 0.05 0.04 0.04 0.03 0.03	0.04 0.05 0.04 0.04 0.03 0.03	0.04 0.04 0.04 0.04 0.03 0.03	0.04 0.04 0.04 0.04 0.03 0.03	0.04 0.04 0.04 0.04 0.03 0.03	0.04 0.04 0.04 0.04 0.03 0.03	0.04 0.04 0.04 0.04 0.03 0.03	3 3 2 2 2 2	3 3 2 2 2 2	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	0.9 0.8 1.0 1.1 1.1 1.1	0.9 0.9 1.1 1.1 1.1 1.1	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	1.7 1.8 2.0 2.0 2.0 2.0	1.8 1.8 2.0 2.0 1.7 1.7	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-1 1.0 2.0 2.0 2.0 2.0	1.0 1.0 1.5 1.5 3.0 3.0	<-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05	<-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05	<-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05				

Remarks: DA: Depth-Averaged
Calm: Small or no wave; Moderate: Between calm and rough; Rough : White capped or rougher

**Expansion of Hong Kong International Airport into a Three-Runway System
Baseline Water Quality Monitoring
Water Quality Monitoring Results at IM11 during Mid-Flood Tide**

Date	Weather Condition	Sea Condition	Sampling Time	Water Depth (m)	Sampling Depth (m)	Current Speed (m/s)	Current Direction	Water Temperature (°C)		pH		Salinity (ppt)		DO Saturation (%)		Dissolved Oxygen (mg/L)			Turbidity(NTU)			Suspended Solids (mg/L)			Total Alkalinity (ppm)			Observed construction activities		Other Observations							
								Value	Average	Value	Average	Value	Average	Value	Average	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average		DA	<100m from location	>100m from location				
3-May-16	Cloudy	Moderate	15:33	7.9	Surface	1.0	0.4	215	24.3	24.3	8.1	8.1	13.1	13.1	101.7	101.6	7.9	7.9	7.1	5.1	5.0	8.4	4	4	6	74	74	87	N/A	N/A	N/A						
						1.0	0.4	222	24.3	8.1	8.1	13.1	13.1	101.6	101.6	7.9	7.9	7.1	5.0	5.0	8.4	4	4	6	74	74											
					Middle	4.0	0.2	210	22.6	22.6	8.1	8.1	21.0	21.0	83.1	83.1	6.4	6.4	6.2	6.2	6.2	7.2	7.2	8.4	5	6	6					90	91	87	N/A	N/A	N/A
						4.0	0.2	222	22.6	22.6	8.1	8.1	21.0	21.0	83.1	83.1	6.4	6.4	6.2	6.2	6.2	7.2	7.2	8.4	5	6	6					91	91				
					Bottom	6.9	0.3	289	22.3	22.3	8.0	8.0	23.3	23.3	81.8	81.8	6.2	6.2	6.2	6.2	6.2	13.0	12.9	8.4	7	7	6					97	97	87	N/A	N/A	N/A
						6.9	0.3	312	22.3	22.3	8.0	8.0	23.3	23.3	81.9	81.8	6.2	6.2	6.2	6.2	6.2	12.9	12.9	8.4	7	7	6					97	97				

Remarks: DA: Depth-Averaged
Calm: Small or no wave; Moderate: Between calm and rough; Rough : White capped or rougher

Expansion of Hong Kong International Airport into a Three-Runway System
Baseline Water Quality Monitoring
Water Quality Monitoring Results at IM11 during Mid-Flood Tide

Date	Weather Condition	Sea Condition	Sampling Time	Water Depth (m)	Sampling Depth (m)	Ammonia as N (mg/L)			Unionized Ammonia as N			Nitrite as N (mg/L)			Nitrate as N (mg/L)			Total Kjeldahl Nitrogen as N (mg/L)			Total Phosphorus as P (mg/L)			Reactive Phosphorus as P (mg/L)			Arsenic (µg/L)			Cadmium (µg/L)			Chromium (µg/L)			Copper (µg/L)			Lead (µg/L)			Nickel (µg/L)			Silver (µg/L)			Zinc (µg/L)			Mercury (µg/L)								
						Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average	DA
						3-May-16	Cloudy	Moderate	15:33	7.9	Surface 1.0 1.0 4.0 4.0 6.9 6.9	0.12 0.12 0.13 0.13 0.12 0.11	0.12	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	0.10 0.10 0.09 0.09 0.06 0.06	0.1 0.1 0.1 0.1 0.1 0.1	0.1	1.12 1.12 0.99 1.00 0.97 0.98	1.1 1.1 1.0 1.0 0.7 0.7	0.9	0.50 0.50 0.60 0.60 0.40 0.40	0.5 0.5 0.6 0.6 0.4 0.4	0.5	0.04 0.04 0.04 0.04 0.02 0.02	0.04 0.04 0.03 0.03 0.03 0.03	0.03	0.02 0.03 0.03 0.03 0.02 0.02	0.03 0.03 0.03 0.03 0.02 0.02	0.03	3 3 3 3 2 2	3 3 3 3 2 2	3	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	1.0 1.0 0.9 1.0 0.8 0.9	1.0 1.0 1.0 1.0 0.9 0.9	0.9	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	<-0.2 <-0.2 <-0.2 <-0.2 <-0.2 <-0.2	1.8 1.6 2.0 1.7 1.0 1.1	1.7 1.7 1.9 1.9 1.1 1.1	1.5	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	<-0.1 <-0.1 <-0.1 <-0.1 <-0.1 <-0.1	2.0 2.0 3.0 3.0 1.0 1.0	2.0 2.0 3.0 3.0 2.0 2.0	2.3	<-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05	<-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05	<-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05			

Remarks: DA: Depth-Averaged
 Calm: Small or no wave; Moderate: Between calm and rough; Rough: White capped or rougher

Expansion of Hong Kong International Airport into a Three-Runway System

Baseline Water Quality Monitoring

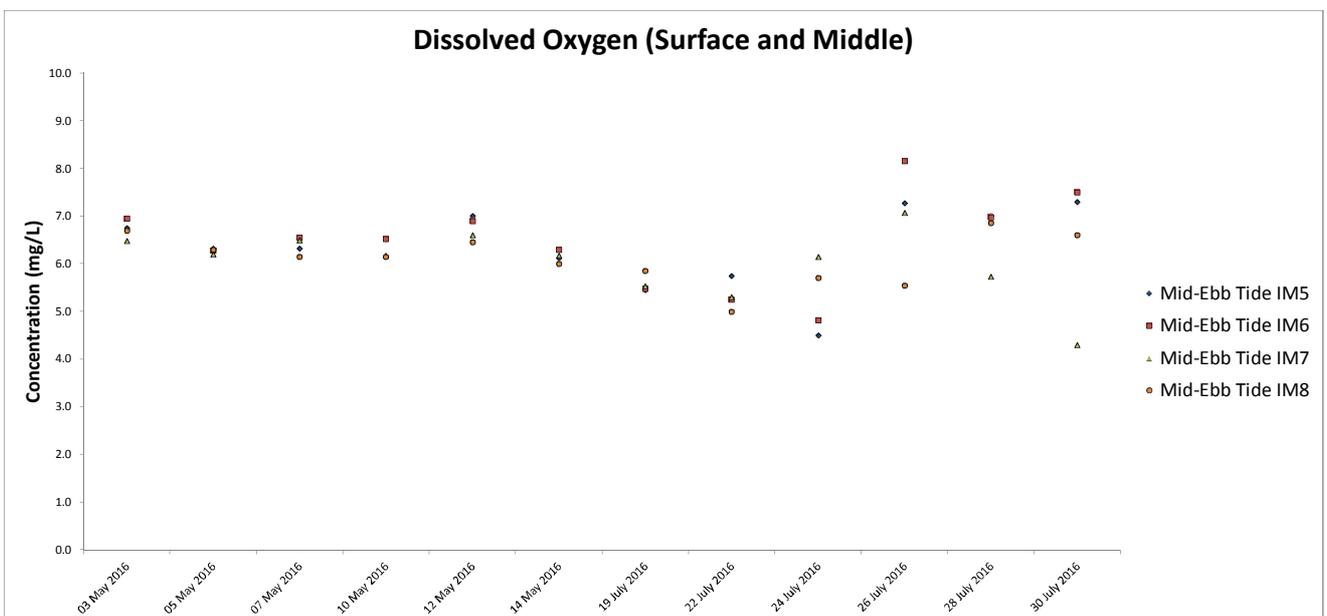
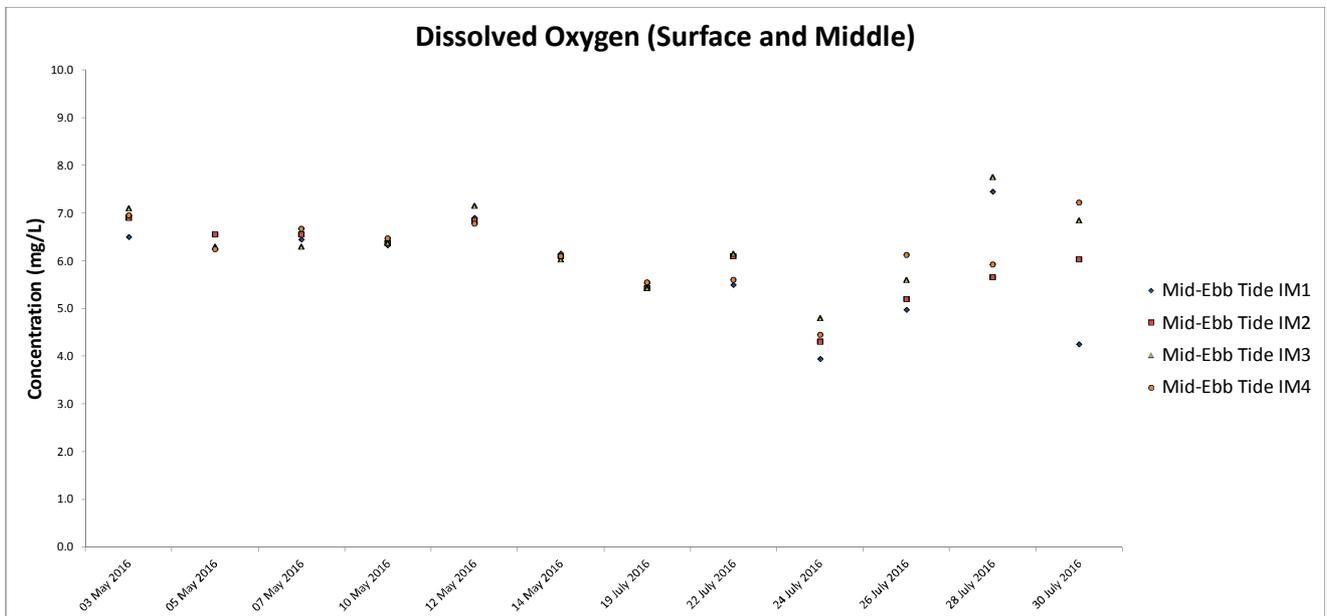
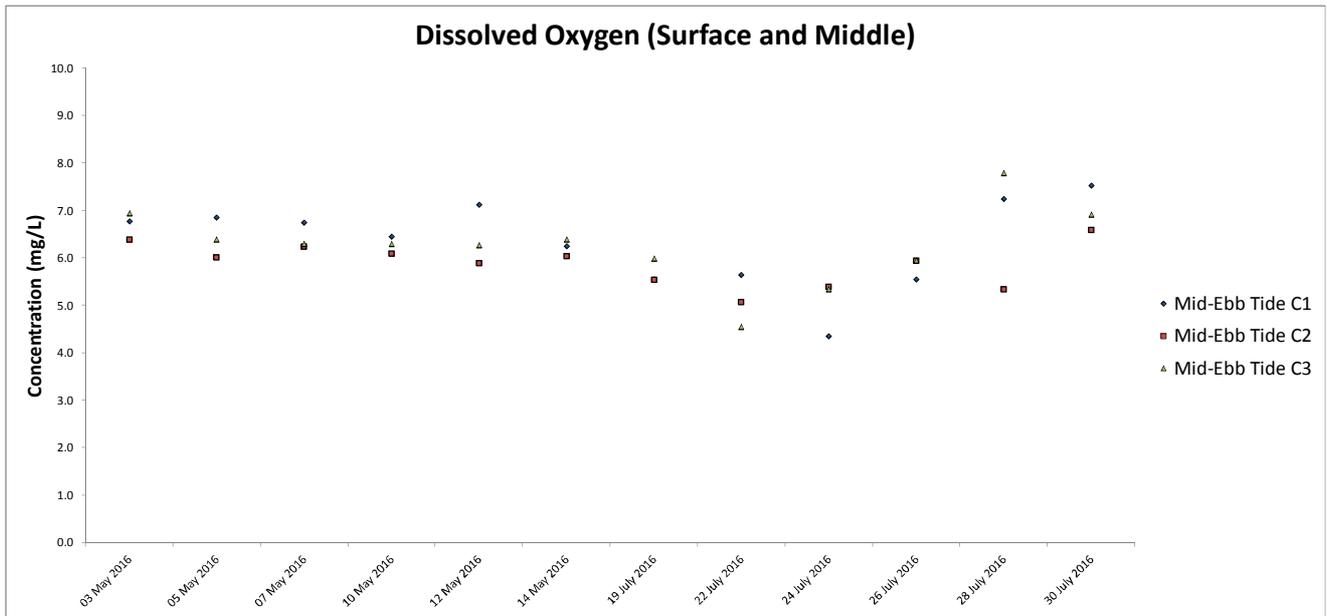
Water Quality Monitoring Results at SR2 during Mid-Flood Tide

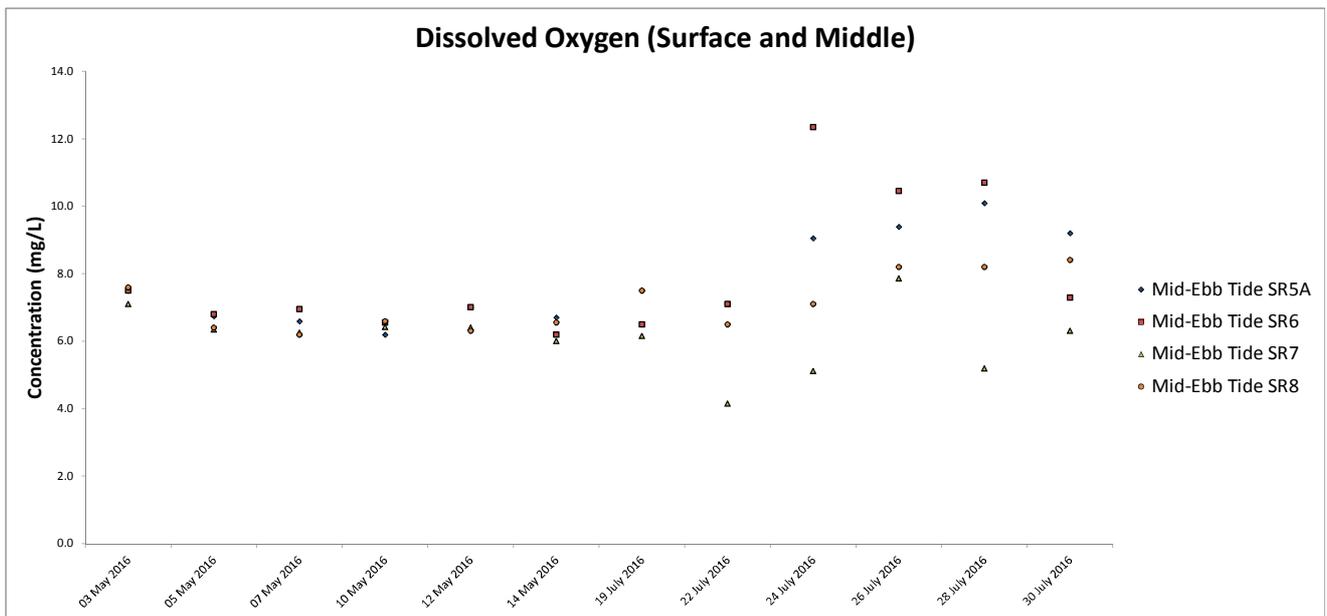
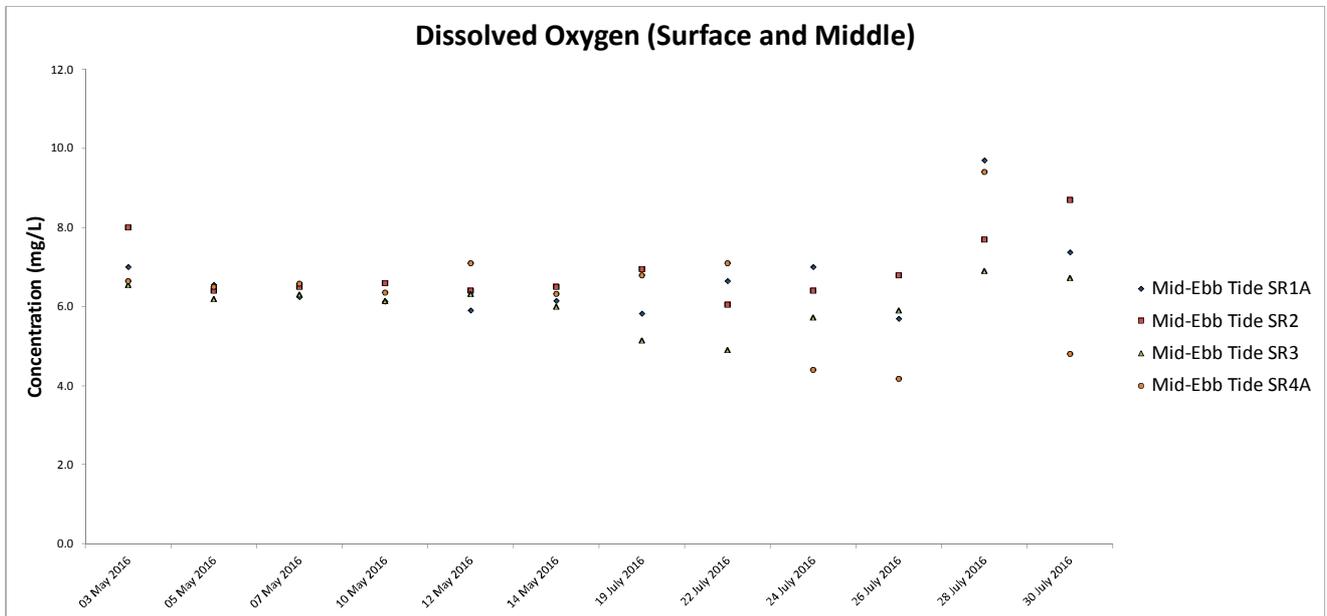
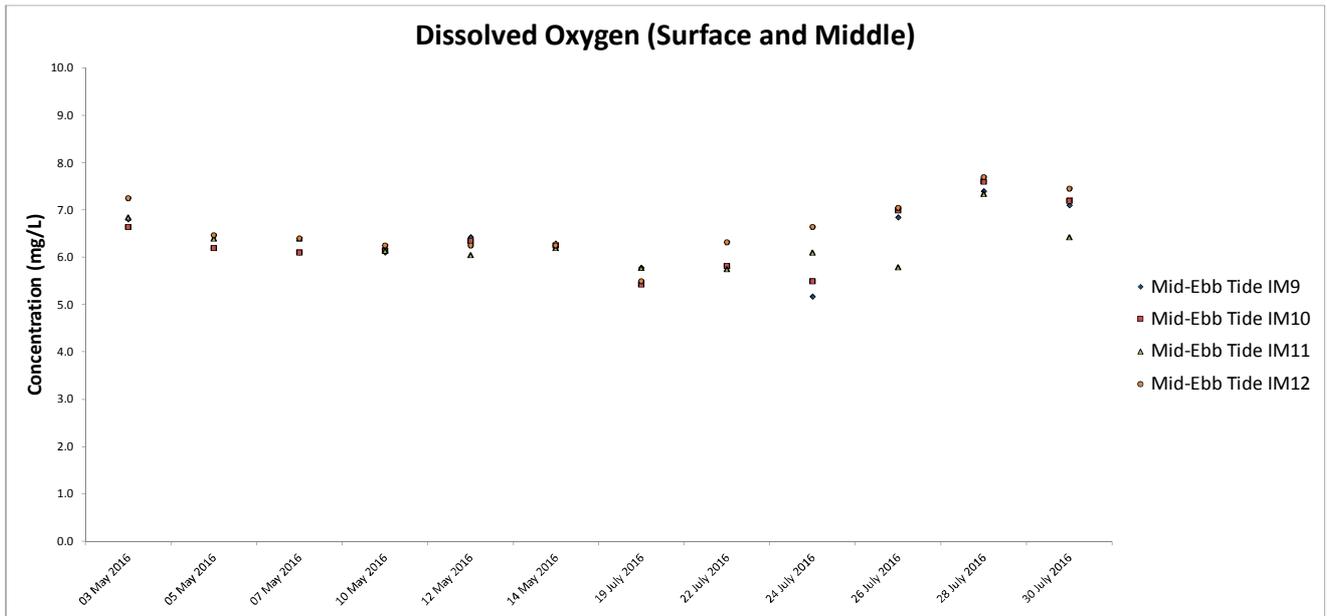
Date	Weather Condition	Sea Condition	Sampling Time	Water Depth (m)	Sampling Depth (m)	Current Speed (m/s)	Current Direction	Water Temperature (°C)		pH		Salinity (ppt)		DO Saturation (%)		Dissolved Oxygen (mg/L)			Turbidity (NTU)			Suspended Solids (mg/L)			Observed construction activities		Other Observations			
								Value	Average	Value	Average	Value	Average	Value	Average	Value	Average	DA	Value	Average	DA	Value	Average	DA	Value	Average		DA	<100m from location	>100m from location
								3-May-16	Cloudy	Calm	16:27	4.6	Surface 1.0 2.3 2.3 Middle 2.3 2.3 Bottom 3.6 3.6	0.5 0.6 - - 0.1 0.1	299 309 - - 212 214	23.7 23.7 - - 22.5 22.5	23.7	8.2 8.2	8.2	19.0 19.1	19.1	106.8 106.8	106.8	8.1 8.1	8.1	8.1		4.2 4.2	4.2	4.8
5-May-16	Cloudy	Moderate	18:24	4.5	Surface 1.0 1.0 2.3 2.3 Middle 2.3 2.3 Bottom 3.5 3.5	0.5 0.5 - - 0.3 0.4	311 334 - - 282 291	23.6 23.6 - - 23.3 23.3	23.6	8.1 8.1	8.1	21.7 21.7	21.7	86.7 86.7	86.7	6.5 6.5	6.5	6.5	10.6 10.6	10.6	14.6	17 17 - - 16 17	17	17	N/A	N/A	N/A			
7-May-16	Cloudy	Calm	20:17	4.2	Surface 1.0 1.0 2.1 2.1 Middle 2.1 2.1 Bottom 3.2 3.2	0.5 0.5 - - 0.5 0.5	56 57 - - 61 63	24.4 24.4 - - 24.4 24.4	24.4	8.0 8.0	8.0	19.0 19.0	19.0	82.7 82.7	82.7	6.2 6.2	6.2	6.2	11.3 11.3	11.3	11.1	11 13 - - 17 16	12	14	N/A	N/A	N/A			
10-May-16	Cloudy	Calm	07:59	5.0	Surface 1.0 1.0 2.5 2.5 Middle 2.5 2.5 Bottom 4.0 4.0	0.2 0.2 - - 0.2 0.2	195 201 - - 187 188	24.7 24.7 - - 24.5 24.5	24.7	7.9 7.9	7.9	18.2 18.2	18.2	79.5 79.5	79.5	6.0 6.0	6.0	6.0	16.1 16.3	16.2	20.6	14 13 - - 28 29	14	21	N/A	N/A	N/A			
12-May-16	Sunny	Moderate	09:22	4.7	Surface 1.0 1.0 2.4 2.4 Middle 2.4 2.4 Bottom 3.7 3.7	0.2 0.2 - - 0.2 0.2	87 91 - - 112 114	24.3 24.3 - - 24.2 24.1	24.3	7.8 7.8	7.8	18.5 18.4	18.4	85.0 85.3	85.2	6.4 6.4	6.4	6.4	6.5 6.8	6.7	7.2	7 6 - - 8 9	7	8	N/A	N/A	N/A			
14-May-16	Cloudy	Moderate	13:04	4.9	Surface 1.0 1.0 2.5 2.5 Middle 2.5 2.5 Bottom 3.9 3.9	0.1 0.2 - - 0.2 0.2	95 99 - - 116 116	24.4 24.4 - - 24.0 24.0	24.4	8.1 8.1	8.1	20.7 20.7	20.7	90.8 90.8	90.8	6.7 6.7	6.7	6.7	3.9 4.0	4.0	5.6	3 2 - - 3 2	3	3	N/A	N/A	N/A			
19-Jul-16	Cloudy	Rough	20:03	4.6	Surface 1.0 1.0 2.3 2.3 Middle 2.3 2.3 Bottom 3.6 3.6	0.4 0.4 - - 0.7 0.7	64 65 - - 73 79	27.6 27.6 - - 27.3 27.3	27.6	8.1 8.1	8.1	17.6 17.6	17.6	97.3 96.5	96.9	7.0 6.9	6.9	6.9	8.5 9.6	9.1	10.7	8 7 - - 6 6	8	7	N/A	N/A	N/A			
22-Jul-16	Fine	Moderate	21:49	4.6	Surface 1.0 1.0 2.3 2.3 Middle 2.3 2.3 Bottom 3.6 3.6	0.5 0.5 - - 0.3 0.4	137 145 - - 81 81	27.1 27.1 - - 26.5 26.6	27.1	7.9 7.9	7.9	21.2 21.0	21.1	87.9 87.9	87.9	6.2 6.2	6.2	6.2	5.8 5.8	5.8	5.9	7 7 - - 10 9	7	8	N/A	N/A	N/A			
24-Jul-16	Sunny	Moderate	08:41	4.9	Surface 1.0 1.0 2.5 2.5 Middle 2.5 2.5 Bottom 3.9 3.9	0.3 0.4 - - 0.1 0.2	319 343 - - 216 216	26.7 26.7 - - 25.9 26.0	26.7	7.8 7.8	7.8	21.7 21.7	21.7	80.0 80.0	80.0	5.7 5.7	5.7	5.7	6.0 6.0	6.0	8.8	9 9 - - 22 22	9	16	N/A	N/A	N/A			
26-Jul-16	Sunny	Moderate	10:44	4.5	Surface 1.0 1.0 2.3 2.3 Middle 2.3 2.3 Bottom 3.5 3.5	0.3 0.3 - - 0.2 0.2	289 311 - - 207 211	26.3 26.3 - - 25.9 25.9	26.3	7.8 7.8	7.8	23.7 23.7	23.7	81.0 80.8	80.9	5.7 5.7	5.7	5.7	12.5 13.5	13.0	15.8	11 10 - - 19 20	11	15	N/A	N/A	N/A			
28-Jul-16	Fine	Moderate	07:30	4.6	Surface 1.0 1.0 2.3 2.3 Middle 2.3 2.3 Bottom 3.6 3.6	0.4 0.5 - - 0.3 0.3	77 78 - - 79 86	27.7 27.7 - - 26.4 26.4	27.7	7.9 7.9	7.9	19.2 19.2	19.2	96.9 96.9	96.9	6.9 6.9	6.9	6.9	2.7 2.7	2.7	10.7	6 6 - - 16 17	6	11	N/A	N/A	N/A			
30-Jul-16	Cloudy	Calm	17:34	4.3	Surface 1.0 1.0 2.2 2.2 Middle 2.2 2.2 Bottom 3.3 3.3	0.3 0.4 - - 0.2 0.2	173 186 - - 135 143	27.8 27.8 - - 26.1 26.2	27.8	8.2 8.2	8.2	20.5 20.5	20.5	136.1 135.7	135.9	9.5 9.5	9.5	9.5	5.8 5.9	5.9	9.2	8 7 - - 11 12	8	10	N/A	N/A	N/A			

