

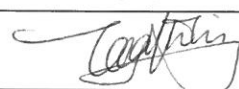
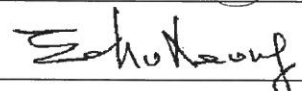
**China Harbour Engineering Company Limited**

Contract No. HY/2010/02

**Hong Kong – Zhuhai – Macao Bridge  
Hong Kong Boundary Crossing  
Facilities –  
Reclamation Works**

**Quarterly EM&A Report for  
June 2015- August 2015**

[01/2016]

	Name	Signature
Prepared & Checked:	Y T Tang	
Reviewed, Approved and Certified:	Echo Leong (ETL)	

Version:	Rev. 0	Date: 23 February 2016
----------	--------	------------------------

**Disclaimer**

This report is prepared for China Harbour Engineering Company Limited and is given for its sole benefit in relation to and pursuant to Contract No. HY/2010/02 Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities-Reclamation Works and may not be disclosed to, quoted to or relied upon by any person other than China Harbour Engineering Company Limited without our prior written consent. No person (other than China Harbour Engineering Company Limited) into whose possession a copy of this report comes may rely on this report without our express written consent and China Harbour Engineering Company Limited may not rely on it for any purpose other than as described above.

AECOM Asia Co. Ltd.  
15/F, Grand Central Plaza, Tower 1, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong  
Tel: (852) 3922 9000 Fax: (852) 2317 7609 www.aecom.com

23 February 2016

By Fax (3698 5999) and By Post

Ove Arup & Partners  
Chief Resident Engineer's Office  
5 Ying Hei Road, Tung Chung, Lantau  
Hong Kong

Attention: Mr. Paul Appleton

Dear Sir,

**Re: Agreement No. CE 48/2011 (EP)  
Environmental Project Office for the  
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities,  
and Tuen Mun-Chek Lap Kok Link – Investigation**

**Contract No. HY/2010/02 – HZMB HKBCF – Reclamation Works  
Quarterly EM&A Report for June 2015 to August 2015**

Reference is made to the Environmental Team's submission of the Quarterly Environmental Monitoring & Audit Report for June 2015 to August 2015 certified by the ET Leader (ET's ref.: "60249820/C/RMKY16022301" dated 23 February 2016) and provided to us via e-mail on 23 February 2016.

We are pleased to inform you that we have no adverse comment on the captioned Quarterly Environmental Monitoring & Audit Report for June 2015 to August 2015.

Please be reminded that our verification to your report does not release any of your obligations in the EM&A Manual under the applicable Environmental Permit(s) for this Project.

Thank you very much for your attention and please feel free to contact the undersigned should you require further information.

Yours faithfully,  
For and on behalf of  
Ramboll Environ Hong Kong Limited



Raymond Dai  
Independent Environmental Checker

c.c.	HyD	Mr. Matthew Fung	(By Fax: 3188 6614)
	HyD	Mr. Wai-Ping Lee	(By Fax: 3188 6614)
	AECOM	Ms. Echo Leong	(By Fax: 2317 7609)
	CHEC	Mr. Lim Kim Chuan	(By Fax: 2578 0413)

Internal: DY, YH, CL, JLau, ENPO Site

## TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	3
1 INTRODUCTION	6
1.1 Background	6
1.2 Scope of Report	6
1.3 Contract Organization	7
1.4 Summary of Construction Works	8
2 SUMMARY OF EM&A PROGRAMME REQUIREMENTS	9
2.1 Monitoring Parameters	9
2.2 Environmental Quality Performance (Action/Limit Levels)	10
2.3 Environmental Mitigation Measures	10
3 MONITORING RESULTS	11
3.1 Air Quality Monitoring	11
3.2 Noise Monitoring	13
3.3 Water Quality Monitoring	15
3.4 Dolphin Monitoring	18
3.5 Environmental Site Inspection and Audit	20
4 ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS	22
4.1 Summary of Solid and Liquid Waste Management	22
5 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES	23
5.1 Implementation Status of Environmental Mitigation Measures	23
6 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT	31
7 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS	32
7.1 Summary of Environmental Complaints, Notification of Summons and Successful Prosecutions	32
8 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS	35
8.1 Comments on mitigation measures	35
8.2 Recommendations on EM&A Programme	36
8.3 Conclusions	37

## List of Tables

Table 1.1	Contact Information of Key Personnel
Table 3.1	Summary of Number of Monitoring Events for 1-hr & 24-hr TSP Concentration
Table 3.2	Summary of Number of Exceedances for 1-hr & 24-hr TSP Monitoring
Table 3.3	Summary of Number of Monitoring Events for Impact Noise
Table 3.4	Summary of Number of Monitoring Exceedances for Impact Noise
Table 3.5	Summary of Water Quality Exceedances in June 2015 – August 2015
Table 3.6	Summary of Key Dolphin Survey Findings in June 2015 –August 2015
Table 3.7	Summary of STG and ANI encounter rates in June 2015 –August 2015

## Figures

Figure 1	General Contract Layout Plan
Figure 2	Impact Air Quality and Noise Monitoring Stations and Wind Station
Figure 3	Impact Water Quality Monitoring Stations
Figure 4	Impact Dolphin Monitoring Line Transect Layout Map
Figure 5	Environmental Complaint Handling Procedure

## List of Appendices

Appendix A	Project Organization for Environmental Works
Appendix B	Three Month Rolling Construction Programmes
Appendix C	Implementation Schedule of Environmental Mitigation Measures (EMIS)
Appendix D	Summary of Action and Limit Levels
Appendix E	Graphical Presentation of Impact Air Quality Monitoring Results
Appendix F	Graphical Presentation of Impact Daytime Construction Noise Monitoring Results
Appendix G	Graphical Presentation of Impact Water Quality Monitoring Results
Appendix H	Impact Dolphin Monitoring Survey Findings and Analysis
Appendix I	Quarterly Summary of Waste Flow Table
Appendix J	Cumulative Statistics on Exceedances, Complaints, Notifications of Summons and Successful Prosecutions
Appendix K	Event Action Plan
Appendix L	Incident Report on Action Level or Limit Level Non-compliance for Impact Dolphin Monitoring

## EXECUTIVE SUMMARY

Contract No. HY/2010/02 – Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Work (here below, known as “the Contract”) mainly comprises reclamation at the northeast of the Hong Kong International Airport of an area of about 130-hectare for the construction of an artificial island for the development of the Hong Kong Boundary Crossing Facilities (HKBCF), and about 19-hectare for the southern landfall of the Tuen Mun - Chek Lap Kok Link (TMCLKL). It is a designated Project and is governed by the current permits for the Contract, i.e. the amended Environmental Permits (EPs) issued on 17 July 2015 (EP-353/2009/I) and 13 March 2015 (EP-354/2009/D) (for TMCLKL Southern Landfall Reclamation only).

Ove Arup & Partners Hong Kong Limited (Arup) was appointed by Highways Department (HyD) as the consultants for the design and construction assignment for the Contract’s reclamation works (i.e. the Engineer for the Contract).

China Harbour Engineering Company Limited (CHEC) was awarded by HyD as the Contractor to undertake the construction work of the Contract.

Ramboll Environ Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) for the Project.

AECOM Asia Co. Ltd. (AECOM) was appointed by CHEC to undertake the role of Environmental Team for the Contract for carrying out the environmental monitoring and audit (EM&A) works.

The construction phase of the Contract under the EPs was commenced on 12 March 2012 and will be tentatively completed by early Year 2016. The EM&A programme, including air quality, noise, water quality and dolphin monitoring and environmental site inspections, was commenced on 12 March 2012.

This report documents the findings of EM&A works conducted in the period between 1 June 2015 and 31 August 2015. As informed by the Contractor, major activities in the reporting quarter were:-

### **Marine-base**

- Cellular structure – Connecting Arcs
- Cellular structure – Capping Beams
- Cellular structure – Backfill
- Conforming sloping seawalls – Geo-textile
- Maintenance of silt curtain & silt screen at sea water intake of HKIA
- Rubble Mound Seawall
- Rock fill

### **Land-base**

- Earthwork fill
- Jet grout columns works
- Surcharge removal & laying
- Deep Cement Mixing
- Removal of Temporary Seawall
- Vertical Band Drains
- Installations of Precast Culverts except sloping outfalls
- Maintenance works of Site Office at Works Area WA2
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Maintenance of Temporary Marine Access at Works Area WA2

A summary of monitoring and audit activities conducted in the reporting quarter is listed below:

24-hour Total Suspended Particulates (TSP) monitoring	16 sessions
1-hour TSP monitoring	16 sessions
Noise monitoring	13 sessions
Impact water quality monitoring	40 sessions
Impact dolphin monitoring	6 surveys
Joint Environmental site inspection	13 sessions

### **Breaches of Action and Limit Levels for Air Quality**

One (1) Limit Level Exceedance of 24hr-TSP was recorded at AMS2 on 10 August 2015. After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract. No 1hr-TSP was recorded in the reporting period.

### **Breaches of Action and Limit Levels for Noise**

For construction noise, no exceedance was recorded at all monitoring stations in the reporting month.

### **Breaches of Action and Limit Levels for Water Quality**

Two (2) Action Level Exceedances of suspend solids were recorded at IS5 and IS(Mf)6 during flood tide on 17 July 2015, the exceedances were confirmed after checking against relevant control station(s) during flood tide i.e. CS6, CSA and CS(Mf)5 following the Action and Limit Levels for Water Quality. After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract.

### **Breaches of Action and Limit Levels for Impact Dolphin Monitoring**

One (1) Limit Level exceedance of dolphin monitoring was recorded in the reporting quarter. After investigation, it was concluded that the HZMB works is one of the contributing factors affecting the dolphins. It was also concluded the contribution of impacts due to the HZMB works as a whole (or individual marine Contracts) cannot be quantified nor separate from the other stress factors. Event Action Plan for Impact Dolphin Monitoring was triggered. For detail of investigation, please refer to appendix L. Event Action Plan for Impact Dolphin Monitoring was triggered. For detail of investigation, please refer to appendix L.

### **Implementation Status and Review of Environmental Mitigation Measures**

Most of the recommended mitigation measures, as included in the EM&A programme, were implemented properly in the reporting quarter.

The recommended environmental mitigation measures effectively minimize the potential environmental impacts from the Project. The EM&A programme effectively monitored the environmental impacts from the construction activities and ensure the proper implementation of mitigation measures. No particular recommendation was advised for the improvement of the programme.

Moreover, regular review and checking on the construction methodologies, working processes and plants were carried out to ensure the environmental impacts were kept minimal and recommended environmental mitigation measures were implemented effectively.

### **Complaint, Notification of Summons and Successful Prosecution**

As informed by the Contractor, 3 July 2015, an air quality complaint has been received on 11 June 2015 by HyD via complaint hotline 1823. The complainant complained that sand and dust pollution near Richland Garden, 138 Wu Chui Road, Tuen Mun, caused by sand delivery barges. After investigation, there is no adequate information to conclude the observed impact is related to this Contract.

As informed by ER of this Contract on 13 July 2015, EPD referred a noise related complaint to this Contract on 13 July 2015. The complainant complained noise came from BCF site near HK Skycity Marriott Hotel during nighttime period of the past 10 days which involves excavation with a grab dredger, transfer of excavated material using a derrick barge and a tug boat, and backfilling with a pelican barge. Based on EPD's record, the above activities are covered by CNP no. GW-RS0503-15. After investigation, the construction activities carried

out during restricted hour between 1- 13 July 2015 were considered complied with CNP conditions (no. GW-RS0503-15).

As informed by the Contractor on 30 July, Home Affairs Department referred a complaint to Project team of this Contract on 29 July 2015. The complaint involved Mr. Chan and Mr. Tang, Resident Representatives of Tong Fuk Village who complained significant sand loss of Tong Fuk Beach, particularly after typhoon when the beach was hit by strong waves; this exposed the rocks at the beach. The complainant enquired whether the sand loss is related to sand extraction for construction of airport and reclamation works of HZMB artificial island. After investigation, the complaint is considered as non-Contract related.

No notification of summons or prosecution was received in the reporting period

## 1 INTRODUCTION

### 1.1 Background

- 1.1.1 Contract No. HY/2010/02 – Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Work (here below, known as “the Contract”) mainly comprises reclamation at the northeast of the Hong Kong International Airport of an area of about 130-hectare for the construction of an artificial island for the development of the Hong Kong Boundary Crossing Facilities (HKBCF), and about 19-hectare for the southern landfall of the Tuen Mun - Chek Lap Kok Link (TMCLKL).
- 1.1.2 The environmental impact assessment (EIA) reports (Hong Kong – Zhuhai – Macao Bridge Hong Kong Boundary Crossing Facilities – EIA Report (Register No. AEIAR-145/2009) (HKBCFEIA) and Tuen Mun – Chek Lap Kok Link – EIA Report (Register No. AEIAR-146/2009) (TMCLKLEIA), and their environmental monitoring and audit (EM&A) Manuals (original EM&A Manuals), for the Contract were approved by Environmental Protection Department (EPD) in October 2009.
- 1.1.3 EPD subsequently issued the Environmental Permit (EP) for HKBCF in November 2009 (EP-353/2009) and the Variation of Environmental Permit (VEP) in June 2010 (EP-353/2009/A), November 2010 (EP-353/2009/B), November 2011 (EP-353/2009/C), March 2012 (EP-353/2009/D), October 2012 (EP-353/2009/E), April 2013 (EP-353/2009/F), August 2013 (EP-353/2009/G), January 2015 (EP-353/2009/H) and July 2015 (EP-353/2009/I). Similarly, EPD issued the Environmental Permit (EP) for TMCLKL in November 2009 (EP-354/2009) and the Variation of Environmental Permit (VEP) in December 2010 (EP-354/2009/A), January 2014 (EP-354/2009/B), December 2014 (EP-354/2009/C) and March 2015 (EP-354/2009/D).
- 1.1.4 The Project is a designated Project and is governed by the current permits for the Project, i.e. the amended EPs issued on 17 July 2015 (EP-353/2009/I) and 13 March 2015 (EP-354/2009/D) (for TMCLKL Southern Landfall Reclamation only).
- 1.1.5 A Contract Specific EM&A Manual, which included all Contract-relation contents from the original EM&A Manuals for the Project, was issued in May 2012.
- 1.1.6 Ove Arup & Partners Hong Kong Limited (Arup) was appointed by Highways Department (HyD) as the consultants for the design and construction assignment for the Contract’s reclamation works (i.e. the Engineer for the Contract).
- 1.1.7 China Harbour Engineering Company Limited (CHEC) was awarded by HyD as the Contractor to undertake the construction work of the Contract.
- 1.1.8 Ramboll Environ Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) for the Project.
- 1.1.9 AECOM Asia Co. Ltd. (AECOM) was appointed by CHEC to undertake the role of Environmental Team for the Contract for carrying out the EM&A works.
- 1.1.10 The construction phase of the Contract under the EPs was commenced on 12 March 2012 and will be tentatively completed by early Year 2016.
- 1.1.11 According to the Contract Specific EM&A Manual, there is a need of an EM&A programme including air quality, noise, water quality and dolphin monitoring and environmental site inspections. The EM&A programme of the Contract commenced on 12 March 2012.

### 1.2 Scope of Report

- 1.2.1 This is the fourteenth quarterly EM&A Report under the Contract No. HY/2010/02 Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Works. This report presents a summary of the environmental monitoring and audit works, list of activities and mitigation measures proposed by the ET for the Contract from 1 June 2015 to 31 August 2015.



**1.3 Contract Organization**

1.3.1 The Contract organization structure is shown in Appendix A. The key personnel contact names and numbers are summarized in Table 1.1.

**Table 1.1 Contact Information of Key Personnel**

Party	Position	Name	Telephone	Fax
Engineer's Representative (ER) (Ove Arup & Partners Hong Kong Limited)	Chief Resident Engineer	Paul Appleton	3698 5889	2698 5999
IEC / ENPO (Ramboll Environ Hong Kong Limited)	Independent Environmental Checker	Raymond Dai	3465 2888	3548 6988
	Environmental Project Office Leader	Y.H. Hui	3547 2133	3465 2899
Contractor (China Harbour Engineering Company Limited)	General Manager (S&E)	Daniel Leung	3157 1086	2578 0413
	Environmental Officer	Louie Chan	36932254	2578 0413
	24-hour Hotline	Alan C.C. Yeung	9448 0325	--
ET (AECOM Asia Company Limited)	ET Leader	Echo Leong	3922 9280	2317 7609

#### 1.4 Summary of Construction Works

- 1.4.1 The construction phase of the Project under the EP commenced on 12 March 2012.
- 1.4.2 As informed by the Contractor, details of the major works carried out in the reporting quarter are listed below:-

##### **Marine-base**

- Cellular structure – Connecting Arcs
- Cellular structure – Capping Beams
- Cellular structure – Backfill
- Conforming sloping seawalls – Geo-textile
- Maintenance of silt curtain & silt screen at sea water intake of HKIA
- Rubble Mound Seawall
- Rock fill

##### **Land-base**

- Earthwork fill
- Jet grout columns works
- Surcharge removal & laying
- Deep Cement Mixing
- Removal of Temporary Seawall
- Vertical Band Drains
- Installations of Precast Culverts except sloping outfalls
- Maintenance works of Site Office at Works Area WA2
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Maintenance of Temporary Marine Access at Works Area WA2

- 1.4.3 The 3-month rolling construction programme of the Contract is shown in Appendix B.
- 1.4.4 The general layout plan of the Contract site showing the detailed works areas is shown in Figure 1.
- 1.4.5 The environmental mitigation measures implementation schedule are presented in Appendix C.

## 2 SUMMARY OF EM&A PROGRAMME REQUIREMENTS

### 2.1 Monitoring Parameters

- 2.1.1 The Contract Specific EM&A Manual designated 4 air quality monitoring stations, 2 noise monitoring stations, 21 water monitoring stations (9 Impact Stations, 7 Sensitive Receiver Stations and 5 Control/Far Field Stations) to monitor environmental impacts on air quality, noise and water quality respectively. Pre-set and fixed transect line vessel based dolphin survey was required in two AFCD designated areas (Northeast and Northwest Lantau survey areas). The impact dolphin monitoring at each survey area should be conducted twice per month.
- 2.1.2 For impact air quality monitoring, monitoring locations AMS2 (Tung Chung Development Pier) and AMS7 (Hong Kong SkyCity Marriott Hotel) were set up at the proposed locations in accordance with Contract Specific EM&A Manual. The conditional omission of Monitoring Station AMS6 was effective since 19 November 2012. For monitoring location AMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, approval for carrying out impact monitoring could not be obtained from the principal of the school. Permission on setting up and carrying out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact air quality monitoring was conducted at site boundary of the site office area in Works Area WA2 (AMS3B) respectively. Same baseline and Action Level for air quality, as derived from the baseline monitoring data recorded at Ho Yu College, was adopted for this alternative air quality location.
- 2.1.3 For impact noise monitoring, monitoring locations NMS2 (Seaview Crescent Tower 1) was set up at the proposed locations in accordance with Contract Specific EM&A Manual. However, for monitoring location NMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, approval for carrying out impact monitoring could not be obtained from the principal of the school. Permission on setting up and carrying out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact noise monitoring was conducted at site boundary of the site office area in Works Area WA2 (NMS3B) respectively. Same baseline noise level, as derived from the baseline monitoring data recorded at Ho Yu College was adopted for this alternative noise monitoring location. Reference is made to ET's proposal of relocation of air quality monitoring station (AMS7) dated on 2 February 2015, with no further comment received from IEC on 2 February 2015 and no objection received from EPD on 5 February 2015, the impact air quality monitoring station AMS7 (Hong Kong SkyCity Marriott Hotel) has been relocated to AMS7A (Chu Kong Air-Sea Union Transportation Company Limited) on 3 February 2015. Action Level for air quality, as derived from the baseline monitoring data recorded at Hong Kong SkyCity Marriott Hotel, was adopted for this alternative air quality location.
- 2.1.4 In accordance with the Contract Specific EM&A Manual, twenty-one stations were designated for impact water quality monitoring. The nine Impact Stations (IS) were chosen on the basis of their proximity to the reclamation and thus the greatest potential for water quality impacts, the seven Sensitive Receiver Stations (SR) were chosen as they are close to the key sensitive receives and the five Control/ Far Field Stations (CS) were chosen to facilitate comparison of the water quality of the IS stations with less influence by the Contract/ ambient water quality conditions.
- 2.1.5 Due to safety concern and topographical condition of the original locations of SR4 and SR10B, alternative impact water quality monitoring stations, naming as SR4(N) and SR10B(N), were adopted, which are situated in vicinity of the original impact water quality monitoring stations (SR4 and SR10B) and could be reachable. Same baseline and Action Level for water quality, as derived from the baseline monitoring data recorded, were adopted for these alternative impact water quality monitoring stations.
- 2.1.6 The monitoring locations used during the reporting quarter are depicted in Figures 2, 3 and 4 respectively.
- 2.1.7 The Contract Specific EM&A Manual also required environmental site inspections for air quality, noise, water quality, chemical, waste management, marine ecology and landscape and visual impact.

## **2.2 Environmental Quality Performance (Action/Limit Levels)**

- 2.2.1 The environmental quality performance limits (i.e. Action and/or Limit Levels) of air and water quality monitoring were derived from the baseline air and water quality monitoring results at the respective monitoring stations, while the environmental quality performance limits of noise monitoring were defined in the EM&A Manual.
- 2.2.2 The environmental quality performance limits of air quality, noise and water monitoring are given in Appendix D.

## **2.3 Environmental Mitigation Measures**

- 2.3.1 Relevant environmental mitigation measures were stipulated in the Particular Specification and EPs (EP-353/2009/I and EP-354/2009/D) (for TMCLKL Southern Landfall Reclamation only) for the Contractor to adopt. A list of environmental mitigation measures and their implementation statuses are given in Appendix C.

### 3 MONITORING RESULTS

#### 3.1 Air Quality Monitoring

- 3.1.1 In accordance with the Contract Specific EM&A Manual, impact 1-hour Total Suspended Particulates (TSP) monitoring was conducted for at least three times every 6 days, while impact 24-hour TSP monitoring was carried out for at least once every 6 days at the 4 monitoring stations (AMS2, AMS3B, AMS6 and AMS7A).
- 3.1.2 The monitoring locations for impact air quality monitoring are depicted in Figure 2. However, for AMS6 (Dragonair/CNAC (Group) Building), permission on setting up and carrying out impact monitoring works was sought, however, access to the premise has not been granted yet on this report issuing date.
- 3.1.3 Reference is made to ET’s proposal of relocation of air quality monitoring station (AMS7) dated on 2 February 2015, with no further comment received from IEC on 2 February 2015 and no objection received from EPD on 5 February 2015, the impact air quality monitoring station AMS7 (Hong Kong SkyCity Marriott Hotel) has been relocated to AMS7A (Chu Kong Air-Sea Union Transportation Company Limited) on 3 February 2015. Action Level for air quality, as derived from the baseline monitoring data recorded at Hong Kong SkyCity Marriott Hotel, was adopted for this alternative air quality location.
- 3.1.4 The weather was mostly fine and sunny, with occasional cloudy in the reporting quarter. The major dust source in the reporting quarter included construction activities from the Contract, as well as nearby traffic emissions.
- 3.1.5 The number of monitoring events and exceedances recorded in each month of the reporting quarter are presented in Table 3.1 and Table 3.2 respectively.
- 3.1.6 Due to malfunction of High Volume Sampler equipment located at monitoring station AMS3B, the 24hr TSP monitoring need to be rescheduled from 1 June 2015 16:00pm – 2 June 2015 16:00pm to 2 June 2015 13:30 pm – 3 June 2015 13:30 pm.

**Table 3.1 Summary of Number of Monitoring Events for 1-hr & 24-hr TSP Concentration**

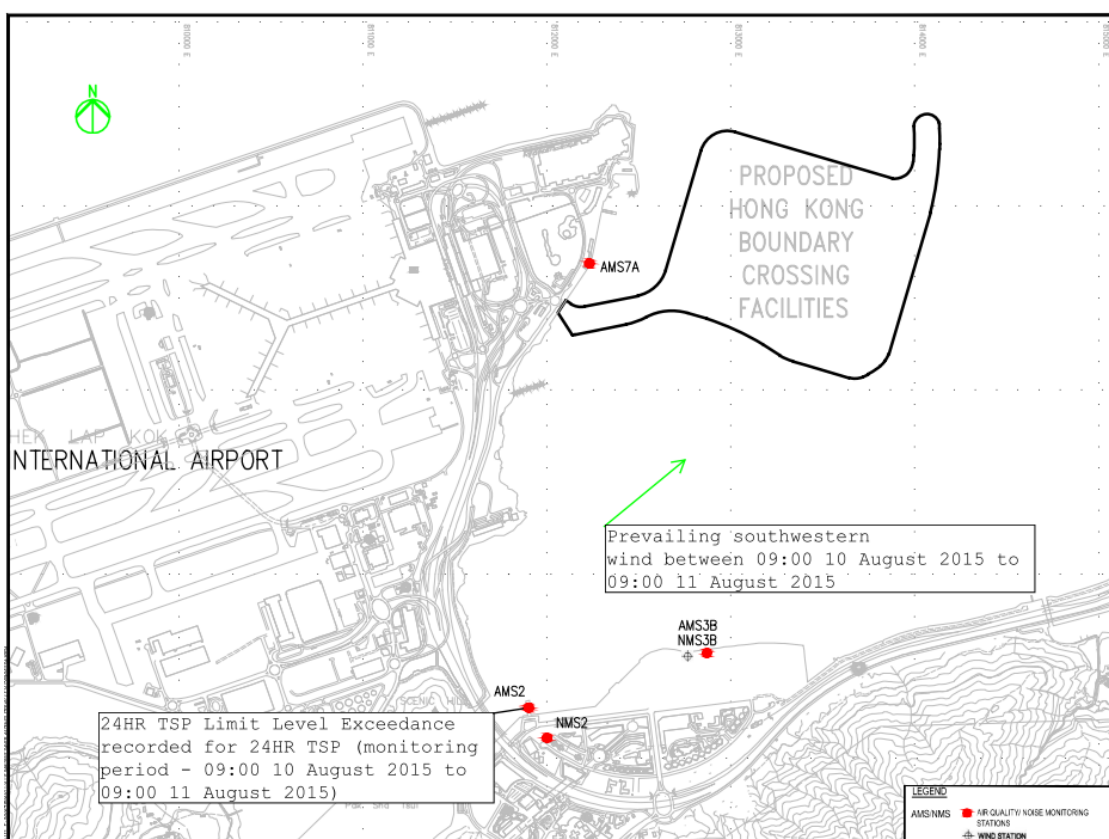
Monitoring Parameter	Location	No. of monitoring events		
		June 15	July 15	August 15
1-hr TSP	AMS2	18	15	15
	AMS3B	18	15	15
	AMS7A	18	15	15
24-hr TSP	AMS2	6	5	5
	AMS3B	6	5	5
	AMS7A	6	5	5

**Table 3.2 Summary of Number of Exceedances for 1-hr & 24-hr TSP Monitoring**

Monitoring Parameter	Location	Level of Exceedance	Numbers of Exceedance		
			June 15	July 15	August 15
1-hr TSP	AMS2	Action	0	0	0
		Limit	0	0	0
	AMS3B	Action	0	0	0
		Limit	0	0	0
	AMS7A	Action	0	0	0
		Limit	0	0	0
		<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>
24-hr TSP	AMS2	Action	0	0	0
		Limit	0	0	1
	AMS3B	Action	0	0	0
		Limit	0	0	0
	AMS7A	Action	0	0	0
		Limit	0	0	0

		<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>
--	--	--------------	----------	----------	----------

- 3.1.7 One (1) Limit Level Exceedance of 24hr-TSP with a reading of 270µg/m3 was recorded at AMS2 on 10 August 2015.
- 3.1.7.1 According to information provided by the Contractor during the monitoring period, no changes of major works in the construction site of this Contract since box-culvert installation had been commenced in July 2015.
- 3.1.7.2 Functional checking on HVS at AMS2 was done. Air flow of the HVS was checked and the flow was steady during the 24-hr TSP sampling at AMS2. The filter paper was re-weighted by the assigned HOKLAS laboratory and the result was reconfirmed.
- 3.1.7.3 The 1-hr TSP values recorded at AMS2 on 10 August 15, were 81µg/m3, 80µg/m3 and 81µg/m3 respectively. All measured values are well below the Action and Limit Levels.
- 3.1.7.4 The measured 24-hr TSP values recorded at AMS7A (which is located closer to active works than AMS2) on 10 August 15 was 29µg/m3, which was below the Action and Limit Levels.
- 3.1.7.5 Site inspection for box-culvert installation at Portion D was jointly conducted by ET, Contractor and RSS on 6 August 2015, no fugitive dust was observed at Portion D during the joint site inspection on 6 August 2015.
- 3.1.7.6 Box-culvert being installed at Portion D which is relatively far away from monitoring station AMS2 where the limit exceedance of 24-hr TSP was recorded. As refer to the wind direction data collected at Chek Lap Kok by Hong Kong Observatory during the monitoring period on 10 and 11 August 2015 (also see attached), Southwestern winds were prevailing during the monitoring period. Construction works carried out by this Contract are unlikely to cause dust exceedance at AMS2 under the abovementioned prevailing wind directions. (Also see below layout map for reference.)



- 3.1.7.7 In addition, no fugitive dust was expected to be generated in the process of box-culvert installation, as such, works activities from this Contract is unlikely to contribute to the recorded 24hr-TSP limit level exceedance.
- 3.1.7.8 The latest available checking record shows that plant engine is operated by ULSD.
- 3.1.7.9 With reference to the watering record, watering was provided 8 times per day on site from 8 to 14 August 2015.
- 3.1.7.10 As such, the dust exceedance was therefore considered not to be due to works of this Contract
- 3.1.7.11 The Contractor was recommended to continue implementing existing dust mitigation measures and the Contractor was reminded ensure to undertake watering at least 8 times per day on all exposed soil within the Contract site and associated work areas throughout the construction phase.
- 3.1.7.12 The event action plan is annexed in Appendix K.
- 3.1.7.13 Meteorological information collected from the wind station during the monitoring periods on the monitoring dates, as shown in Figure 2, including wind speed and wind direction, is annexed in Appendix H of monthly EM&A report June, July and August 2015 respectively.

## **3.2 Noise Monitoring**

- 3.2.1 Impact noise monitoring was conducted at the 2 monitoring stations (NMS2 and NMS3B) for at least once per week during 07:00 – 19:00 in the reporting quarter.
- 3.2.2 The monitoring locations used during the reporting quarter are depicted in Figure 2.
- 3.2.3 No Action or Limit Level Exceedance of construction noise was recorded in the reporting quarter.
- 3.2.4 Major noise sources during the noise monitoring included construction activities of the Contract and nearby traffic noise.
- 3.2.5 The number of impact noise monitoring events and exceedances are summarized in Table 3.3 and Table 3.4 respectively.

**Table 3.3 Summary of Number of Monitoring Events for Impact Noise**

Monitoring Parameter	Location	No. of monitoring events		
		June 15	July 15	August 15
	NMS2	5	4	4
	NMS3B	5	4	4

**Table 3.4 Summary of Number of Monitoring Exceedances for Impact Noise**

Monitoring Parameter	Location	Level of Exceedance	Level of Exceedance		
			June 15	July 15	August 15
	NMS2	Action	0	0	0
		Limit	0	0	0
	NMS3B	Action	0	0	0
		Limit	0	0	0
		<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>

3.2.6 The graphical plots of the trends of the monitoring results are provided in Appendix F. No specific trend of the monitoring results or existence of persistent pollution source was noted.

3.2.7 The event action plan is annexed in Appendix K.



### 3.3 Water Quality Monitoring

3.3.1 The monitoring locations used during the reporting quarter are depicted in Figure 3.

3.3.2 The scheduled water quality monitoring at mid ebb on 10 July 2015 was cancelled due to Tropical Cyclone Warning Signal no. 3 or above was hoisted 3 hours before the commencement of scheduled water quality monitoring.

3.3.3 A total of (2) two exceedances were recorded in this reporting quarter:

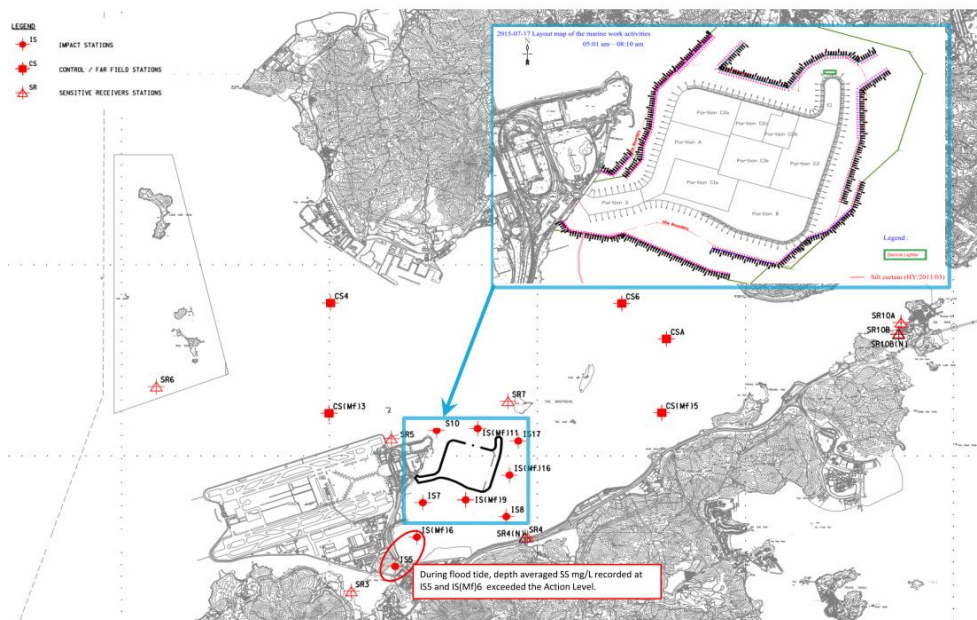
**Table 3.5 Summary of Water Quality Exceedances in June 2015 – August 2015**

Station	Exceedance Level	DO (S&M)		DO (Bottom)		Turbidity		SS		Total	
		Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood
IS5	Action	0	0	0	0	0	0	0	1	0	1
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)6	Action	0	0	0	0	0	0	0	1	0	1
	Limit	0	0	0	0	0	0	0	0	0	0
IS7	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS8	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)9	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS10	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)11	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)16	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS17	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR3	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR4(N)	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR5	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR6	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR7	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR10A	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR10B (N)	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
Total	Action	0	0	0	0	0	0	0	2	0	2
	Limit	0	0	0	0	0	0	0	0	0	0

Note: S: Surface;  
 M: Mid-depth;

3.3.4 For the two (2) Action Level Exceedances of suspended solids were recorded at IS5 and IS(Mf)6 during flood tide on 17 July 2015, the exceedances were confirmed after checking against relevant control station(s) during flood tide i.e. CS6, CSA and CS(Mf)5 following the Action and Limit Levels for Water Quality.

3.3.4.1 Below layout map shows no marine work was conducted at south and southwestern part of the HKBCF Reclamation Works during flood tide on 17 July 2015:



- 3.3.4.2 Exceedances recorded at IS5 and IS(Mf)6 during flood tide are unlikely due to marine based construction activities of the Contract because:
- 3.3.4.3 Attached layout map shows no marine work was conducted at south and southwestern part of the HKBCF Reclamation Works during flood tide on 17 July 2015, therefore it is unlikely that the SS exceedances recorded at IS5 and IS(Mf)6 during flood tide are caused by HKBCF Reclamation Works.
- 3.3.4.4 Monitoring stations IS7 and IS(Mf)9 are located relatively closer to HKBCF Reclamation Works than monitoring station IS(Mf)6 and IS5. However, all suspended solid results recorded at IS7 and IS(Mf)9 were lower than the action and limit level, as such, the action level exceedances of SS recorded at IS(Mf)6 and IS5 are unlikely attributed to HKBCF Reclamation Works.
- 3.3.4.5 In addition, turbidity level recorded at IS5, IS(Mf)6, IS7 and IS(Mf)9 were below the action and limit level. This indicates the turbidity level at area near IS5 and IS(Mf)6 was not adversely affected.
- 3.3.4.6 With reference to the silt curtain checking record of 17 July 2015, defects such as disconnection of the silt curtain was not observed at south and southwestern part of the perimeter silt curtain which are close to the IS5 and IS(Mf)6.
- 3.3.4.7 The exceedances are likely due to local effects in the vicinity of IS5 and IS(Mf)6.
- 3.3.4.8 After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract.
- 3.3.4.9 Action taken under the action plan
1. Not applicable as SS was not measured in situ;
  2. After considering the above mentioned investigation results, it appears that it was unlikely that the SS exceedances were attributed to active construction activities of this Contract;
  3. IEC, Contractor and ER were informed via email;
  4. Monitoring data, all plant, equipment and Contractor's working methods were checked;
  5. Since it is considered that the SS exceedance is unlikely to be Contract related, as such, actions 5-7 under the EAP are not considered applicable.
- 3.3.4.10 Nevertheless, the Contractor was reminded to ensure provision of ongoing maintenance to the silt curtains and to carry out maintenance work once defects were found.
- 3.3.4.11 Maintenance work of the silt curtain was carried out by the Contractor on a daily basis except Sunday and public holiday.
- 3.3.5 The graphical plots of the trends of the monitoring results are provided in Appendix G. No specific trend of the monitoring results or existence of persistent pollution source was noted.
- 3.3.6 The event action plan is annexed in Appendix K.

### 3.4 Dolphin Monitoring

- 3.4.1 In accordance with the Contract Specific EM&A Manual, pre-set and fixed transect line vessel based dolphin survey was required in two AFCD designated areas (Northeast Lantau (NEL) and Northwest Lantau (NWL) survey areas). The impact dolphin monitoring at each survey area should be conducted twice per month.
- 3.4.2 The impact dolphin monitoring conducted is vessel-based and combines line-transect and photo-ID methodology, which have adopted similar survey methodologies as that adopted during baseline monitoring to facilitate comparisons between datasets.
- 3.4.3 The layout map of impact dolphin monitoring have been provided by AFCD and is shown in Figure 4.
- 3.4.4 The effort summary and sighting details during the reporting quarter are shown in the Appendix H. A summary of key findings of the dolphin surveys completed during the reporting quarter is shown below:

**Table 3.6 Summary of Key Dolphin Survey Findings in June 2015 – August 2015**

Number of Impact Surveys Completed^	6
Survey Distance Travelled under Favourable On- Effort Condition	644.6km
Number of Sightings	13 sightings (7 sightings are "on effort" (which are all under favourable condition), 6 "sightings are opportunistic")
Number of dolphin individual sighted	43 individuals (the best estimated group size)
Dolphin Encounter Rate#	NEL: 0 NWL: 1.7
Dolphin Group Size	Average of NEL: 0 Average of NWL: 3.3 Varied from 1-9 individuals
Most Often frequent dolphin sighting area	Northern Sha Chau and Lung Kwu Chau Marine Park, the western limit of NWL and Tai O area.

Remarks:

^ Completion of line transect survey of NEL and NWL survey area once was counted as one complete survey.  
 # Dolphin Encounter Rate = (Sum of 1<sup>st</sup> 2<sup>nd</sup>, 3<sup>rd</sup> month's total sighting/ Sum of 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> month's total effort)\*100km (encounter rates are calculated using on effort sightings made under favourable conditions only.)

- 3.4.5 One (1) Limit Level exceedance of dolphin monitoring was recorded in the reporting quarter. After investigation, it was concluded that the HZMB works is one of the contributing factors affecting the dolphins. It was also concluded the contribution of impacts due to the HZMB works as a whole (or individual marine Contracts) cannot be quantified nor separate from the other stress factors. Event Action Plan for Impact Dolphin Monitoring was triggered. For detail of investigation, please refer to appendix L.

**Table 3.7 Summary of STG and ANI encounter rates in June 2015 - August 2015**

	NEL	NWL	Level Exceeded
STG*	0	1.7	Limit
ANI**	0	4.7	

\*Quarterly Average Encounter Rate of Number of Dolphin Sightings (STG) presents averaged encounter rates of the three monitored months in terms of groups per 100km per survey event.

STG Encounter rate = (Average of (total number sighting/total effort) of 1st and 2nd completed survey# of 1st month+ Average of (total number sighting/total effort) of 1st and 2nd completed survey# of 2nd month + Average of (total number sighting/total effort) of 1st and 2nd completed survey# of 3rd month)/3\*100km

\*\*Quarterly Average Encounter Rate of Total Number of Dolphins (ANI) presents averaged encounter rates of the three monitored months in terms of individuals per 100km per survey event.

ANI Encounter rate = (Average of (total number of Individual/total effort) of 1st and 2nd completed survey# of 1st month+ Average of (total number of Individual/total effort) of 1st and 2nd completed survey# of 2nd month + Average of (total number of Individual/total effort) of 1st and 2nd completed survey# of 3rd month +)/3\*100km

- 3.4.6 Details of the comparison and analysis methodology and their findings and discussions are annexed in Appendix H. re
- 3.4.7 Coordinates for transect lines 1, 2, 7, 8, 9 and 11 have been proposed by ET on 19 July 2015 , verified by IEC on 4 August 2015 and approved by EPD on 19 August. For this Contract HY/2010/02, the approved lines were travelled since 24 and 25 August 2015.

### **3.5 Environmental Site Inspection and Audit**

- 3.5.1 Site Inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures for the Contract. In the reporting quarter, 13 site inspections were carried out. Recommendations on remedial actions were given to the Contractors for the deficiencies identified during the site audits.
- 3.5.2 Particular observations during the site inspections are described below:

#### ***Air Quality***

- 3.5.3 Dust was observed when vehicle passes through access roads at portion C2c and E2 and when vehicle passed through road at Portion C1a and Portion D; fugitive dust was observed when vehicle was drove pass portion C2c and road at Portion B, E2 and during rock filling; fugitive dust was observed at northeastern part of the site and at northeastern part of the site. the Contractor was reminded to provide sufficient dust control measures to prevent generation of fugitive dust. The Contractor provided watering or other preventative measures to prevent generation of fugitive dust. (Closed)
- 3.5.4 Exposed soil was observed at Portion D, the Contractor was reminded to provide sufficient measures to prevent site runoff of turbid water to the sea or to area which is outside the site boundary. (Reminder)
- 3.5.5 Dark smoke emission from plant/equipment was observed at Portion D and C1a; from pelican barge was observed at Portion C2b and emitted from excavator was observed at Portion D, the Contractor was reminded to ensure dark smoke emission from plant/equipment should be avoided. The Contractor prevented dark smoke emission of plant/equipment. (Closed)
- 3.5.6 Watering was observed during site walk, the Contractor was reminded to continue to provide sufficient dust control measures and ensure generation of fugitive dust is prevented. (Reminder)
- 3.5.7 Rock material was observed dry; the Contractor was reminded to moisten to prevent generation of fugitive dust during operation. The Contractor provided dust control measure on barge. (Closed)

#### ***Noise***

- 3.5.8 The panel of the air compressor at Portion C2c was observed open during operation. The Contractor was reminded to keep all flaps and/or panels closed during operation. The Contractor subsequently closed the panels. (Closed)

#### ***Water Quality***

- 3.5.9 Defect on part of the pipe for transferring DCM material was observed on barge (天駿 3). The Contractor was reminded to ensure all pipes in a good condition and provide sandbags along the edge of the barge in order to prevent such materials from entering nearby water (Closed)
- 3.5.10 Tipping of rock material to the sea was observed at Portion D, the Contractor was reminded to keep the tipping point as low as possible. (Reminder)
- 3.5.11 Insufficient sand bags was observed on idle grout production facilities, the Contractor was reminded to provide enough sand bags before operation of the grout production facilities to prevent potential runoff. (Reminder)

#### ***Chemical and Waste Management***

- 3.5.12 A generator was placed on ground without provision of drip tray on barge (天駿 3), chemical containers were placed on bare ground without provision of drip tray at Portion C2C.. The Contractor was reminded to provide the generator with drip tray to retain oil leakage, if any. The Contractor removed the generator on barge on barge (天駿 3). (Closed)

- 3.5.13 Oil drum was observed outside drip tray at Portion C1 and on barge Wing Hop Lee, were observed without drip tray at workshop area; oil drums were observed without drip tray on barge. The Contractor was reminded to provide mitigation measure such as drip tray to oil drum. The Contractor provided drip tray to oil drums. (Closed)
- 3.5.14 Idle air compressors were observed without drip tray, the Contractor was reminded to provide trip tray to air compressor before use of air compressor. (Reminder)
- 3.5.15 General refuse and bags of general refuse were observed on land area of Portion D and C1a; was observed at entrance area of workshop at portion C1a and C2c.. The Contractor was reminded to regularly clear the general refuse and provide rubbish bin with cover/lid. The Contractor cleared the general refuse on land area of Portion D and C1a. (Closed)
- 3.5.16 Water was observed inside drip tray at workshop area, the Contractor was reminded to clear the water accumulated inside drip tray to prevent runoff. The Contractor subsequently cleared the water accumulated in the drip tray. (Closed)
- 3.5.17 Oil stain was observed on ground at workshop area; the Contractor was reminded to clean the oil stain and disposed them of as chemical waste, subsequently, the Contractor cleared the oil stain and disposed them of as chemical waste. (Closed)
- 3.5.18 Floating debris on water surface at Portion D was observed. The Contractor was reminded to remove the debris on sea regularly. The Contractor removed the debris on sea. (Closed)
- 3.5.19 Temporary waste storage or rubbish bin was not provided on land area of Portion B beside Portion E2. To keep the site clean and tidy, the Contractor was reminded to provide rubbish bin with cover/lid to works area. (Reminder)
- 3.5.20 It was observed that liquid was accumulated inside drip tray, the Contractor was reminded to regularly clear the water accumulated inside drip tray to prevent potential runoff. The Contractor subsequently rectified the situation and cleared the water accumulated inside drip tray. (Closed)
- 3.5.21 It was observed that sand was loaded inside drip tray. The Contractor was reminded to clear the sand inside drip tray. (Pending for Contractor's rectification)
- 3.5.22 A deformed drip tray was observed on site. The Contractor was reminded to provide drip tray which can effectively contain potential leakage of oil. (Pending for Contractor's rectification)

#### ***Landscape and Visual Impact***

- 3.5.23 No relevant adverse impact was observed in the reporting month.