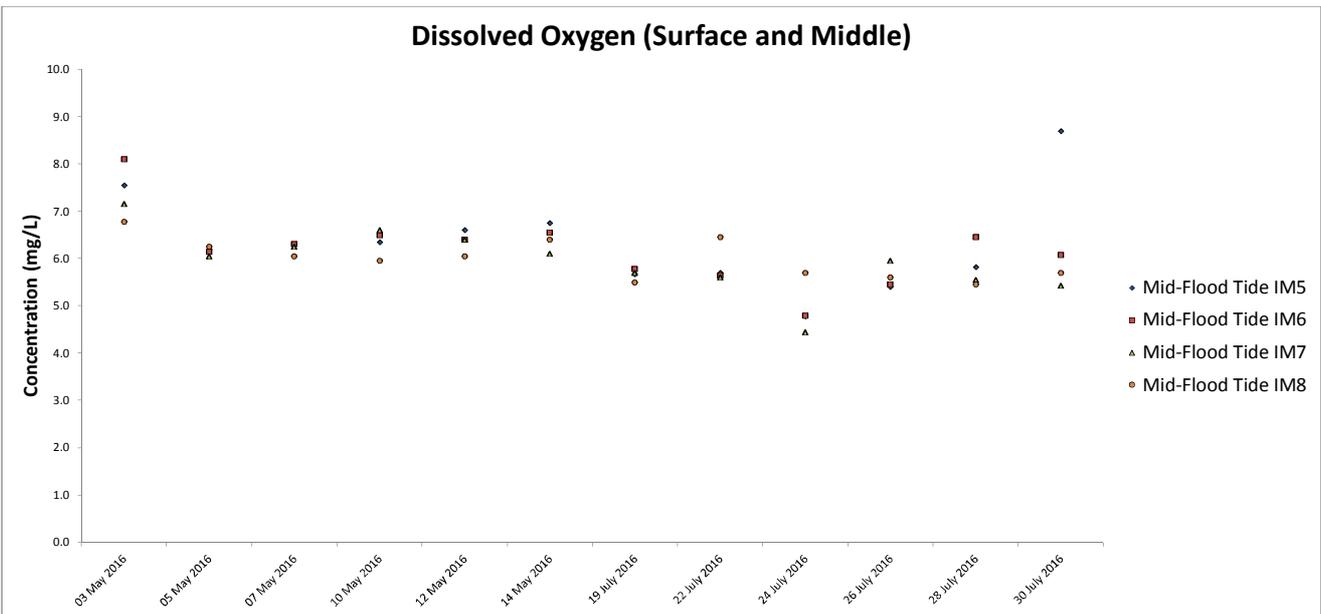
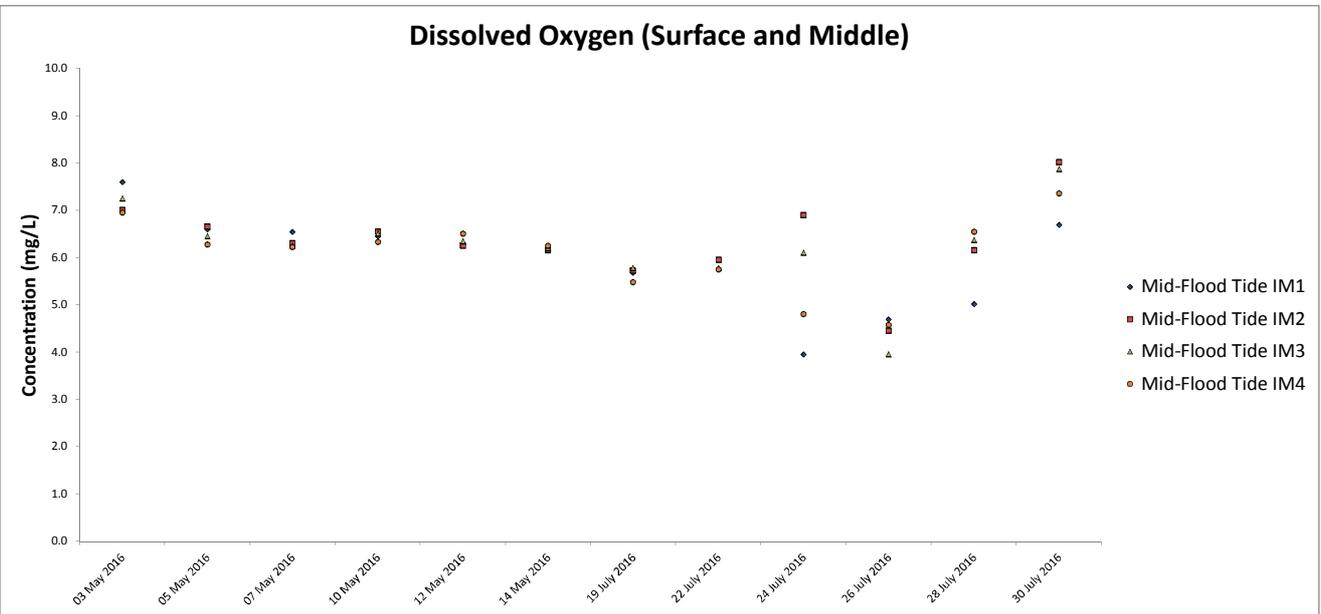
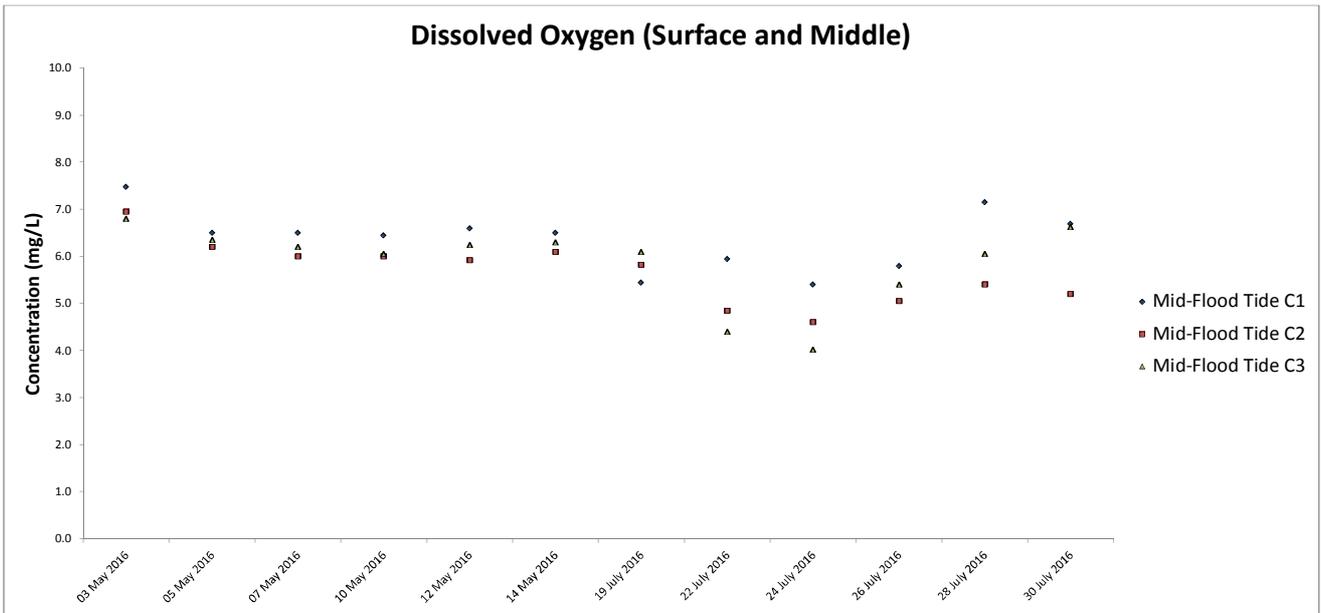
Remarks: DA: Depth-Averaged

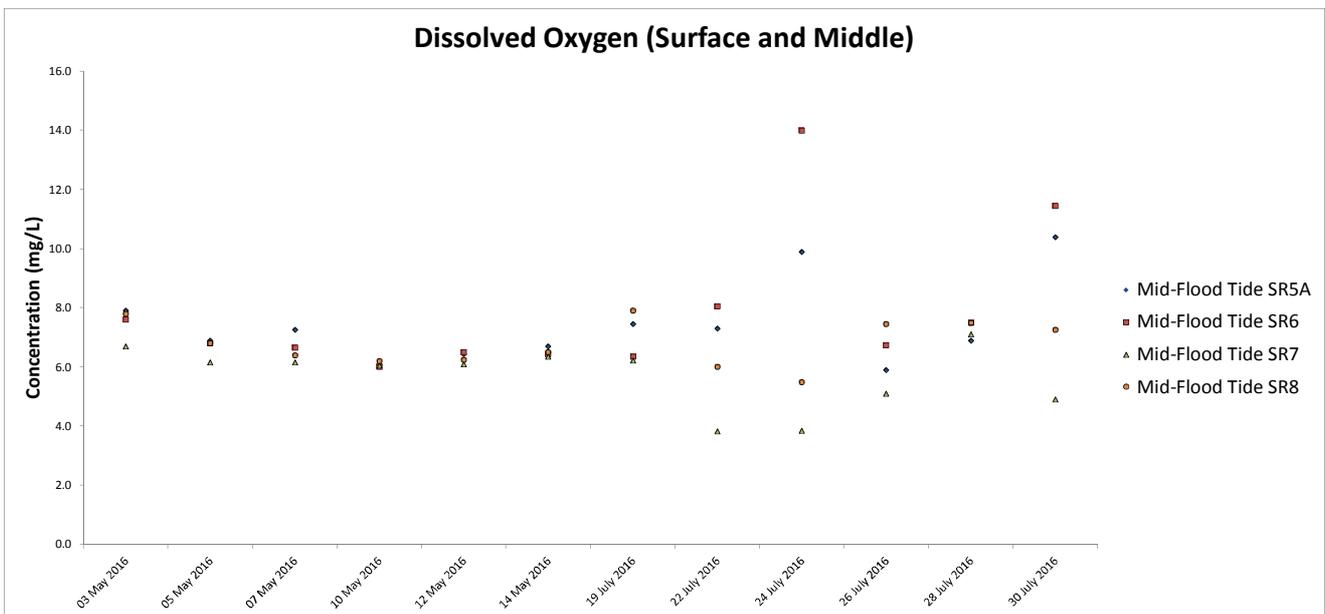
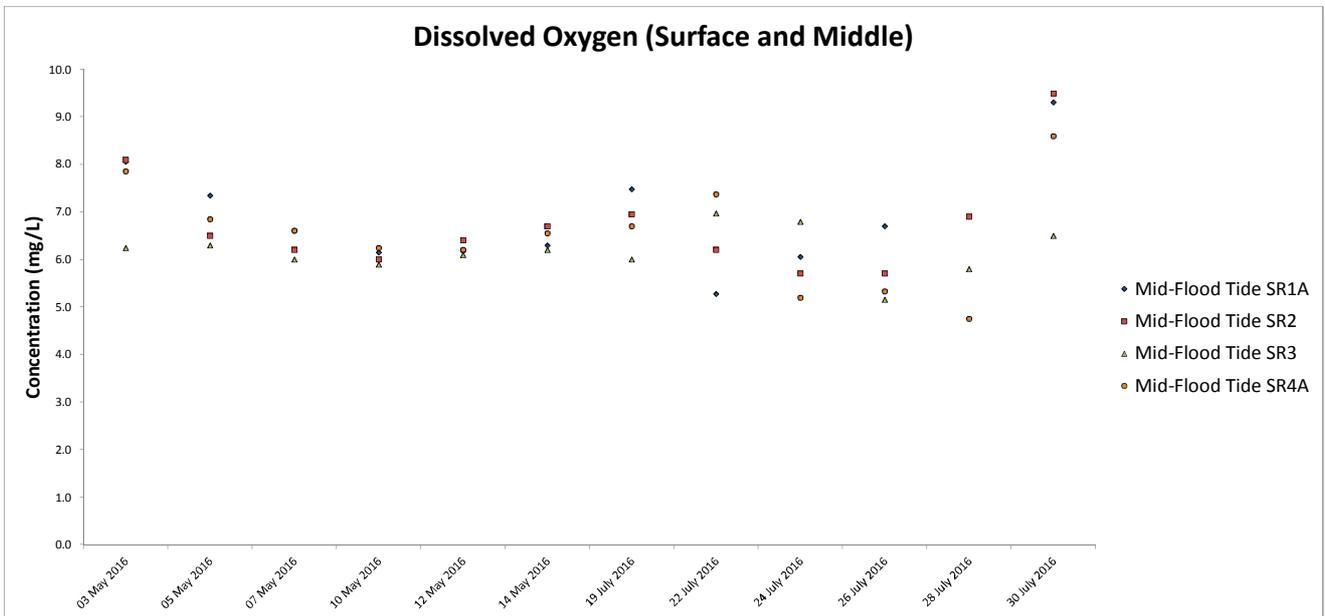
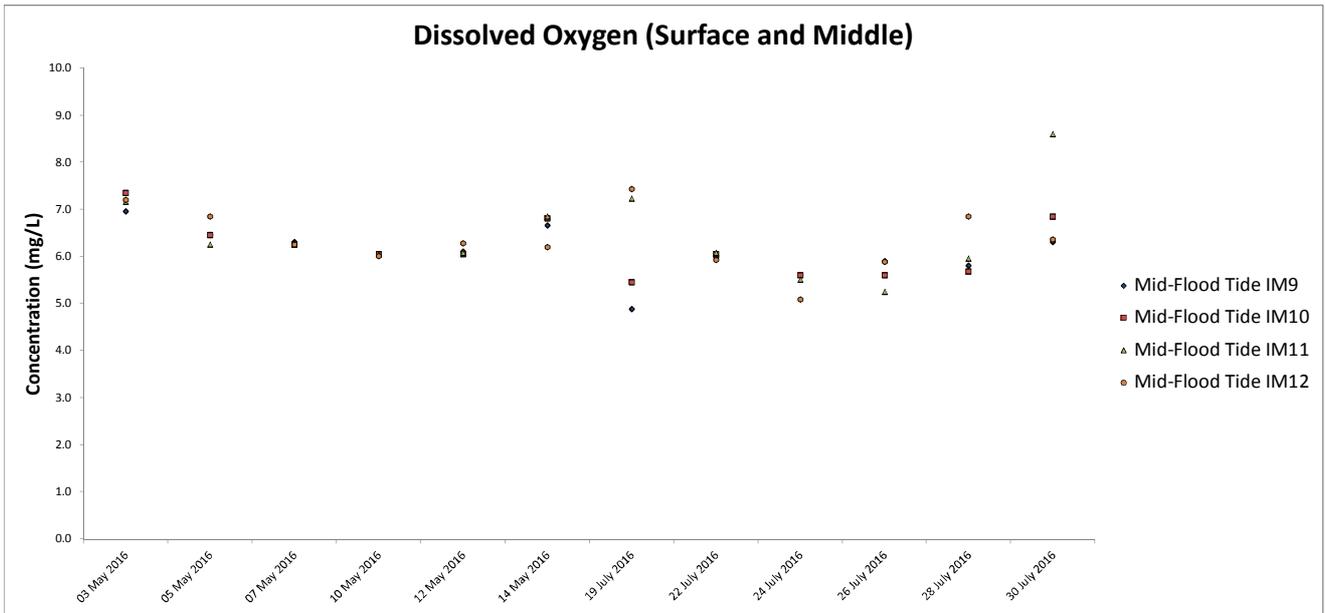
Calm: Small or no wave; Moderate: Between calm and rough; Rough: White capped or rougher

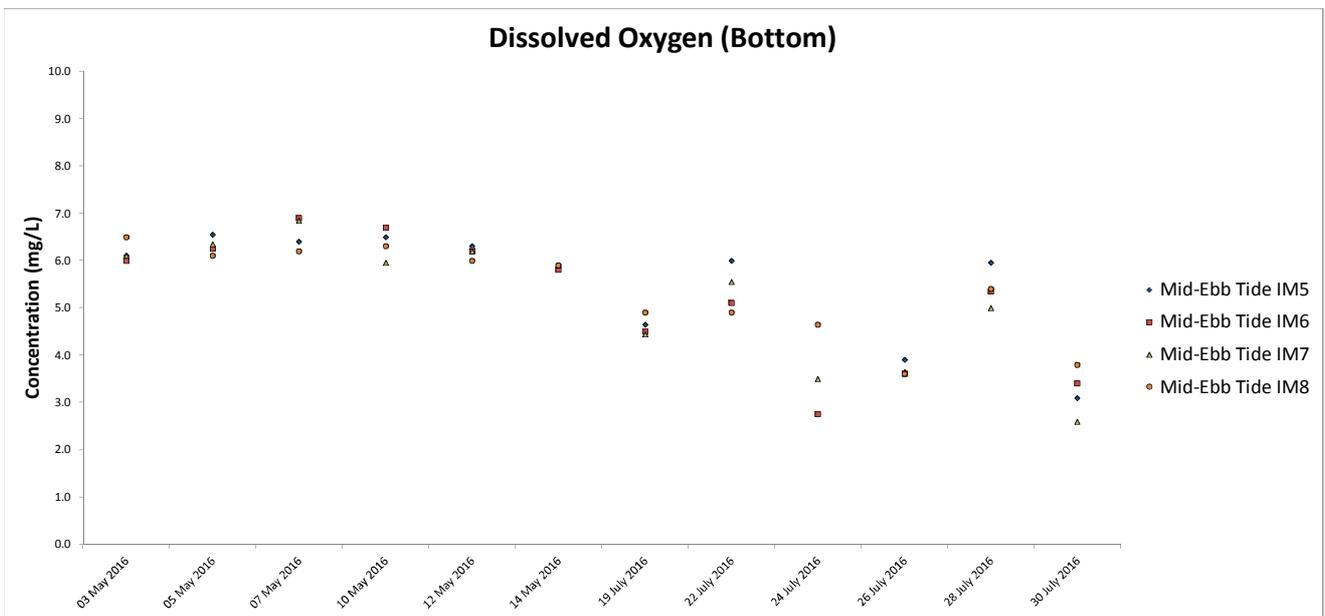
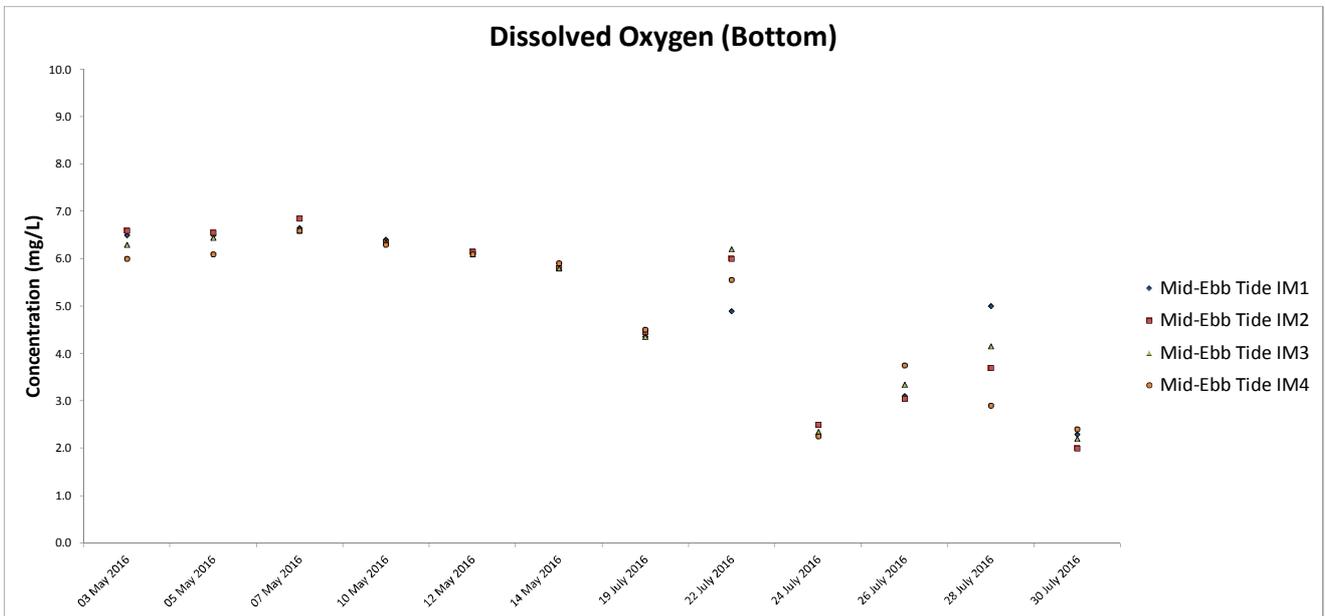
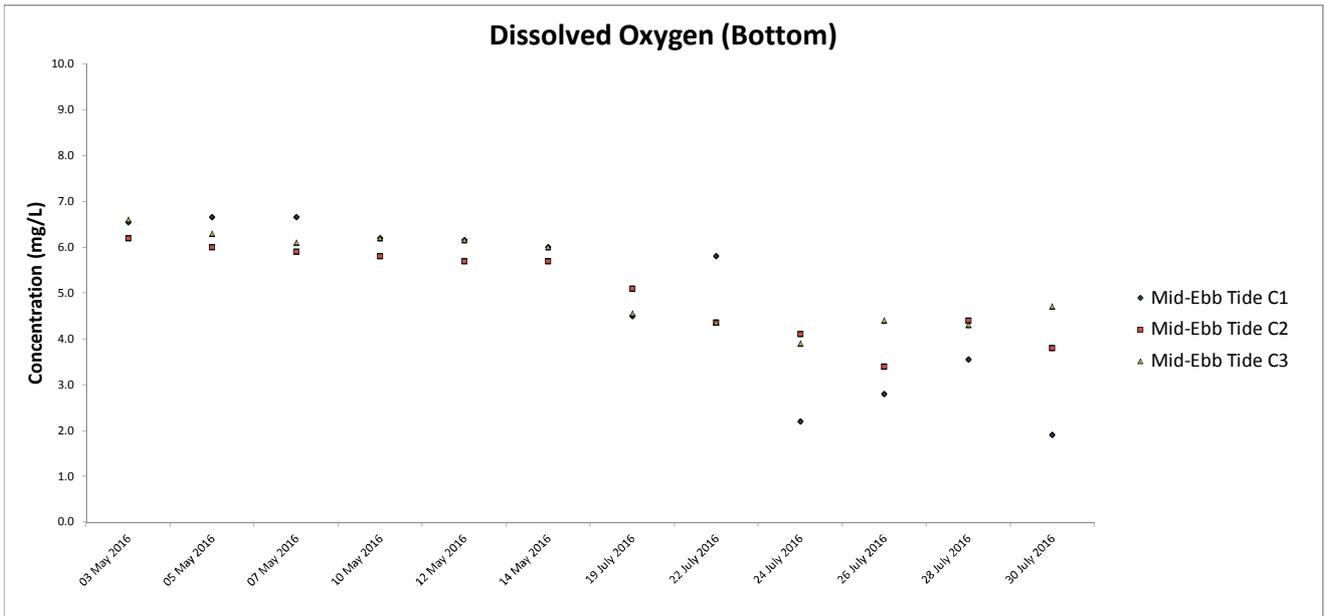
Appendix 3.2 Graphical Presentations of the Baseline Monitoring Results

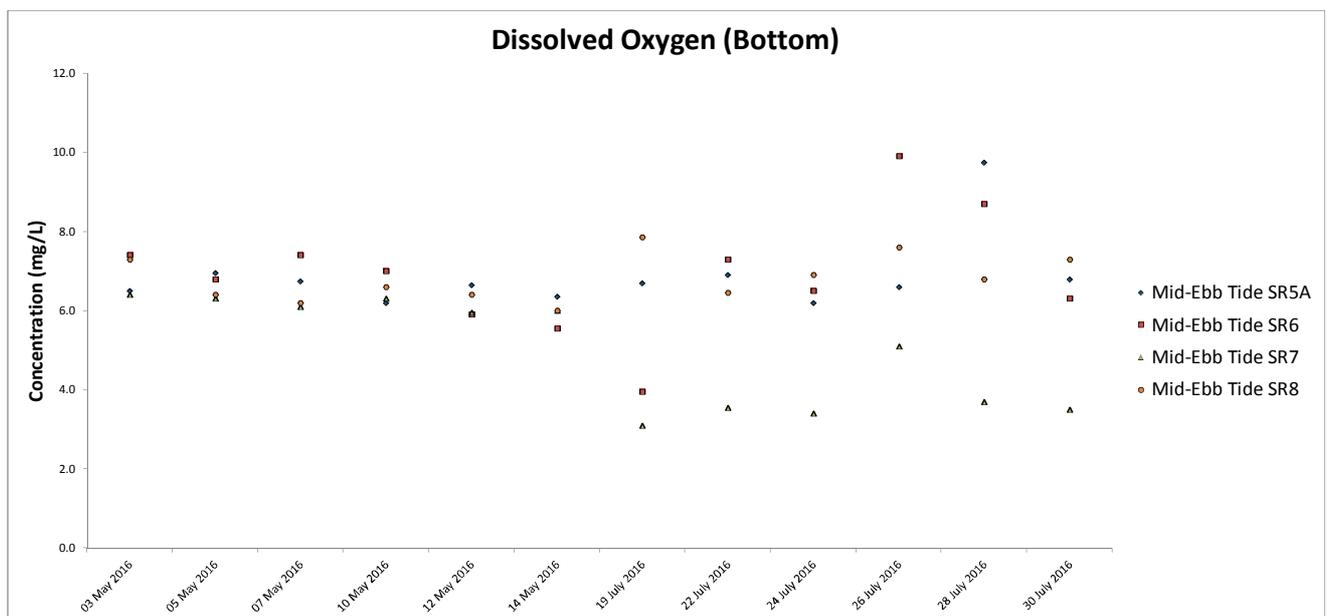
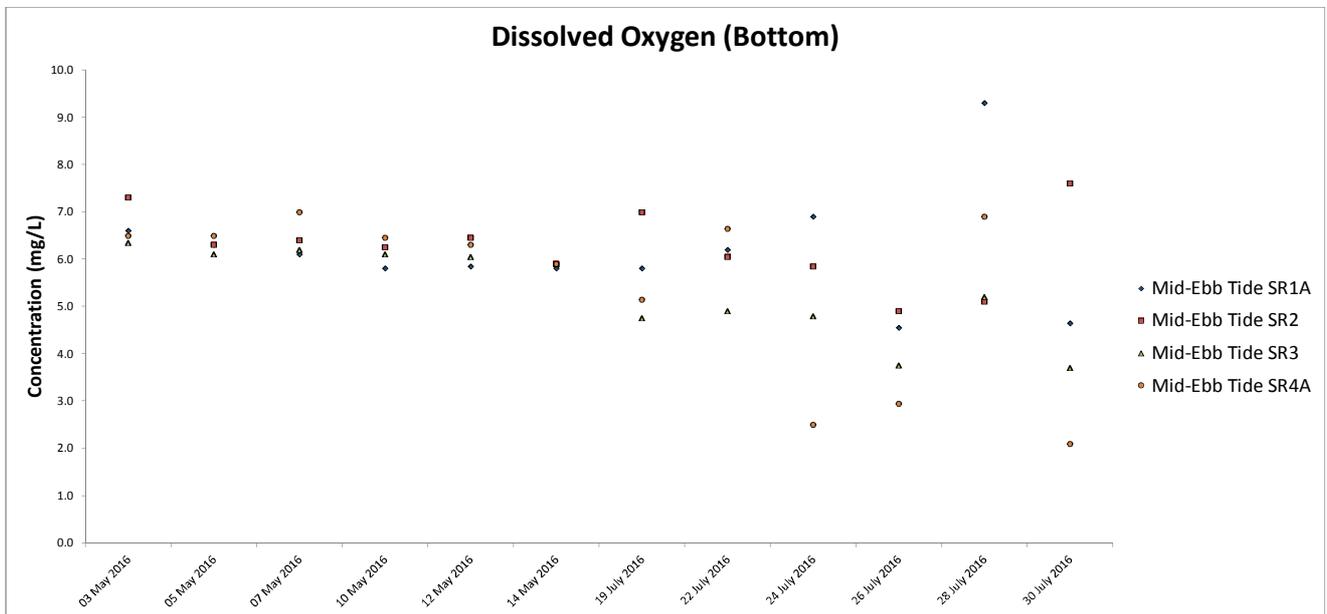
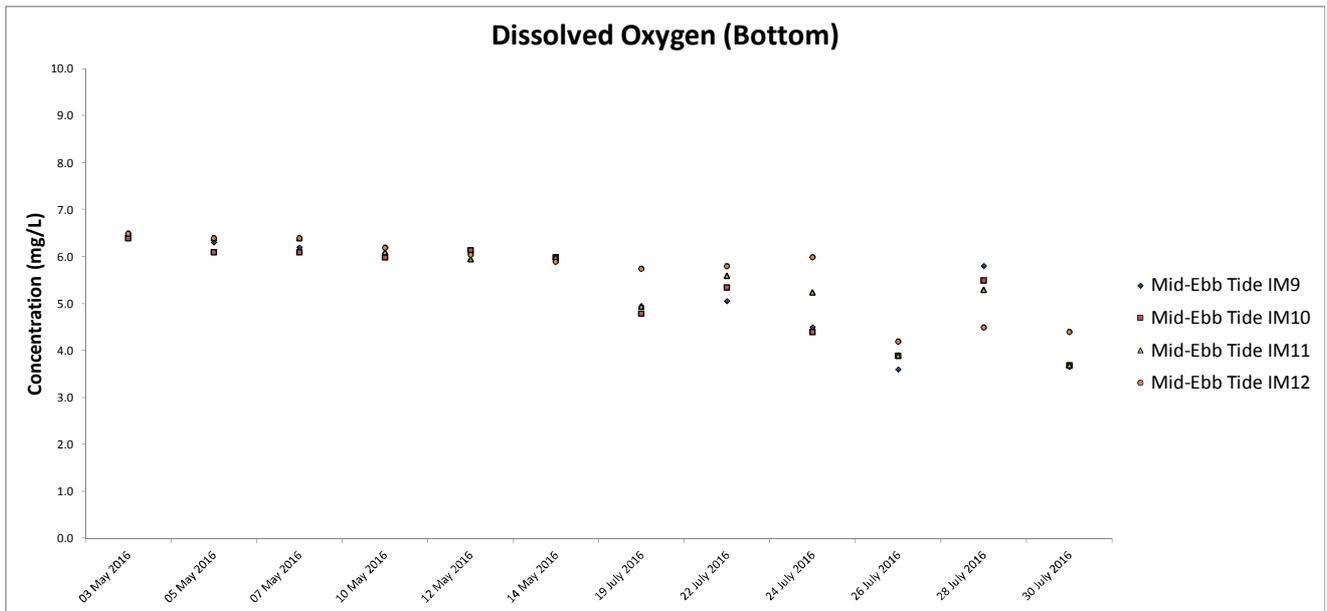