#### ***Others***

- 3.5.24 Rectifications of remaining identified items are undergoing by the Contractor. Follow-up inspections on the status on provision of mitigation measures will be conducted to ensure all identified items are mitigated properly.

## **4 ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS**

### **4.1 Summary of Solid and Liquid Waste Management**

- 4.1.1 The Contractor registered as a chemical waste producer for this Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting.
- 4.1.2 As advised by the Contractor, 522,025.4m<sup>3</sup> of fill were imported for the Contract use in the reporting period. 15kg of metal, 979kg of paper/cardboard packaging, 5,122kg plastics, and 169m<sup>3</sup> of general refuse were generated and disposed of in the reporting period. Monthly summary of waste flow table is detailed in Appendix I.
- 4.1.3 The Contractor is advised to properly maintain on site C&D materials and wastes collection, sorting and recording system, dispose of C&D materials and wastes at designated ground and maximize reuse / recycle of C&D materials and wastes. The Contractor is reminded to properly maintain the site tidiness and dispose of the wastes accumulated on site regularly and properly.
- 4.1.4 The Contractor is reminded that chemical waste containers should be properly treated and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.

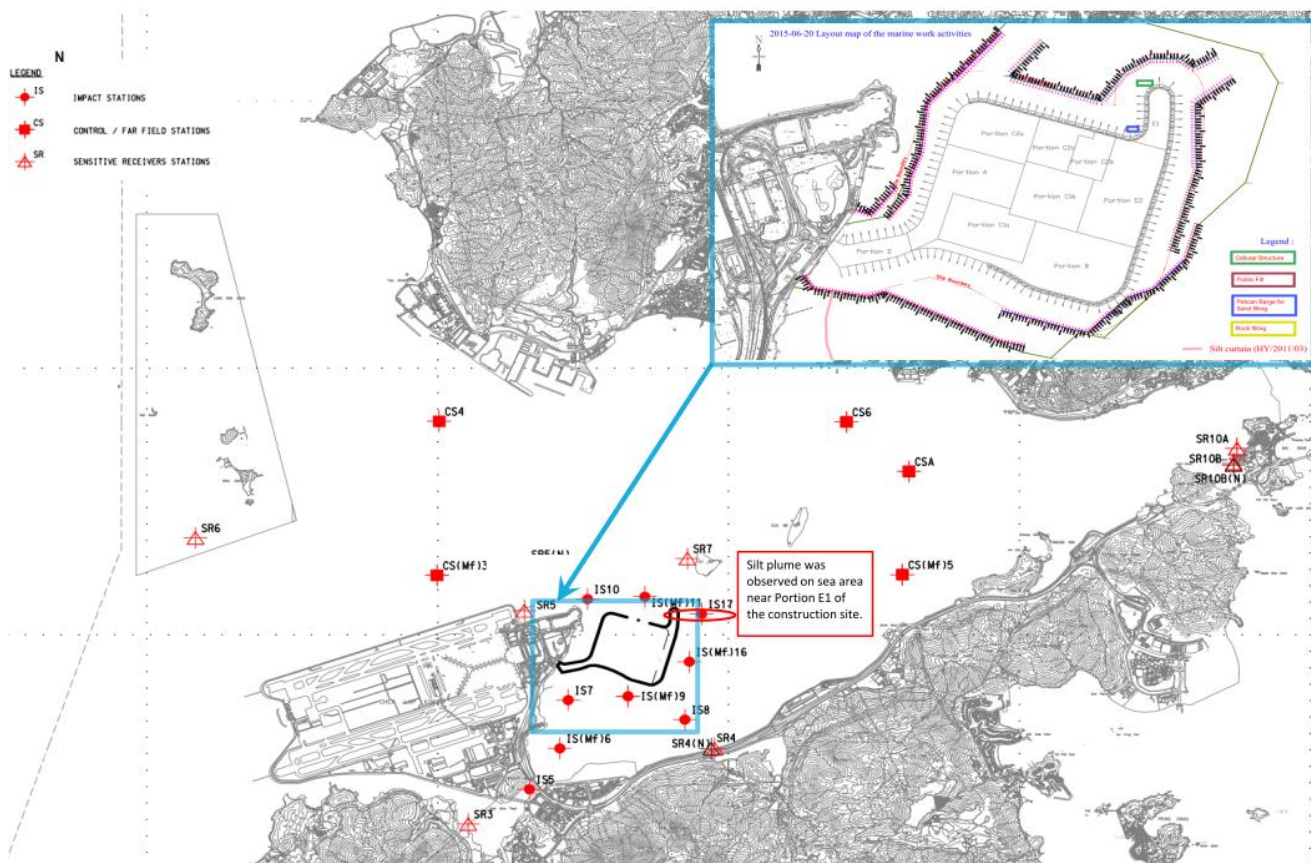


## 5 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

### 5.1 Implementation Status of Environmental Mitigation Measures

- 5.1.1 In response to the site audit findings, the Contractors carried out corrective actions.
- 5.1.2 A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in Appendix C. Most of the recommended mitigation measures are being upheld. Moreover, regular review and checking on the construction methodologies, working processes and plants were carried out to ensure the environmental impacts were kept minimal and recommended environmental mitigation measures were implemented effectively.
- 5.1.3 Training of marine travel route for marine vessels operator was given to relevant staff and relevant records were kept properly.
- 5.1.4 Regarding the implementation of dolphin monitoring and protection measures (i.e. implementation of Dolphin Watching Plan, Dolphin Exclusion Zone and Silt Curtain integrity Check), regular checks were conducted by experienced MMOs within the works area to ensure that no dolphins were trapped by the silt curtain area. There were no dolphins spotted within the silt curtain during this quarter. The relevant procedures were followed and all measures were well implemented. The silt curtains were also inspected in accordance to the submitted plan. As informed by the Contractor, a precast box culvert segment was delivered to Portion D on 10 Aug 2015, 22 Aug 2015 and 25 Aug 2015, the northwestern part of the perimeter silt curtain was temporarily opened for the delivery. Dolphin Exclusion Zone was implemented accordingly.
- 5.1.5 Acoustic decoupling measures on noisy plants on construction vessels were checked regularly and the Contractor was reminded to ensure provision of ongoing maintenance to noisy plants and to carry out improvement work once insufficient acoustic decoupling measures were found.
- 5.1.6 Frequency of watering per day on exposed soil was checked; with reference to the record provided by the Contract, watering was conducted at least 8 times per day on reclaimed land. The frequency of watering is the mainly refer to water truck. Sprinklers are only served to strengthen dust control measure for busy traffic at the entrance of Portion D. As informed by the Contractor, during the malfunction period of sprinkler, water truck will enhance watering at such area. The Contractor was reminded to ensure provision of watering of at least 8 times per day on all exposed soil within the Contract site and associated works areas throughout the construction phase.
- 5.1.7 As informed by the Contractor, an area of Portion B has been handed over to other Contract and the perimeter silt curtain near this area of Portion B has been rearranged on 31 July 2015 for berthing another Contractor's vessels (which do not belong to this Contract). IEC/ENPO was informed on 5 Aug 2015 immediately after ET's review. IEC/ENPO provided further comments on 1 September 2015, ET responded 2 September 2015 with notification letter ref.:60249820/rmky15090201. IEC/ENPO expressed no further comment via letter ref.: HYDHZMBEEM00\_0\_03351L.15 on 8 September 2015 for the removal of section of perimeter silt curtain near Portion B of HKBCF.

5.1.8 IEC/ENPO notified ET via email on 22 June 2015 that silt plume was observed being dispersed from Portion E1 to the open waters outside the silt curtain for the HZMB HKBCF Contract maintained by Contract No. HY/2010/02 at about 3:00 pm on 20 June 2015. For location of sea area near Portion E1 of the construction site, also see layout map below:



5.1.8.1 Investigation actions taken:

- Tide level, construction activities and implementation of mitigation measures were reviewed.
- Site inspection was conducted on 22 and 25 June 2015 to inspect sea area Portion E1 of HKBCF Reclamation Works.
- Available Impact Water Quality Monitoring (IWQM) data obtained 19 and 22 June 2015 were reviewed (refer to monitoring data attached). Available Impact Water Quality Monitoring (IWQM) data obtained 19 and 22 June 2015 were reviewed (refer to monitoring data attached).

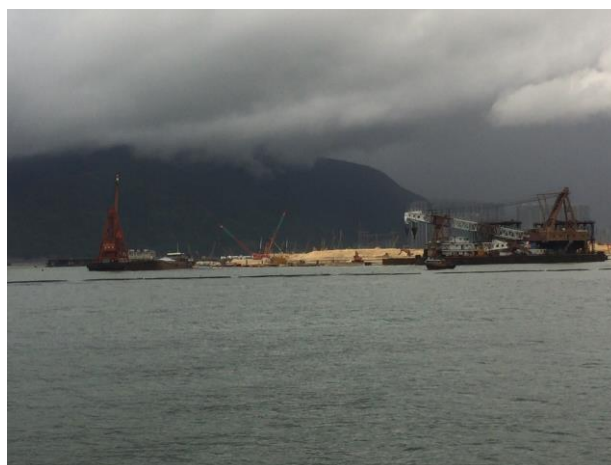
5.1.8.2 Review of Contractor’s silt curtain:

- Contractor’s silt curtain checking record of 19 and 22 June 2015 were reviewed. Defects such as disconnection or missing parts of silt curtain was not observed at the perimeter silt curtain located northeast of the HKBCF reclamation works.

- 5.1.8.3 During the site inspection conducted on 22 and 25 June 2015, Defects such as disconnection or missing parts of silt curtain was not observed at the perimeter silt curtain located northeast of the HKBCF reclamation works.
- 5.1.8.4 Photo records taken on 22 and 25 June 2015 shows that the sea condition at sea area near the northeast side of the HKBCF Reclamation Works and no silt plume was observed spreading out from Portion E1 of the construction site through the silt curtain.
- 5.1.8.5 Review of Contractor's vessel activities on 20 June 2015 and tidal level for working vessels belonging to Contract No. HY/2010/02 as observed in the photo:
- 5.1.8.6 As show by attached layout map, vessel 起七 for cellular structure installation was located at near arc-cell nos.079-080 of Portion E1 of HKBCF reclamation works on 20 June 2015. Site record provided by the Contractor shows that vessel 起七 was under maintenance between 20-22 June 2015 due to lifting crane was broken down, therefore both vessel 起七 & arc cell installation works was basically idled.
- 5.1.8.7 Information obtained from Hong Kong Observatory shows that the tide level was approximately 1.3 meter at 15:00 at Chek Lap Kok on 20 June 2015. However, vessel 起七 was a non-self-propelled vessel and no tug boat was observed at about 15:00 as shown by the photo taken on 20 June 2015 (Also refer to attached photo record for reference). In addition, for the marine working vessels anchored near the left side of 起七, no working activity was found according to Contractor's site daily record of 20 June 2015. The two boats located at far left on the photo, near silt plume, are unlikely belong to this Contract. The vessel in the middle of the photo, near silt plume, is a flattop barge waiting for or commencement of the box culvert work at Portion D, therefore it is likely that the flattop barge was idle at about 15:00 on 20 June 2015. As such, there was no adequate information to indicate that the observed silt plume was generated by active works or due to inadequate clearance maintained between vessels of this Contract and the sea bed during navigation.
- 5.1.8.8 Furthermore, no observation of silt plume was reported to this Contract after 1500 on 20 June 2015, it is likely that the silt plume disappeared shortly after it was observed on 20 June 2015.
- 5.1.8.9 Site inspection conducted on 22 and 25 June 2015:
- 5.1.8.10 No silt plume around the E1 of HKBCF reclamation works were observed during the site inspection conducted on 22 and 25 June 2015. (Also refer to attached photo record for reference.)
- 5.1.8.11 Review of Suspended Solids (SS) level and turbidity level recorded at IS(Mf)11, IS17, IS(Mf)16 and SR7 on 19 and 22 June 2015:
- 5.1.8.12 Available water quality monitoring data shows that data recorded on 19 and 22 June 2015 at monitoring station close the observed silt plume i.e. IS(Mf)11, IS17, IS(Mf)16 and SR7 were below the action and limit level. This indicates the water quality at sea area close to portion E1 was not adversely affected on 19 and 22 June 2015.
- 5.1.8.13 There were no silt plume observed on 22 and 25 June 2015 during site inspection and no deterioration of water quality were recorded on 19 and 22 June 2015, as such, there is no adequate information which indicates that the silt plume observed on 20 June 2015 was lasting and continuous.
- 5.1.8.14 Nevertheless, the Contractor was reminded to regularly check the performance of the silt curtain and ensure swift provision of maintenance to the perimeter silt curtains once defects of the perimeter silt curtain were observed.
- 5.1.8.15 Photo record taken on 20 June 2015 at about 15:00 shows that silt plume was observed near the silt curtain for HZMB HKBCF Contract maintained by Contract No. HY/2010/02.



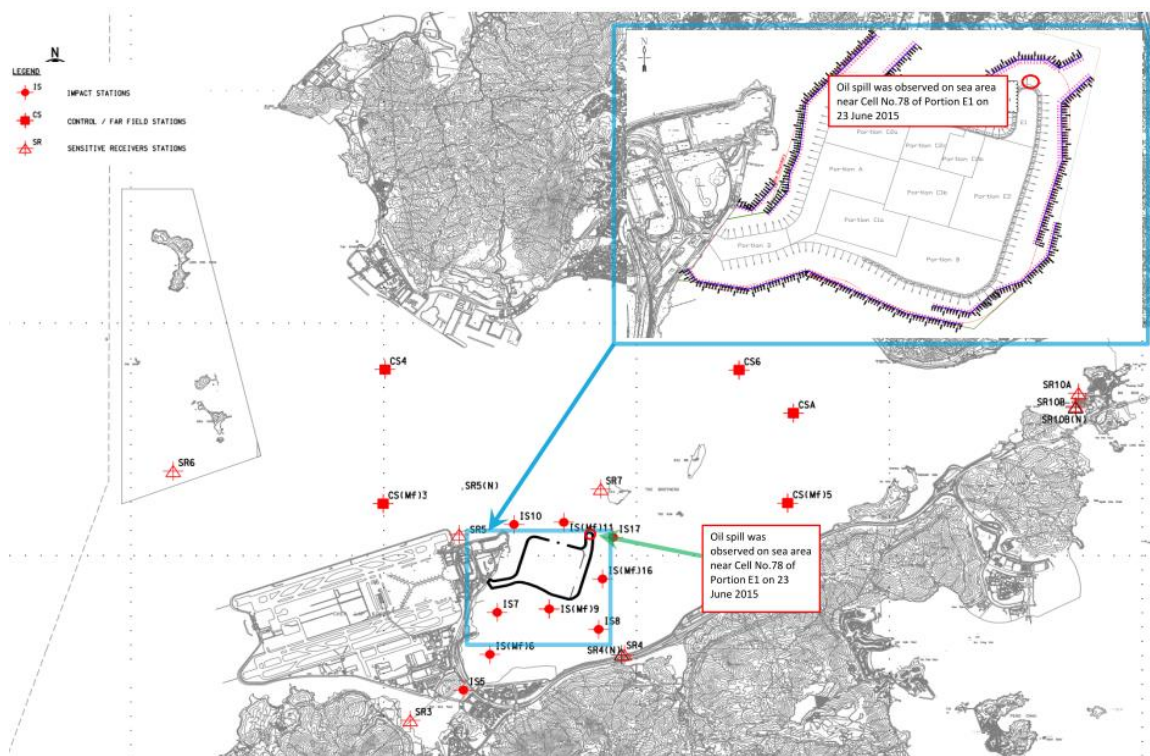
5.1.8.16 Photo record taken on 22 June 2015 shows that no silt plume around Portion E1 of HKBCF reclamation works were observed during the site inspection conducted on 22 June 2015.



5.1.8.17 Photo record taken on 25 June 2015 shows that no silt plume around Portion E1 of HKBCF reclamation works were observed during the site inspection conducted on 25 June 2015.



5.1.9 Oil spillage incident was observed at Sea area near Cell No. 78 on 23 June 2015 (also refer to attached layout map).



5.1.9.1 Detail of the oil spill and Contractor's actions taken in response to the spill incident have been reviewed and summarised as follow:

- The oil on sea was observed by the Contractor and RSS on 23 June 2015.
- The Contractor organised manpower to identify the spill source, but the source of oil spill was not identified.
- The Contractor equipped people involved in the cleanup works with personal protective equipment such as gloves prior to the removal of any leaked chemical or chemical waste.
- Pads and Pillow of the Spill Kit were applied to absorb and remove the spillage.

- 5.1.9.2 Oil observed on sea area near Cell No. 78 on 23 June 2015 at 09:45 a.m. on 23 June 2015 by Contractor and RSS. The following actions was taken by the Contractor:
- 5.1.9.3 The Contractor organized manpower to identify the spill source, the vessel (三航起 7) located close to the oil spill was inspected but the source of oil spill was not identified.
- 5.1.9.4 The oil spill was identified during join site inspection conducted by the Contractor and RSS on 23 June 2015 as discrete, non-continuous source with approximately 10m<sup>2</sup> spread. Also refer to photo below:
- 5.1.9.5 The oil spill was identified during join site inspection conducted by the Contractor and RSS on 23 June 2015 as discrete, non-continuous source with approximately 10m<sup>2</sup> spread. The below photo shows that the Contractor deployed absorption booms to remove the floating oil from water.



- 5.1.9.6 The used absorption booms were collected using disposal bags as part of the spill kits item. The used absorption booms were disposed of as chemical waste by the Contractor. (Also refer to photo record below)



- 5.1.9.7 The oil stain observed was limited at nearby Northeastern sea area within the silt curtain.
- 5.1.9.8 Photo record shows that oil on sea was no longer on sea area near Cell No. 78. (Also refer to photo record below)



- 5.1.9.9 Monitoring stations IS10, IS(Mf)11, SR7 and IS17 are the monitoring stations close to location of observed oil spill (also refer to attached layout map). Available Impact water quality monitoring data record of IS10, IS(Mf)11, SR7 and IS17 have been reviewed. There is no water quality exceedance recorded at IS10, IS(Mf)11, SR7 and IS17 on 24 June 2015.
- 5.1.9.10 The Contractor was reminded to enhance environmental toolbox talk on chemical waste handling and to continue to follow the spill response plan when oil is observed on sea.
- 5.1.9.11 As informed by the Contractor, an area of Portion B has been handed over to other Contract and the perimeter silt curtain near this area of Portion B has been rearranged on 31 July 2015 for berthing another Contractor's vessels (which do not belong to this Contract). IEC/ENPO was informed on 5 Aug 2015 immediately after ET's review. IEC/ENPO provided further comments on 1 September 2015, ET responded 2 September 2015 with notification letter ref.:60249820/rmky15090201. IEC/ENPO expressed no further comment via letter ref.: HYDHZMBEEM00\_0\_03351L.15 on 8 September 2015 for the removal of section of perimeter silt curtain near Portion B of HKBCF.



## **6 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT**

- 6.1.1 One (1) Limit Level Exceedance of 24hr-TSP was recorded at AMS2 on 10 August 2015. After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract. All 1-Hour TSP results were below the Action and Limit Level in the reporting period.
- 6.1.2 For construction noise, no exceedance was recorded at all monitoring stations in the reporting period.
- 6.1.3 Two (2) Action Level Exceedances of suspend solids were recorded at IS5 and IS(Mf)6 during flood tide on 17 July 2015, the exceedances were confirmed after checking against relevant control station(s) during flood tide i.e. CS6, CSA and CS(Mf)5 following the Action and Limit Levels for Water Quality. After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract.
- 6.1.4 One (1) Limit Level exceedance of dolphin monitoring was recorded in the reporting quarter. After investigation, it was concluded that the HZMB works is one of the contributing factors affecting the dolphins. It was also concluded the contribution of impacts due to the HZMB works as a whole (or individual marine Contracts) cannot be quantified nor separate from the other stress factors. Event Action Plan for Impact Dolphin Monitoring was triggered. For detail of investigation, please refer to appendix L.
- 6.1.5 Cumulative statistics on exceedances is provided in Appendix J.

## **7 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS**

### **7.1 Summary of Environmental Complaints, Notification of Summons and Successful Prosecutions**

7.1.1 The Environmental Complaint Handling Procedure is annexed in Figure 5.

7.1.2 As informed by the Contractor, 3 July 2015, an air quality complaint was received on 11 June 2015 by HyD via complaint hotline 1823. The complainant complained that sand and dust pollution near Richland Garden, 138 Wu Chui Road, Tuen Mun, caused by sand delivery barges. After investigation, there is no adequate information to conclude the observed impact is related to this Contract.

#### 7.1.2.1 Investigation Actions:

- Reviewed 1-hour TSP and 24-hours TSP monitoring data within the complaint period 2- 29 June 2015.
- Site inspections were conducted jointly with RSS, IEC and the Contractor on 11 June 2015 and jointly with RSS and the Contractor on 4, 18 and 25 June 2015.
- Reviewed information provided by the Contractor.

#### 7.1.2.2 Investigation findings:

- There is no sufficient information provided by the complainant to make sure that the concerned barges are related to this Contract.
- Date of the observed impact was not specified by the complainant so the impact air quality monitoring (IAQM) results between 2- 29 June 2015 for monitoring stations close to the concerned area – AQMS1, ASR1, ASR5, ASR6 and ASR10 have been reviewed and there was no action/limit level exceedance of 1-hour TSP or 24-hour TSP of impact air quality monitoring results recorded at AQMS1, ASR1, ASR5, ASR6 and ASR10 between 2- 29 June 2015.
- In addition, site inspections were conducted jointly with RSS, IEC and the Contractor on 11 June 2015 and jointly with RSS and the Contractor on 4, 18 and 25 June 2015, but no generation of fugitive dust was observed to be caused by barges loaded with filling material.
- As informed by the Contract, no sand barge of this Contract was berthed near Tuen Mun area in June 2015.

7.1.2.3 After investigation, there is no adequate information to conclude the observed impact is related to this Contract.

7.1.2.4 The Contractor was advised to ensure to continue the provision of fugitive dust mitigation measures to barges loaded with filling material such as watering to sand filling material on sand barges, as necessary.

7.1.3 As informed by ER of this Contract on 13 July 2015, EPD referred a noise related complaint to this Contract on 13 July 2015, details as follows:

- A complainant complained that serious noise nuisance was caused by loading and unloading of construction material of barges at construction site of HZMB artificial island near Tung Chung development pier during late night period. The complainant requested follow-up and reply.
- A complainant left message at EPD's complaint hotline on 11 July 2015 and complained that construction noise was generated even after 23:00 at night from the artificial island outside Seaview Crescent, this situation has last over 10 days and requested follow-up.

7.1.3.1 As further informed by ENPO which further checked with EPD regarding the captioned complaint, with respect to the further information provided by EPD, two complaints could be referred as the same incident. Further complaint detail was given by EPD to Project team of this Contract on 15 July 2015 as follows:

- The complainant complained noise came from BCF site near HK Skycity Marriott Hotel during nighttime period of the past 10 days which involves excavation with a grab dredger, transfer of excavated material using a derrick barge and a tug boat, and backfilling with a pelican barge. Based on EPD's record, the above activities are covered by CNP no. GW-RS0503-15.

7.1.3.2 Investigation Actions:

- Review of valid CNP no. GW-RS0503-15.
- Review of Contractor's construction activities conducted at BCF site near HK Skycity Marriott Hotel, Zone D of CNP No.GW-RS0503-15, between 23:00 till 07:00 of next day on 1 - 13 July 2015
- Review of Contractor compliance checking record.

7.1.3.3 Investigation and Findings:

- After review of the valid CNP no. GW-RS0503-15 for this Contract, operation of a grab dredger, a derrick barge, a tug boat, and pelican barge during nighttime period is covered by CNP no. GW-RS0503-15 between 1- 13 July 2015.
- With referred to the site dairy summary records provided by the Contractor, no more than 1 vessel (dredger or derrick) operated at the same time between 23:00 till 07:00 of next day on 1 - 13 July 2015 at Zone D of CNP No.GW-RS0503-15 (please see attached Plan no.1 for respective zones). This shows that the construction activities carried out after 23:00 from 01 July to 13 July 2015 at Zone D complied with the conditions of a valid CNP No.GW-RS0503-15. Construction activities conducted between 23:00 till 07:00 of next day on 1 - 13 July 2015 at Zone D of CNP No.GW-RS0503-15 were summarised on layout maps attached.
- Compliance checking records of 1- 13 July 2015 provided by the Contractor were reviewed and record shows that construction works were carried out in compliance with the CNP no. GW-RS0503-15 in effect.
- Further informed by the Contractor on 15 July 2015 EPD spot-checked the construction site of this Contract in the afternoon of 15 July 2015 and on 16 July 2015, EPD spot-checked the construction site of this Contract from 23:35 15 July 2015 to 01:55 16 July 2015. No adverse comments or non-conformance was observed by the EPD on both visits. The Contractor was reminded by EPD to strictly follow with all terms and conditions of the CNP no. GW-RS0503-15.
- As a result, the construction activities carried out during restricted hour between 1- 13 July 2015 were considered complied with conditions CNP no. GW-RS0503-15.

7.1.3.4 The Contractor was reminded to continue to strictly follow with all terms and conditions of a valid CNP

- 7.1.4 As informed by the Contractor on 30 July 2015, Home Affairs Department referred a complaint to Project team of this Contract on 29 July 2015. The complaint involved Mr. Chan and Mr. Tang, Resident Representatives of Tong Fuk Village who complained significant sand loss of Tong Fuk Beach, particularly after typhoon when the beach was hit by strong waves; this exposed the rocks at the beach. The complainant enquired whether the sand loss is related to sand extraction for construction of airport and reclamation works of HZMB artificial island.
- 7.1.4.1 Investigation action:
- Review Contractor's source of sand filling material.
- 7.1.4.2 Investigation result:
- The Contractor of HKBCF Reclamation Works confirmed that this Contract did not have any sand filling material that was sourced from the captioned area. As such, it is unlikely that the reported sand loss is attributed to construction activities of this Contract.
- 7.1.4.3 The complaint is considered as non-Contract related.
- 7.1.5 No notification of summons or prosecution was received in the reporting quarter.
- 7.1.6 Statistics on complaints, notifications of summons and successful prosecutions are summarized in Appendix N.

## 8 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

### 8.1 Comments on mitigation measures

8.1.1 According to the environmental site inspections performed in the reporting quarter, the following recommendations were provided:

#### ***Air Quality Impact***

- All working plants and vessels on site should be regularly inspected and properly maintained to avoid dark smoke emission.
- All vehicles should be washed to remove any dusty materials before leaving the site.
- Haul roads should be sufficiently dampened to minimize fugitive dust generation.
- Wheel washing facilities should be properly maintained and reviewed to ensure properly functioning.
- Temporary exposed slopes and open stockpiles should be properly covered.
- Enclosure should be erected for cement debagging, batching and mixing operations.
- Water spraying should be provided to suppress fugitive dust for any dusty construction activity.
- Regular review and provide maintenance to dust control measures such as sprinkler system.

#### ***Construction Noise Impact***

- Quieter powered mechanical equipment should be used as far as possible.
- Noisy operations should be oriented to a direction away from sensitive receivers as far as possible.
- Proper and effective noise control measures for operating equipment and machinery on-site should be provided, such as erection of movable noise barriers or enclosure for noisy plants. Closely check and replace the sound insulation materials regularly
- Vessels and equipment operating should be checked regularly and properly maintained.
- Noise Emission Label (NEL) shall be affixed to the air compressor and hand-held breaker operating within works area.
- Acoustic decoupling measures should be properly implemented for all existing and incoming construction vessels with continuous and regularly checking to ensure effective implementation of acoustic decoupling measures.

#### ***Water Quality Impact***

- Regular review and maintenance of silt curtain systems, drainage systems and desilting facilities in order to make sure they are functioning effectively.
- Construction of seawall should be completed as early as possible.
- Regular inspect and review the loading process from barges to avoid splashing of material.
- Silt, debris and leaves accumulated at public drains, wheel washing bays and perimeter u-channels and desilting facilities should be cleaned up regularly.
- Silty effluent should be treated/ desilted before discharged. Untreated effluent should be prevented from entering public drain channel.

- Proper drainage channels/bunds should be provided at the site boundaries to collect/intercept the surface run-off from works areas.
- Exposed slopes and stockpiles should be covered up properly during rainstorm.

#### ***Chemical and Waste Management***

- All types of wastes, both on land and floating in the sea, should be collected and sorted properly and disposed of timely and properly. They should be properly stored in designated areas within works areas temporarily.
- All chemical containers and oil drums should be properly stored and labelled.
- All plants and vehicles on site should be properly maintained to prevent oil leakage.
- All kinds of maintenance works should be carried out within roofed, paved and confined areas.
- All drain holes of the drip trays utilized within works areas should be properly plugged to avoid any oil and chemical waste leakage.
- Oil stains on soil surface and empty chemical containers should be cleared and disposed of as chemical waste.
- Regular review should be conducted for working barges and patrol boats to ensure sufficient measures and spill control kits were provided on working barges and patrol boats to avoid any spreading of leaked oil/chemicals.

#### ***Landscape and Visual Impact***

- All existing, retained/transplanted trees at the works areas should be properly fenced off and regularly inspected.
- Control night-time lighting and glare by hooding all lights.

## **8.2 Recommendations on EM&A Programme**

- 8.2.1 The impact monitoring programme for air quality, noise, water quality and dolphin ensured that any deterioration in environmental condition was readily detected and timely actions taken to rectify any non-compliance. Assessment and analysis of monitoring results collected demonstrated the environmental impacts of the Contract. With implementation of recommended effective environmental mitigation measures, the Contract's environmental impacts were considered as environmentally acceptable. The weekly environmental site inspections ensured that all the environmental mitigation measures recommended were effectively implemented.
- 8.2.2 The recommended environmental mitigation measures, as included in the EM&A programme, effectively minimize the potential environmental impacts from the Contract. Also, the EM&A programme effectively monitored the environmental impacts from the construction activities and ensure the proper implementation of mitigation measures. No particular recommendation was advised for the improvement of the programme.

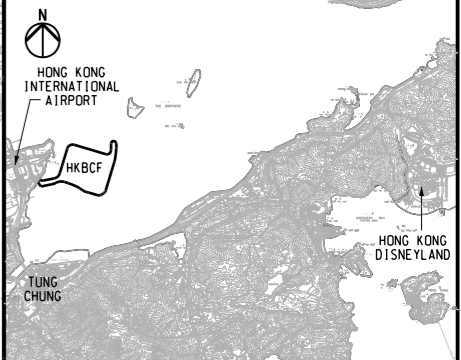
### 8.3 Conclusions

- 8.3.1 The construction phase and EM&A programme of the Contract commenced on 12 March 2012.
- 8.3.2 One (1) Limit Level Exceedance of 24hr-TSP was recorded at AMS2 on 10 August 2015. After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract. All 1-Hour TSP results were below the Action and Limit Level in the reporting period.
- 8.3.3 For construction noise, no exceedance was recorded at all monitoring stations in the reporting period.
- 8.3.4 Two (2) Action Level Exceedances of suspend solids were recorded at IS5 and IS(Mf)6 during flood tide on 17 July 2015, the exceedances were confirmed after checking against relevant control station(s) during flood tide i.e. CS6, CSA and CS(Mf)5 following the Action and Limit Levels for Water Quality. After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract.
- 8.3.5 One (1) Limit Level exceedance of dolphin monitoring was recorded in the reporting quarter. After investigation, it was concluded that the HZMB works is one of the contributing factors affecting the dolphins. It was also concluded the contribution of impacts due to the HZMB works as a whole (or individual marine Contracts) cannot be quantified nor separate from the other stress factors. Event Action Plan for Impact Dolphin Monitoring was triggered. For detail of investigation, please refer to appendix L.
- 8.3.6 Due to malfunction of High Volume Sampler equipment located at monitoring station AMS3B, the 24hr TSP monitoring need to be rescheduled from 1 June 2015 16:00pm – 2 June 2015 16:00pm to 2 June 2015 13:30 pm – 3 June 2015 13:30 pm.
- 8.3.7 The scheduled water quality monitoring at mid ebb on 10 July 2015 was cancelled due to Tropical Cyclone Warning Signal no. 3 or above was hoisted 3 hours before the commencement of scheduled water quality monitoring.
- 8.3.8 As informed by the Contractor, an area of Portion B has been handed over to other Contract and the perimeter silt curtain near this area of Portion B has been rearranged on 31 July 2015 for berthing another Contractor's vessels (which do not belong to this Contract). IEC/ENPO was informed on 5 Aug 2015 immediately after ET's review. IEC/ENPO provided further comments on 1 September 2015, ET responded 2 September 2015 with notification letter ref.:60249820/rmky15090201. IEC/ENPO expressed no further comment via letter ref.: HYDHZMBEEM00\_0\_03351L.15 on 8 September 2015 for the removal of section of perimeter silt curtain near Portion B of HKBCF.
- 8.3.9 Environmental site inspection was carried out thirteen times in the reporting quarter. Recommendations on remedial actions were given to the Contractors for the deficiencies identified during the site audits.
- 8.3.10 As informed by the Contractor, 3 July 2015, an air quality complaint has been received on 11 June 2015 by HyD via complaint hotline 1823. The complainant complained that sand and dust pollution near Richland Garden, 138 Wu Chui Road, Tuen Mun, caused by sand delivery barges. After investigation, there is no adequate information to conclude the observed impact is related to this Contract.
- 8.3.11 As informed by ER of this Contract on 13 July 2015, EPD referred a noise related complaint to this Contract on 13 July 2015. The complainant complained noise came from BCF site near HK Skycity Marriott Hotel during nighttime period of the past 10 days which involves excavation with a grab dredger, transfer of excavated material using a derrick barge and a tug boat, and backfilling with a pelican barge. Based on EPD's record, the above activities are covered by CNP no. GW-RS0503-15. After investigation, the construction activities carried out during restricted hour between 1- 13 July 2015 were considered complied with CNP conditions (no. GW-RS0503-15).

- 8.3.12 As informed by the Contractor on 30 July, Home Affairs Department referred a complaint to Project team of this Contract on 29 July 2015. The complaint involved Mr. Chan and Mr. Tang, Resident Representatives of Tong Fuk Village who complained significant sand loss of Tong Fuk Beach, particularly after typhoon when the beach was hit by strong waves; this exposed the rocks at the beach. The complainant enquired whether the sand loss is related to sand extraction for construction of airport and reclamation works of HZMB artificial island. After investigation, the complaint is considered as non-Contract related.
- 8.3.13 Notification of summons or prosecution was received in the reporting quarter.
- 8.3.14 IEC/ENPO notified ET via email on 22 June 2015 that silt plume was observed being dispersed from Portion E1 to the open waters outside the silt curtain for the HZMB HKBCF Contract maintained by Contract No. HY/2010/02 at about 3:00 pm on 20 June 2015. After investigation, no adequate information which indicates that the silt plume observed on 20 June 2015 was lasting and continuous.
- 8.3.15 Oil spillage incident was observed at Sea area near Cell No. 78 on 23 June 2015. Following the spill response plan ET, IEC and the RSS were informed of the incident by the Contractor.
- 8.3.16 Apart from the above mentioned monitoring, most of the recommended mitigation measures, as included in the EM&A programme, were implemented properly in the reporting quarter.
- 8.3.17 The recommended environmental mitigation measures effectively minimize the potential environmental impacts from the Contract. The EM&A programme effectively monitored the environmental impacts from the construction activities and ensure the proper implementation of mitigation measures. No particular recommendation was advised for the improvement of the programme.
- 8.3.18 Moreover, regular review and checking on the construction methodologies, working processes and plants were carried out to ensure the environmental impacts were kept minimal and recommended environmental mitigation measures were implemented effectively.



DO NOT SCALE DRAWING. CHECK ALL DIMENSIONS ON-SITE.  
ALL RIGHTS RESERVED.  
© OVE ARUP & PARTNERS HONG KONG LIMITED.



KEY PLAN

- NOTES**
1. ALL COORDINATES ARE RELATED TO HONG KONG 1980 GRID.
  2. ALL LEVELS ARE IN METRES ABOVE HONG KONG PRINCIPAL DATUM (mPD).
  3. REFER TO DRG NO. 211036/SL/1002 FOR THE DEFINITION OF SETTING OUT LINE (SOL) FOR THE HONG KONG BOUNDARY CROSSING FACILITIES (HKBCF) RECLAMATION SITE.
  4. REFER TO DRG NO. 211036/SL/1004 FOR DETAILS OF SITE BOUNDARY.
  5. FOR EXTENT OF SORTING FACILITIES AT FILL BANK AT TSEUNG KWAN O AREA 137 REFER TO DRG NO. 211036/SL/1015.

- LEGEND**
- SITE BOUNDARY
  - SETTING OUT LINE (SOL)
  - WORKS AREA BOUNDARY

Rev	Description	By	Date
-	FOR CONSTRUCTION	HYJL	11/11

Consultant

**ARUP** 奧雅納工程顧問  
Ove Arup & Partners Hong Kong Limited

Supported By :

- Ecosystems Ltd.
- EDA Marine Ltd.
- Geotechnical Consulting Group (Asia) Ltd.
- Hong Kong Cetacean Research Project
- IntelBuild Technyx Asia Limited
- Tony Gee and Partners LLP

Contract No. and Title:  
**Contract No. HY/2010/02**  
**Hong Kong-Zhuhai-Macao Bridge**  
**Hong Kong Boundary Crossing Facilities**  
**- Reclamation Works**

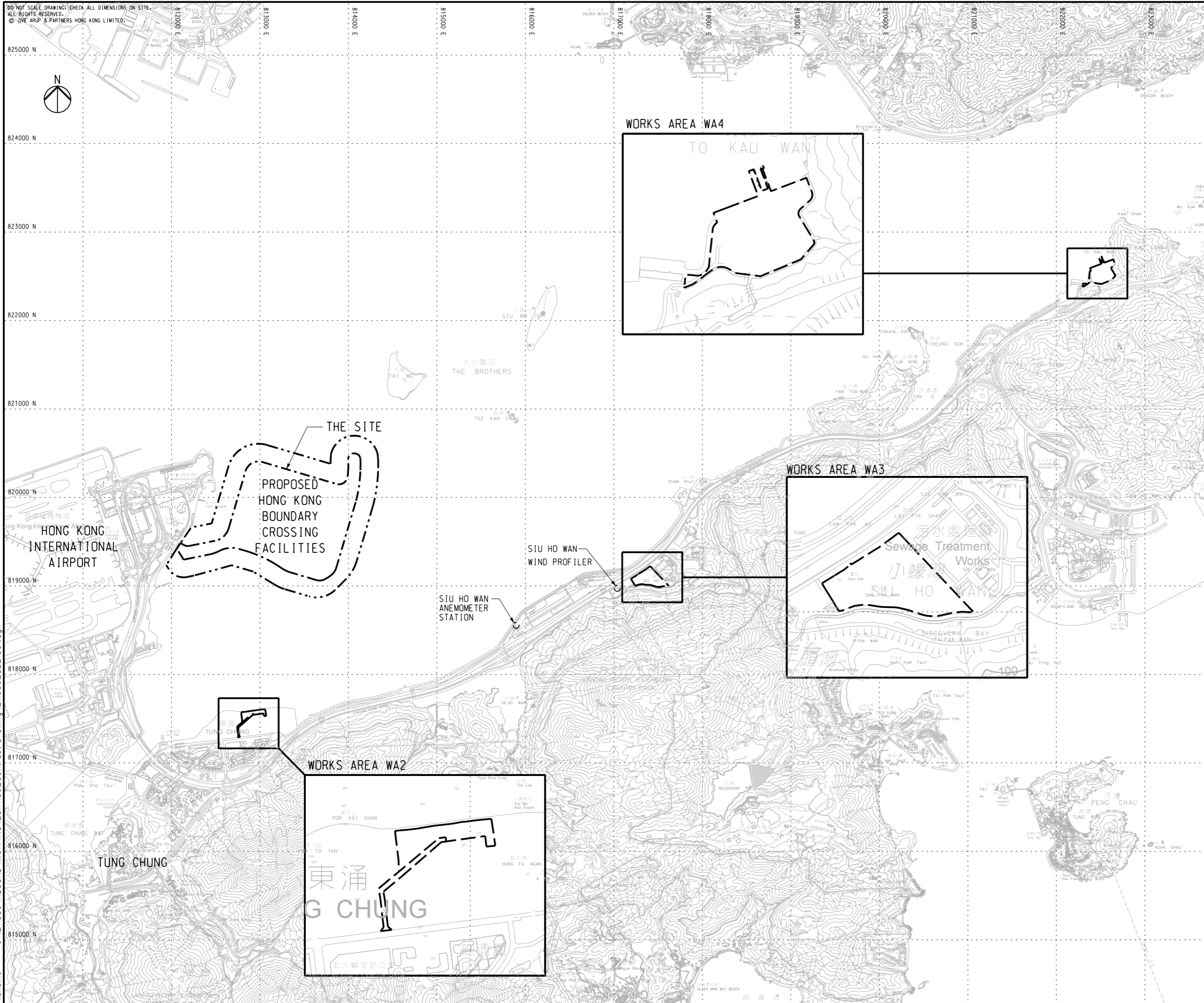
Drawing title  
**KEY PLAN**

Drawing no. <b>211036/SL/1001</b>		Rev. -	
Drawn RL	Date 11/09	Checked KKY	Approved DML
Scale 1:20000 @A1 1:40000 @A3		Status <b>WORKING</b>	

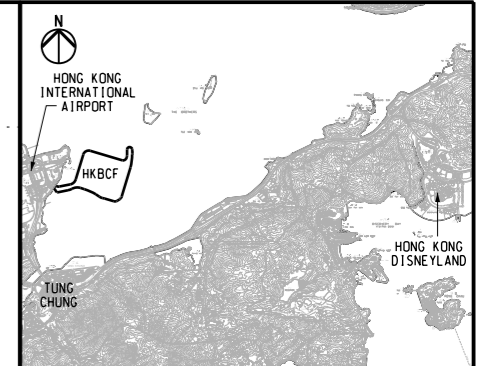
COPYRIGHT RESERVED

路政署  
**HIGHWAYS DEPARTMENT**  
 港珠澳大橋香港工程管理局  
 Hong Kong - Zhuhai - Macao Bridge  
 Hong Kong Project Management Office

Printed by : 12/17/2011  
 Filename : J:\211036\RECORD\WORKING\20111130\_Contract Drawing\_211036\_SL\_1001.dgn



DO NOT SCALE DRAWING. CHECK ALL DIMENSIONS ON SITE.  
 ALL RIGHTS RESERVED.  
 © OVE ARUP & PARTNERS HONG KONG LIMITED.



KEY PLAN

- NOTES**
- FOR LEGENDS AND NOTES FOR CHAIN LINK FENCE AND GATE REFER TO DRG NO. 211036/SL/1013.
  - THE ERECTION OF CHAIN LINK FENCE AND GATES SHALL BE COMPLETED BY THE HANDOVER DATE OF EACH PORTION OF SITE, OR AS INSTRUCTED BY THE ENGINEER.
  - FOR SETTING OUT COORDINATES OF DIFFERENT PORTIONS OF SITE REFER TO DRG NO. 211036/SL/1003.
  - ACCESS POINTS BETWEEN PORTIONS SHALL BE PROVIDED BY THE CONTRACTOR, AND THE LOCATIONS SHALL BE AGREED WITH THE ENGINEER ON SITE.
  - FOR HOARDING AND FENCE AT FILL BANK AT TSEUNG KWAN O AREA 137 REFER TO DRG NO. 211036/SL/1015.