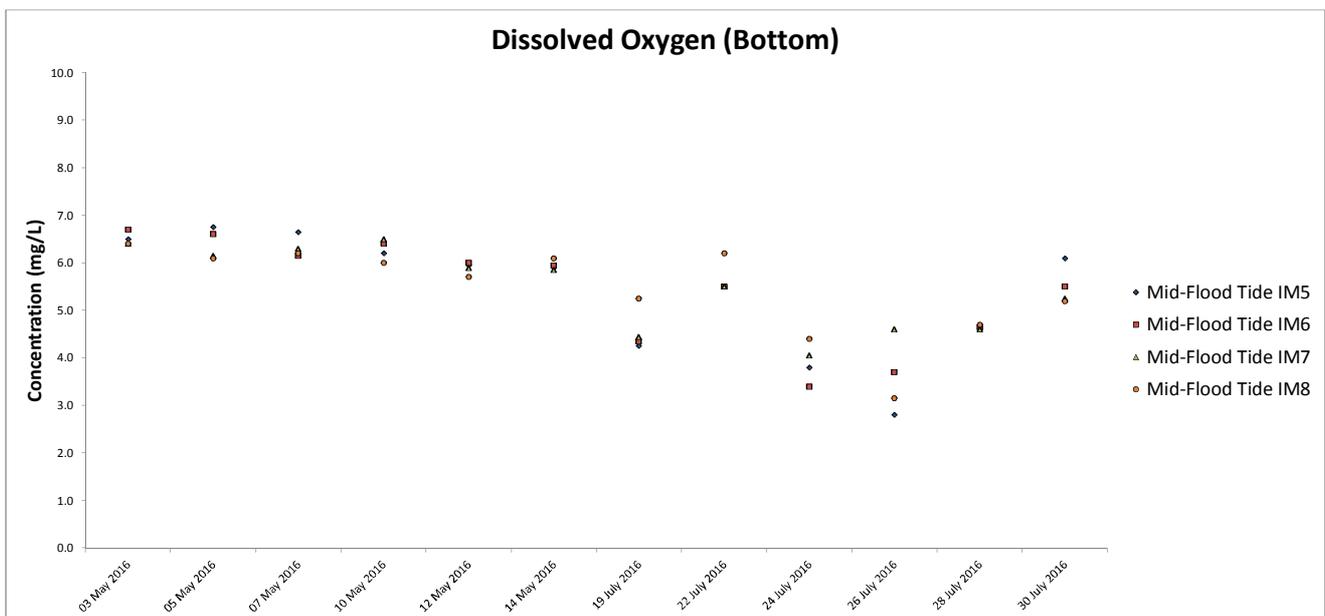
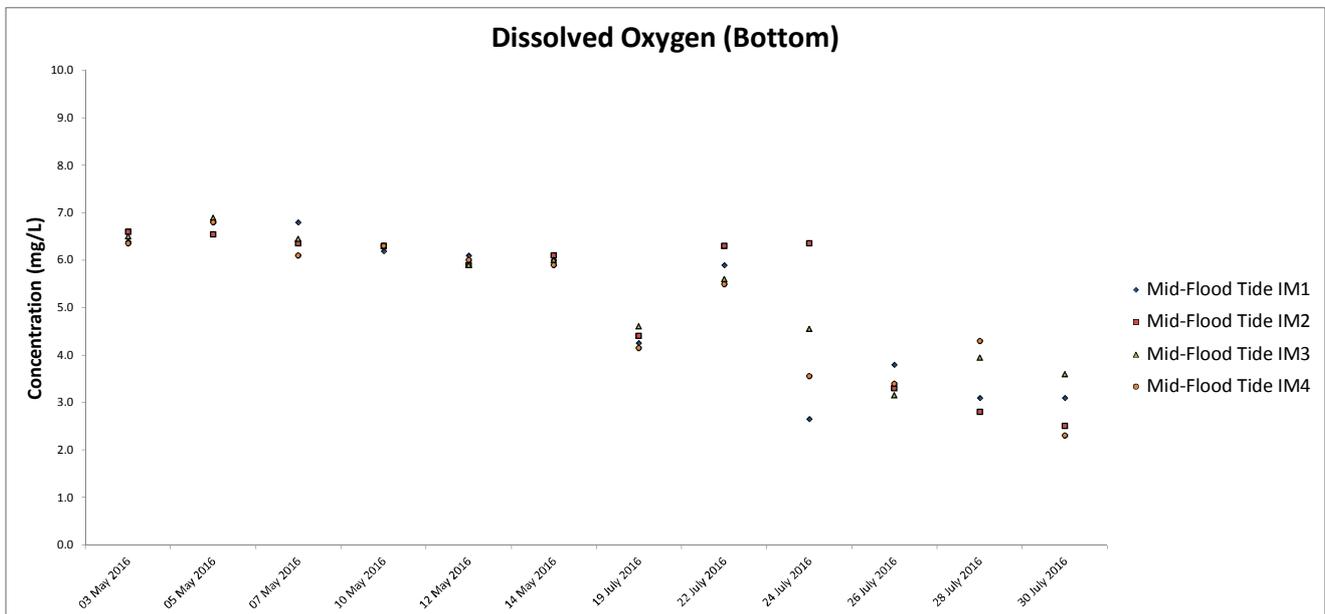
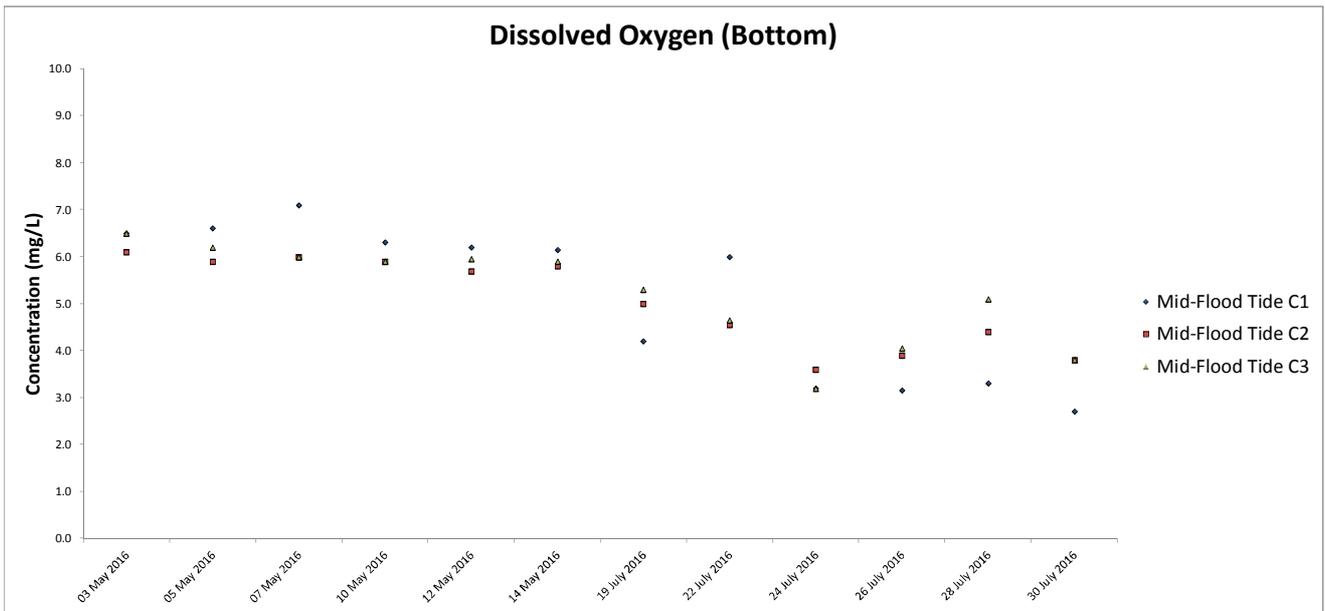


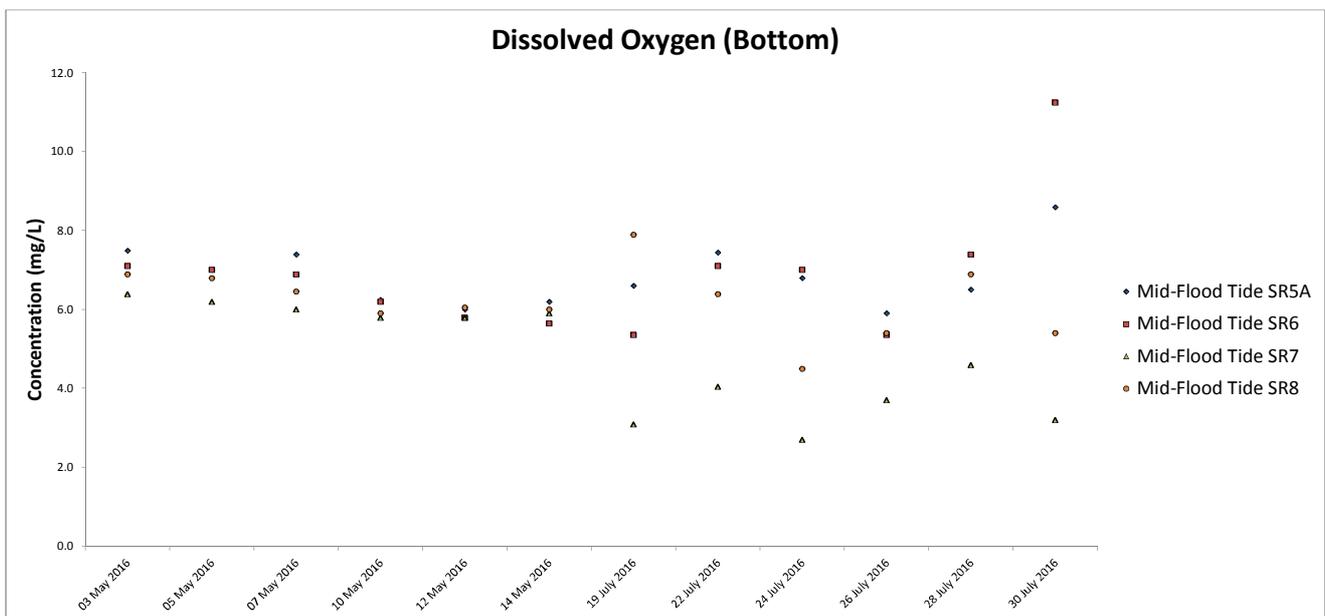
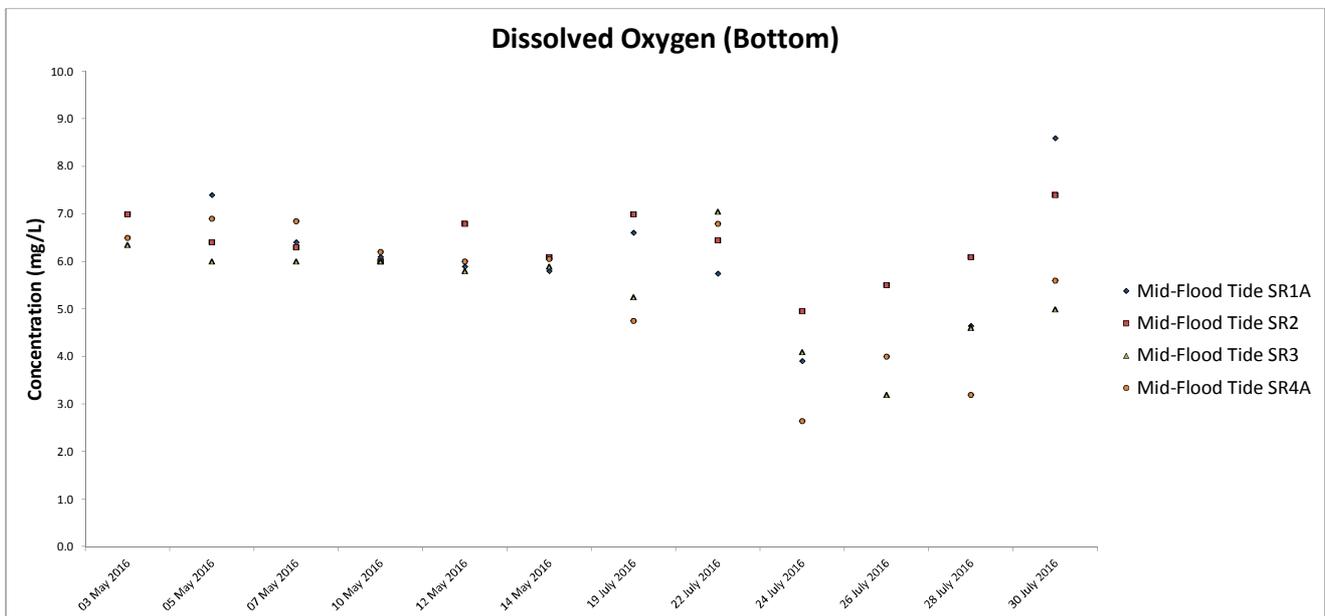
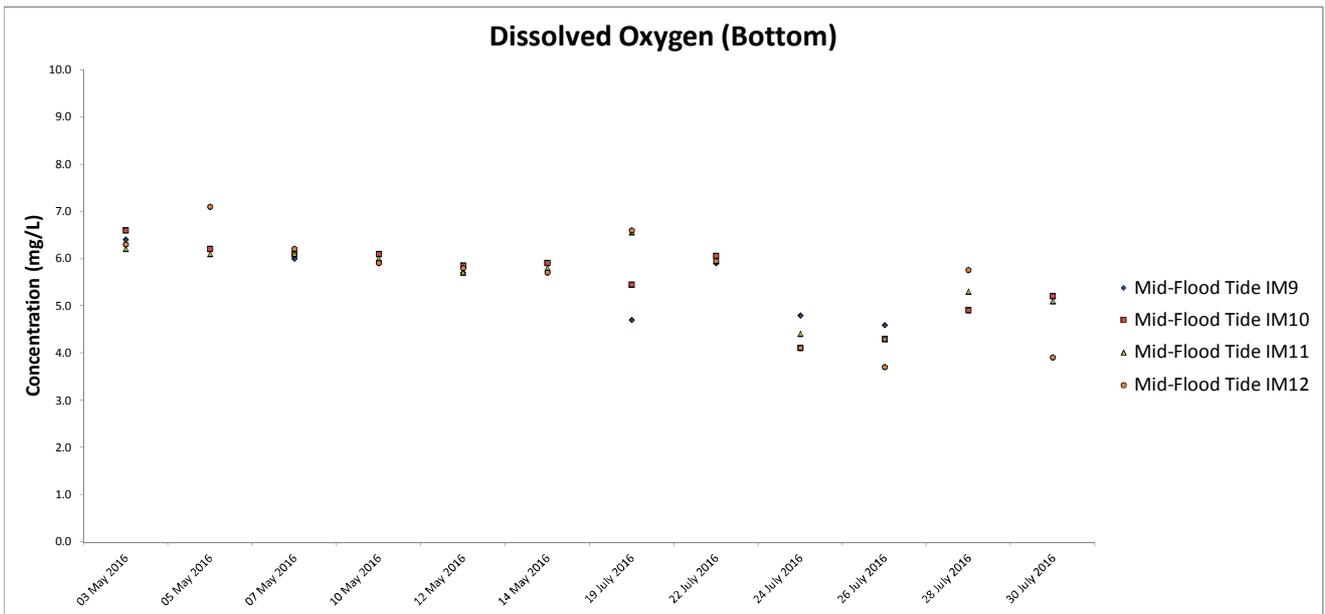


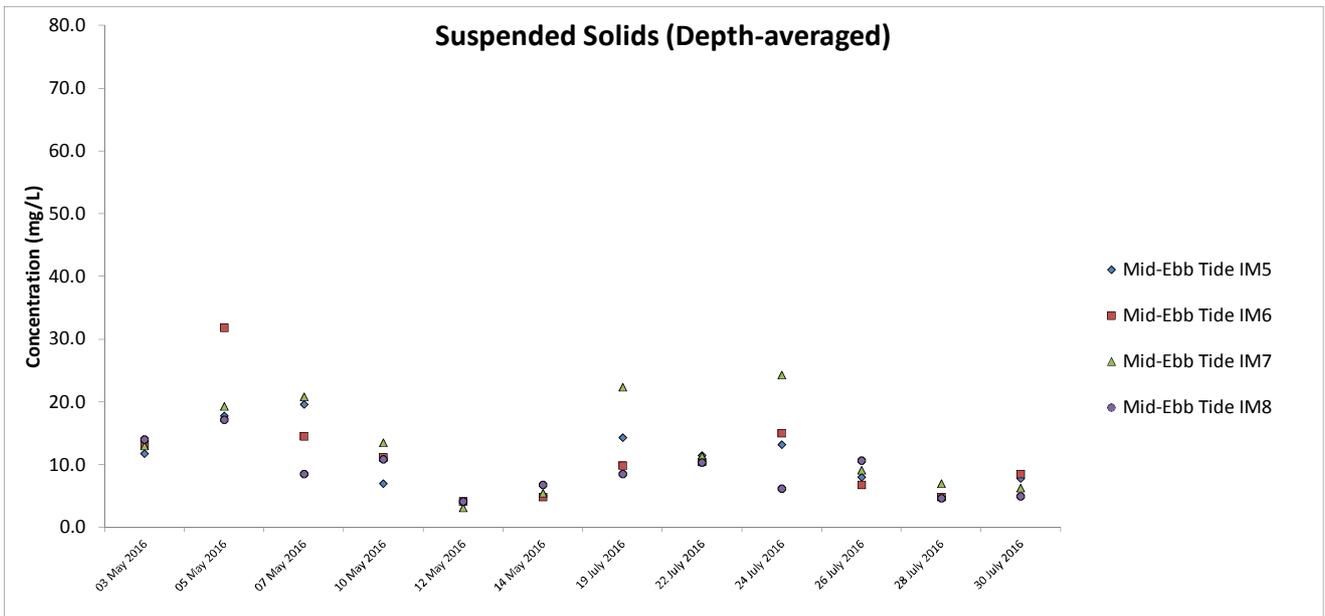
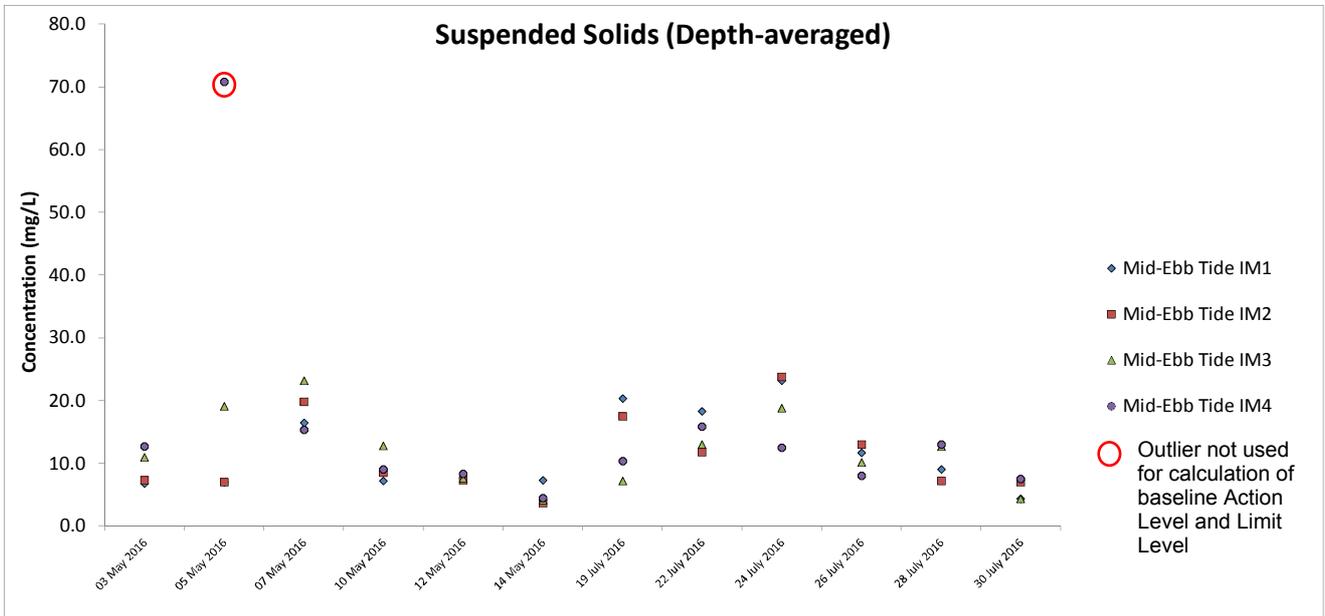
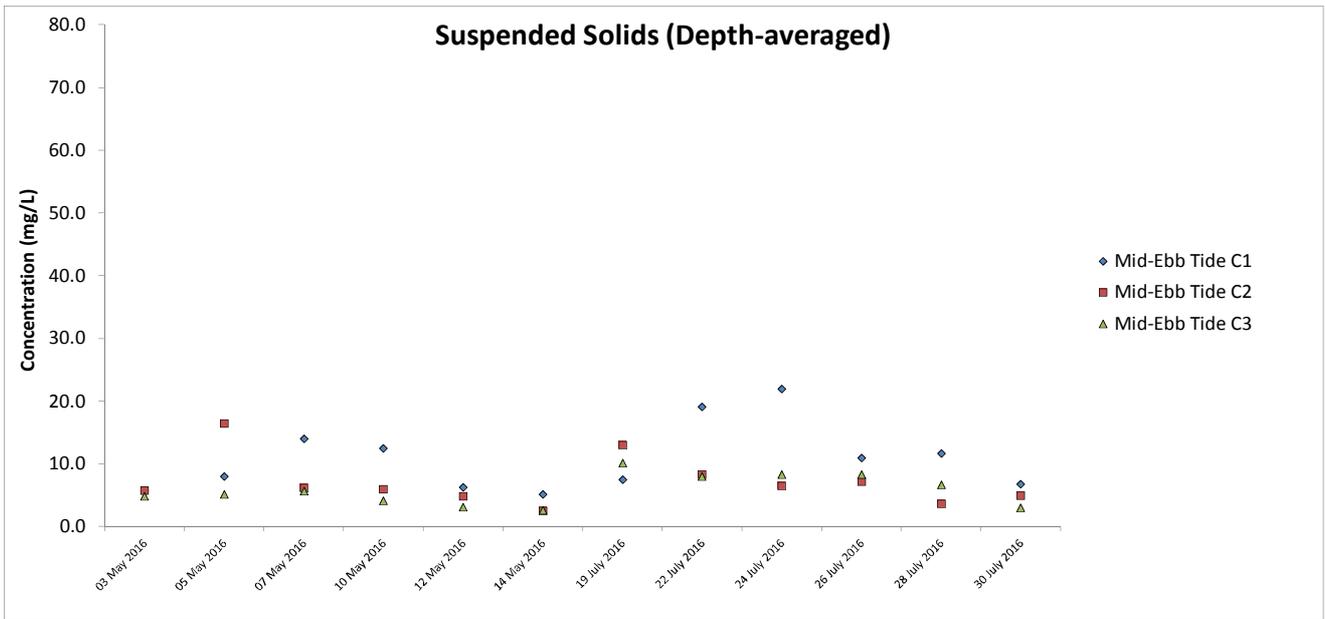


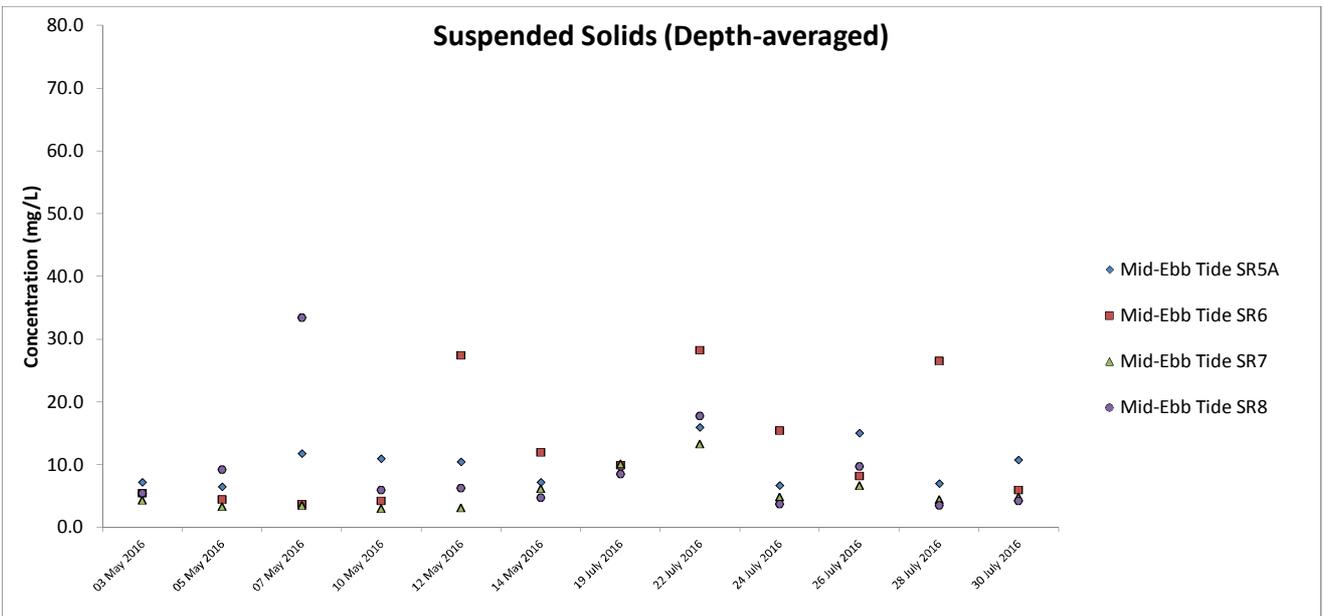
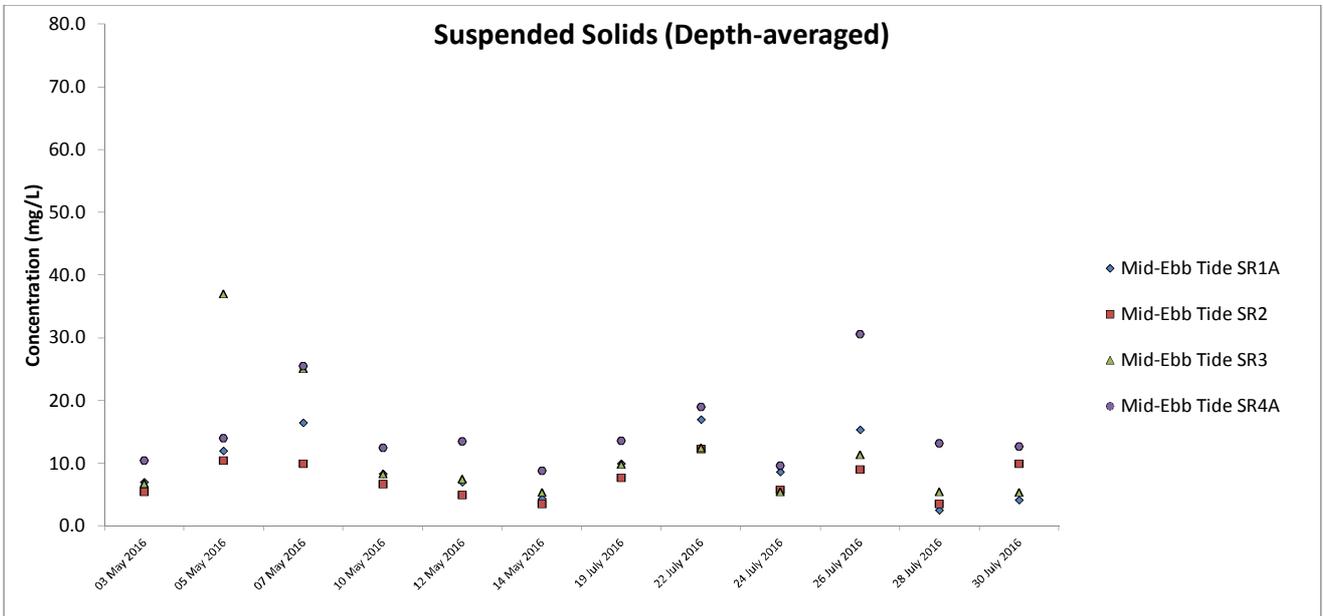
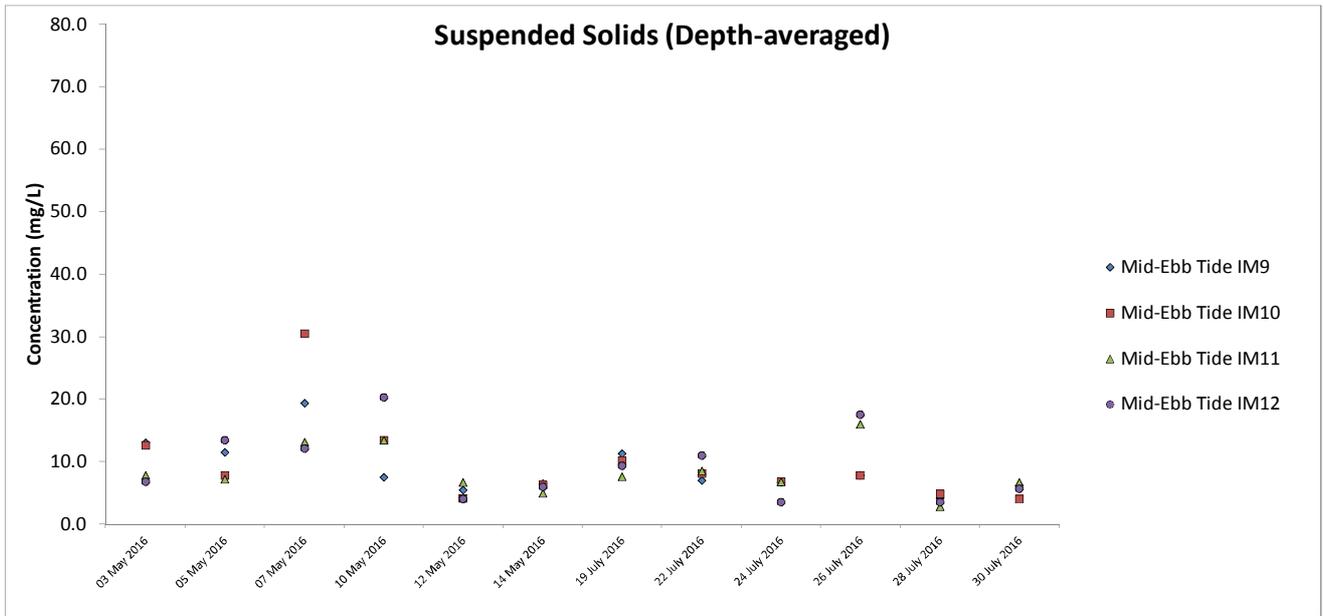