**LEGEND**

	SETTING OUT LINE (SOL)
	WORKS AREA BOUNDARY
	PORTIONS BOUNDARY LINE

Rev	Description	By	Date
-	FOR CONSTRUCTION	HYJL	11/11

Consultant

**ARUP** 奧雅納工程顧問 •  
 Ove Arup & Partners Hong Kong Limited

Supported By :

- Ecosystems Ltd. ○
- EDA Marine Ltd. ○
- Geotechnical Consulting Group (Asia) Ltd. ○
- Hong Kong Cetacean Research Project ○
- Intel:Build Technyx Asia Limited ○
- Tony Gee and Partners LLP ○

Contract No. and Title:  
**Contract No. HY/2010/02**  
**Hong Kong-Zhuhai-Macao Bridge**  
**Hong Kong Boundary Crossing Facilities**  
**- Reclamation Works**

Drawing title  
**WORKS AREA LAYOUT**  
**AND HOARDING PLAN**  
**(SHEET 2 OF 3)**

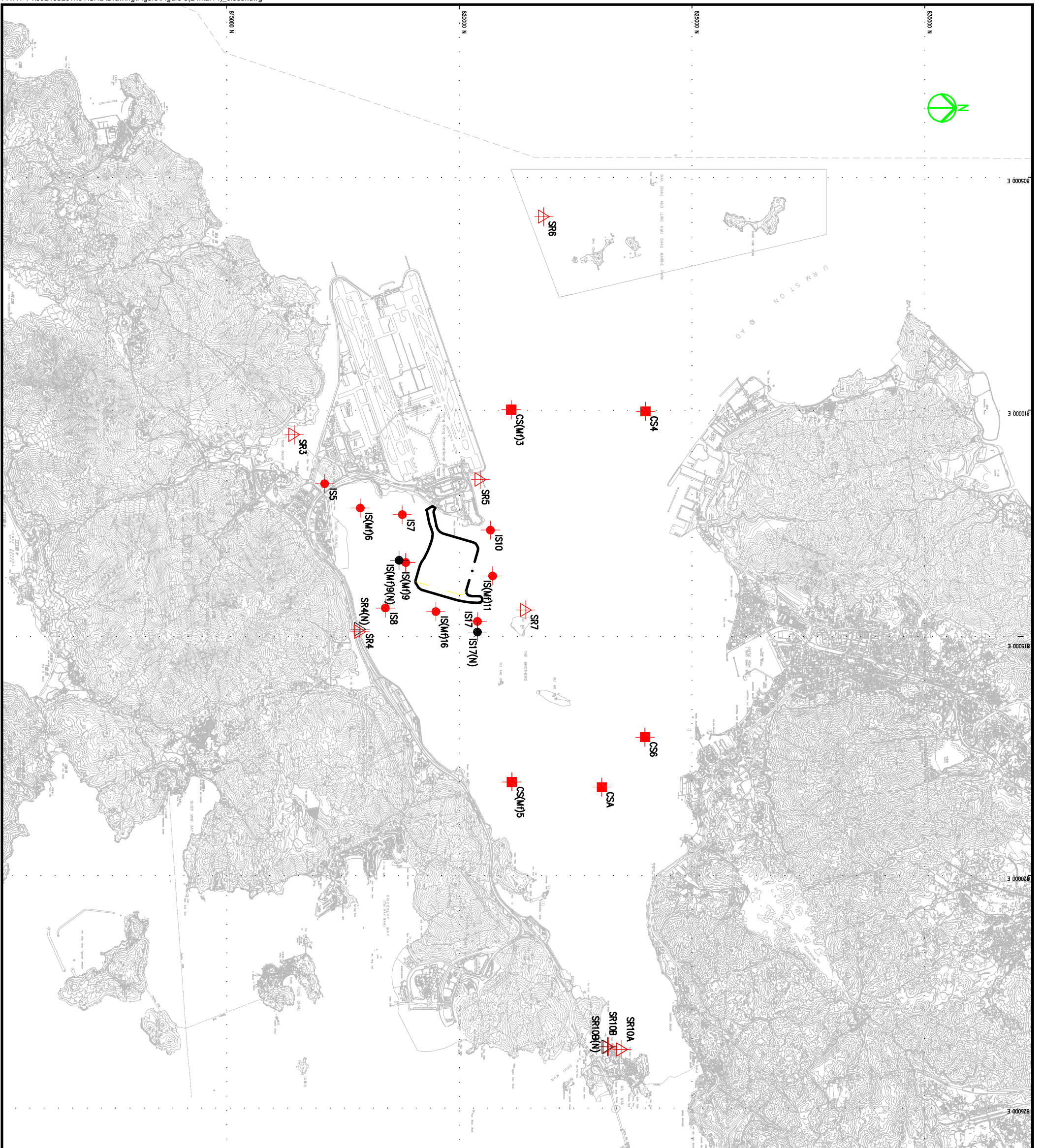
Drawing no. 211036/SL/1014		Rev. -	
Drawn RL	Date 06/10	Checked KKY	Approved DML
Scale 1:5000 @A1 1:10000 @A3		Status <b>WORKING</b>	

COPYRIGHT RESERVED

**路政署**  
**HIGHWAYS DEPARTMENT**  
 港珠澳大橋香港工程管理局  
 Hong Kong - Zhuhai - Macao Bridge  
 Hong Kong Project Management Office

Printed by : 12/17/2011  
 Filename : J:\211036\RECORD\WORKING\20111130\_Contract Drawing\_211036\_SL\_1014.dgn





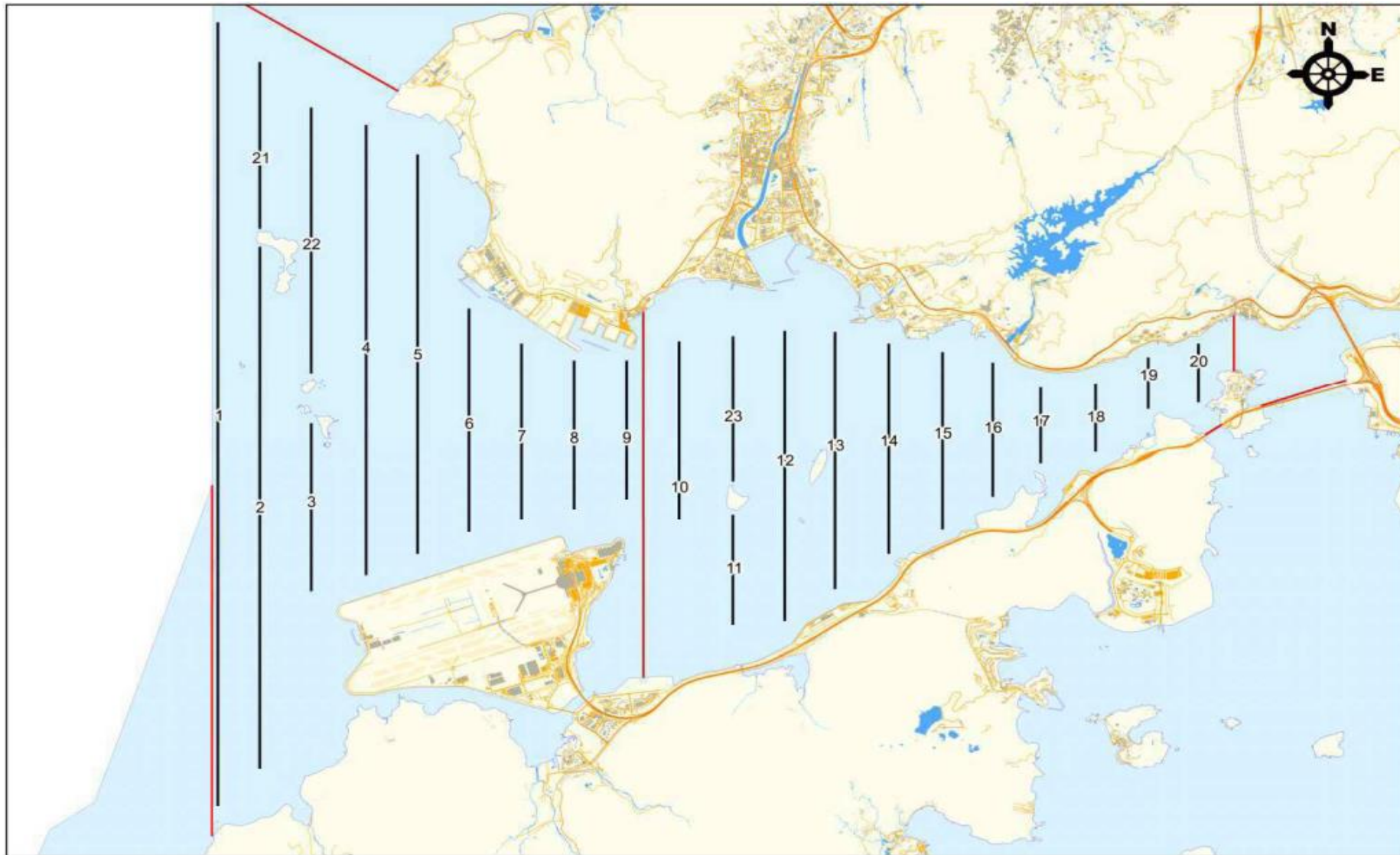
**LEGEND**

- IS IMPACT STATIONS
- CS CONTROL / FAR FIELD STATIONS
- SR SENSITIVE RECEIVERS STATIONS
- SR SENSITIVE RECEIVERS STATIONS (RELOCATED)
- IS IMPACT STATIONS (RELOCATED)

**SETTING OUT SCHEDULE**

MONITORING STATIONS	CO-ORDINATES	
	EASTING	NORTHING
IS5	811579	817106
IS(M)16	812101	817873
IS7	812244	818777
IS8	814251	818412
IS(M)9	813273	818850
IS(M)9(N)	813226	818708
IS10	812577	820670
IS(M)11	813562	820716
IS(M)16	814328	819497
IS17	814539	820391
IS17(N)	814767	820391
SR3	810525	816456
SR4(N)	814705	817859
SR5	811489	820455
SR6	805837	821818
SR7	814293	821431
SR10A	823741	823495
SR10B(N)	823683	823187
CS(M)3	809989	821117
CS(M)5	817990	821129
CS4	810025	824004
CS6	817028	823992
CSA	818103	823064

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and disclaims any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.

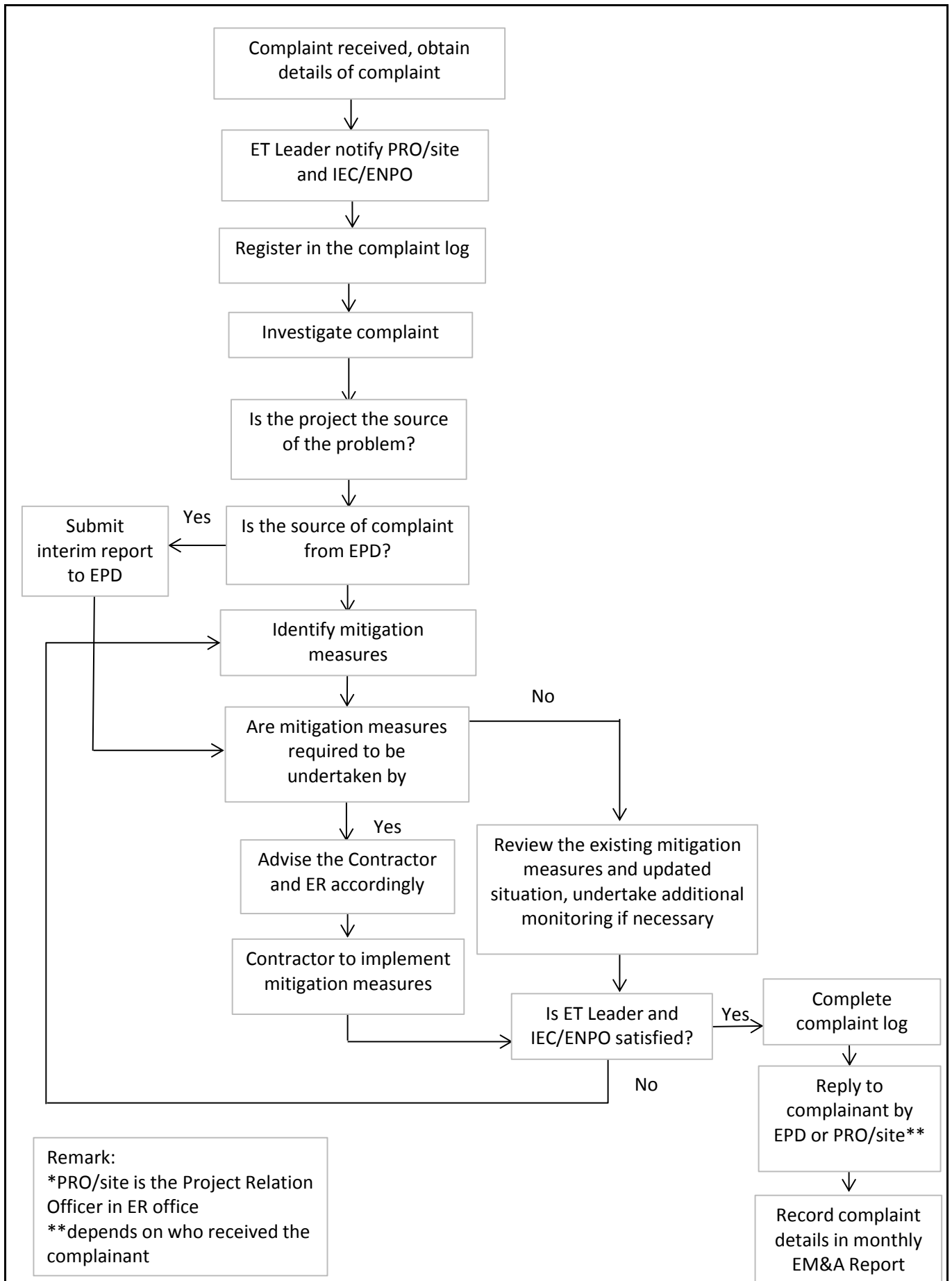


**Remarks:**

\*Transect 10 is now 3.6km in length due to the HKBCF construction site.

^Coordinates for transect lines 1, 2, 7, 8, 9 and 11 have been updated in respect to the Proposal for Alteration of Transect Line for Dolphin Monitoring approved by EPD on 19 August 2015. The total transect length for both NEL and NWL combined is 108km.

This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

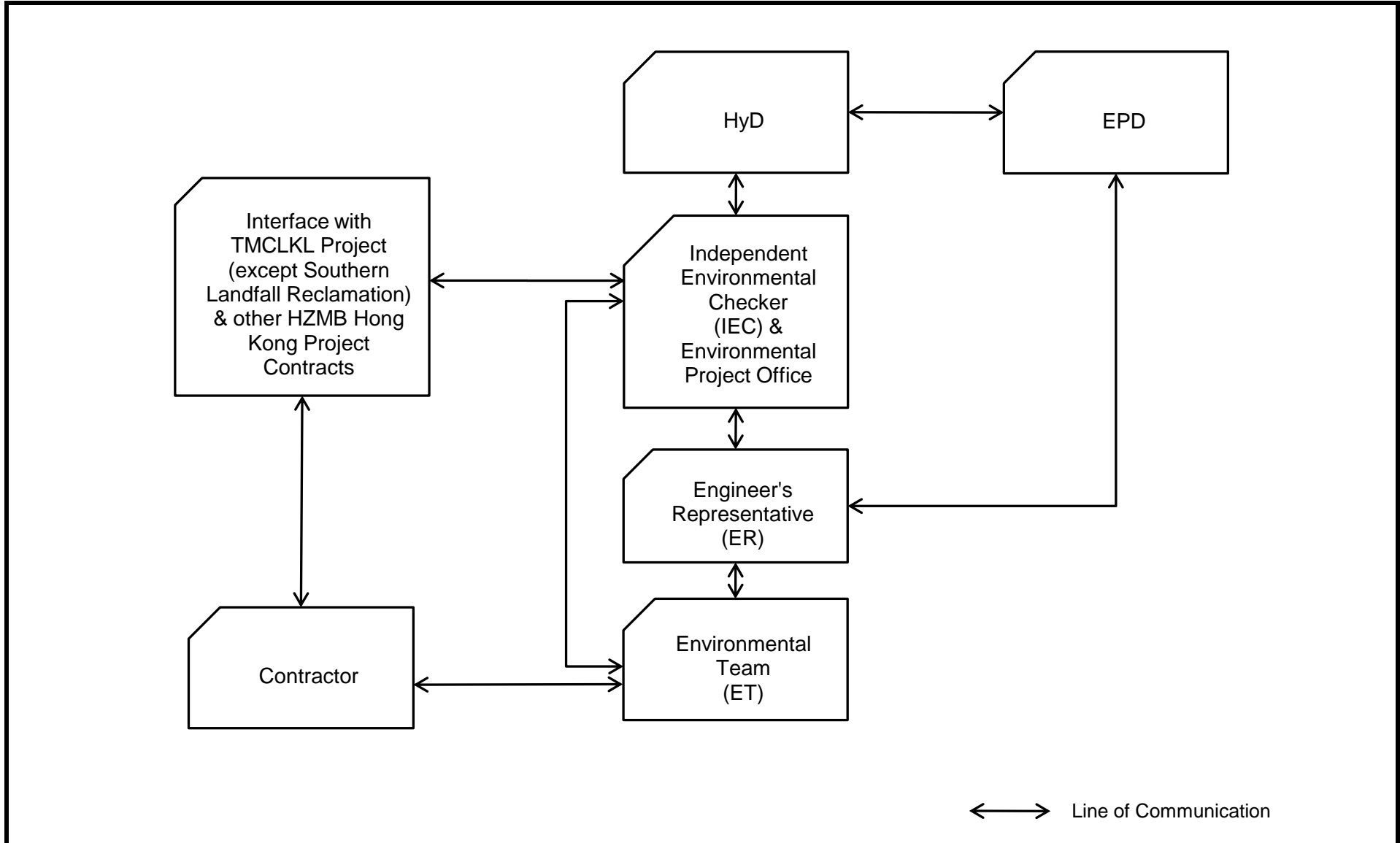


Environmental Complaint Handling Procedure

Project No.: 60249820

Date: July 2012

Figure 5



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.

Activity ID	Activity Name	Original Duration	Start	Finish	2015			
					Jun 43	Jul 44	Aug 45	Sep 46
<b>HKBCF DWP Ver.7 Revised Updated on 21October2015 Final</b>		1745	21-May-12 A	28-Feb-17				
SURB3-005	PB Main Area East-N Removal DCM material	14	01-Jun-15 A	14-Jun-15 A				
<b>Contract Key Dates</b>		5	21-Jul-15 A	27-Jul-15 A				
<b>Key Dates for achievement of Stages and completion of Sections</b>		5	21-Jul-15 A	27-Jul-15 A				
G1060	KD-04C1 Completion of Section A Main Area AC1 CLP Substation 15Jul2014 SA3	0		27-Jul-15 A				
G1080	KD-06C4TM, Completion of Section BC4TM Main Area East-S 12Sep2014 SA4	0		21-Jul-15 A				
<b>Work Zone, as defined in PS Clause 1.03(6)</b>		515	19-Oct-14 A	16-Mar-16				
<b>Portion A, B, C &amp; E</b>		515	19-Oct-14 A	16-Mar-16				
<b>Portion A, B, C &amp; E</b>		515	19-Oct-14 A	16-Mar-16				
<b>Seawall</b>		237	28-Apr-15 A	03-Sep-15 A				
<b>Cellular Structures</b>		93	30-May-15 A	31-Aug-15 A				
<b>Cellular Main Cells 85cells</b>		2	30-Jun-15 A	02-Jul-15 A				
<b>Full Guide Frames Method 85cells</b>		2	30-Jun-15 A	02-Jul-15 A				
<b>Portion E1 C078 &amp; C079 &amp; Portion E2 C065 &amp; C066 4cells</b>		2	30-Jun-15 A	02-Jul-15 A				
CSE1-040-01	PE1 C078 Sand Fill to Top	2	01-Jul-15 A	02-Jul-15 A				
CSE1-040-11	PE1 C079 Sand Fill to Top	1	30-Jun-15 A	30-Jun-15 A				
<b>Connecting Arcs</b>		33	30-May-15 A	02-Jul-15 A				
<b>Portion E1 between C077/078 to C079/080 3nrs</b>		33	30-May-15 A	02-Jul-15 A				
<b>C077/078</b>		1	01-Jul-15 A	02-Jul-15 A				
CAE1-2110	PE1 C077/078 Sand Fill to Top	2	01-Jul-15 A	02-Jul-15 A				
<b>C078/079</b>		26	03-Jun-15 A	29-Jun-15 A				
CAE1-4060	PE1 C078/079 - Land Side Arc Sheetpile Assembly	12	03-Jun-15 A	14-Jun-15 A				
CAE1-4065	PE1 C078/079 - Machine Repair	8	10-Jun-15 A	17-Jun-15 A				
CAE1-4070	PE1 C078/079 - Land Side Arc Sheetpile Drivening	4	15-Jun-15 A	18-Jun-15 A				
CAE1-4080	PE1 C078/079 - Removal of Guide Frame	1	24-Jun-15 A	24-Jun-15 A				
CAE1-4090	PE1 C078/079 - Removal of Temp Piles	2	26-Jun-15 A	27-Jun-15 A				
CAE1-4100	PE1 C078/079 - Backfill	2	28-Jun-15 A	29-Jun-15 A				
<b>C079/080</b>		32	30-May-15 A	01-Jul-15 A				
CAE1-3070	PE1 C079/080 - Land Side Arc Sheetpile Drivening	4	30-May-15 A	02-Jun-15 A				
CAE1-3080	PE1 C079/080 - Removal of Guide Frame	1	25-Jun-15 A	25-Jun-15 A				
CAE1-3090	PE1 C079/080 - Removal of Temp Piles	2	28-Jun-15 A	29-Jun-15 A				
CAE1-3100	PE1 C079/080 - Backfill	2	30-Jun-15 A	01-Jul-15 A				
<b>Capping Beams</b>		73	18-Jun-15 A	31-Aug-15 A				
<b>Portion E1 between C090 to C074 Capping Beams</b>		73	18-Jun-15 A	31-Aug-15 A				
CAE1-027	PE1 Completion of Drivening Connecting Arcs C077/C078, C078/C079 & C079/C080 on 18Jur	0		18-Jun-15 A				
CBE1-020	PE1 Capping Beams structure C080 to C077 4cells 10days/cell	36	24-Jul-15 A	31-Aug-15 A				
<b>Conforming Sloping Seawalls</b>		204	28-Apr-15 A	03-Sep-15 A				
<b>Geotextile</b>		26	02-Jul-15 A	28-Jul-15 A				
<b>Seawall Portion E1 at C068 - C090 23cells</b>		26	02-Jul-15 A	28-Jul-15 A				
SGE1-014	PE1 Formation Level at C079 - C078 2cells 20,000m3	19	02-Jul-15 A	20-Jul-15 A				

- Remaining Level of Effort
- Critical Remaining Work
- Actual Level of Effort
- Milestone
- Actual Work
- Summary
- Remaining Work



Activity ID	Activity Name	Original Duration	Start	Finish	2015			
					Jun 43	Jul 44	Aug 45	Sep 46
SGE1-020	PE1 Geotextile at C079 - C078 2cells	7	21-Jul-15 A	28-Jul-15 A				
<b>Rockfill</b>								
<b>Seawall Portion E1 at C068 - C090 23cells</b>								
RFE1-040	PE1 10-60kg Underlayer 5,650m3	6	29-Jul-15 A	03-Sep-15 A				
RFE1-050	PE1 10-60kg Echo	5	05-Aug-15 A	10-Aug-15 A				
RFE1-060	PE1 10-60kg Trimming and Acceptance	5	11-Aug-15 A	15-Aug-15 A				
RFE1-070	PE1 Type2 Rockfill upto -6mPD 8,849m3	16	16-Aug-15 A	03-Sep-15 A				
RFE1-080	PE1 Type1 Rockfill upto -6mPD 6,632m3	16	17-Aug-15 A	03-Sep-15 A				
<b>Rock Armour</b>								
<b>Portion B At K040 - K048 (Ch1600 - Ch1990)</b>								
RFB2-040	PB at K040 - K048 in front of cells Removal of temporary rockfill 3.5m/day	54	28-Apr-15 A	21-Jul-15 A				
RFB2-060	PB at K040 - K048 in front of cells Rock Armour 1-3ton 11,802m3 141m3/day	54	08-May-15 A	31-Jul-15 A				
<b>Reclamation</b>								
<b>Marine Fill</b>								
<b>Land Portion E1</b>								
MFE1-005	PE1 Marine Sand Fill upto -8.0mPD 51,373m3	17	01-Jul-15 A	20-Jul-15 A				
<b>Earthwork Fill</b>								
<b>Land Portion C2a</b>								
EFC2a-051	PC2a Edge Area C108-C112 Remedial works by additional band drains (outstanding 1,659nrs i	85	23-Mar-15 A	04-Jul-15 A				
EFC2a-052	PC2a Edge Area C108-C112 Install Instrumentation 2points	30	01-Jun-15 A	04-Jul-15 A				
EFC2a-055	PC2a Edge Area NorthWest Earthwork Fill Type D Sand 100% stg2 50,077m3 10,000m/day b	6	16-Jun-15 A	22-Jun-15 A				
<b>Land Portion C2b</b>								
EFC2b-010	PC2b Earthwork Fill Type B public w compaction upto +5.5mPD 168,546m3 5,000m3/day	193	31-Dec-14 A	30-Jul-15 A				
<b>Land Portion C2c</b>								
EFC2c-010	PC2c Earthwork Fill Type B public w compaction upto +5.5mPD 276,853m3 5,000m3/day	241	31-Dec-14 A	20-Sep-15 A				
<b>Surcharge</b>								
<b>Portion A Surcharge</b>								
<b>Main Reclamation Areas</b>								
<b>Area of CLP substation</b>								
SUEA2-0075	PA CLP Issue of Surcharge Removal by RE on 21Jul2015	0	21-Jul-15 A	21-Jul-15 A				
SUEA2-0080	PA CLP Substation Sand Surcharge Removal on Main Area 60,410m3 10,000m3/day	6	21-Jul-15 A	27-Jul-15 A				
SUEA2-0090	Completion of CLP Substation	0	21-Jul-15 A	27-Jul-15 A				
<b>Edge Area From SOL offset within 180m to 50m</b>								
<b>CH5+110 to 5+440 Portion A North</b>								
<b>Area of 50m to 120 from Offset</b>								
SUEA1-2090	PA North 120m-50m from Offset Surcharge Period +11.5mPD 8mths (24Aug2015)	240	28-Dec-14 A	24-Aug-15 A				
<b>Area of 0 to 50m from Offset</b>								
SUEA1-2180	PA North 50m-10m Surcharge Period +7.0mPD 8mths (15Jun2015)	240	19-Oct-14 A	15-Jun-15 A				
<b>CH5+440 to 5+650 Portion A South</b>								
<b>Area of 40m - 120m from Offset (other CLP area)</b>								
<b>Upto +11.5mPD Area</b>								
SUEA3-0070	PA South Surcharge Period +11.5mPD 8mths (8 Nov2015)	240	14-Mar-15 A	08-Nov-15 A				
<b>Area of 10m - 40m from Offset (other CLP area)</b>								

█ Remaining Level of Effort    █ Critical Remaining Work  
█ Actual Level of Effort    ◆ Milestone  
█ Actual Work    ▶ Summary  
█ Remaining Work

Activity ID	Activity Name	Original Duration	Start	Finish	2015				
					Jun 43	Jul 44	Aug 45	Sep 46	
SUEA4-0070	PA South 40m-10m Surcharge Period 8mths (12Jul2015)	240	15-Nov-14 A	12-Jul-15 A					
<b>Land Portion B</b>					463	11-Nov-14 A	16-Feb-16		
<b>Edge Areas</b>					241	11-Mar-15 A	06-Nov-15		
<b>at K013 - K027</b>					96	27-May-15 A	31-Aug-15 A		
SUEB0-010	PB Edge Area K013-K027 Sand Surcharge upto 6.5mPD 41,766m3 10,000m3/day	23	27-May-15 A	22-Jun-15 A					
SUEB0-012	PB Edge Area K013-K027 Sand Surcharge Checking at +6.5mPD	60	23-Jun-15 A	21-Aug-15 A					
SUEB0-014	PB Edge Area K013-K027 Sand Surcharge upto 7.5mPD 41,766m3 5,000m3/day	8	22-Aug-15 A	31-Aug-15 A					
<b>at K028 - K035</b>					134	16-May-15 A	26-Sep-15 A		
SUEB0-070	PB Edge Area K028-K035 Surcharge Period +8.5mPD 4.5mths	134	16-May-15 A	26-Sep-15 A					
<b>at K036 - K039</b>					180	11-May-15 A	06-Nov-15		
SUEB0-062	PB Edge Area K036-K039 Sand Surcharge upto 8.5mPD 45,448m3 10,000m3/day	40	11-May-15 A	25-Jun-15 A					
SUEB0-125	PB Edge Area K036-K039 Surcharge Period +8.5mPD 4.5mths	134	26-Jun-15 A	06-Nov-15					
<b>at K047 - K052 (w Deep Cement Mixing)</b>					146	11-Mar-15 A	04-Aug-15 A		
DCM-2020	PB Edge Area K047-K052 Deep Cement Mixing 30m width - Installation 123,470m3	112	11-Mar-15 A	30-Jun-15 A					
DCM-2030	PB Edge Area K047-K052 Deep Cement Mixing 30m width - Hardening	31	01-Jul-15 A	31-Jul-15 A					
DCM-2040	PB Edge Area K047-K052 Filling up to +5.5mPD 35,000m3 10,000m3/day at DCM by Dump	3	01-Aug-15 A	04-Aug-15 A					
<b>Reclamation Areas</b>					463	11-Nov-14 A	16-Feb-16		
SURB0-045	PB Surcharge Removal Stage 1 issued by RE on 16Jun2015 (start 22Jun2015)	0	16-Jun-15 A						
SURB1-045	PB Surcharge Removal Stage 2 issued by RE on 31Jul2015 (start 01Aug2015)	0	31-Jul-15 A						
SURB2-045	PB Surcharge Removal Stage 3 issued by RE on 19Aug2015 (start 19Aug2015)	0	19-Aug-15 A						
<b>at East of Main Area</b>					34	15-Jun-15 A	20-Jul-15 A		
SURB0-044	PB Main Area East Sand Surcharge Removal instructed by RE	0		15-Jun-15 A					
SURB0-050	PB Main Area East Sand Surcharge Removal 211,956m3 10,000m3/day	27	22-Jun-15 A	20-Jul-15 A					
<b>at West of Main Area stg1</b>					69	19-Aug-15 A	31-Oct-15		
SURB1-040	PB Main Area West-S Sand Surcharge Removal 291,223m3 10,000m3/day	69	19-Aug-15 A	31-Oct-15					
<b>at West of Main Area stg2</b>					355	11-Nov-14 A	31-Oct-15		
SURB2-030	PB Main Area West-N Sand Surcharge Period +11.5mPD (10Jun2015 after 7mths)	212	11-Nov-14 A	10-Jun-15 A					
SURB2-035	PB Main Area West-N Sand Surcharge Stage 2 Removal instructed by RE on 31Jul2015	0	31-Jul-15 A						
SURB2-040	PB Main Area West-N Sand Surcharge Removal 335,714m3 10,000m3/day	86	01-Aug-15 A	31-Oct-15					
<b>at North- East of Main Area</b>					247	15-Jun-15 A	16-Feb-16		
SURB3-010	PB Main Area East-N Sand Surcharge upto +8.5mPD 29,149m3 14,000m3/day	14	15-Jun-15 A	30-Jun-15 A					
SURB3-020	PB Main Area East-N Sand Surcharge upto +11.5mPD 75,499m3 14,000m3/day	18	01-Jul-15 A	21-Jul-15 A					
SURB3-030	PB Main Area East-N Sand Surcharge Period +11.5mPD 7mths	210	22-Jul-15 A	16-Feb-16					
<b>Land Portion C2a</b>					204	30-May-15 A	19-Dec-15		
<b>Edge Areas</b>					204	30-May-15 A	19-Dec-15		
<b>Deep Cement Mixing Works at C101 - C103</b>					71	30-May-15 A	09-Aug-15 A		
DCM-3020	PC2a Edge Area C101-C103 43m width x 128.5m Length Installation 753nrs 18nrs/day	43	30-May-15 A	11-Jul-15 A					
DCM-3030	PC2a Edge Area C101-C103 Hardening & Pause Period	30	11-Jul-15 A	09-Aug-15 A					
<b>Option - Deep Cement Mixing Works at C104 - C109</b>					115	27-Aug-15 A	19-Dec-15		
DCM-4120	PC2a Edge Area C104-C109 Instruction by RE	0	27-Aug-15 A						
DCM-4130	PC2a Edge Area C104-C109 43m width x 260m Installation 2,235nrs (Outstanding 1,175nrs, 2	115	27-Aug-15 A	19-Dec-15					
<b>at C110 - C112 Cellular Seawall</b>					29	23-Jun-15 A	22-Jul-15 A		

█ Remaining Level of Effort    █ Critical Remaining Work  
█ Actual Level of Effort    ◆ Milestone  
█ Actual Work    ▶ Summary  
█ Remaining Work

Activity ID	Activity Name	Original Duration	Start	Finish	2015			
					Jun 43	Jul 44	Aug 45	Sep 46
SUEC2a-005	PC2a Edge Area C110-C112 Sand Surcharge Period +5.5mPD 1mth	30	23-Jun-15 A	22-Jul-15 A				
<b>CH4+710 - CH5+110 Rubble Mound Seawall</b>		19	12-Aug-15 A	31-Aug-15 A				
<b>10-73m</b>		17	14-Aug-15 A	31-Aug-15 A				
SUEC2a-1030	PC2a C113-C117 10m-73m Surcharge Sand upto 6.5mPD 8,914m3 5,000m3/day by Dump Tr	2	14-Aug-15 A	15-Aug-15 A				
SUEC2a-1034	PC2a C113-C117 10m-73m Checking Strength at +6.5mPD	7	16-Aug-15 A	22-Aug-15 A				
SUEC2a-1036	PC2a C113-C117 10m-73m Surcharge Sand upto 7.5mPD 8,914m3 5,000m3/day by Dump Tr	5	26-Aug-15 A	31-Aug-15 A				
<b>73-120m</b>		11	12-Aug-15 A	25-Aug-15 A				
SUEC2a-2022	PC2a C113-C117 73m-120m Surcharge Sand upto 6.5mPD 5,672m3 5,000m3/day by Dump T	2	12-Aug-15 A	13-Aug-15 A				
SUEC2a-2026	PC2a C113-C117 73m-120m Surcharge Sand upto 7.5mPD 5,672m3 5,000m3/day by Dump T	2	24-Aug-15 A	25-Aug-15 A				
<b>Reclamation Areas</b>		17	19-Aug-15 A	05-Sep-15 A				
<b>C2aC2</b>		17	19-Aug-15 A	05-Sep-15 A				
SURC2aC2-01	PC2a C2aC2 Sand Surcharge Laying 8.5mPD to 9.5mPD 30000m3 5,000m3/day	4	19-Aug-15 A	22-Aug-15 A				
SURC2aC2-02	PC2a C2aC2 Stability Checking at 9.5mPD	7	23-Aug-15 A	29-Aug-15 A				
SURC2aC2-03	PC2a C2aC2 Sand Surcharge Laying 9.5mPD to 10.5mPD 30000m3 5,000m3/day	6	31-Aug-15 A	05-Sep-15 A				
<b>Land Portion C1a</b>		427	15-Jan-15 A	16-Mar-16				
<b>Reclamation Areas</b>		427	15-Jan-15 A	16-Mar-16				
<b>C3</b>		243	15-Jan-15 A	15-Sep-15 A				
SURC1a-020	PC1a Main Area East Sand Surcharge Period as +11.5mPD 7mths	213	15-Jan-15 A	15-Aug-15 A				
SURC1a-022	PC1a Main Area West Sand Surcharge Period as +11.5mPD 8mths	244	15-Jan-15 A	15-Sep-15 A				
<b>C4</b>		268	23-Jun-15 A	16-Mar-16				
SURC1a-100	PC1a South Land Area Sand Surcharge up to 6.5mPD 7,000m3 5,000m3/day by Dump Trucks	4	23-Jun-15 A	26-Jun-15 A				
SURC1a-110	PC1a South Land Area Sand Surcharge up to 7.5mPD 7,000m3 5,000m3/day by Dump Trucks	3	27-Jun-15 A	30-Jun-15 A				
SURC1a-120	PC1a South Land Area Sand Surcharge up to 8.5mPD 6,000m3 5,000m3/day by Dump Trucks	5	01-Jul-15 A	06-Jul-15 A				
SURC1a-130	PC1a South Land Area Sand Surcharge up to 11.5mPD 20,000m3 5,000m3/day by Dump Tru	12	07-Jul-15 A	20-Jul-15 A				
SURC1a-140	PC1a South East Land Area Sand Surcharge Period at +11.5mPD 7mths (15Feb2016)	210	21-Jul-15 A	15-Feb-16				
SURC1a-150	PC1a South West Land Area Sand Surcharge Period at +11.5mPD 8mths (16Mar2016)	240	21-Jul-15 A	16-Mar-16				
<b>Land Portion C1b</b>		416	22-Jan-15 A	12-Mar-16				
<b>Reclamation Areas</b>		416	22-Jan-15 A	12-Mar-16				
<b>West (1/4 Areas)</b>		217	22-Jan-15 A	27-Aug-15 A				
SURC1b-020	PC1b West Sand Surcharge Period +11.5mPD 7mths	218	22-Jan-15 A	27-Aug-15 A				
<b>East (3/4 Areas)</b>		236	01-Feb-15 A	24-Sep-15 A				
SURC1b-050	PC1b East Sand Surcharge Period +11.5mPD 7mths	236	01-Feb-15 A	24-Sep-15 A				
<b>North Side close to Portion C2b</b>		260	27-Jun-15 A	12-Mar-16				
SURC1b-1010	PC1b Main Area Sand Surcharge Laying upto 8.5mPD 30,000m3 5,000m3/day by Dump Trucl	31	27-Jun-15 A	02-Aug-15 A				
SURC1b-1020	PC1b Main Area Sand Surcharge Laying upto 11.5mPD 30,000m3 5,000m3/day by Dump Tru	12	03-Aug-15 A	15-Aug-15 A				
SURC1b-1030	PC1b Main Area Sand Surcharge Period as +11.5mPD 7mths	210	16-Aug-15 A	12-Mar-16				
<b>North Side close to Portion C2c</b>		25	01-Aug-15 A	31-Aug-15 A				
SURC1b-1060	PC1b Main Area Sand Surcharge Laying upto 8.5mPD 42,351m3 5,000m3/day by Dump Trucl	13	01-Aug-15 A	15-Aug-15 A				
SURC1b-1070	PC1b Main Area Sand Surcharge Laying upto 11.5mPD 42,351m3 5,000m3/day by Dump Tru	18	11-Aug-15 A	31-Aug-15 A				
<b>Land Portion E2</b>		351	29-Mar-15 A	13-Mar-16				
<b>North Part</b>		209	29-Mar-15 A	23-Oct-15				
<b>Edge Areas - North, Land Area &amp; Edge Area C064-C067</b>		137	03-May-15 A	17-Sep-15 A				

█ Remaining Level of Effort    █ Critical Remaining Work  
█ Actual Level of Effort    ◆ Milestone  
█ Actual Work    ▶ Summary  
█ Remaining Work

Activity ID	Activity Name	Original Duration	Start	Finish	2015			
					Jun 43	Jul 44	Aug 45	Sep 46
SUEE2-110	PE2 North & East Edge C064-C067 Sand Surcharge Period at +5.5mPD Testing	138	03-May-15 A	17-Sep-15 A				
SUEE2-115	PE2 North & East Edge C064-C067 Remedial Works by Additional Band Drains	138	03-May-15 A	17-Sep-15 A				
<b>Land Areas - East (TM) C057 - C063 Ch2+300 to Ch2+600</b>								
SURE2-050	PE2 Land C057-C063 Tunnel Sand Surcharge Period as +11.5mPD at tunnel area 7mths	209	29-Mar-15 A	23-Oct-15				
<b>South Part</b>								
<b>Edge Areas East C056 to C063</b>								
SUEE2-020	PE2 Edge C057-C063 Sand Surcharge Period as +8.5mPD 4.5mths	135	31-May-15 A	12-Oct-15 A				
<b>Land Areas</b>								
<b>300m to 100m Zone</b>								
SURE2-510	PE2 Land C052-C056 300m Zone Sand Surcharge Laying upto 8.5mPD stg2 122,640m3 10,0	13	21-Aug-15 A	04-Sep-15 A				
<b>Out of K052 300m</b>								
SURE2-018	PE2 Land C052-C060 Non-Tunnel Sand Surcharge Laying upto 11.5mPD 120,758m3 14,000m	66	01-Jun-15 A	15-Aug-15 A				
SURE2-020	PE2 Land C052-C060 Non-Tunnel Sand Surcharge Period as +11.5mPD 7mths	211	16-Aug-15 A	13-Mar-16				
<b>Land Portion C2b</b>								
<b>Edge Areas</b>								
SUEC2b-040	PC2b Edge Area CPT Test & Instrumentation Installation at +5.5mPD	82	01-Aug-15 A	21-Oct-15				
<b>Reclamation Areas</b>								
<b>North</b>								
SURC2b-011	PC2b Main Area North PBF Surcharge w compaction upto 8.5mPD 62,964m3 5,000m3/day	67	31-Jul-15 A	10-Oct-15 A				
<b>South</b>								
SURC2b-010	PC2b Main Area South PBF Surcharge w compaction upto 8.5mPD 188,893m3 5,000m3/day	28	01-Jul-15 A	30-Jul-15 A				
SURC2b-012	PC2b Main Area South PBF Surcharge Laying upto 11.5mPD 128,842m3 10,000m3/day by D	36	01-Aug-15 A	11-Sep-15 A				
<b>Portion D</b>								
<b>Submission</b>								
<b>Design Submission</b>								
<b>Structural Analysis for Culverts C1 - C4 w Precast Method</b>								
PD-DGN-05010	Structural analysis for Box Culverts C1 - C4 with Precast Method	0	21-Aug-15 A	21-Aug-15 A				
<b>Drainage Impact Assessment &amp; Temporary Diversion (stg2 - for construction of box culvert EC1)</b>								
PD-DGN-07010	Drainage Impact Assessment and Temporary Diversion (Stage 2 - for construction of box culvert)	0	19-Jun-15 A	19-Jun-15 A				
<b>Settlement Assessment for Box Culvert EC1</b>								
PD-DGN-08010	Settlement Assessment for Box culvert EC1 Submission 1st	0	21-Aug-15 A	21-Aug-15 A				
<b>Detailed General Arrangement &amp; RC drawings for C1 to C4 w Precast Method</b>								
PD-DGN-10010	Detailed General Arrangement and RC drawings for Box culverts C1 to C4 with Precast Method	0	21-Aug-15 A	21-Aug-15 A				
<b>Precast Yard for Seawall Blocks &amp; Culverts</b>								
<b>Site Construction</b>								
<b>Surcharge</b>								
<b>West1 Portion</b>								
A1930	PD West1 - Surcharge Removal 60,000m3 5,000m3/day	25	10-May-15 A	03-Jun-15 A				
<b>West2 Portion</b>								
A2230	PD West2 - Surcharge Removal 60,000m3 5,000m3/day	14	05-Jul-15 A	19-Jul-15 A				
<b>East1 Portion</b>								
A1705	PD East1 - Surcharge Removal 60,000m3 5,000m3/day	20	19-Jun-15 A	08-Jul-15 A				

- █ Remaining Level of Effort
- █ Critical Remaining Work
- █ Actual Level of Effort
- █ Actual Work
- █ Remaining Work
- ◆ Milestone
- ▬ Summary