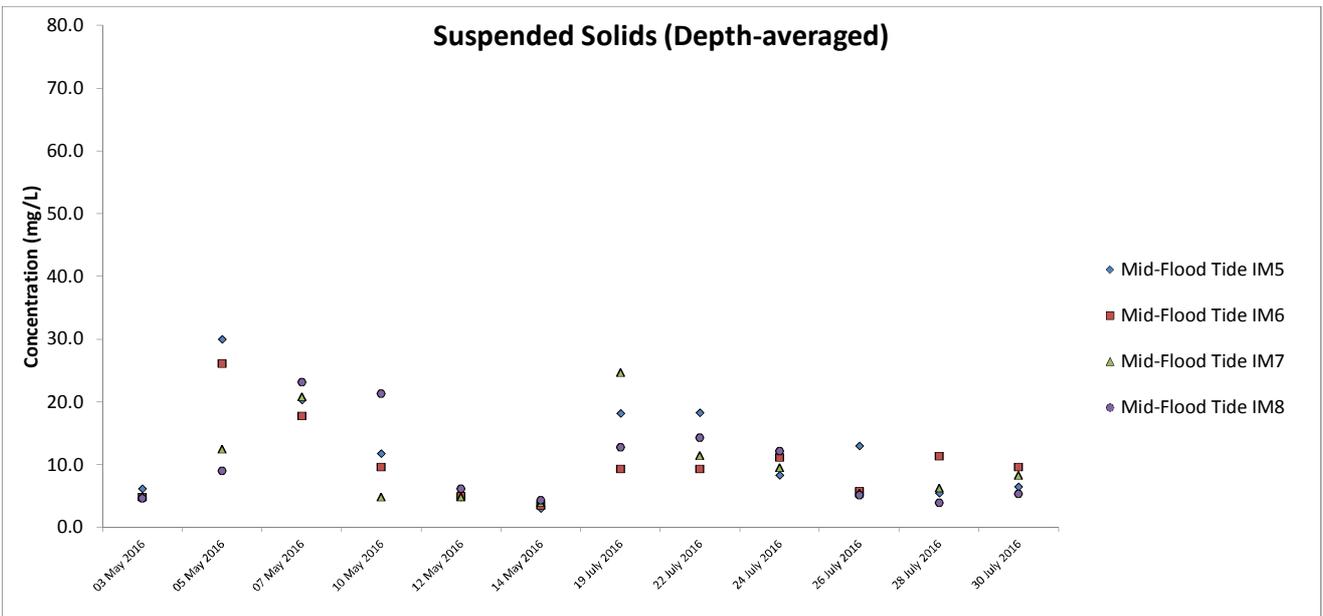
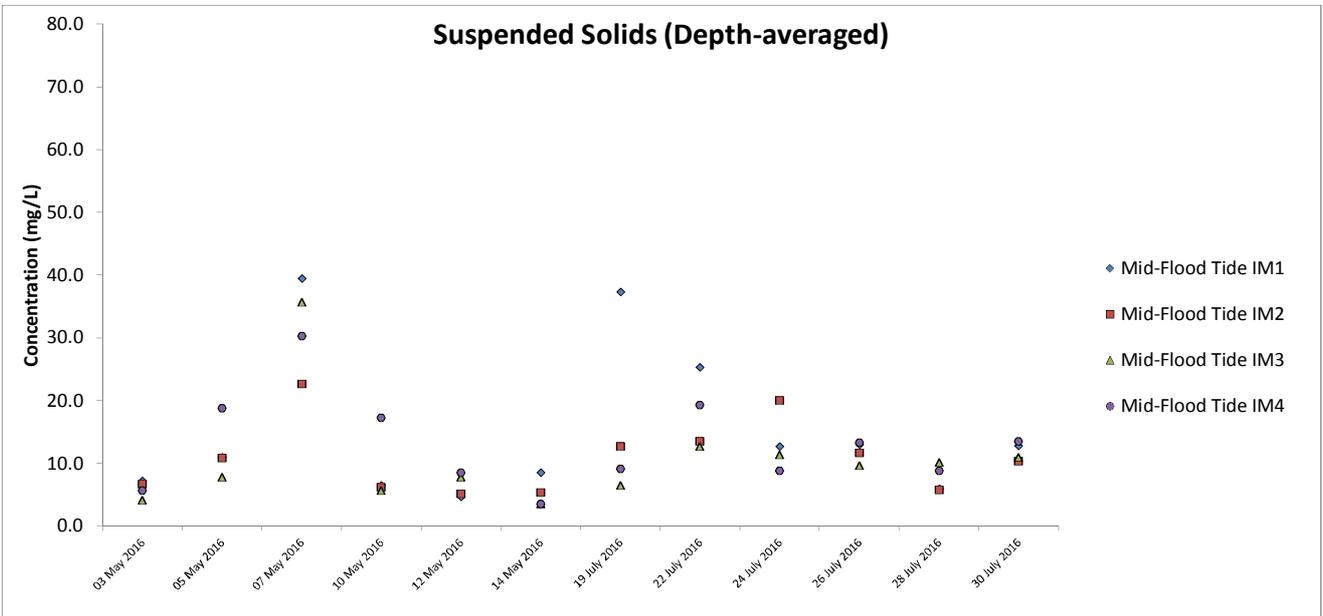
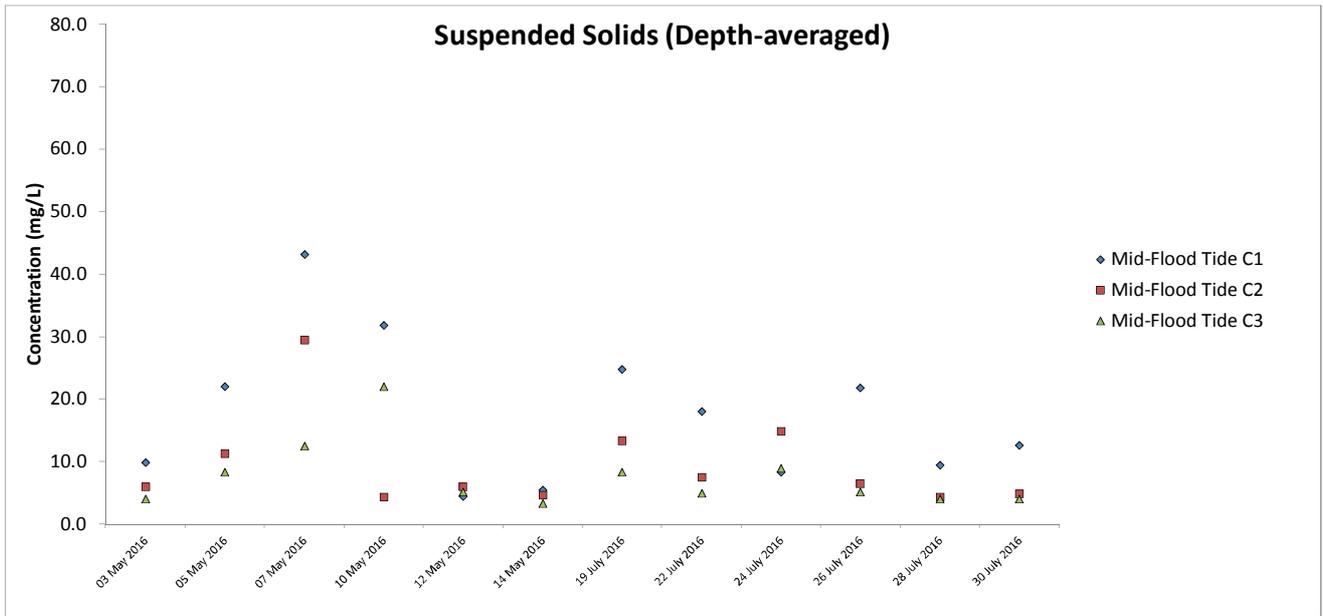


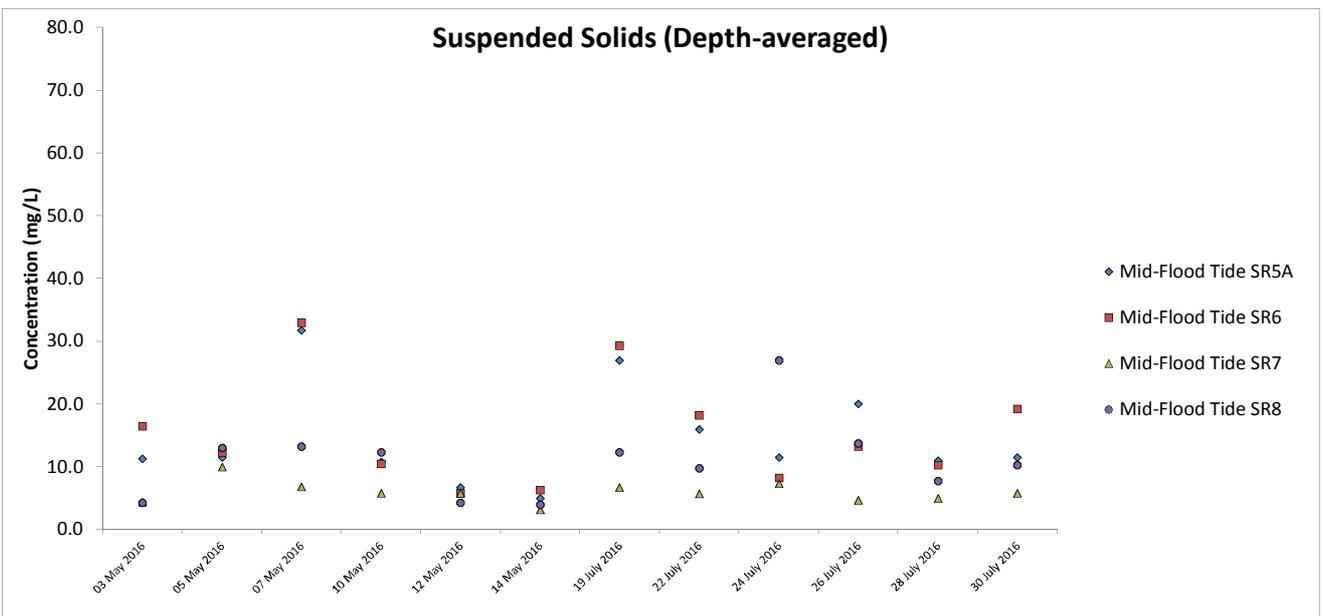
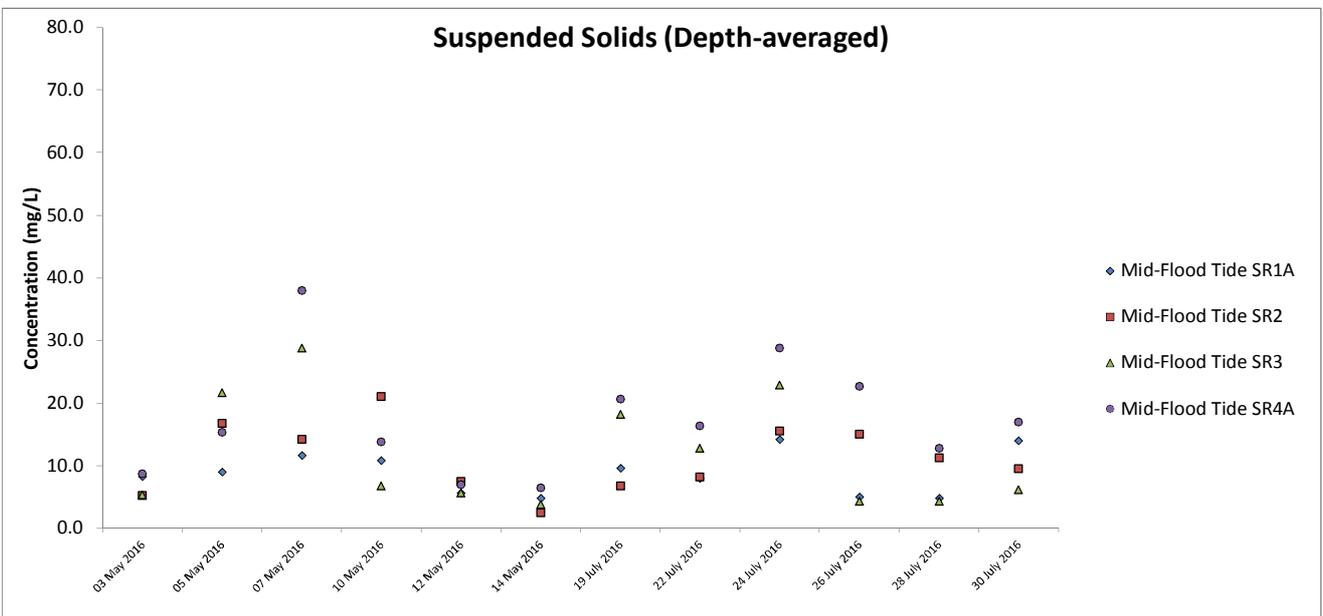
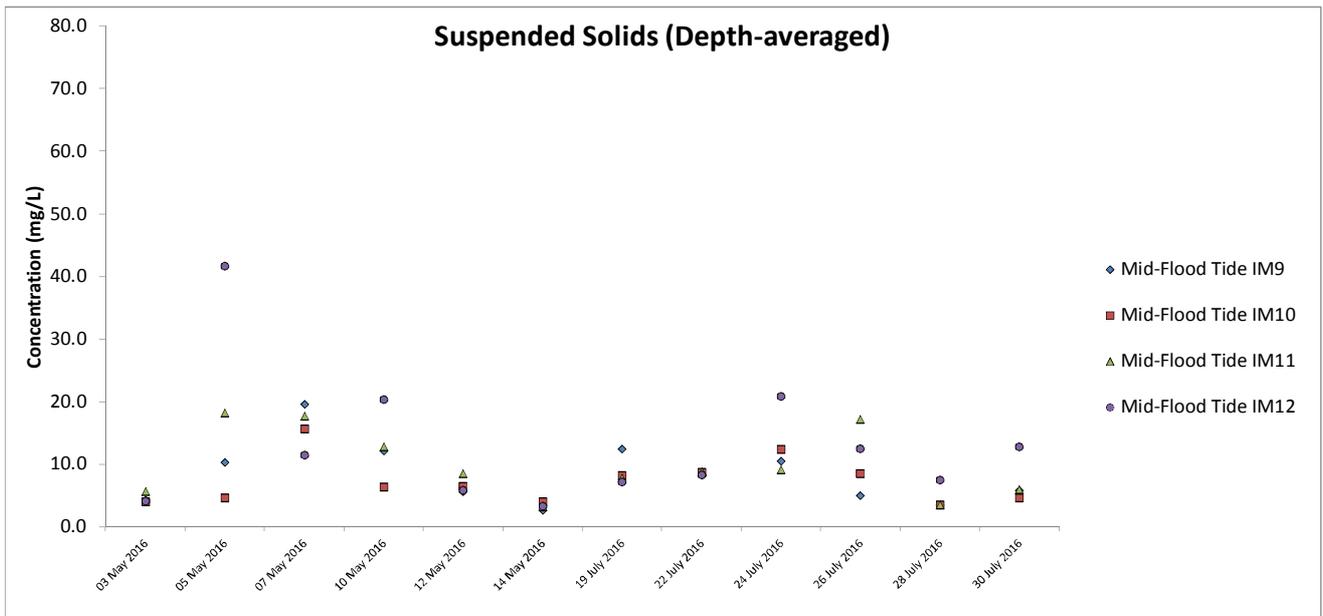


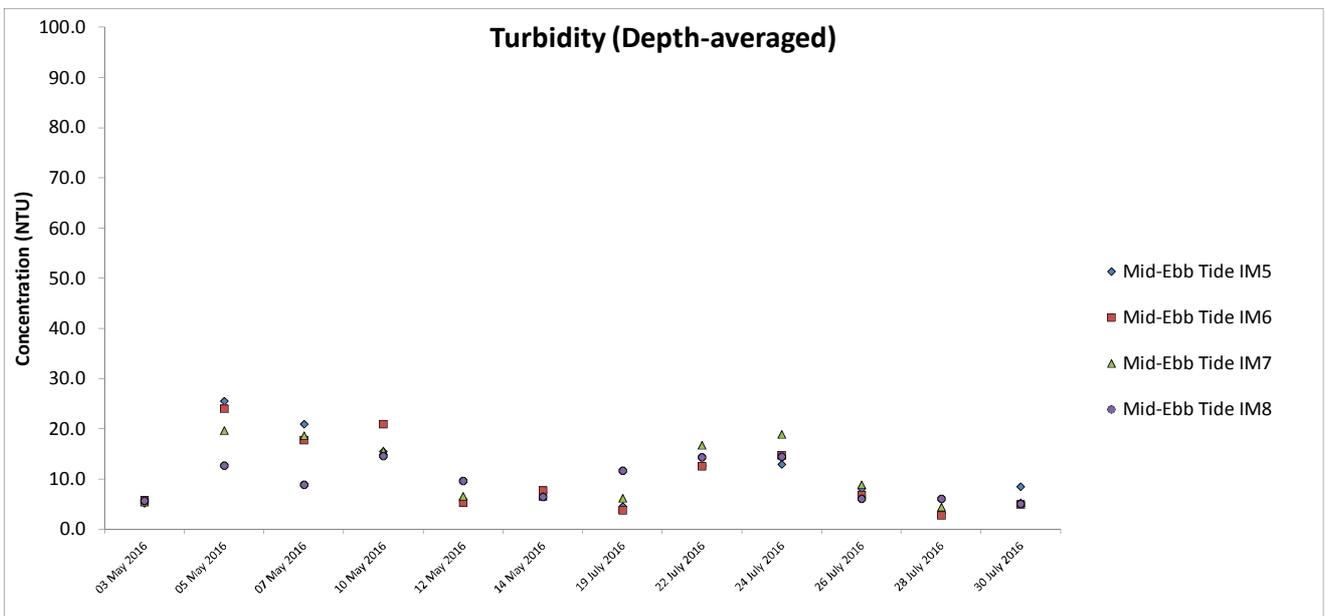
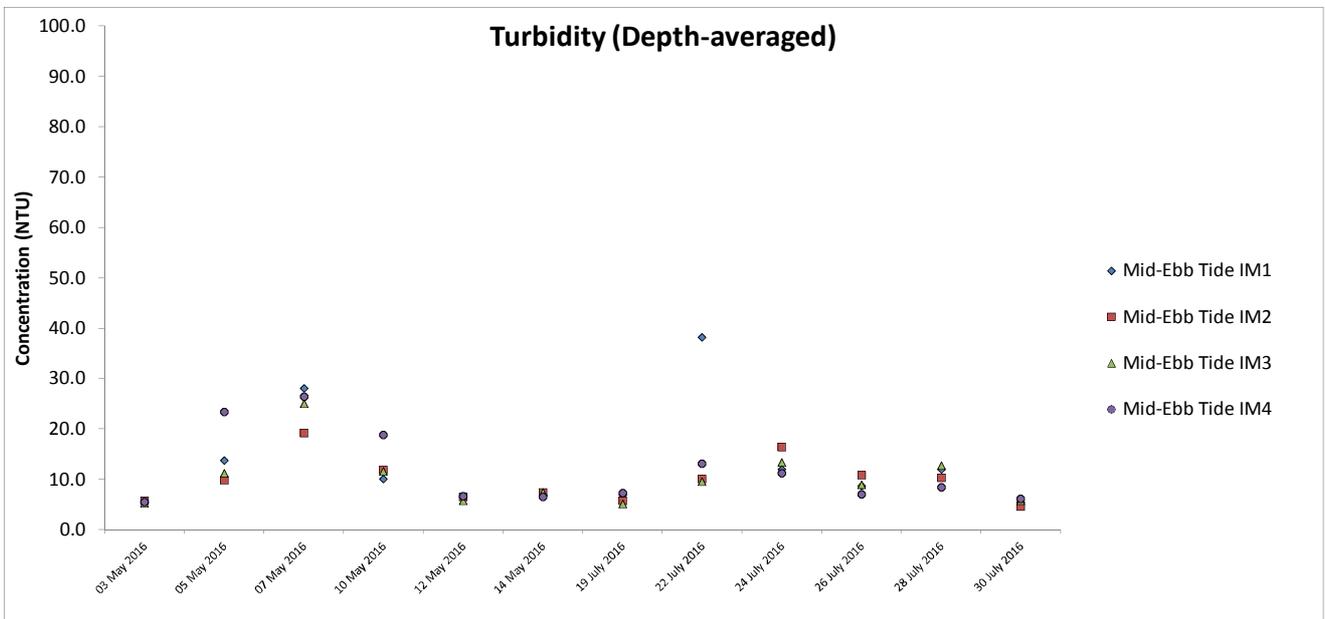
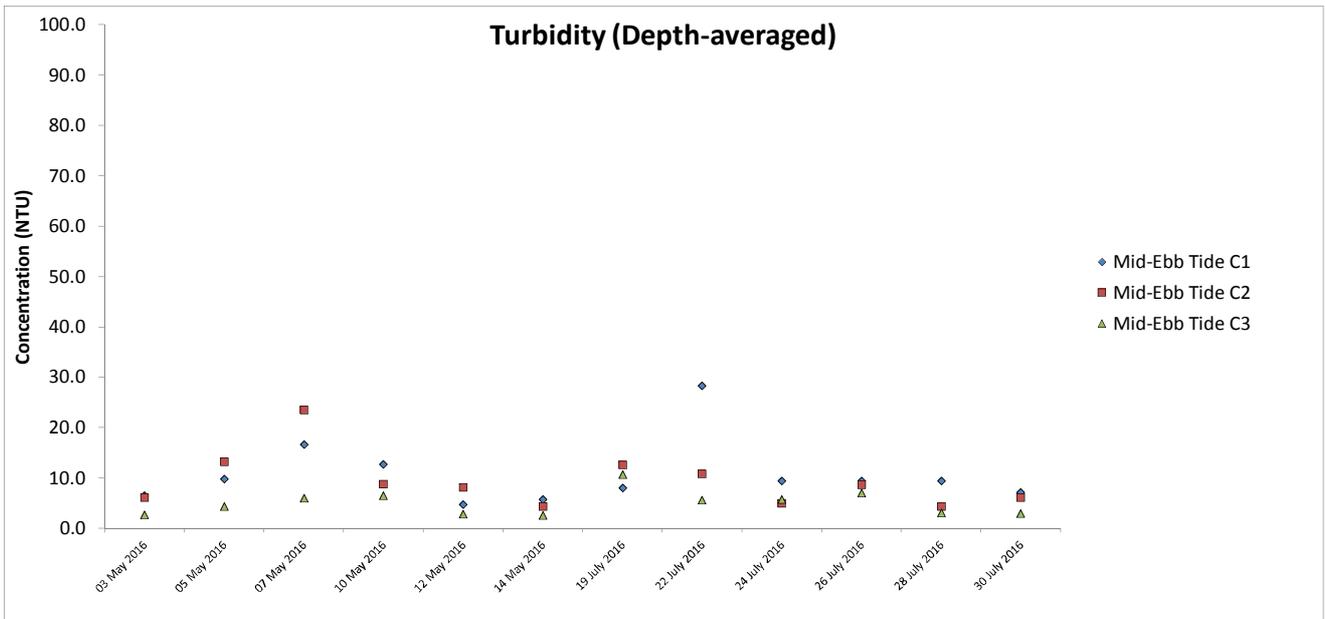


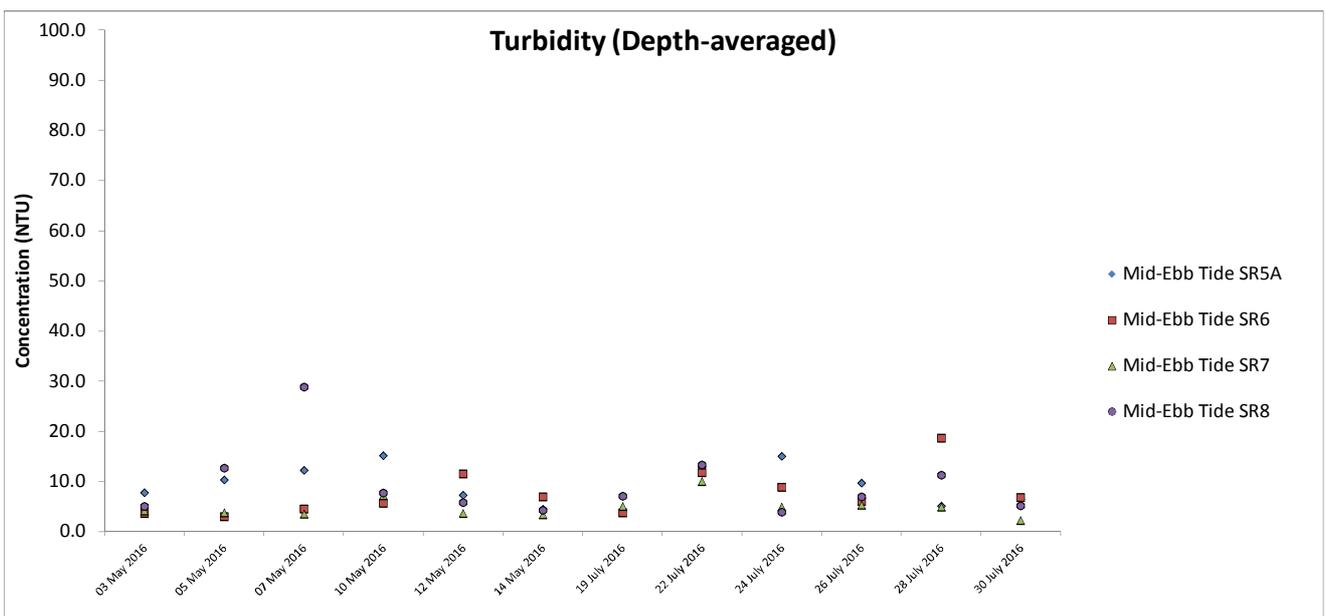
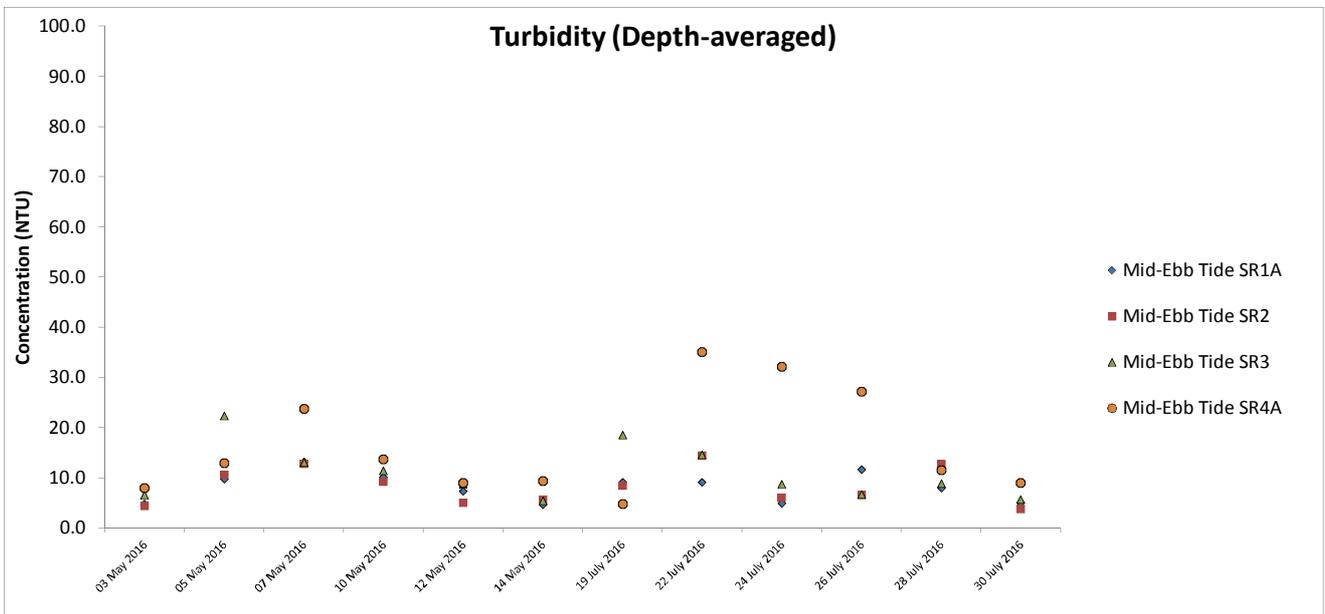
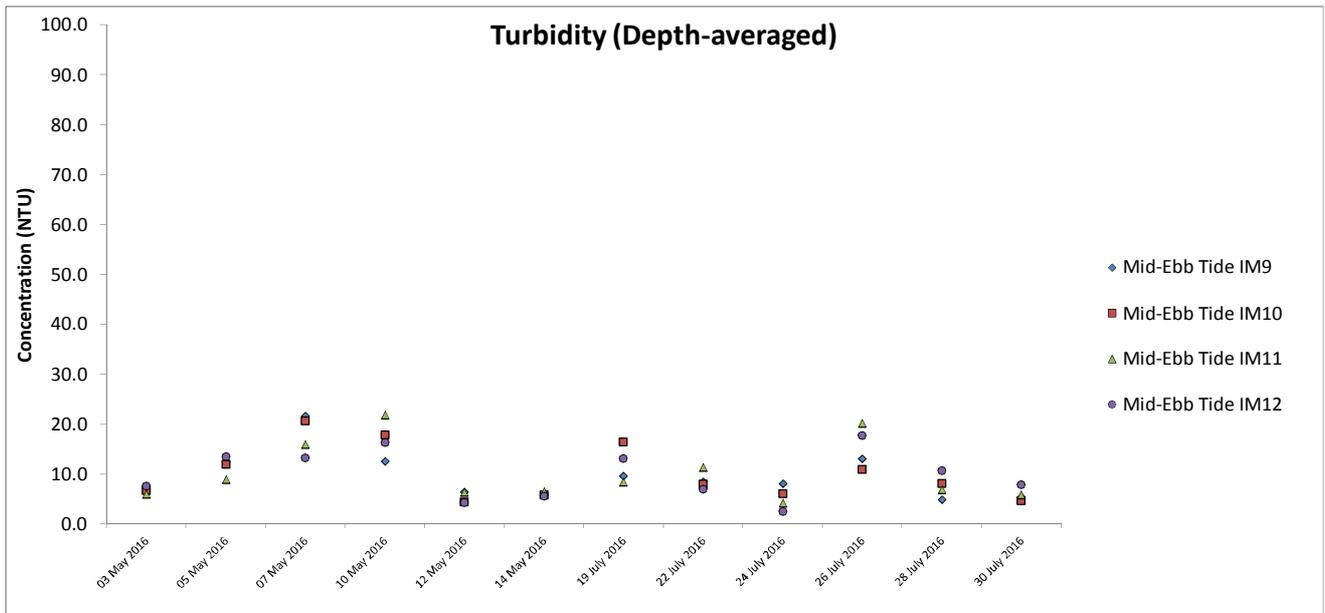


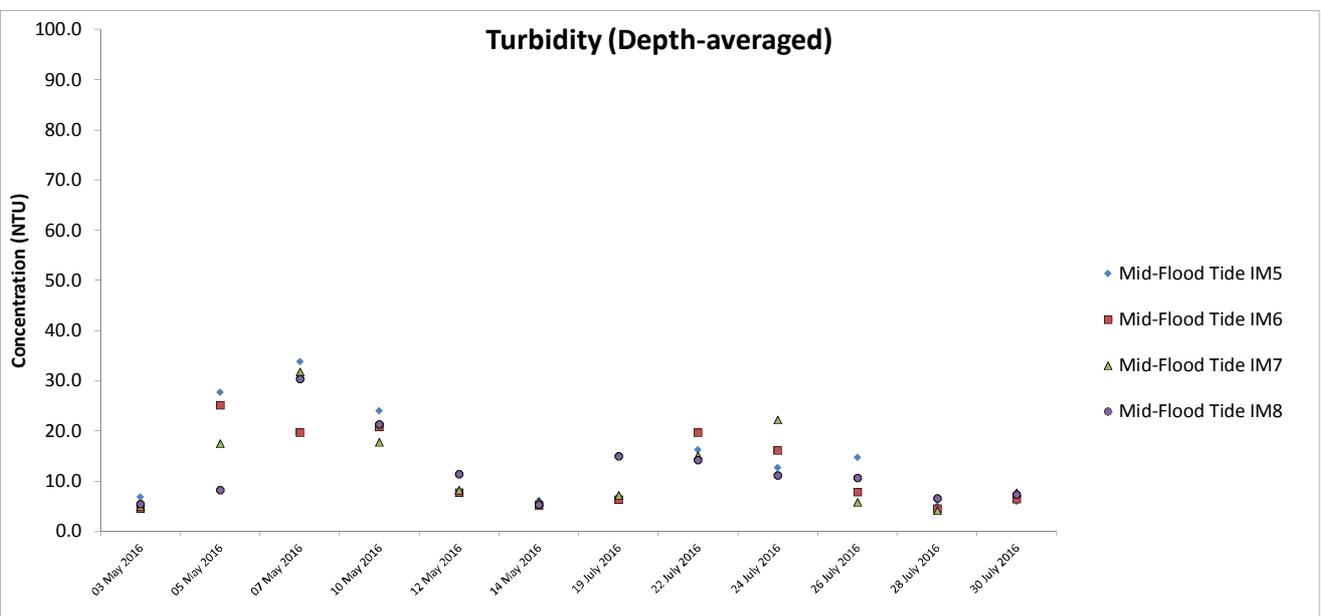
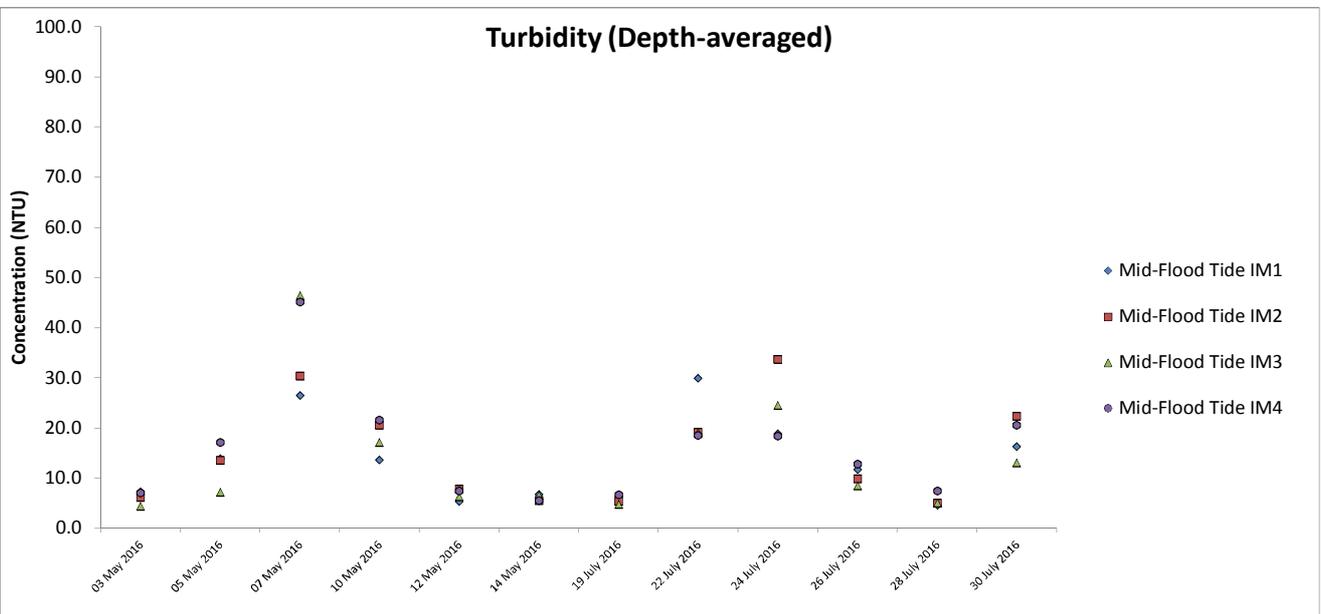
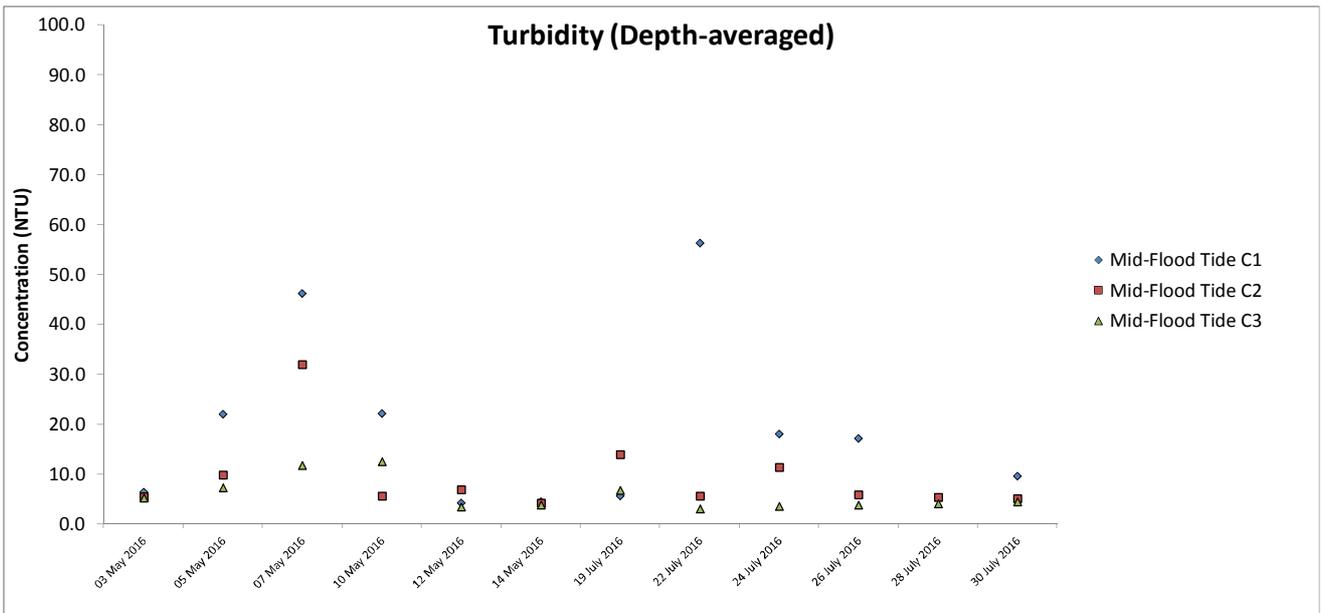


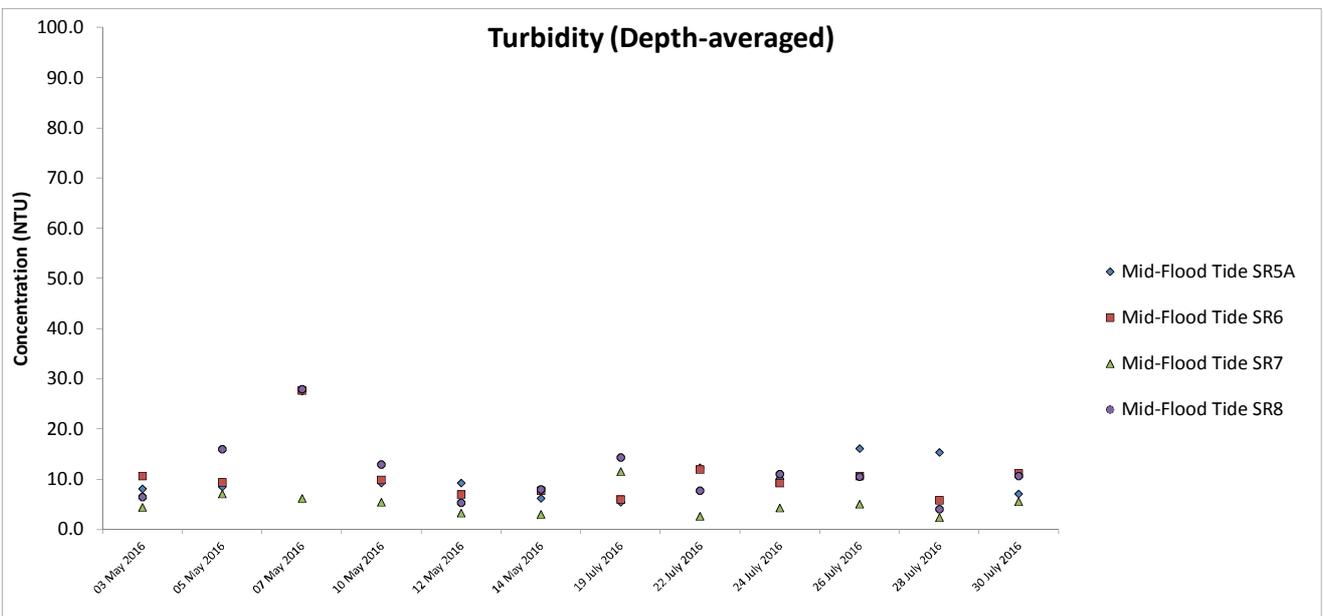
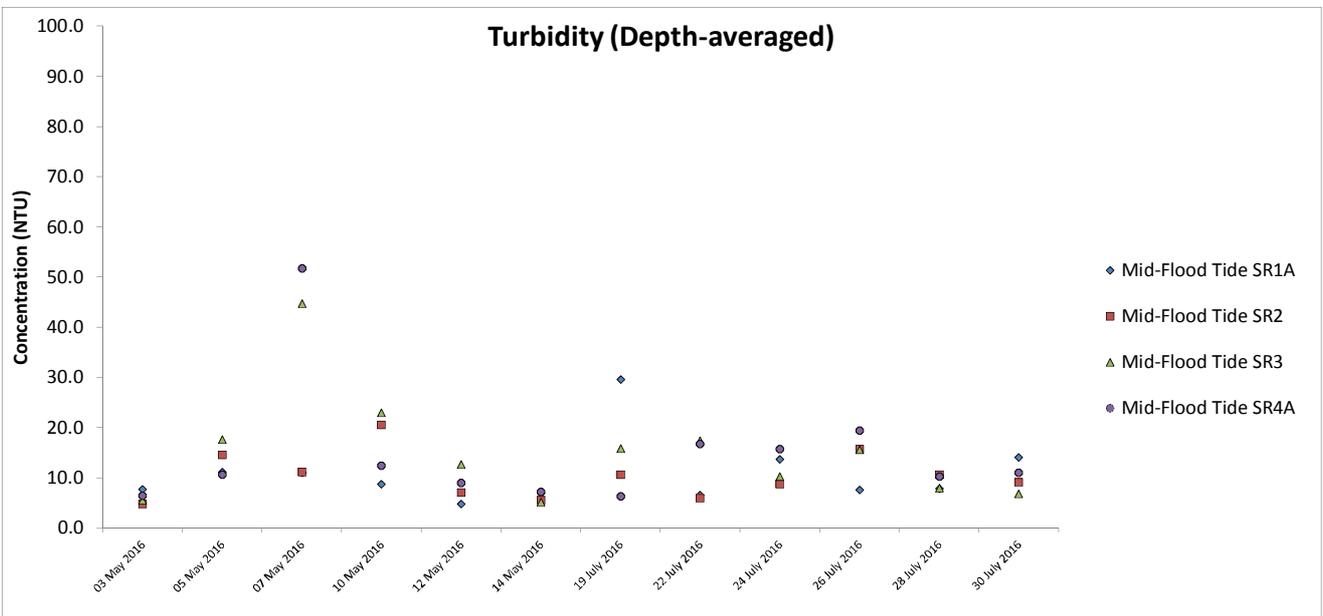
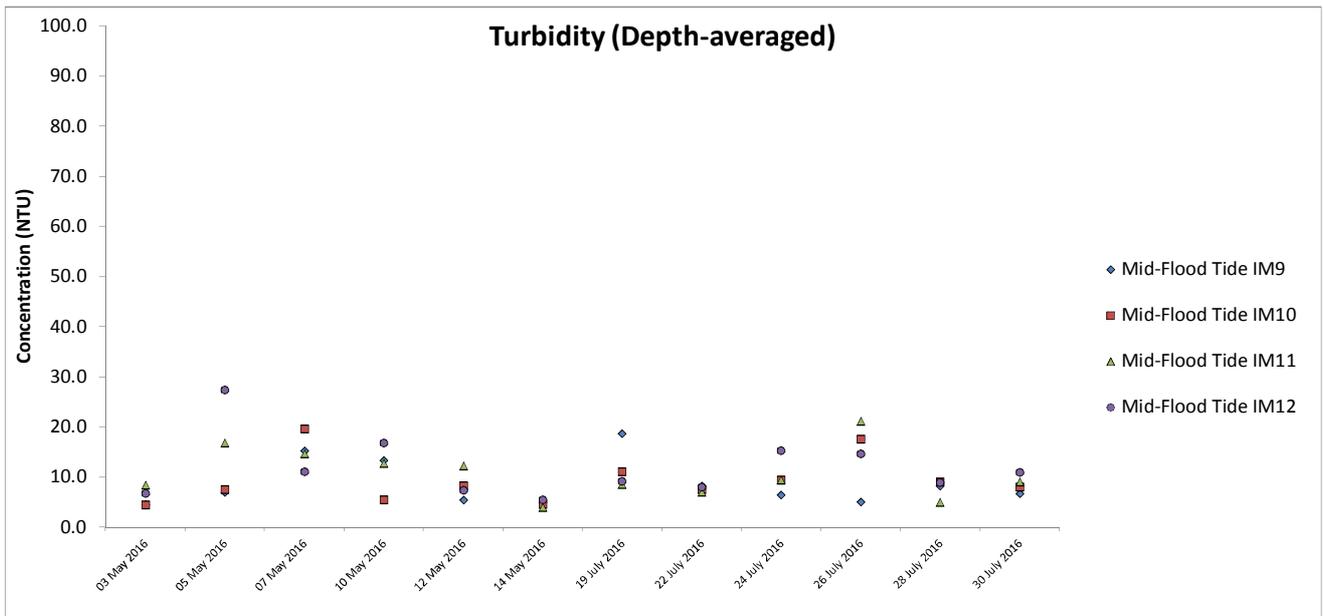


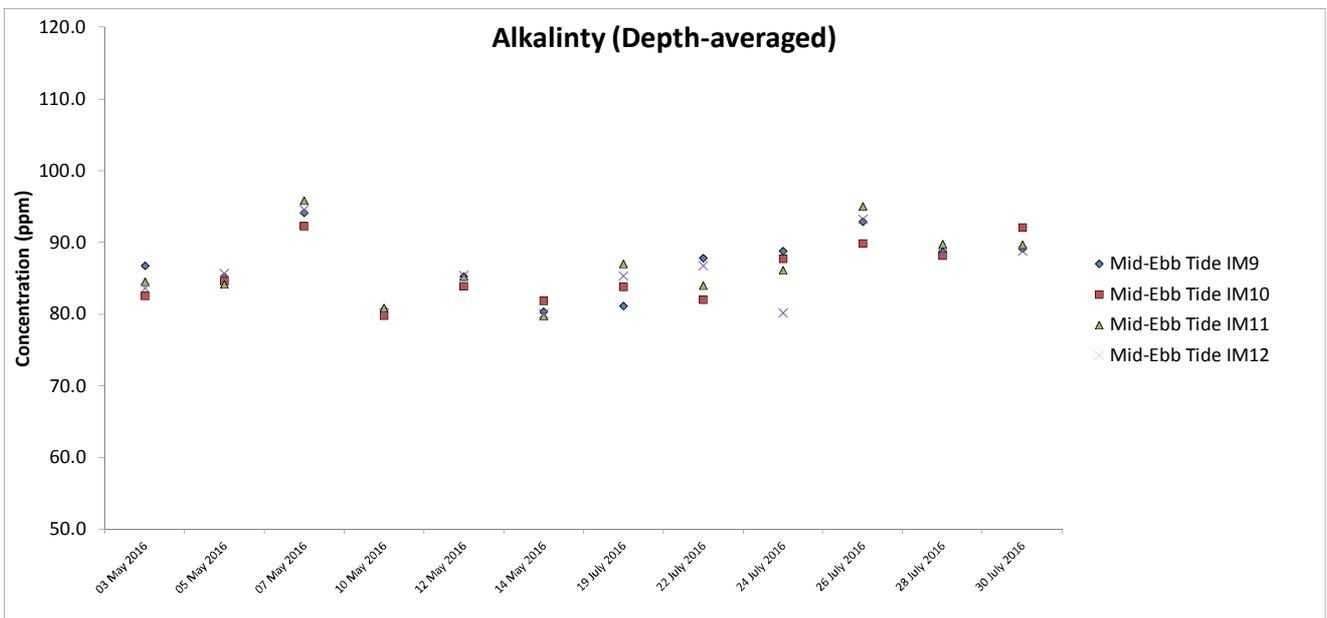
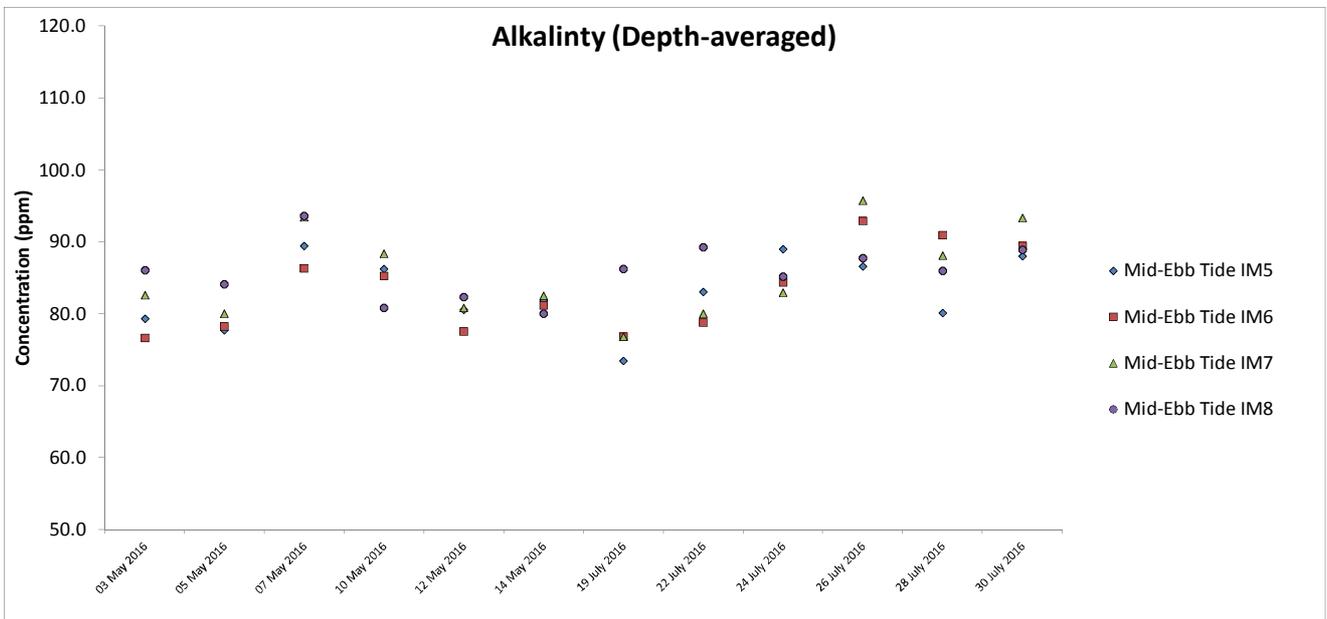
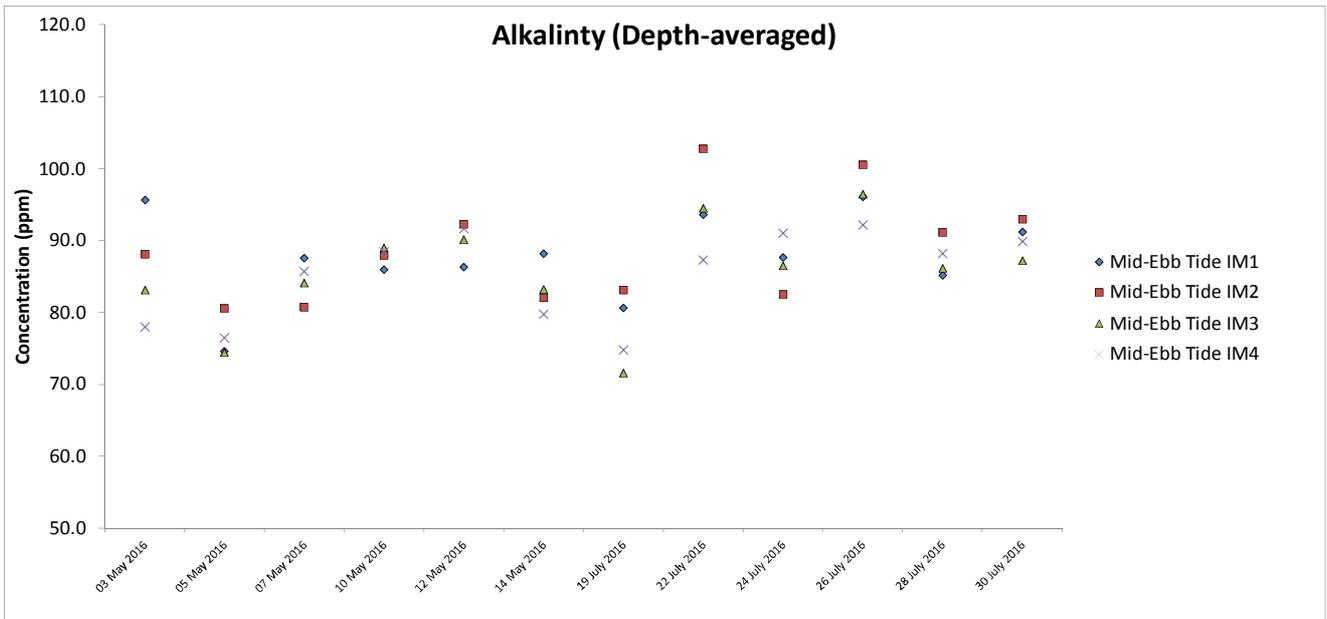