Activity ID	Activity Name	Original Duration	Start	Finish	2015			
					Jun 43	Jul 44	Aug 45	Sep 46
<b>East2 Portion</b>					220			
A2260	PD East2 - Surcharge Period +11.5mPD 6mths	180	28-Dec-14 A	05-Aug-15 A	[Gantt bar]			
A2265	PD East2 - Advanced 7days notice to remove surcharge Zone3 issued by RE 26Jun2015	0	28-Dec-14 A	25-Jun-15 A	[Gantt bar]			
A2270	PD East2 - Surcharge Removal 60,000m3 5,000m3/day	28	09-Jul-15 A	05-Aug-15 A	[Gantt bar]			
<b>C1 to C4</b>					155			
<b>Removal of Temporary Seawall</b>					79			
<b>Removal of North Temporary Seawall</b>					79			
PD-V2-0010	PD C1 - Removal of Temporary Seawall blocks West1 CH6+136 to 6+000 400nrs	12	21-Jun-15 A	02-Jul-15 A	[Gantt bar]			
PD-V2-0015	PD C2 - Removal of Temporary Seawall blocks West2 CH6+000 to 5+893 400nrs	12	19-Jun-15 A	30-Jun-15 A	[Gantt bar]			
PD-V2-0020	PD C3 - Removal of Temporary Seawall blocks East1 CH5+893 to 5+800 400nrs	20	01-Jul-15 A	20-Jul-15 A	[Gantt bar]			
PD-V2-0025	PD C4 - Removal of North Temporary Seawall blocks East2 CH5+800 to 5+650 400nrs	12	06-Aug-15 A	17-Aug-15 A	[Gantt bar]			
PD-V2-0030	PD C1 - Removal of North Temporary Seawall West1 Ch6+136 to CH6+000	17	16-Jun-15 A	02-Jul-15 A	[Gantt bar]			
PD-V2-0035	PD C2 - Removal of North Temporary Seawall West2 Ch6+000 to CH5+900	17	03-Jul-15 A	19-Jul-15 A	[Gantt bar]			
PD-V2-0040	PD C3 - Removal of North Temporary Seawall East1 CH5+900 to CH5+800	17	21-Jul-15 A	06-Aug-15 A	[Gantt bar]			
PD-V2-0045	PD C4 - Removal of North Temporary Seawall East2 CH5+800 to CH5+650	17	18-Aug-15 A	03-Sep-15 A	[Gantt bar]			
<b>Installations of Precast Culverts except sloping outfalls</b>					155			
<b>Culvert C1</b>					155			
PD-C1-0005	PD C1 Pipe Piling Installation	23	08-Jun-15 A	30-Jun-15 A	[Gantt bar]			
PD-C1-0010	PD C1 Excavation 83,000m3 2,500m3/day	38	04-Jun-15 A	11-Jul-15 A	[Gantt bar]			
PD-C1-0020	PD C1 Leveling of Foundation 4,200m2 200m2/day	11	12-Jul-15 A	22-Jul-15 A	[Gantt bar]			
<b>C1-2</b>					38			
PD-C1-2-010	PD C1-2 Back & Delivery to site stg1	2	16-Jul-15 A	18-Jul-15 A	[Gantt bar]			
PD-C1-2-015	PD C1-2 Install the buoyancy Tank	3	19-Jul-15 A	22-Jul-15 A	[Gantt bar]			
PD-C1-2-020	PD C1-2 floating to the location	1	23-Jul-15 A	23-Jul-15 A	[Gantt bar]			
PD-C1-2-040	PD C1-2 Installation	1	23-Jul-15 A	23-Jul-15 A	[Gantt bar]			
PD-C1-2-050	PD C1-2 Removal of North Steel Bulkhead	4	24-Jul-15 A	28-Jul-15 A	[Gantt bar]			
PD-C1-2-100	PD C1-2 Backfill Beside of Culvert	3	21-Aug-15 A	23-Aug-15 A	[Gantt bar]			
PD-C1-2-110	PD C1-2 Backfill upto +3.5mPD except Manholes	2	24-Aug-15 A	25-Aug-15 A	[Gantt bar]			
<b>C1-3</b>					92			
PD-C1-3-010	PD C1-3 Back & Delivery to Site stg2	3	29-Jul-15 A	31-Jul-15 A	[Gantt bar]			
PD-C1-3-015	PD C1-3 Install the buoyancy Tank	2	01-Aug-15 A	02-Aug-15 A	[Gantt bar]			
PD-C1-3-020	PD C1-3 floating to the location	1	03-Aug-15 A	03-Aug-15 A	[Gantt bar]			
PD-C1-3-040	PD C1-3 Installation	1	03-Aug-15 A	03-Aug-15 A	[Gantt bar]			
PD-C1-3-050	PD C1-3 Removal of North Steel Bulkhead	4	04-Aug-15 A	08-Aug-15 A	[Gantt bar]			
PD-C1-3-060	PD C1-3 Removal of South Steel Bulkhead	4	12-Aug-15 A	16-Aug-15 A	[Gantt bar]			
PD-C1-3-080	PD C1-2/3 Movement Joint Installation	3	09-Aug-15 A	11-Aug-15 A	[Gantt bar]			
PD-C1-3-100	PD C1-3 Backfill Beside of Culvert	4	13-Aug-15 A	17-Aug-15 A	[Gantt bar]			
PD-C1-3-110	PD C1-3 Backfill upto +3.5mPD except Manholes	3	29-Aug-15 A	31-Aug-15 A	[Gantt bar]			
<b>C1-4</b>					90			
PD-C1-4-010	PD C1-4 Back & Delivery to Site stg3	4	05-Aug-15 A	07-Aug-15 A	[Gantt bar]			
PD-C1-4-015	PD C1-4 Install the buoyancy Tank	2	08-Aug-15 A	09-Aug-15 A	[Gantt bar]			

■ Remaining Level of Effort    ■ Critical Remaining Work  
■ Actual Level of Effort    ◆ Milestone  
■ Actual Work    ▶ Summary  
■ Remaining Work

Activity ID	Activity Name	Original Duration	Start	Finish	2015			
					Jun	Jul	Aug	Sep
					43	44	45	46
PD-C1-4-020	PD C1-4 floating to the location	1	10-Aug-15 A	10-Aug-15 A				
PD-C1-4-040	PD C1-4 Installation	1	10-Aug-15 A	10-Aug-15 A				
PD-C1-4-050	PD C1-4 Removal of North Steel Bulkhead	4	11-Aug-15 A	15-Aug-15 A				
PD-C1-4-060	PD C1-4 Removal of South Steel Bulkhead	4	19-Aug-15 A	23-Aug-15 A				
PD-C1-4-080	PD C1-3/4 Movement Joint Installation	3	16-Aug-15 A	18-Aug-15 A				
PD-C1-4-100	PD C1-4 Backfill Beside of Culvert	4	20-Aug-15 A	24-Aug-15 A				
<b>C1-5</b>		<b>87</b>	<b>13-Aug-15 A</b>	<b>03-Sep-15 A</b>				
PD-C1-5-010	PD C1-5 & C1-6 Back & Delivery to Site stg4	7	13-Aug-15 A	19-Aug-15 A				
PD-C1-5-015	PD C1-5 Install the buoyancy Tank	2	20-Aug-15 A	21-Aug-15 A				
PD-C1-5-020	PD C1-5 floating to the location	1	22-Aug-15 A	22-Aug-15 A				
PD-C1-5-040	PD C1-5 Installation	1	22-Aug-15 A	22-Aug-15 A				
PD-C1-5-050	PD C1-5 Removal of North Steel Bulkhead	2	23-Aug-15 A	25-Aug-15 A				
PD-C1-5-060	PD C1-5 Removal of South Steel Bulkhead	4	29-Aug-15 A	02-Sep-15 A				
PD-C1-5-080	PD C1-4/5 Movement Joint Installation	3	26-Aug-15 A	28-Aug-15 A				
PD-C1-5-100	PD C1-5 Backfill Beside of Culvert	4	30-Aug-15 A	03-Sep-15 A				
<b>C1-6</b>		<b>4</b>	<b>22-Aug-15 A</b>	<b>26-Aug-15 A</b>				
PD-C1-6-015	PD C1-6 Install the buoyancy Tank	2	22-Aug-15 A	23-Aug-15 A				
PD-C1-6-020	PD C1-6 floating to the location	1	25-Aug-15 A	25-Aug-15 A				
PD-C1-6-040	PD C1-6 Installation	1	26-Aug-15 A	26-Aug-15 A				
<b>Culvert C2</b>		<b>58</b>	<b>06-Jul-15 A</b>	<b>02-Sep-15 A</b>				
PD-C2-0010	PD C2 Excavation 73,000m3 2,500m3/day	34	06-Jul-15 A	08-Aug-15 A				
PD-C2-0020	PD C2 Leveling of Foundation	20	09-Aug-15 A	29-Aug-15 A				
<b>C2-2</b>		<b>7</b>	<b>26-Aug-15 A</b>	<b>02-Sep-15 A</b>				
PD-C2-2-010	PD C2-2 & C2-3 Back & Delivery to site stg5	8	26-Aug-15 A	02-Sep-15 A				
<b>Culvert C3</b>		<b>17</b>	<b>17-Aug-15 A</b>	<b>03-Sep-15 A</b>				
PD-C3-0010	PD C3 Excavation 68,000m3 2,500m3/day	18	17-Aug-15 A	03-Sep-15 A				
<b>Extension Culvert EC1 by one submerble barge</b>		<b>73</b>	<b>02-Aug-15 A</b>	<b>20-Oct-15 A</b>				
<b>Excavation &amp; Supporting</b>		<b>73</b>	<b>02-Aug-15 A</b>	<b>20-Oct-15 A</b>				
PD-EC1-0-010	PD EC1 Sheetpiles at EC1-6	74	02-Aug-15 A	20-Oct-15 A				
<b>Works Area WA2 (Tung Chung)</b>		<b>1434</b>	<b>21-May-12 A</b>	<b>28-Feb-17</b>				
<b>Zone A</b>		<b>1434</b>	<b>21-May-12 A</b>	<b>28-Feb-17</b>				
A1880	Maintenance of Engineer's Accommodation	1434	21-May-12 A	28-Feb-17				
<b>Works Area TKO Fill Bank</b>		<b>1254</b>	<b>25-Sep-12 A</b>	<b>30-Nov-16</b>				
WA-TKO-1040	Operate and Maintain Public Fill Sorting Facilities in Zone A, B1 & B2	1254	25-Sep-12 A	30-Nov-16				

■ Remaining Level of Effort    ■ Critical Remaining Work  
■ Actual Level of Effort    ◆ Milestone  
■ Actual Work    ▼ Summary  
■ Remaining Work

**Appendix C - Implementation Schedule of Environmental Mitigation Measures**

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
<b>Air Quality</b>				
S5.5.6.1 of HKBCFEIA	A1	The contractor shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation	All construction sites	V
S5.5.6.2 of HKBCFEIA and S4.8.1 of TKCLKLEIA	A2	Proper watering of exposed spoil should be undertaken throughout the construction phase: <ul style="list-style-type: none"> <li>• Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;</li> <li>• Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;</li> <li>• A stockpile of dusty material should not be extend beyond the pedestrian barriers, fencing or traffic cones.</li> <li>• Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;</li> <li>• When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary</li> </ul>	All construction sites	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<p>with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;</p> <ul style="list-style-type: none"> <li>• The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;</li> <li>• Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;</li> <li>• Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;</li> <li>• Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;</li> <li>• Any skip hoist for material transport should be totally enclosed by impervious sheeting;</li> <li>• Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides;</li> <li>• Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an</li> </ul>		



EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<p>audible high level alarm which is interlocked with the material filling line and no overfilling is allowed;</p> <ul style="list-style-type: none"> <li>• All unpaved roads/exposed area shall be watered which results in dust suppression by forming moist cohesive films among the discrete grains of road surface material.</li> <li>• No burning of debris or other materials on the works areas is allowed;</li> <li>• Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created;</li> <li>• Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading;</li> <li>• During transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards;</li> <li>• Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system; and</li> <li>• Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable</li> </ul>		

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.		
S5.5.6.3 of HKBCFEIA and S4.8.1 of TKCLKLEIA	A3	The Contractor should undertake proper watering on all exposed spoil and associated work areas (with at least 8 times per day) throughout the construction phase.	All construction sites	V
S5.5.6.4 of HKBCFEIA and S4.11 of TKCLKLEIA	A4	Implement regular dust monitoring under EM&A programme during the construction stage.	Selected representative dust monitoring station	V
S5.5.7.1 of HKBCFEIA	A5	The following mitigation measures should be adopted to prevent fugitive dust emissions for concrete batching plant: <ul style="list-style-type: none"> <li>• Loading, unloading, handling, transfer or storage of any dusty materials should be carried out in totally enclosed system;</li> <li>• All dust-laden air or waste gas generated by the process operations should be properly extracted and vented to fabric filtering system to meet the emission limits for TSP;</li> <li>• Vents for all silos and cement/ pulverised fuel ash (PFA) weighing scale should be fitted with fabric filtering system;</li> <li>• The materials which may generate airborne dusty emissions should be wetted by water spray system;</li> </ul>	All construction sites	N/A

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<ul style="list-style-type: none"> <li>• All receiving hoppers should be enclosed on three sides up to 3m above unloading point;</li> <li>• All conveyor transfer points should be totally enclosed;</li> <li>• All access and route roads within the premises should be paved and wetted; and</li> <li>• Vehicle cleaning facilities should be provided and used by all concrete trucks before leaving the premises to wash off any dust on the wheels and/or body.</li> </ul>		
S5.5.2.7 of HKBCFEIA	A6	The following mitigation measures should be adopted to prevent fugitive dust emissions at barging point: <ul style="list-style-type: none"> <li>• All road surface within the barging facilities will be paved;</li> <li>• Dust enclosures will be provided for the loading ramp;</li> <li>• Vehicles will be required to pass through designated wheels wash facilities; and</li> <li>• Continuous water spray at the loading points.</li> </ul>	All construction sites	N/A (Construction in process)
<b>Construction Noise (Air borne)</b>				
S6.4.10 of HKBCFEIA	N1	Use of good site practices to limit noise emissions by considering the following: <ul style="list-style-type: none"> <li>• only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;</li> <li>• machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;</li> <li>• plant known to emit noise strongly in one direction, where possible, be orientated</li> </ul>	All construction sites	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		so that the noise is directed away from nearby NSRs; <ul style="list-style-type: none"> <li>• silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;</li> <li>• mobile plant should be sited as far away from NSRs as possible and practicable;</li> <li>• material stockpiles, mobile container site officer and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.</li> </ul>		
S6.4.11 of HKBCFEIA	N2	Install temporary hoarding located on the site boundaries between noisy construction activities and NSRs. The conditions of the hoardings shall be properly maintained throughout the construction period.	All construction sites	V
S6.4.12 of HKBCFEIA	N3	Install movable noise barriers (typically density @14kg/m <sup>2</sup> ), acoustic mat or full enclosure close to noisy plants including air compressor, generators, saw.	For plant items listed in Appendix 6D of the EIA report at all construction sites	N/A
S6.4.13 of HKBCFEIA	N4	Select “Quiet plants” which comply with the BS 5228 Part 1 or TM standards.	For plant items listed in Appendix 6D of the EIA report at all construction sites	V
S6.4.14 of HKBCFEIA	N5	Sequencing operation of construction plants where practicable.	All construction sites where practicable	V
S5.1 of	N6	Implement a noise monitoring under EM&A programme.	Selected	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
TMCLKLEIA			representative noise monitoring station	
<b>Waste Management (Construction Waste)</b>				
S12.6 of TMCLKLEIA	WM1	The Contractor shall identify a coordinator for the management of waste.	All construction sites	V
S12.6 of TMCLKLEIA	WM2	The Contractor shall apply for and obtain the appropriate licenses for the disposal of public fill, chemical waste and effluent discharges.	All construction sites	V
S12.6 of TMCLKLEIA	WM3	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All construction sites	V
S8.3.8 of HKBCFEIA and S12.6 of TMCLKLEIA	WM4	<p><u>Construction and Demolition Material</u></p> <p>The following mitigation measures should be implemented in handling the waste:</p> <ul style="list-style-type: none"> <li>• Maintain temporary stockpiles and reuse excavated fill material for backfilling and reinstatement;</li> <li>• Carry out on-site sorting;</li> <li>• Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate;</li> <li>• Adopt ‘Selective Demolition’ technique to demolish the existing structures and facilities with a view to recovering broken concrete effectively for recycling purpose, where possible;</li> </ul>	All construction sites	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<ul style="list-style-type: none"> <li>• Implement a trip-ticket system for each works contract to ensure that the disposal of C&amp;D materials are properly documented and verified;</li> <li>• Implement an enhanced Waste Management Plan similar to ETWBTC (Works) No. 19/2005 – “Environmental Management on Construction Sites” to encourage on-site sorting of C&amp;D materials and to minimize their generation during the course of construction;</li> <li>• In addition, disposal of the C&amp;D materials onto any sensitive locations such as agricultural lands, etc. should be avoided. The Contractor shall propose the final disposal sites to the Project Proponent and get its approval before implementation; and</li> <li>• The surplus surcharge should be transferred to a fill bank.</li> </ul>		
S8.3.9- S8.3.11 of HKBCFEIA and S12.6 of TMCLKLEIA	WM5	<p><u>C&amp;D Waste</u></p> <ul style="list-style-type: none"> <li>• Standard formwork or pre-fabrication should be used as far as practicable in order to minimise the arising of C&amp;D materials. The use of more durable formwork or plastic facing for the construction works should be considered. Use of wooden hoardings should not be used, as in other projects. Metal hoarding and falsework should be used to enhance the possibility of recycling. The purchasing of construction materials will be carefully planned in order to avoid over ordering and wastage.</li> <li>• The Contractor should recycle as much of the C&amp;D materials as possible on-site. Public fill and C&amp;D waste should be segregated and stored in different containers</li> </ul>	All construction sites	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<p>or skips to enhance reuse or recycling of materials and their proper disposal. Where practicable, concrete and masonry can be crushed and used as fill. Steel reinforcement bar can be used by scrap steel mills. Different areas of the sites should be considered for such segregation and storage.</p>		
<p>S8.2.12- S8.3.15 of HKBCFEIA and S12.6 of TMCLKLEIA</p>	<p>WM6</p>	<p><u>Chemical Waste</u></p> <ul style="list-style-type: none"> <li>• Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handled in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.</li> <li>• Containers used for the storage of chemical wastes should be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed; have a capacity of less than 450 liters unless the specification has been approved by the EPD; and display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the regulation.</li> <li>• The storage area for chemical wastes should be clearly labelled and used solely for the storage of chemical waste; enclosed on at least 3 sides; have an impermeable floor and bunding of sufficient capacity to accommodate 110% of the volume of the largest container or 20 % of the total volume of waste stored in that area, whichever is the greatest; have adequate ventilation; covered to prevent rainfall entering; and arranged so that incompatible materials are adequately separated.</li> <li>• Disposal of chemical waste should be via a licensed waste collector; be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Centre</li> </ul>	<p>All construction sites</p>	<p>V</p>

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		which also offers a chemical waste collection service and can supply the necessary storage containers; or be to a reuser of the waste, under approval from the EPD.		
S8.3.16 of HKBCFEIA and S12.6 of TMCLKLEIA	WM7	<p><u>Sewage</u></p> <ul style="list-style-type: none"> <li>Adequate numbers of portable toilets should be provided for the workers. The portable toilets should be maintained in a state, which will not deter the workers from utilizing these portable toilets. Night soil should be collected by licensed collectors regularly.</li> </ul>	All construction sites	V
S8.3.17 of HKBCFEIA and S12.6 of TMCLKLEIA	WM8	<p><u>General Refuse</u></p> <ul style="list-style-type: none"> <li>The site and surroundings shall be kept tidy and litter free. General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical wastes.</li> <li>A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.</li> <li>Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated and made easily accessible. Separate labelled bins for their deposit should be provided if feasible.</li> <li>Office wastes can be reduced through the recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be</li> </ul>	All construction sites	V



EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<p>considered by the Contractor. In addition, waste separation facilities for paper, aluminum cans, plastic bottles etc., should be provided.</p> <ul style="list-style-type: none"> <li>• Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including reduction, reuse and recycling of wastes.</li> <li>• Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station.</li> <li>• All waste containers shall be in a secure area on hardstanding.</li> </ul>		
<b>Water Quality (Construction Phase)</b>				
	W1	<p>Mitigation during the marine works to reduce impacts to within acceptable levels have been recommended and will comprise a series of measures that restrict the method and sequencing of backfilling, as well as protection measures. Details of the measures are provided below:</p>	During filling	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<ul style="list-style-type: none"> <li>• Reclamation filling for the Project shall not proceed until at least 200m of leading seawall at the reclamation area formed above +2.2mPD, unless otherwise agreement was obtained from EPD, except for the 300m gaps for marine access. All underwater filling works shall be carried out behind seawalls to avoid dispersion of suspended solids outside the Project limit;</li> <li>• Except for the filling of the cellular structures, not more than 15% public fill shall be used for reclamation filling below +2.5mPD during construction of the seawall;</li> <li>• After the seawall is completed except for the 300m marine access as indicated in the EPs, not more than 30% public fill shall be used for reclamation filling below +2.5mPD, unless otherwise agreement from EPD was obtained;</li> <li>• Upon completion of 200m leading seawall, no more than a total of 60 filling barge trips per day shall be made with a cumulative maximum daily filling rate of 60,000 m<sup>3</sup> for HKBCF and TMCLKL southern landfall reclamation during the filling operation; and</li> <li>• Upon completion of the whole section of seawall except for the 300m marine access as indicated in the EPs, no more than a total of 190 filling barge trips per day shall be made with a cumulative maximum daily filling rate of 190,000 m<sup>3</sup> for the remaining filling operations for HKBCF and TMCLKL southern landfall reclamation.</li> <li>• Floating type perimeter silt curtains shall be around the HKBCF site before the commencement of marine works. Staggered layers of silt curtain shall be provided</li> </ul>		

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<p>to prevent sediment loss at navigation accesses. The length of each staggered layers shall be at least 200m;</p> <ul style="list-style-type: none"> <li>• Single layer silt curtain to be applied around the North-east airport water intake;</li> <li>• The silt-curtains should be maintained in good condition to ensure the sediment plume generated from filling be confined effectively within the site boundary;</li> <li>• The filling works shall be scheduled to spread the works evenly over a working day;</li> <li>• Cellular structure shall be used for seawall construction;</li> <li>• A layer of geotextile shall be placed on top of the seabed before any filling activities take place inside the cellular structures to form the seawall;</li> <li>• The conveyor belts shall be fitted with windboards and conveyor release points shall be covered with curtain to prevent any spillage of filling materials onto the surrounding waters; and</li> <li>• An additional layer of silt curtain shall be installed near the active stone column installation points. A layer of geotextile with stone blanket on top shall be placed on the seabed prior to stone column installation works.</li> </ul>		
S9.11.1.3 of HKBCFEIA and S6.10 of	W2	<p><u>Land Works</u></p> <p>General construction activities on land should also be governed by standard good working practice. Specific measures to be written into the works contracts should include:</p>	All land-based construction sites	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
TMCLKLEIA		<ul style="list-style-type: none"> <li>• wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters;</li> <li>• sewage effluent and discharges from on-site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the WPCO or collected for disposal offsite. The use of soakaways shall be avoided;</li> <li>• storm drainage shall be directed to storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks;</li> <li>• silt removal facilities, channels and manholes shall be maintained and any deposited silt and grit shall be removed regularly, including specifically at the onset of and after each rainstorm;</li> <li>• temporary access roads should be surfaced with crushed stone or gravel;</li> <li>• rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities;</li> <li>• measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system;</li> <li>• open stockpiles of construction materials (e.g. aggregates and sand) on site</li> </ul>		

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<p>should be covered with tarpaulin or similar fabric during rainstorms;</p> <ul style="list-style-type: none"> <li>• manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers;</li> <li>• discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system;</li> <li>• all vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit;</li> <li>• wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain;</li> <li>• the section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel;</li> <li>• wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects;</li> <li>• vehicle and plant servicing areas, vehicle wash bays and lubrication facilities shall be located under roofed areas. The drainage in these covered areas shall be connected to foul sewers via a petrol interceptor in accordance with the requirements of the WPCO or collected for offsite disposal;</li> </ul>		