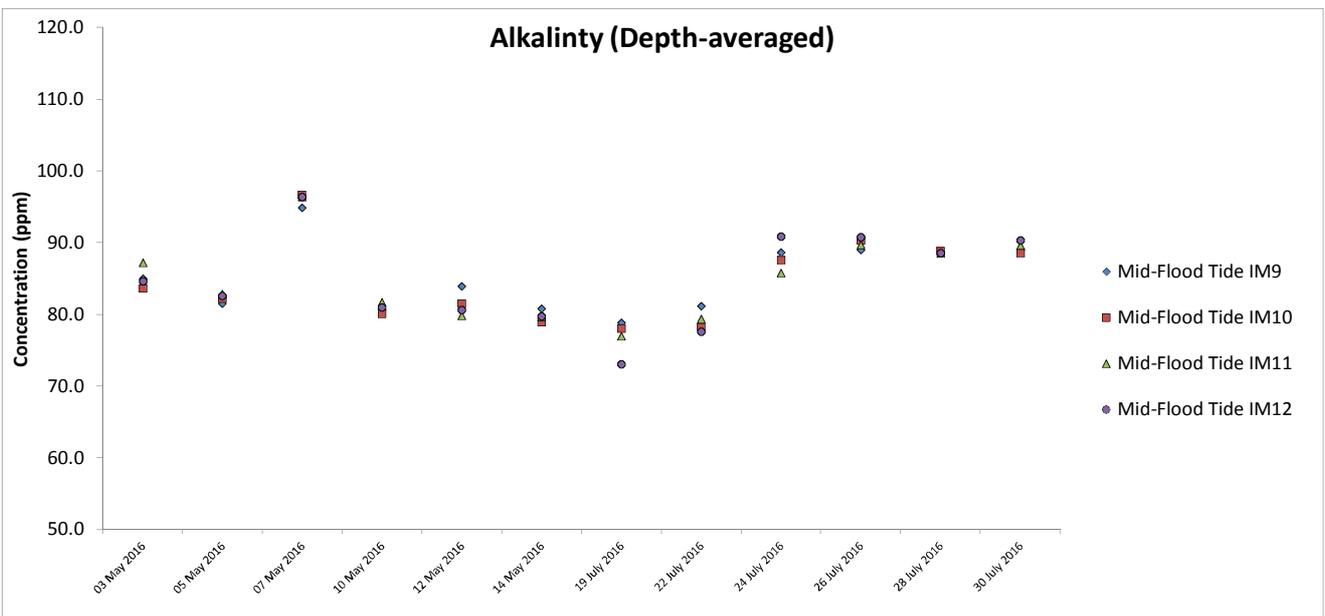
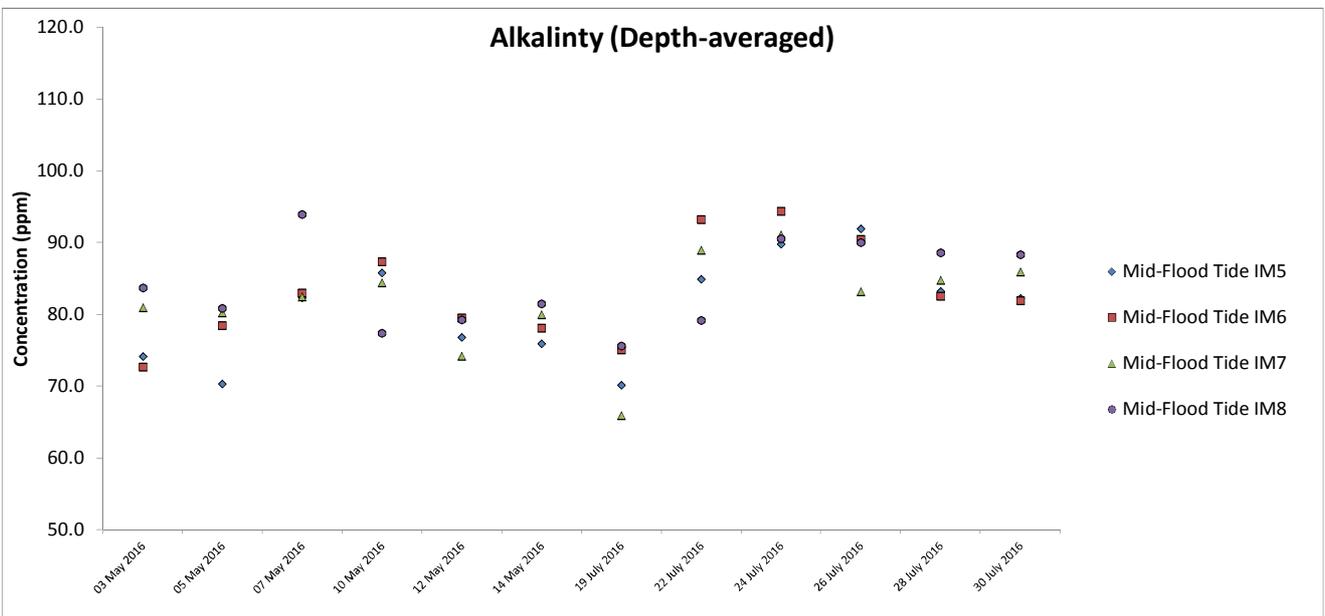
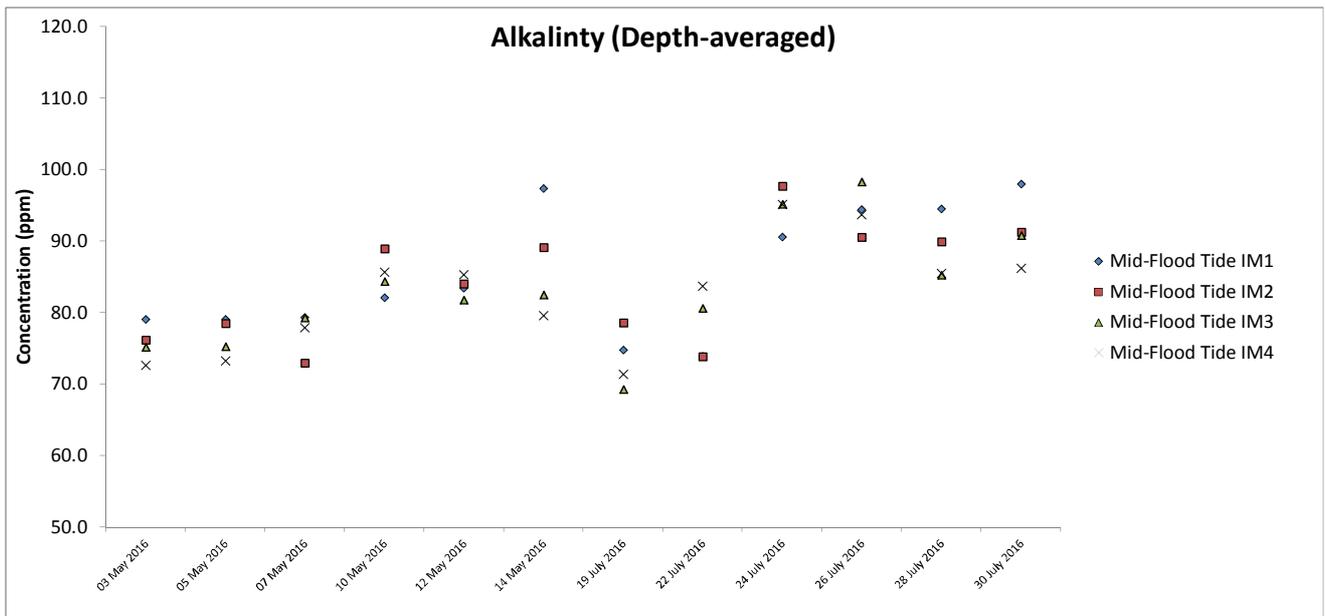


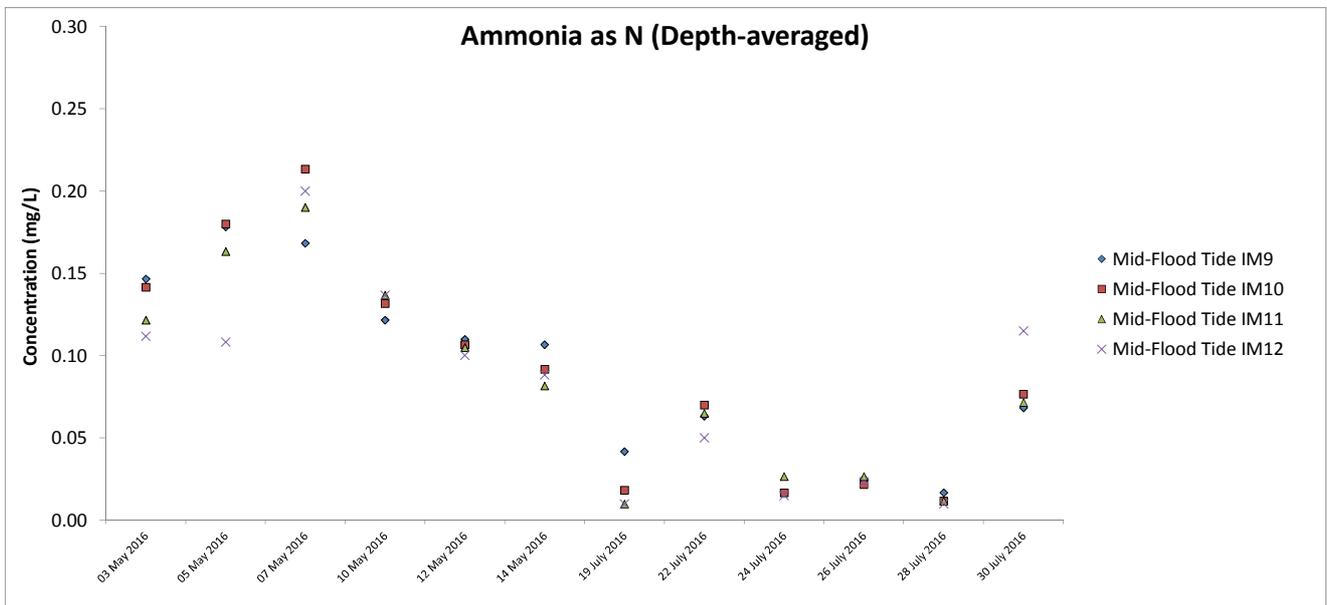
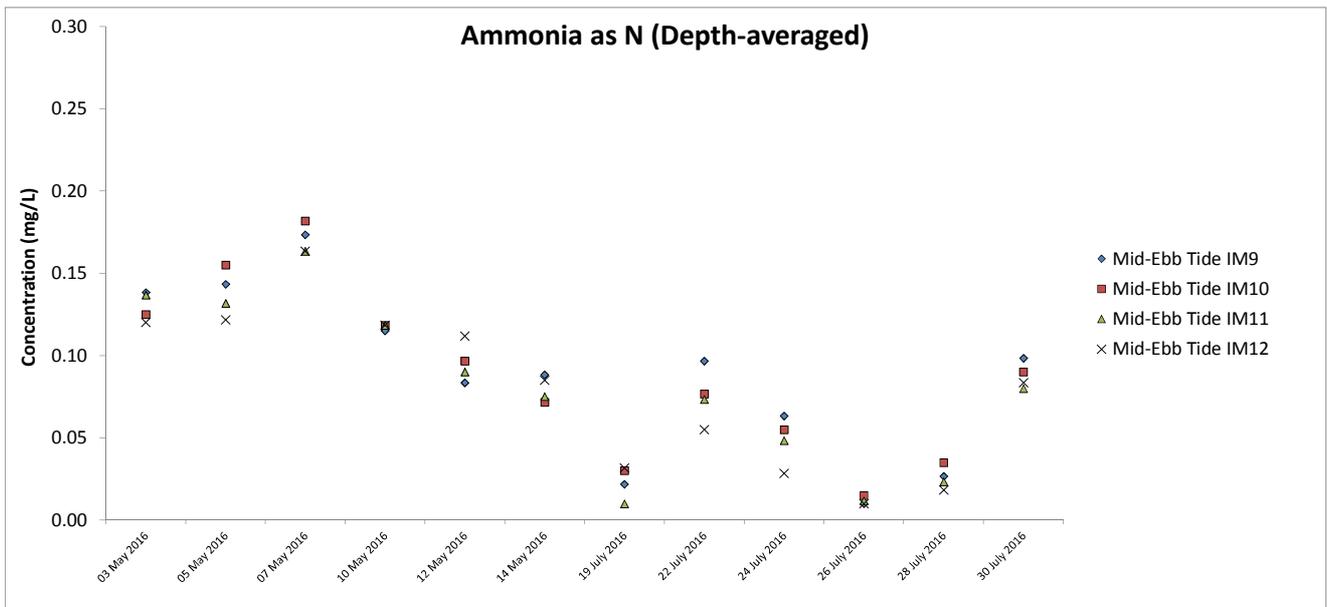


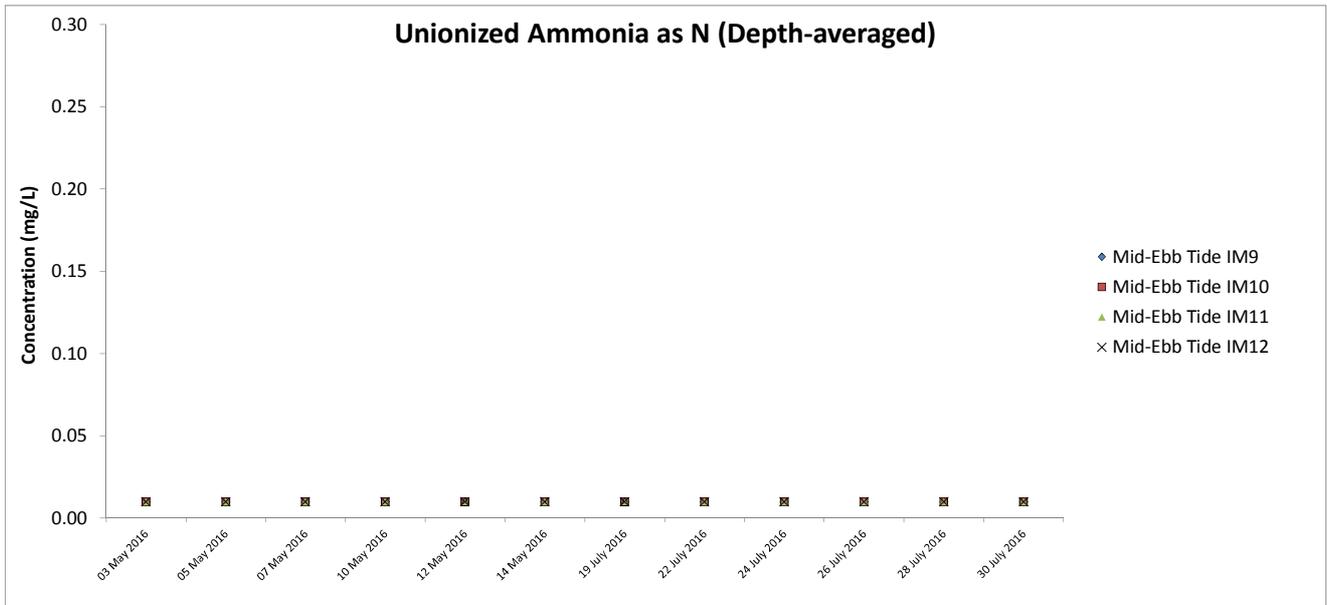




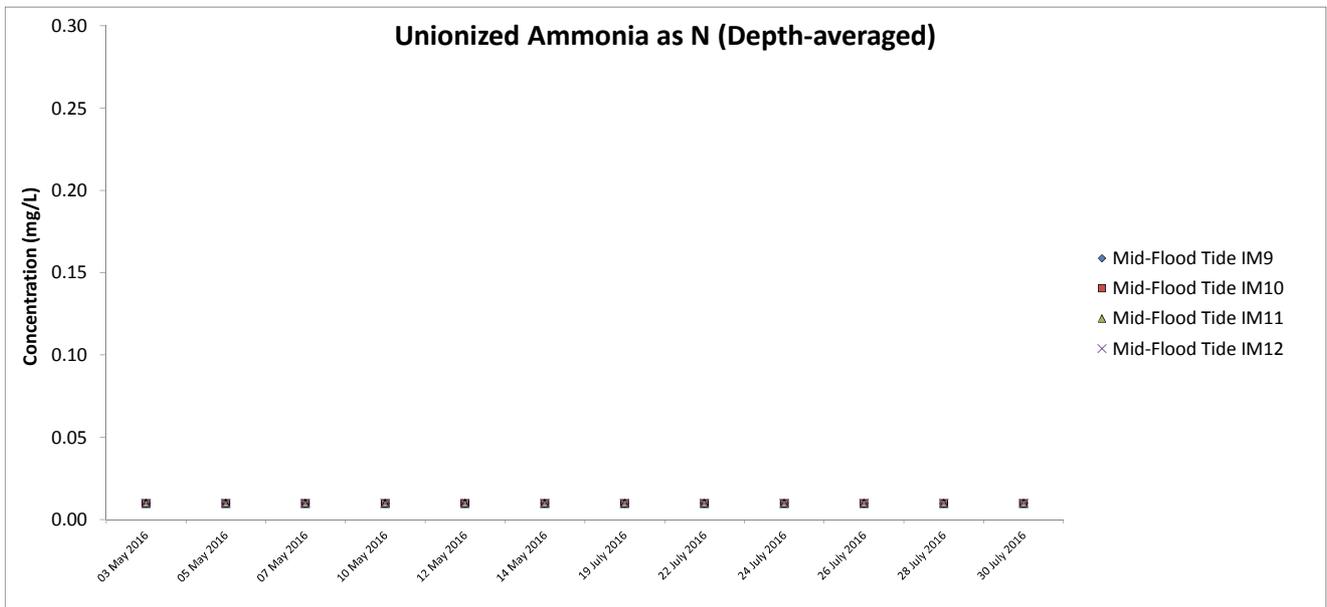




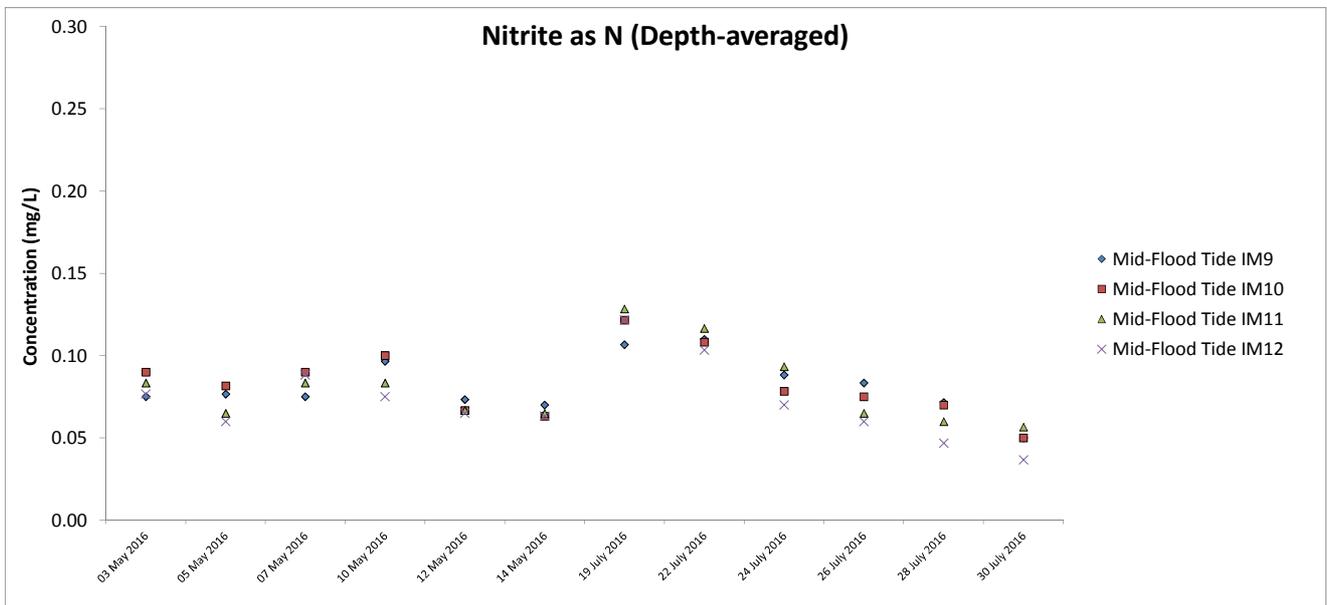
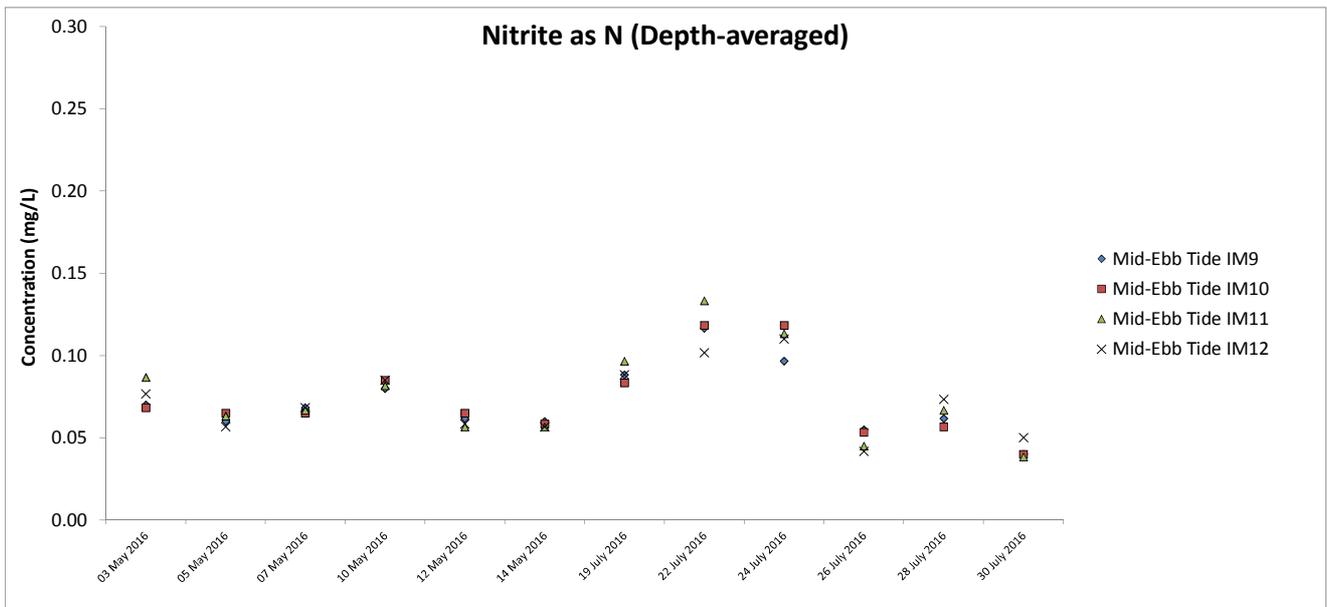


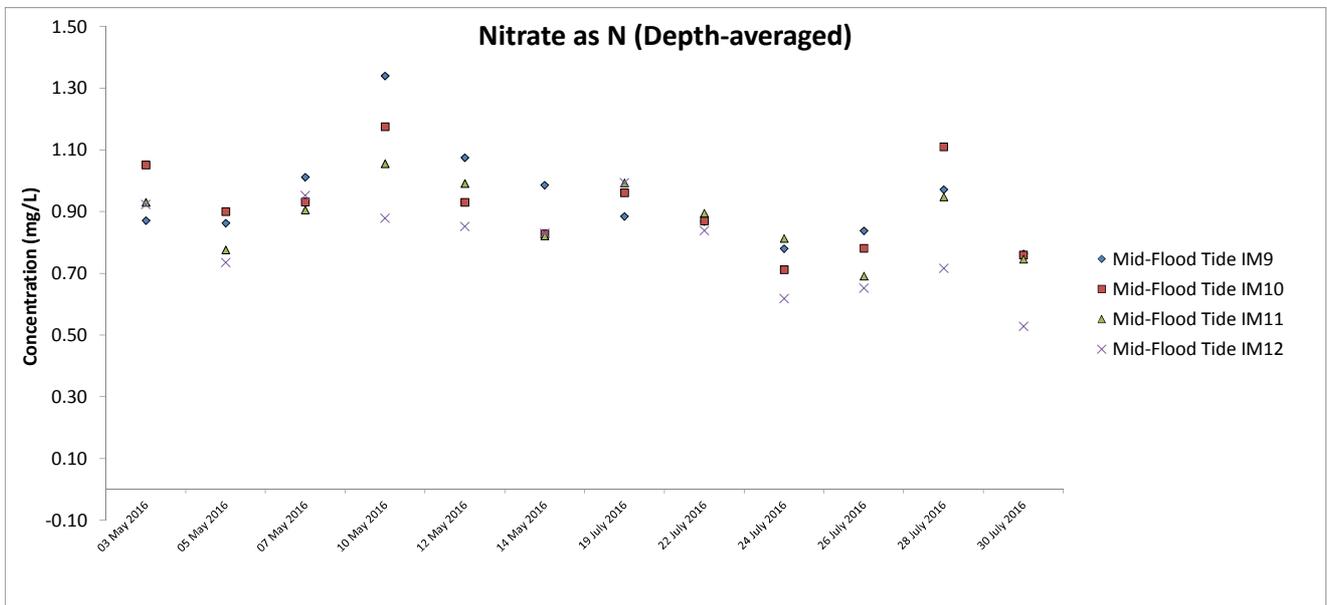
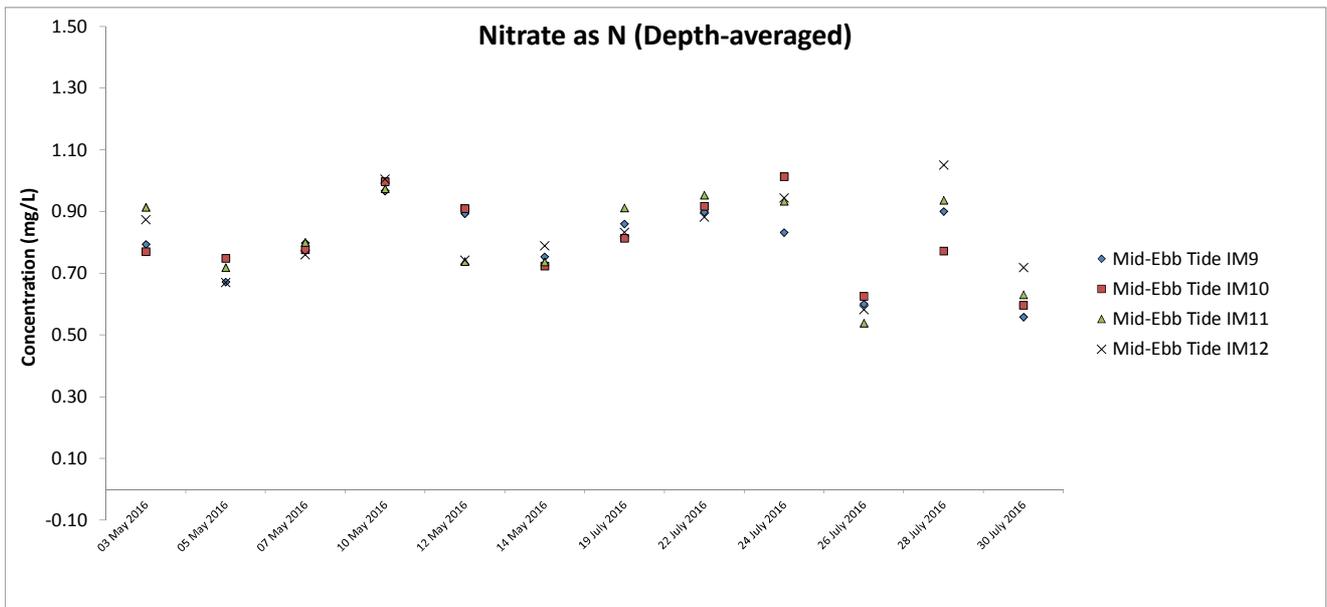


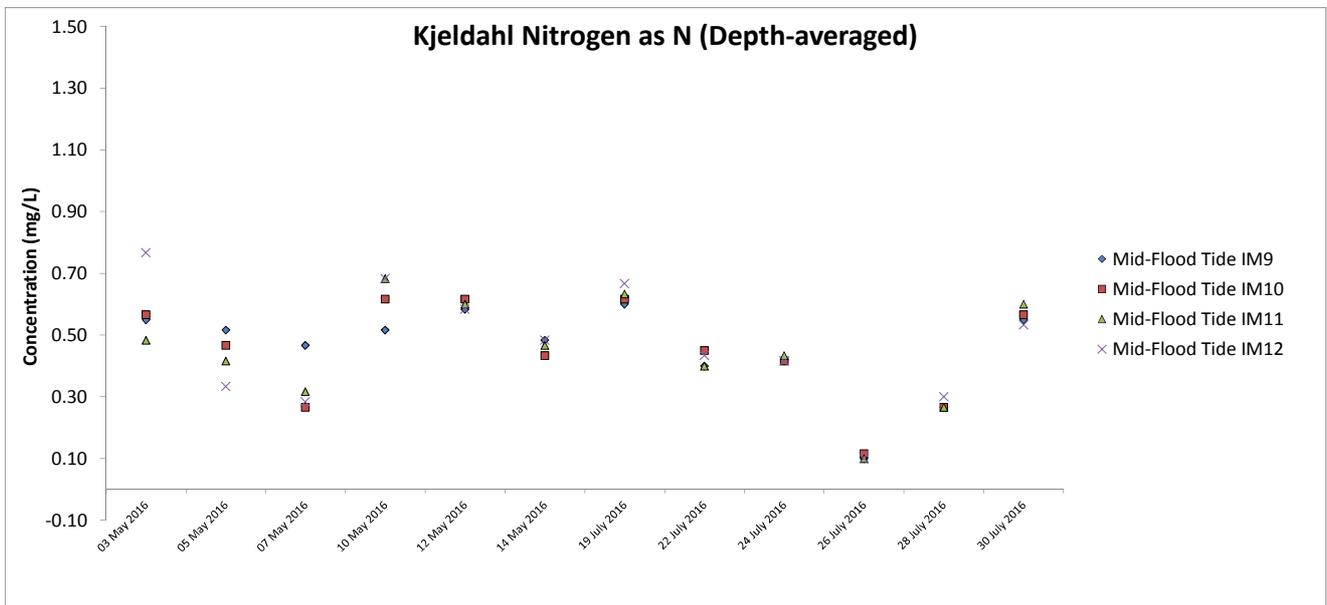
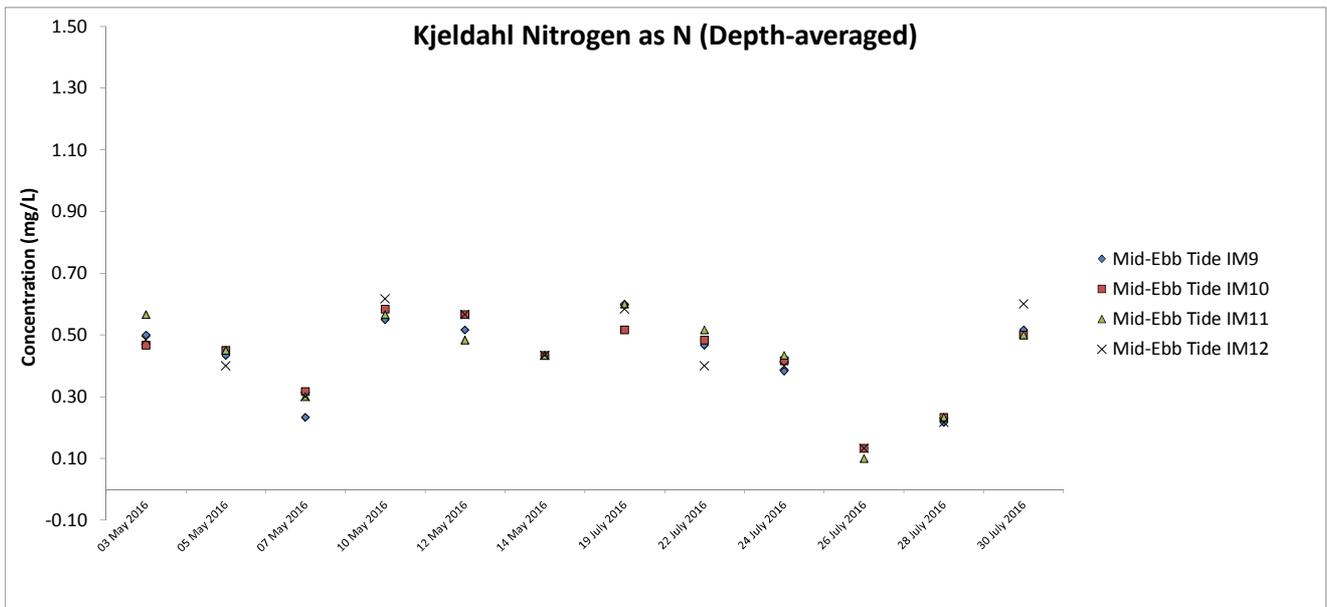
Unionized Ammonia results based on calculation from Ammonia results. Actual results are <0.01 mg/L (Note the reporting limit for Ammonia is 0.01 mg/L).

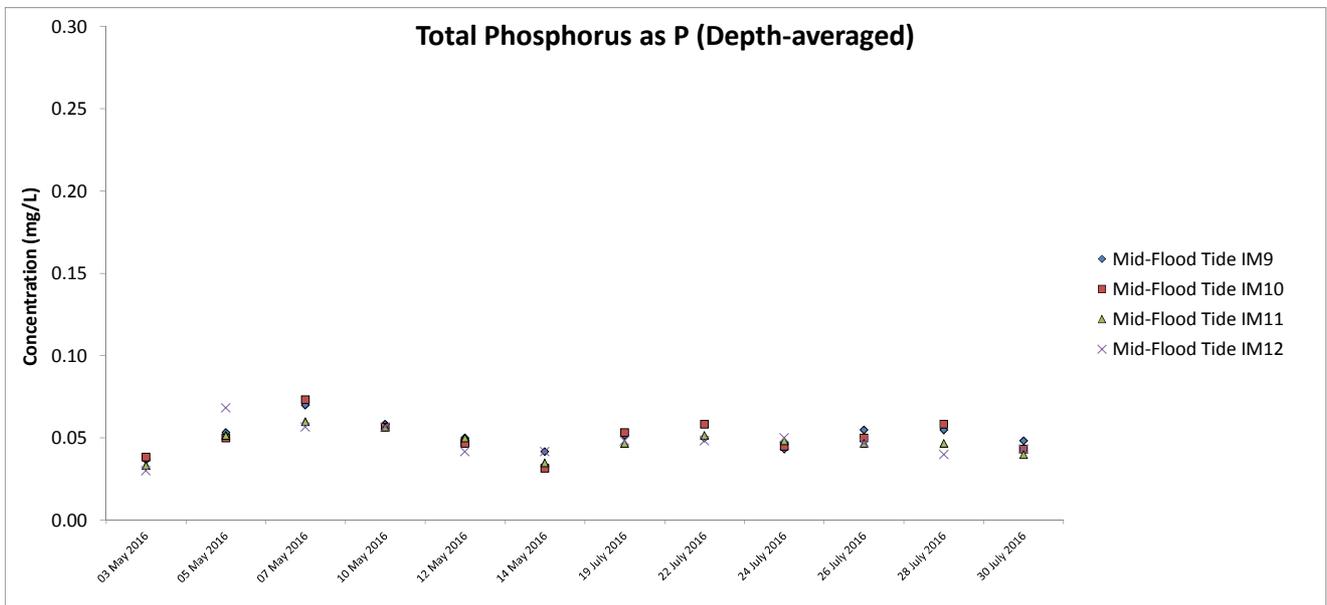
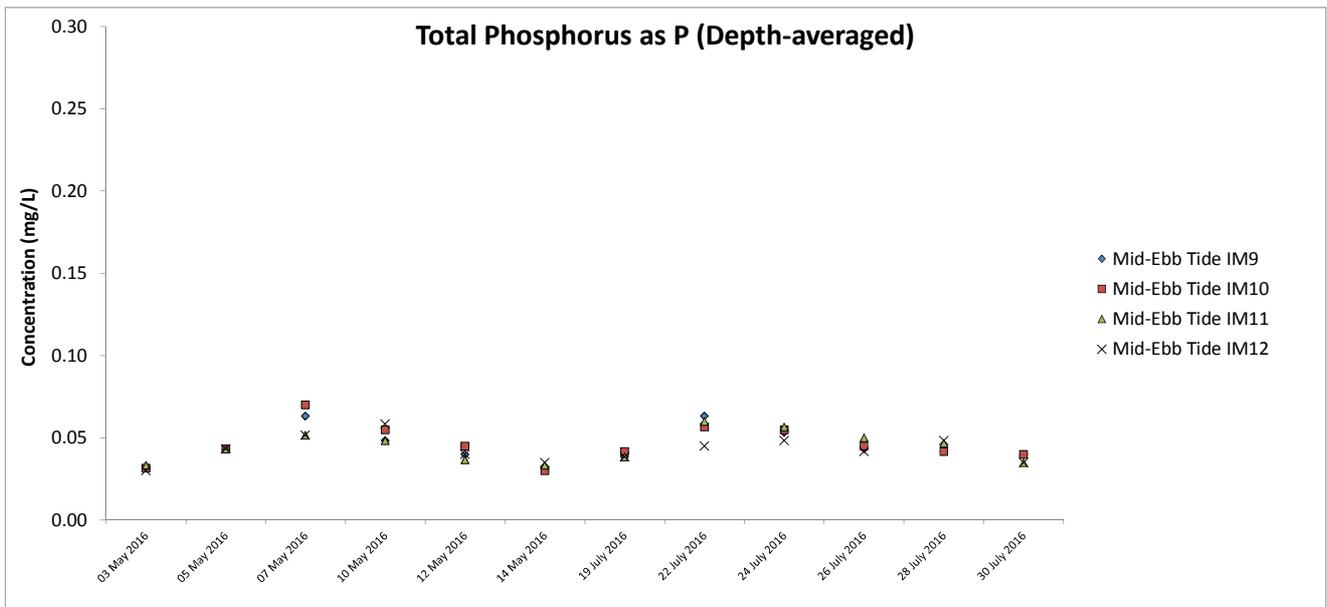


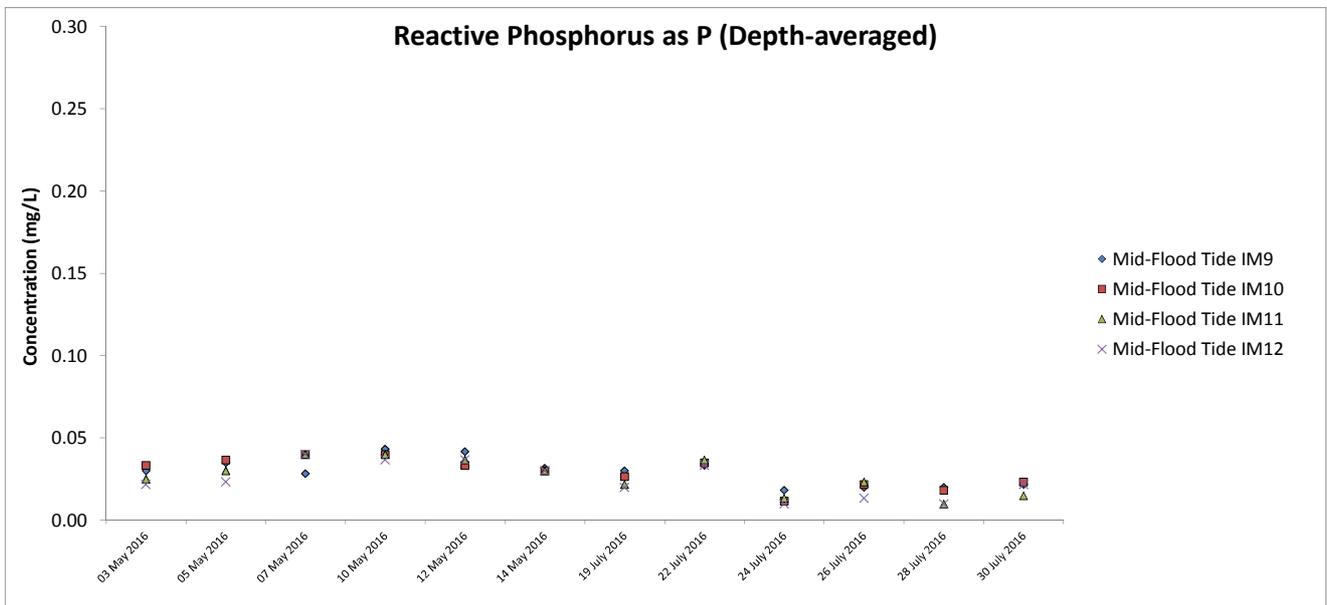
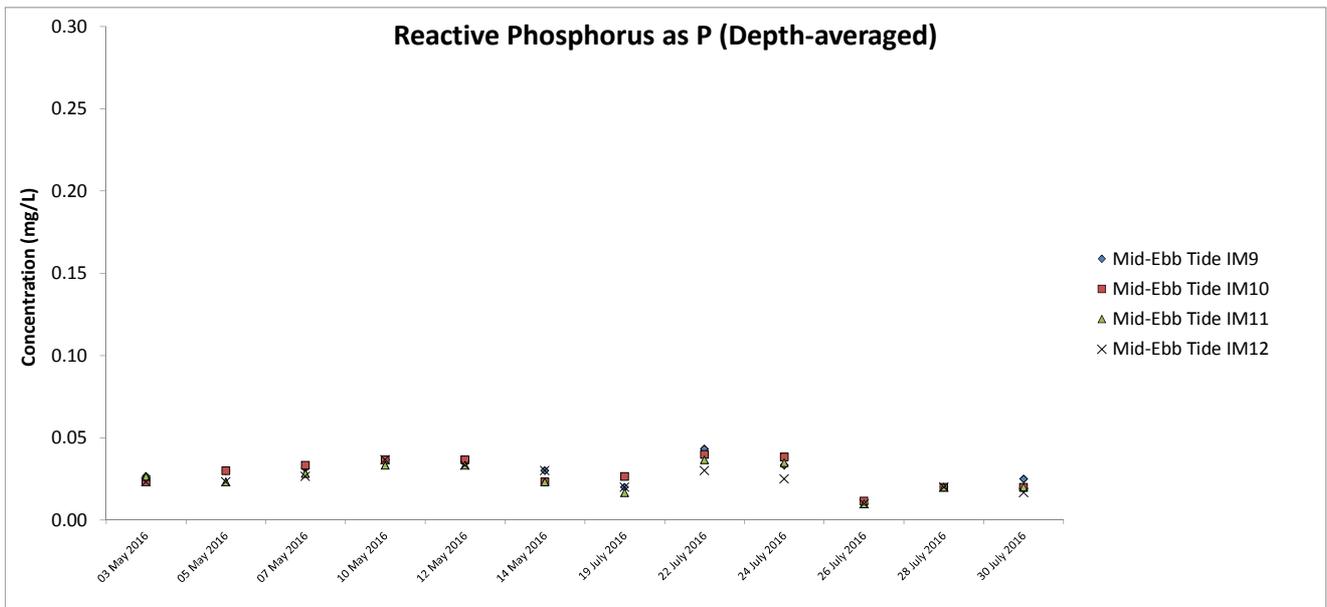
Unionized Ammonia results based on calculation from Ammonia results. Actual results are <0.01 mg/L (Note the reporting limit for Ammonia is 0.01 mg/L).

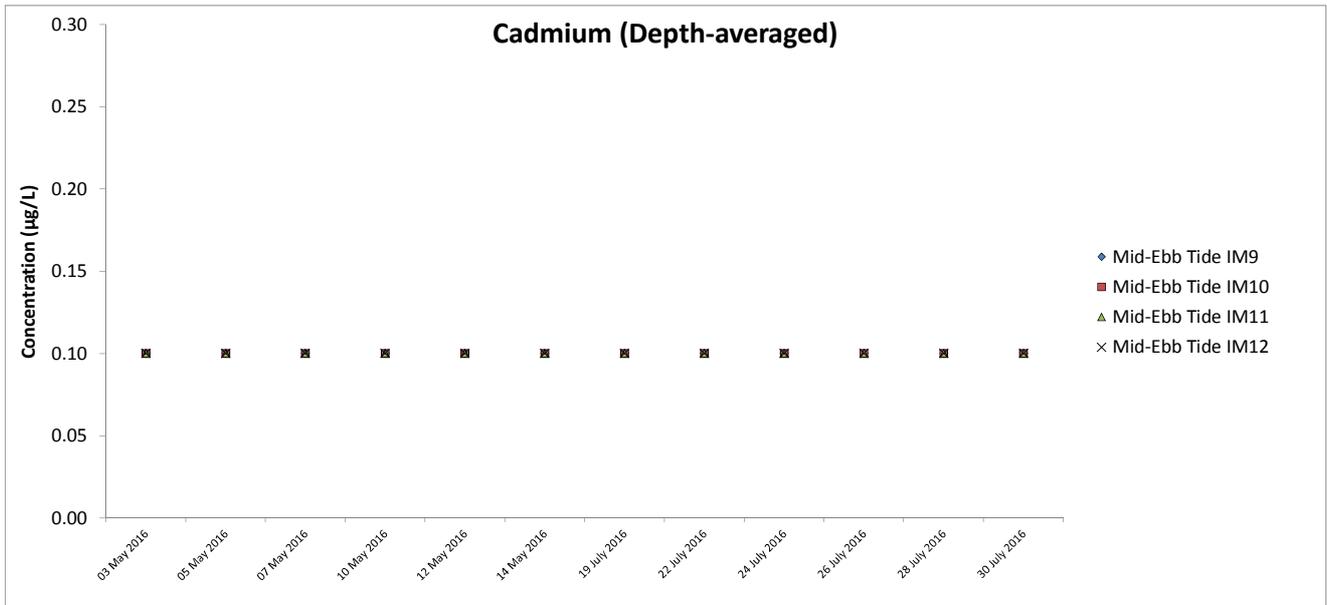




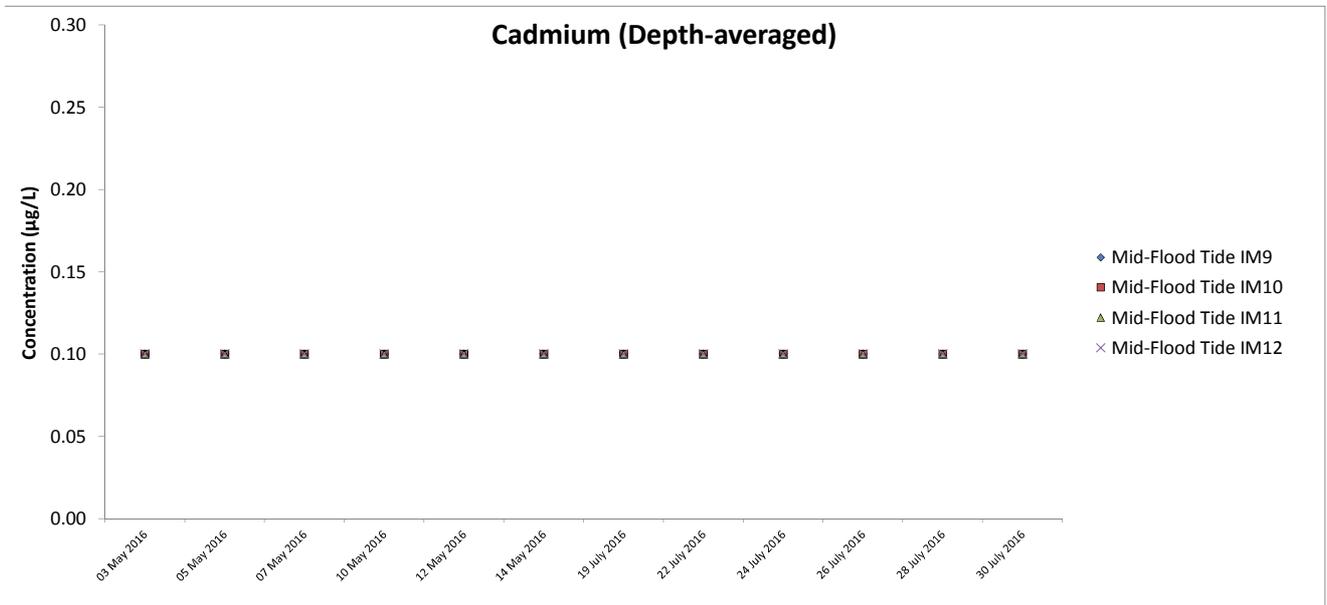




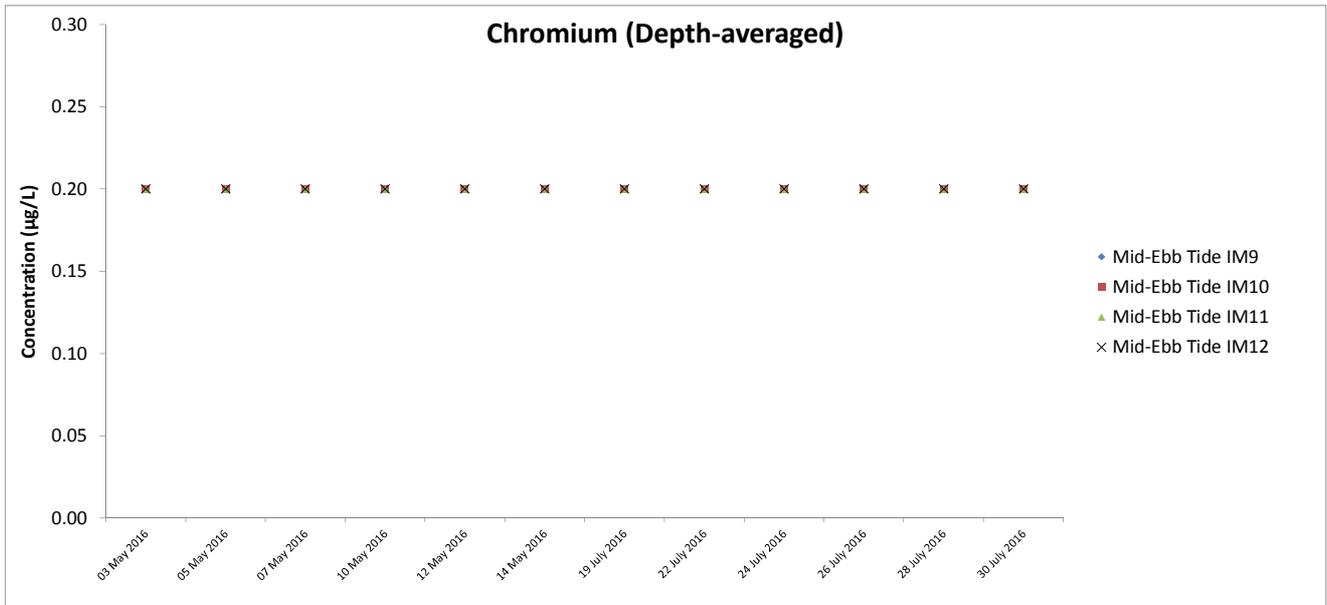




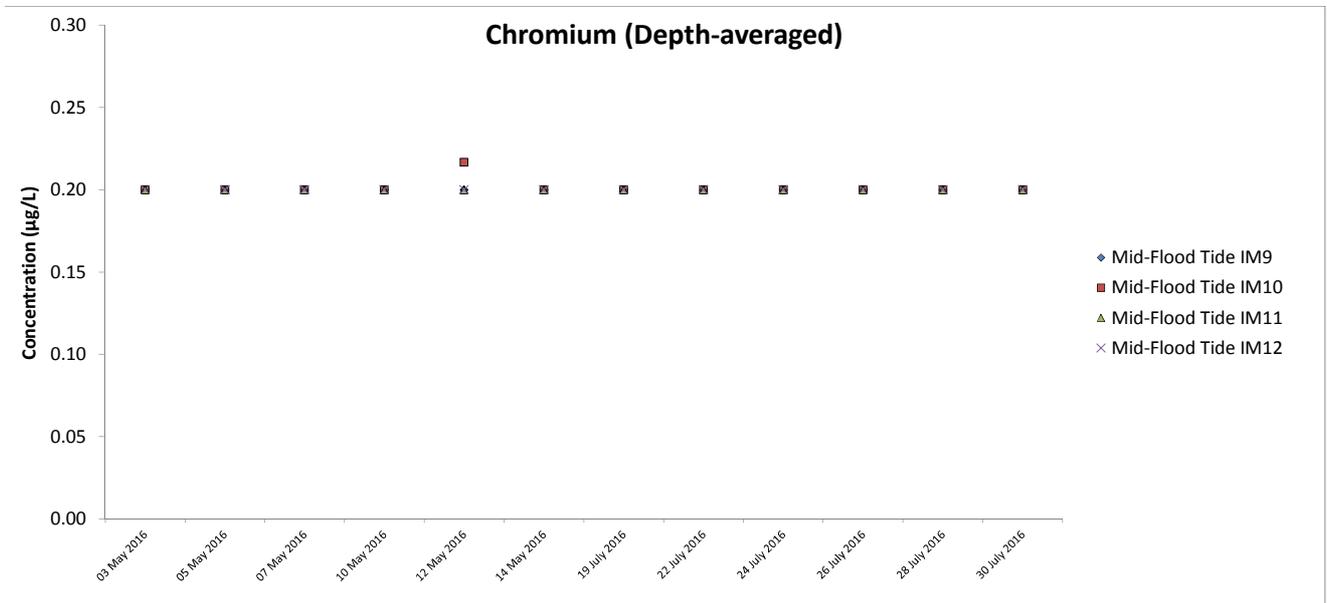
Note: The baseline monitoring results of Cadmium were lower than the laboratory detection level (<0.1 µg/L)

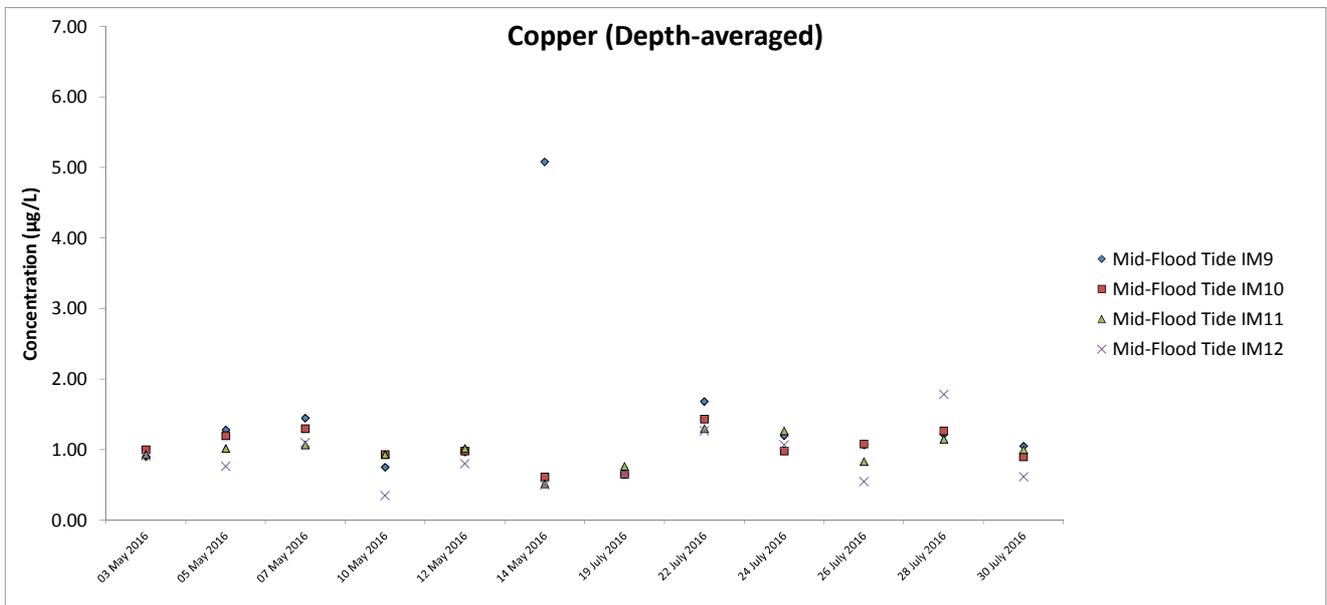
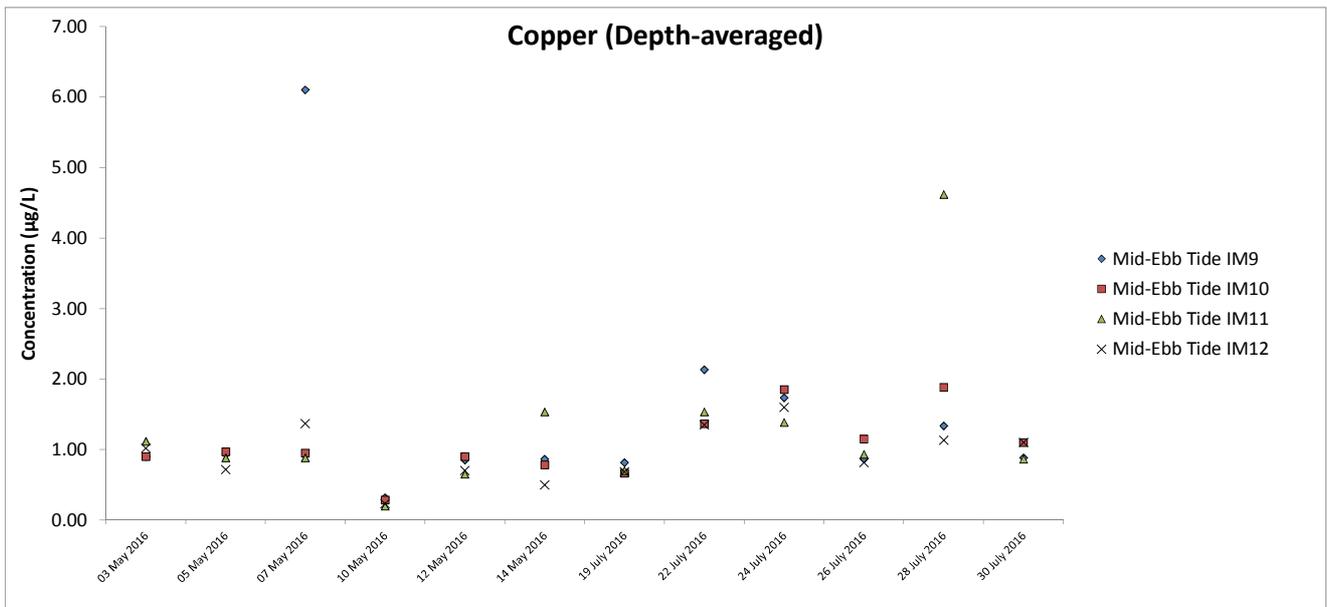


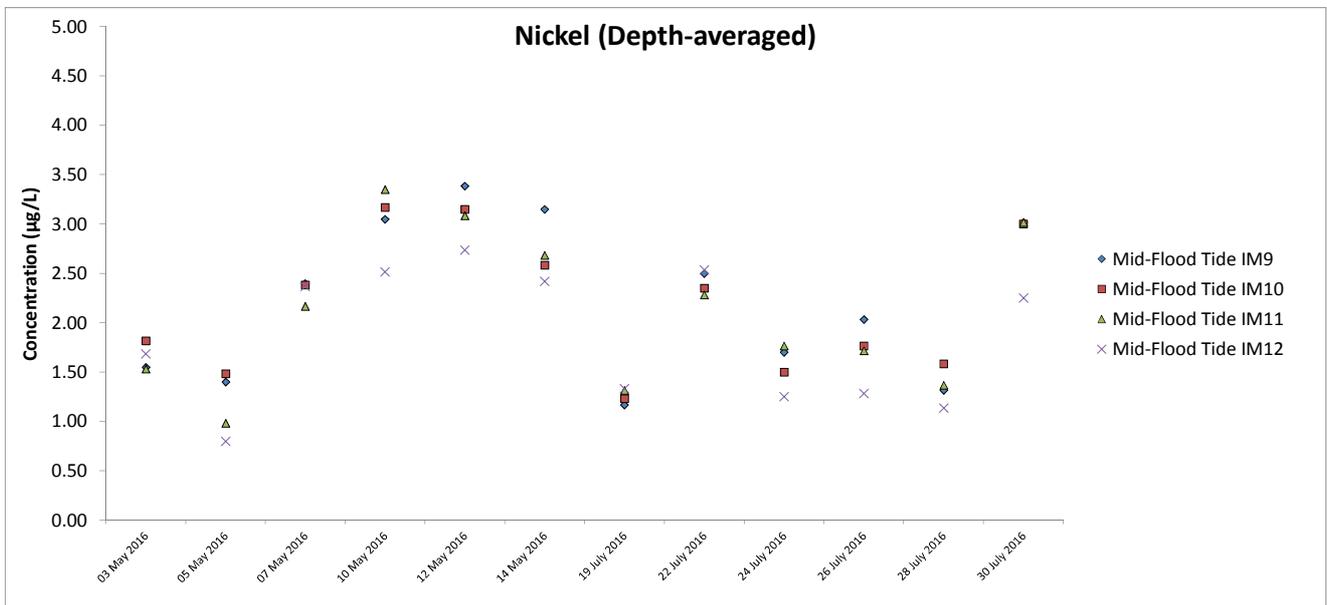
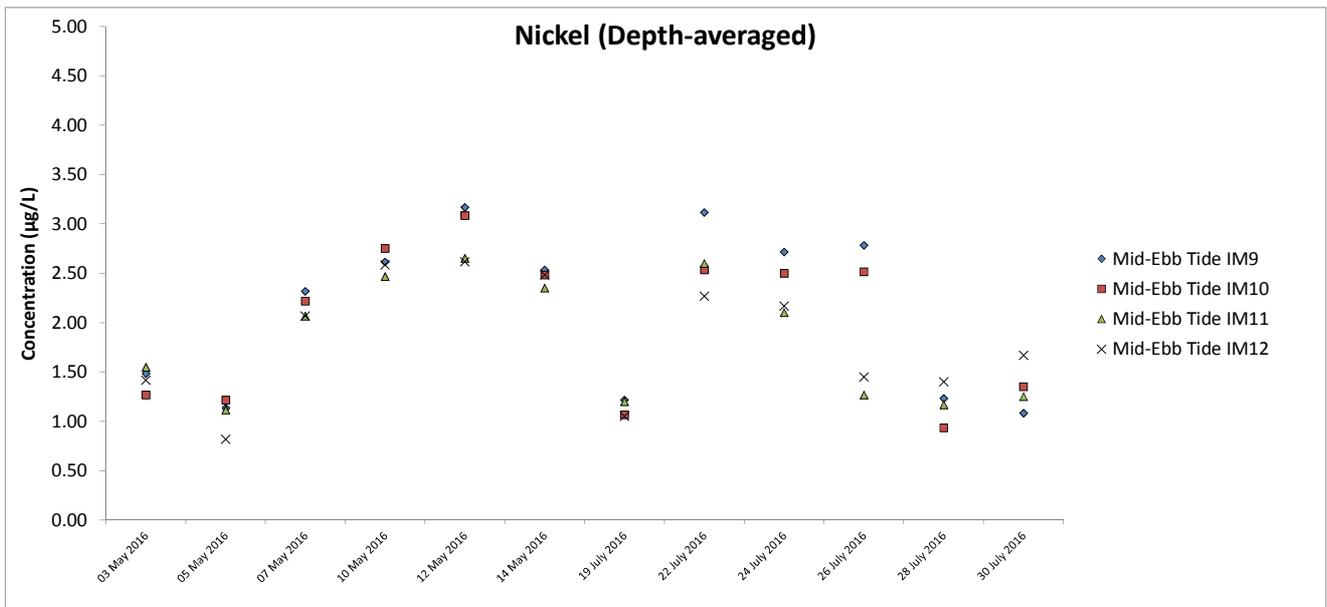
Note: The baseline monitoring results of Cadmium were lower than the laboratory detection level (<0.1 µg/L)

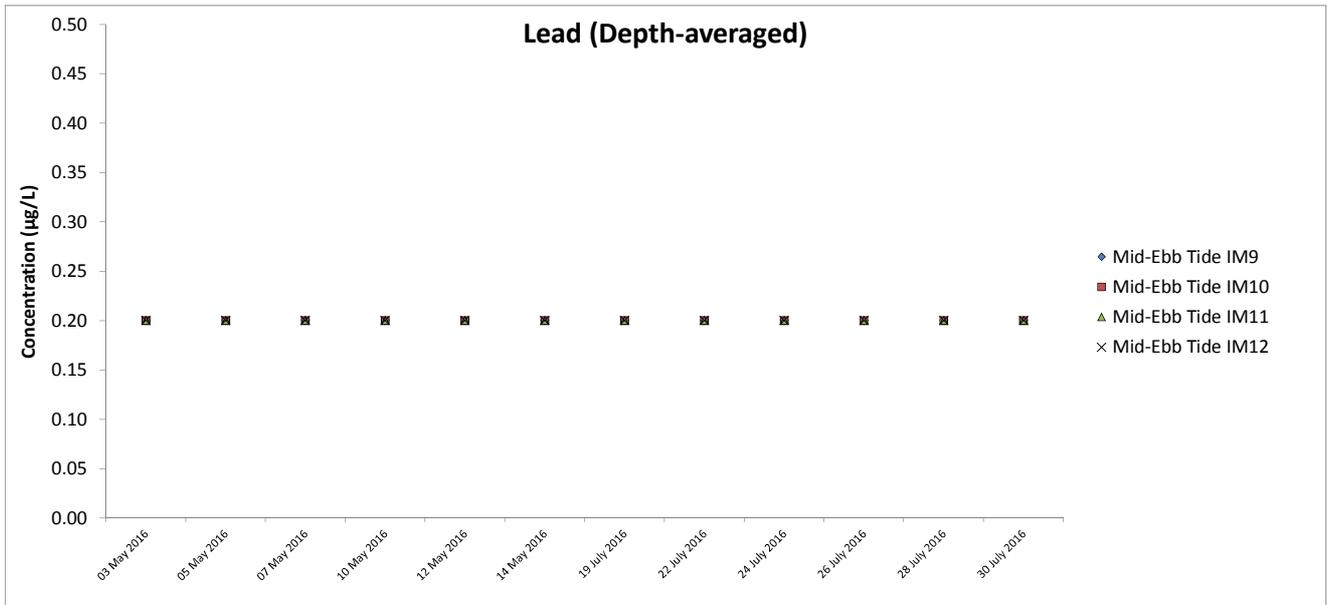


Note: The baseline monitoring results of Chromium were lower than the laboratory detection level (<0.2 µg/L)

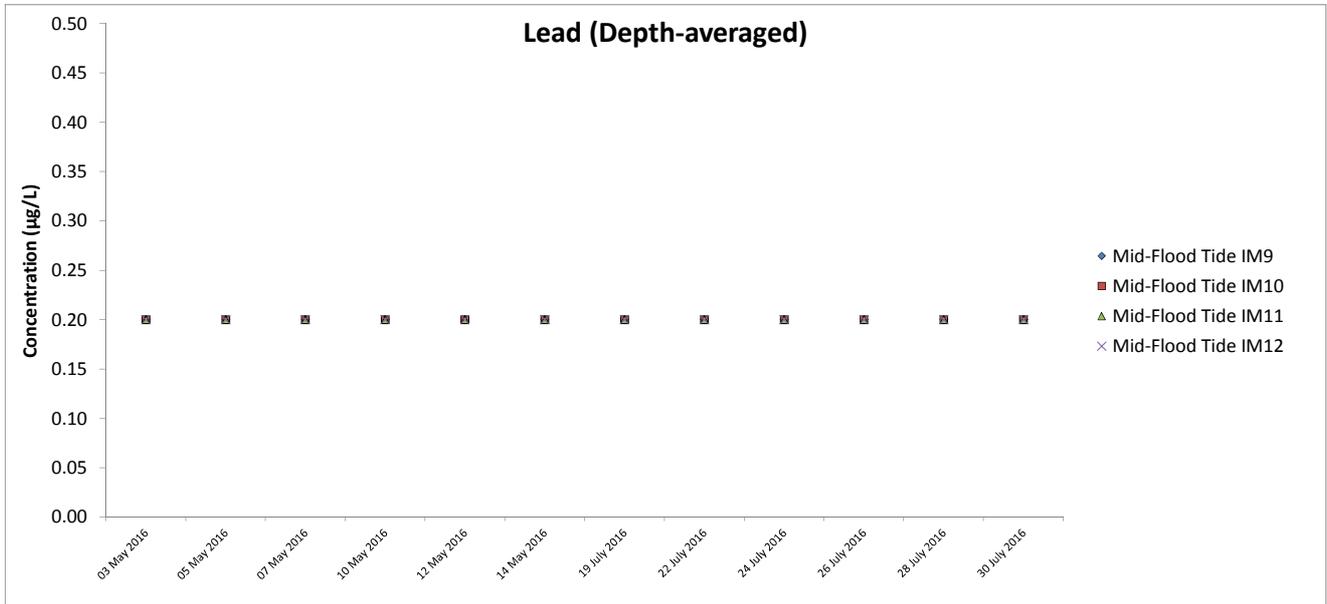




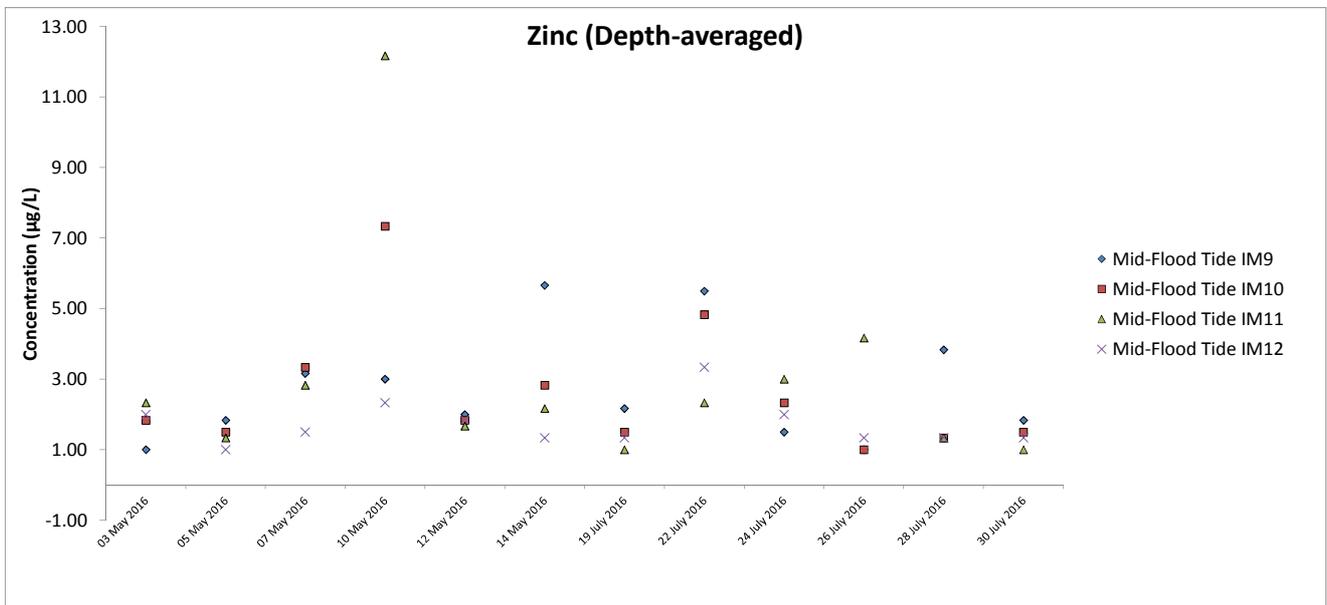
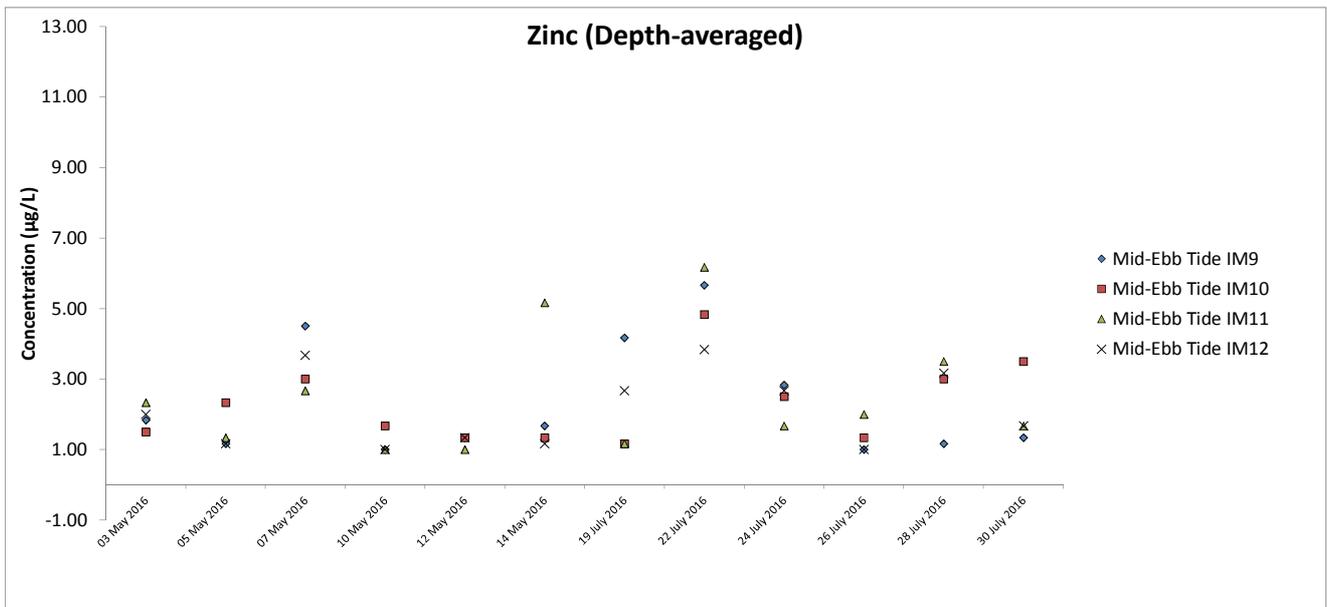


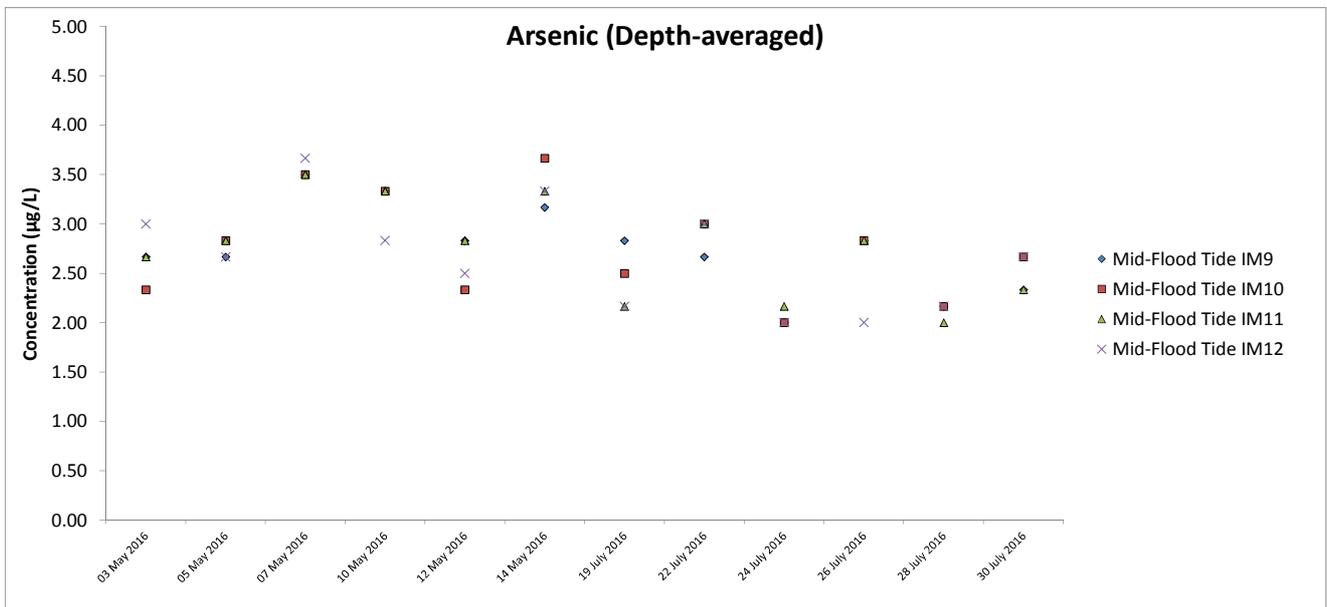
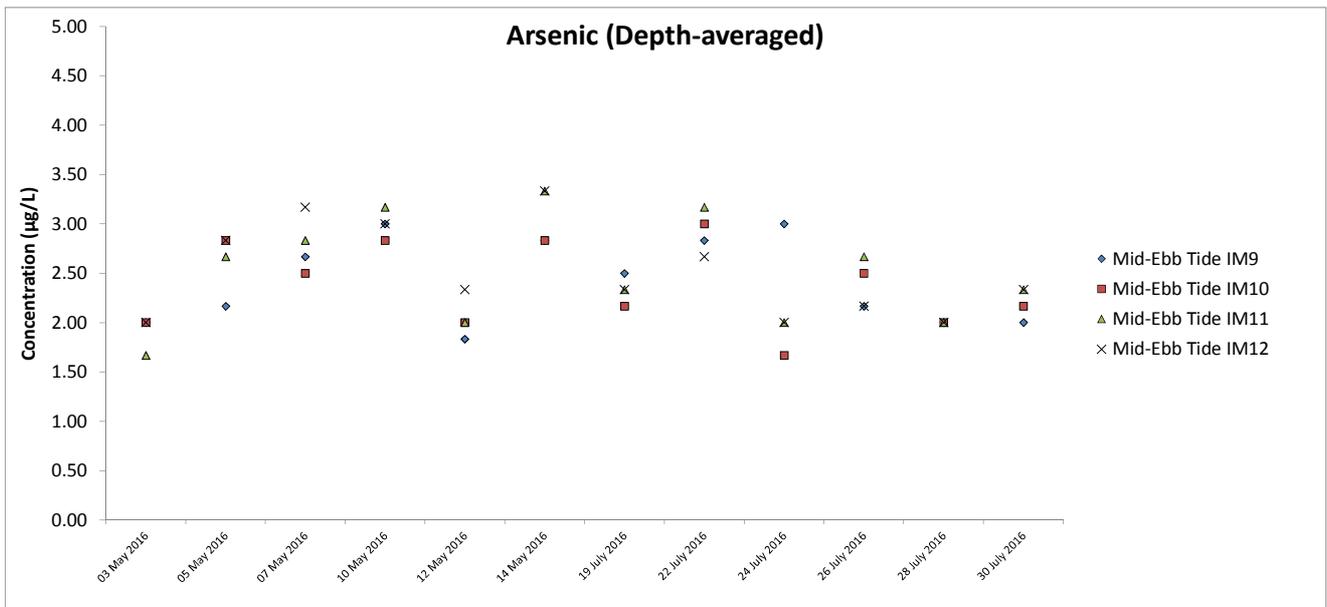


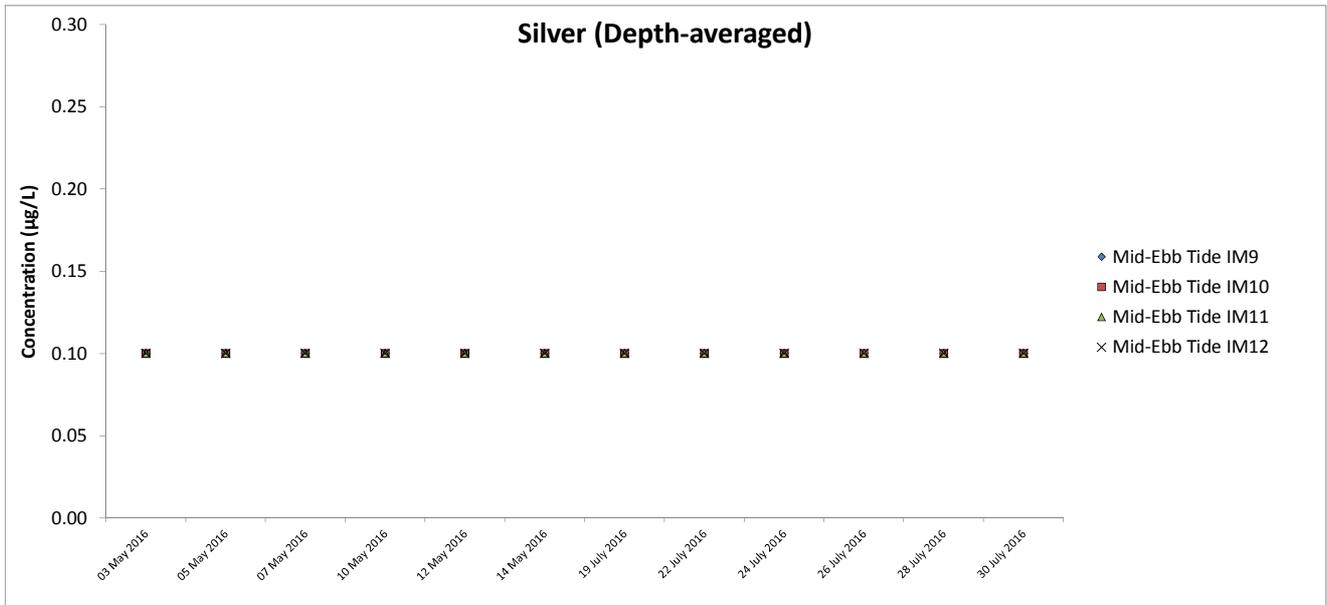
Note: The baseline monitoring results of Lead were lower than the laboratory detection level (<0.2 µg/L)



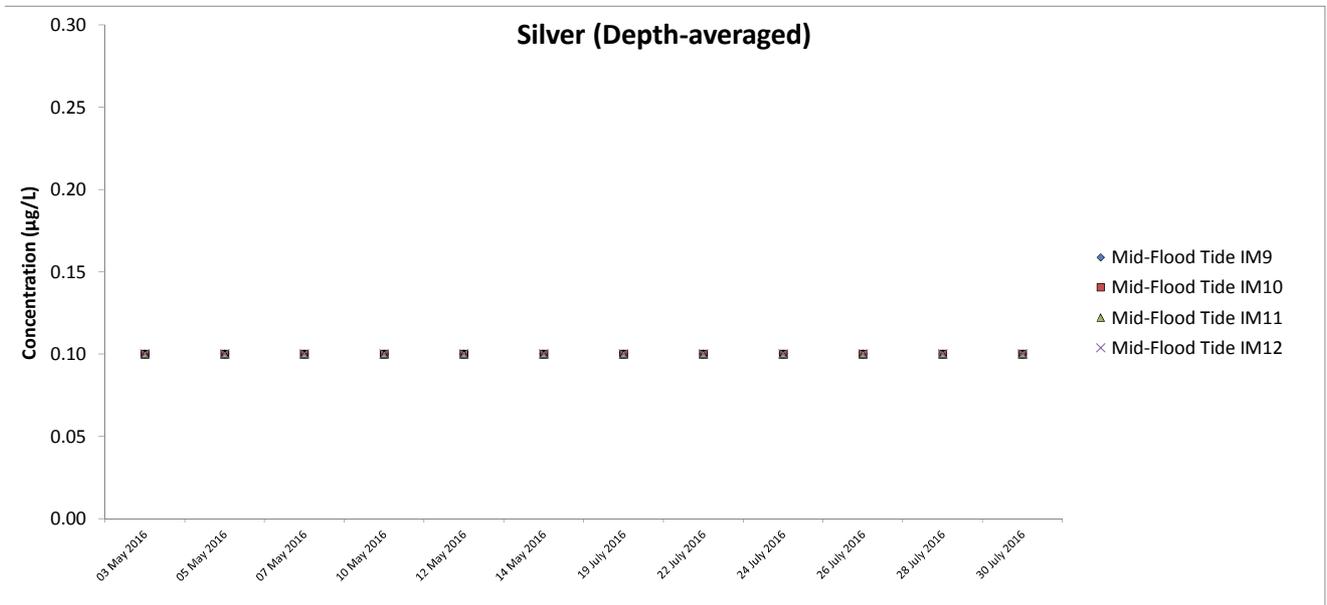
Note: The baseline monitoring results of Lead were lower than the laboratory detection level (<0.2 µg/L)



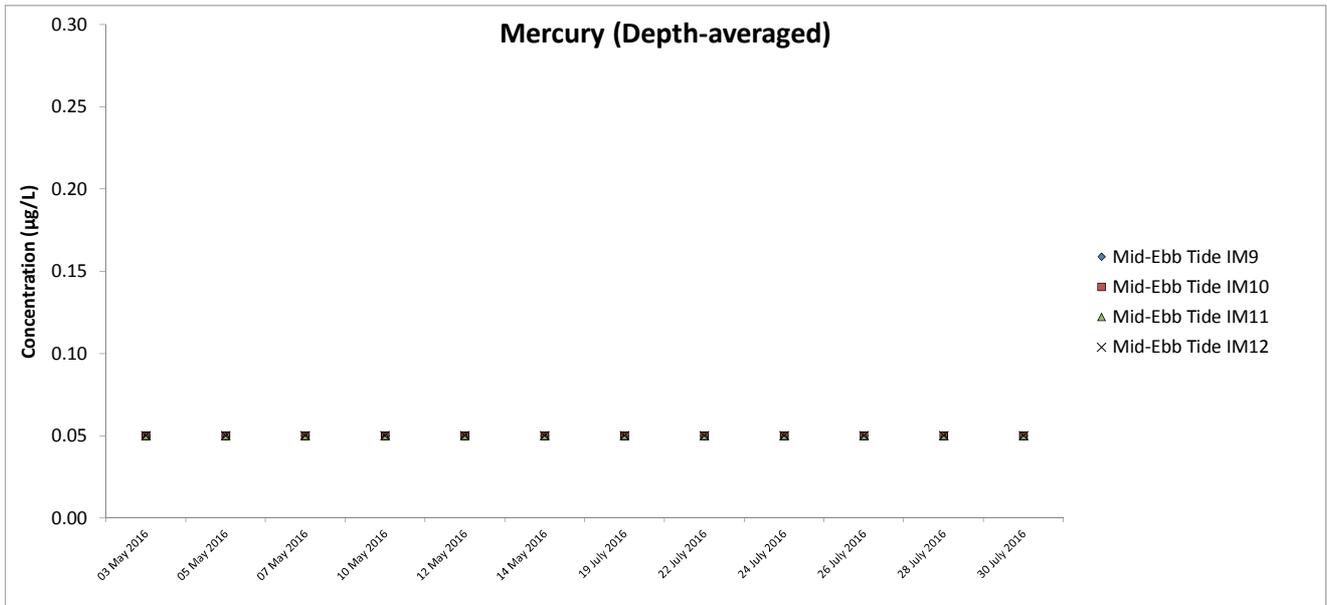




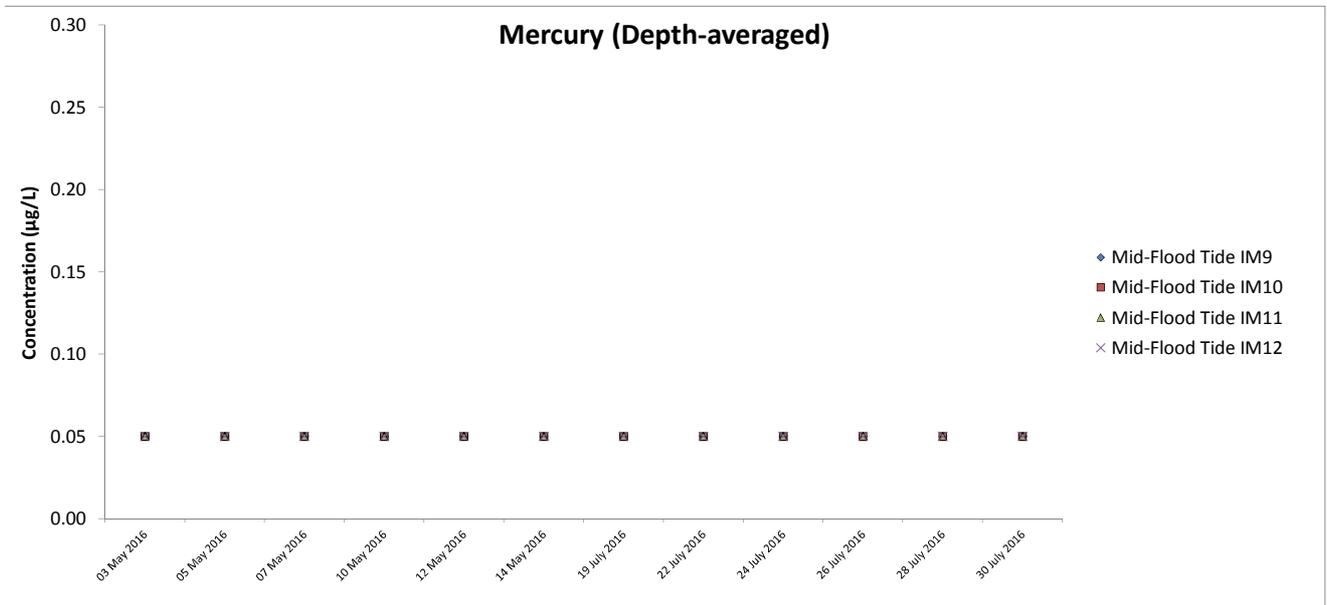
Note: The baseline monitoring results of Silver were lower than the laboratory detection level (<0.1 µg/L)



Note: The baseline monitoring results of Silver were lower than the laboratory detection level (<0.1 µg/L)



Note: The baseline monitoring results of Mercury were lower than the laboratory detection level (<0.05 µg/L)



Note: The baseline monitoring results of Mercury were lower than the laboratory detection level (<0.05 µg/L)