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<ul style="list-style-type: none"> <li>• the contractors shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately;</li> <li>• waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance;</li> <li>• all fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. The storage areas should be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank; and</li> <li>• surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the storm water system..</li> </ul>		
S9.14 of HKBCFEIA and S6.10 of TMCLKLEIA	W3	Implement a water quality monitoring programme	At identified monitoring location	V
S6.10 of TMCLKLEIA	W4	All construction works shall be subject to routine audit to ensure implementation of all EIA recommendations and good working practice.	All construction site areas	V
<b>Ecology (Construction Phase)</b>				
S10.7 of HKBCFEIA and S8.14 of TMCLKLEIA	E1	<ul style="list-style-type: none"> <li>• Install silt curtain during the construction</li> <li>• Limit works fronts</li> <li>• Construct seawall prior to reclamation filling where practicable</li> </ul>	Seawall, reclamation area	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		<ul style="list-style-type: none"> <li>• Good site practices</li> <li>• Strict enforcement of no marine dumping</li> <li>• Site runoff control</li> <li>• Spill response plan</li> </ul>		
S10.7 of HKBCFEIA	E2	<ul style="list-style-type: none"> <li>• Watering to reduce dust generation; prevention of siltation of freshwater habitats; Site runoff should be desilted, to reduce the potential for suspended sediments, organics and other contaminants to enter streams and standing freshwater.</li> </ul>	Land-based works areas	V
S10.7 of HKBCFEIA and S8.14 of TMCLKLEIA	E3	<ul style="list-style-type: none"> <li>• Good site practices, including strictly following the permitted works hours, using quieter machines where practicable, and avoiding excessive lightings during night time.</li> </ul>	Land-based works areas	V
S10.7 of HKBCFEIA and S8.14 of TMCLKLEIA	E4	<ul style="list-style-type: none"> <li>• Dolphin Exclusion Zone</li> <li>• Dolphin watching plan</li> </ul>	Marine works	V
S10.7 of HKBCFEIA and S8.14 of TMCLKLEIA	E5	<ul style="list-style-type: none"> <li>• Decouple compressors and other equipment on working vessels</li> <li>• Proposal on design and implementation of acoustic decoupling measures applied during reclamation works</li> <li>• Avoidance of percussive piling</li> </ul>	Marine works	V
S10.7 of	E6	<ul style="list-style-type: none"> <li>• Control vessel speed</li> </ul>	Marine traffic	V

EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
HKBCFEIA and S8.14 of TMCLKLEIA		<ul style="list-style-type: none"> <li>• Skipper training</li> <li>• Predefined and regular routes for working vessels; avoid Brothers Islands</li> </ul>		
S10.10 of HKBCFEIA and S8.14 of TMCLKLEIA	E7	<ul style="list-style-type: none"> <li>• Vessel based dolphin monitoring</li> </ul>	Northeast and Northwest Lantau	V
<b>Fisheries</b>				
S11.7 of HKBCFEIA	F1	<ul style="list-style-type: none"> <li>• Reduce re-suspension of sediments</li> <li>• Limit works fronts</li> <li>• Good site practices</li> <li>• Strict enforcement of no marine dumping</li> <li>• Spill response plan</li> </ul>	Seawall, reclamation area	V
S11.7 of HKBCFEIA	F2	<ul style="list-style-type: none"> <li>• Install silt-grease trap in the drainage system collecting surface runoff</li> </ul>	Reclamation area	V
<b>Landscape &amp; Visual (Construction Phase)</b>				
S14.3.3. 3 of HKBCFEIA and S10.9 of TMCLKLEIA	LV1	<p><u>Mitigate Landscape Impacts</u></p> <p>G1/CM4 Grass-hydroseed or sheeting bare soil surface and stock pile areas.</p> <p>G9 Reserve of loose natural granite rocks for re-use. Provide new coastline to adopt “natural-look” by means of using armour rocks in the form of natural</p>	All construction site areas	N/A



EIA Ref.	EM&A Log Ref	Environmental Mitigation Measures	Location	Implementation Status
		rock materials and planting strip area accommodating screen buffer to enhance “natural-look” of new coastline.		
S10.9 of TMCLKLEIA	LV2	<u>Mitigate Landscape Impacts</u> CM7 Ensure no run-off into water body adjacent to the Project Area.	All construction site areas	V
S14.3.3. 3 of HKBCFEIA	LV4	<u>Mitigate Visual Impacts</u> V1 Minimize time for construction activities during construction period.	All construction site areas	V
S10.9 of TMCLKLEIA	LV5	<u>Mitigate Visual Impacts</u> CM6 Control night-time lighting and glare by hooding all lights.	All construction site areas	V
<b>EM&amp;A</b>				
S15.2.2 of HKBCFEIA	EM1	An Independent Environmental Checker needs to be employed as per the EM&A Manual.	All construction site areas	V
S15.5 - S15.6 of HKBCFEIA	EM2	<ul style="list-style-type: none"> <li>An Environmental Team needs to be employed as per the EM&amp;A Manual.</li> <li>Prepare a systematic Environmental Management Plan to ensure effective implementation of the mitigation measures.</li> <li>An environmental impact monitoring needs to be implementing by the Environmental Team to ensure all the requirements given in the EM&amp;A Manual are fully complied with.</li> </ul>	All construction site areas	V

Legend: V = implemented;

x = not implemented;

N/A = not applicable

## Appendix D - Summary of Action and Limit Levels

Table 1 – Action and Limit Levels for 1-hour TSP

Location	Action Level	Limit Level
AMS2	374 $\mu\text{g}/\text{m}^3$	500 $\mu\text{g}/\text{m}^3$
AMS3B*	368 $\mu\text{g}/\text{m}^3$	500 $\mu\text{g}/\text{m}^3$
AMS6	360 $\mu\text{g}/\text{m}^3$	500 $\mu\text{g}/\text{m}^3$
AMS7A <sup>#</sup>	370 $\mu\text{g}/\text{m}^3$	500 $\mu\text{g}/\text{m}^3$

Remarks: \* Action Level set out at AMS3 Ho Yu College is adopted.

<sup>#</sup>Action level set out at AMS7 Hong Kong SkyCity Marriott Hotel is adopted.

Table 2 – Action and Limit Levels for 24-hour TSP

Location	Action Level	Limit Level
AMS2	176 $\mu\text{g}/\text{m}^3$	260 $\mu\text{g}/\text{m}^3$
AMS3B*	167 $\mu\text{g}/\text{m}^3$	260 $\mu\text{g}/\text{m}^3$
AMS6	173 $\mu\text{g}/\text{m}^3$	260 $\mu\text{g}/\text{m}^3$
AMS7A <sup>#</sup>	183 $\mu\text{g}/\text{m}^3$	260 $\mu\text{g}/\text{m}^3$

Remarks: \* Action Level set out at AMS3 Ho Yu College is adopted.

<sup>#</sup>Action level set out at AMS7 Hong Kong SkyCity Marriott Hotel is adopted.

Table 3 – Action and Limit Levels for Construction Noise (0700-1900 hrs of normal weekdays)

Location	Action Level	Limit Level
NMS2	When one documented complaint, related to 0700 – 1900 hours on normal weekdays, is received from any one of the sensitive receivers	75 dB(A)
NMS3B		*65 / 70 dB(A)

\*Daytime noise Limit Level of 70 dB(A) applies to education institutions, while 65dB(A) applies during school examination period.

Table 4 – Action and Limit Levels for Water Quality

Parameters	Action	Limit
DO in mg L <sup>-1</sup> (Surface, Middle & Bottom)	<u>Surface and Middle</u> 5.0 <u>Bottom</u> 4.7	<u>Surface and Middle</u> 4.2 (except 5 mg/L for FCZ) <u>Bottom</u> 3.6
SS in mg L <sup>-1</sup> (depth-averaged)	23.5 and 120% of upstream control station's SS at the same tide of the same day	34.4 and 130% of upstream control station's SS at the same tide of the same day and 10mg/L for WSD Seawater intakes
Turbidity in NTU (depth-averaged)	27.5 and 120% of upstream control station's turbidity at the same tide of the same day	47.0 and 130% of upstream control station's turbidity at the same tide of the same day

Notes:

1. "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
2. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
3. For turbidity, SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

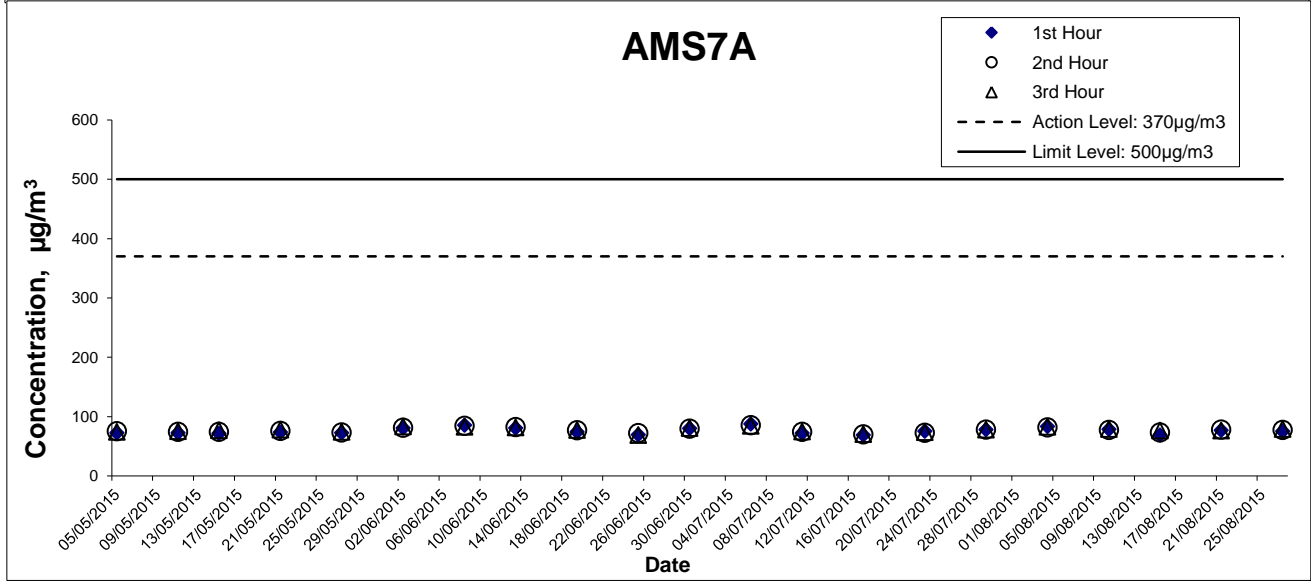
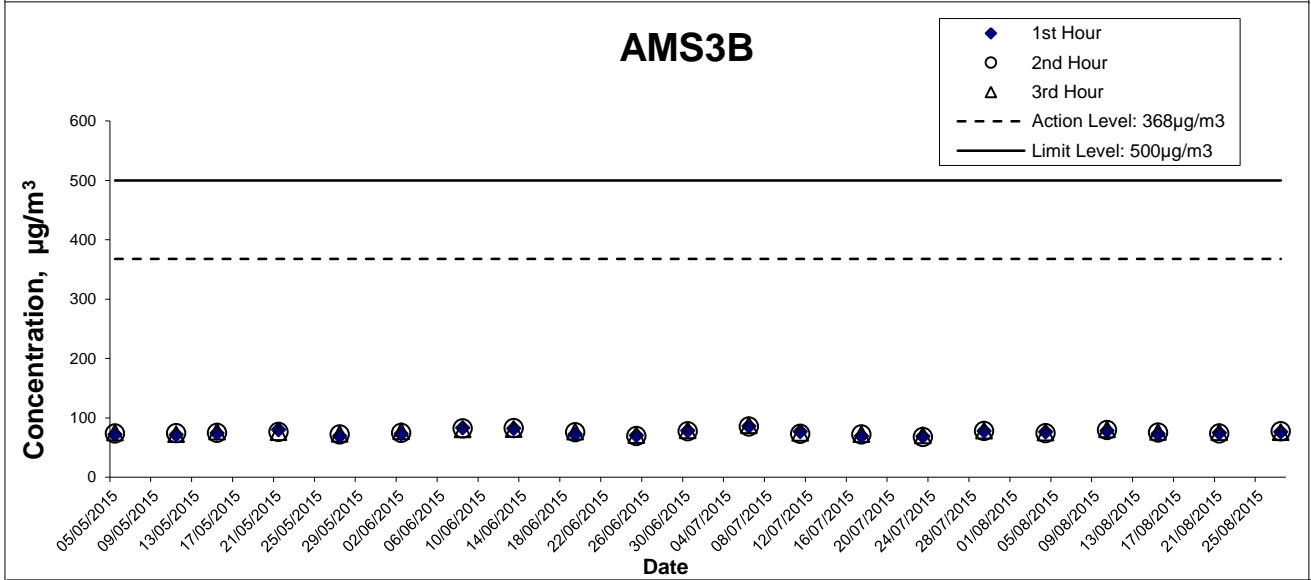
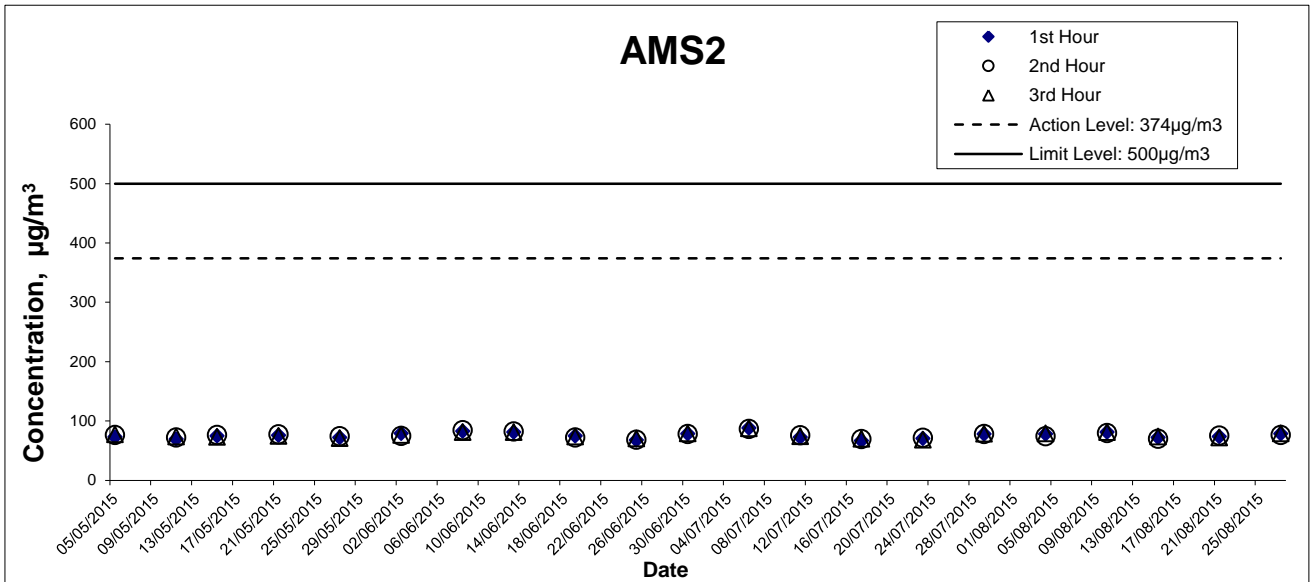
Table 5(a) Action and Limit Levels for Chinese White Dolphin Monitoring - Approach to Define Action Level (AL) and Limit Level (LL):

	<b>North Lantau Social Cluster</b>	
	<b>NEL</b>	<b>NWL</b>
Action Level	(STG < 70% of baseline) & (ANI < 70% of baseline)	(STG < 70% of baseline) & (ANI < 70% of baseline)
Limit Level	[(STG < 40% of baseline) & (ANI < 40% of baseline)] AND [ (STG < 40% of baseline) & (ANI < 40% of baseline)]	

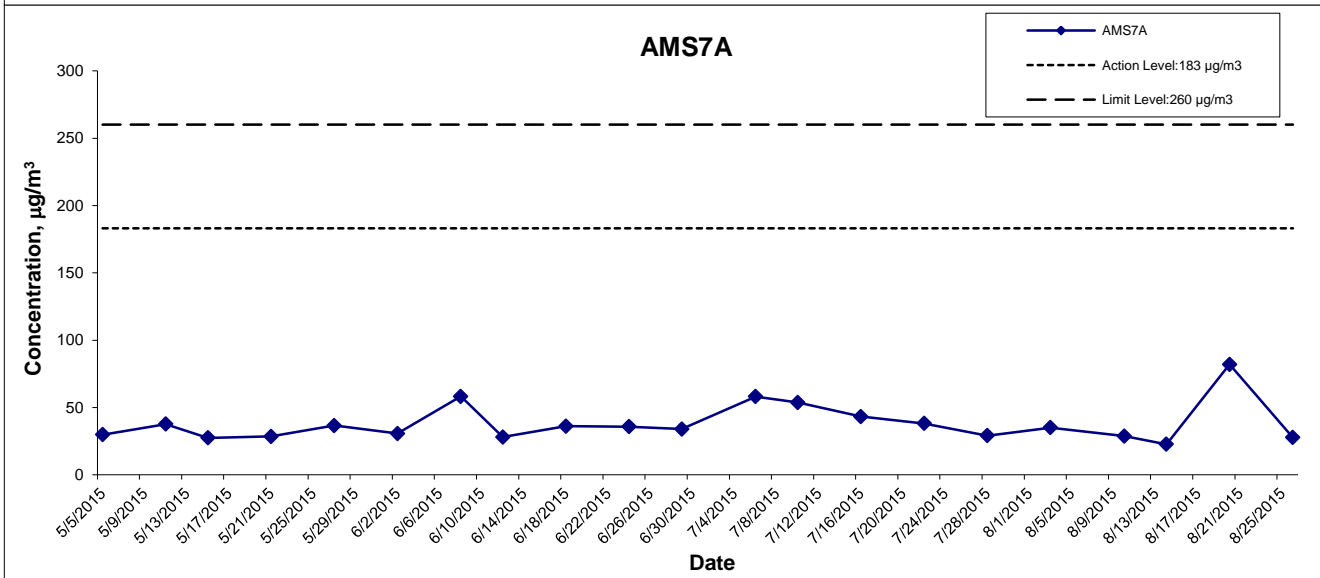
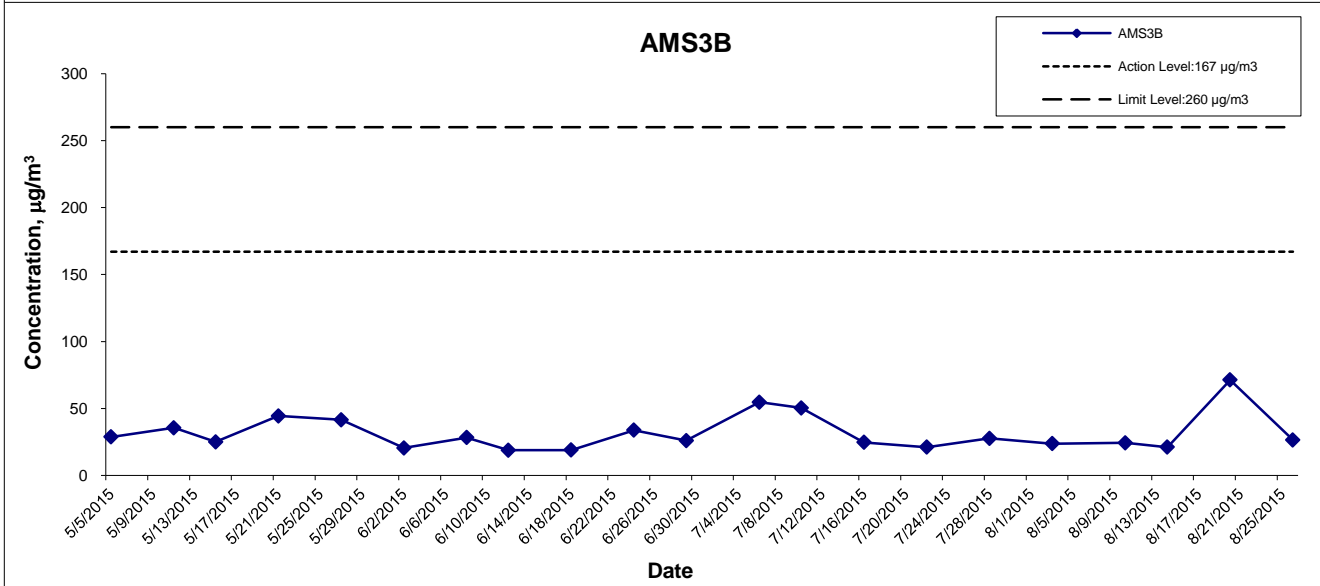
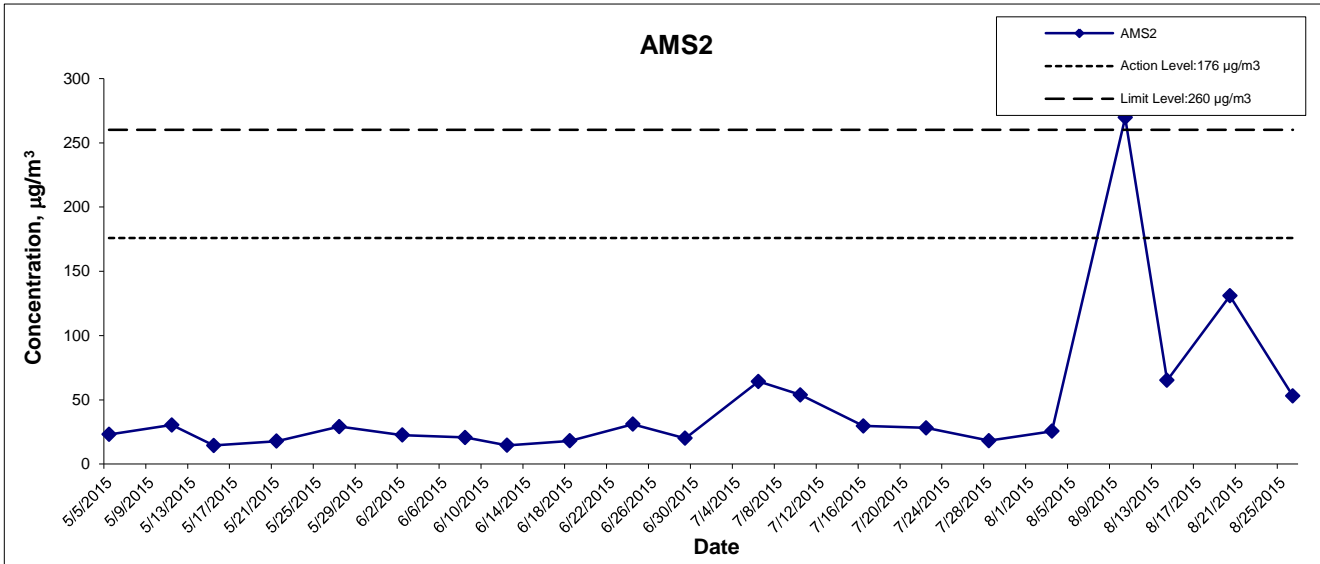
For North Lantau Social Cluster, action level will be trigger if either NEL **or** NWL fall below the criteria; limit level will be triggered if both NEL **and** NWL fall below the criteria.

Table 5(b) Derived Value of Action Level (AL) and Limit Level (LL) for Chinese White Dolphin Monitoring

	<b>North Lantau Social Cluster</b>	
	<b>NEL</b>	<b>NWL</b>
Action Level	(STG < 4.2) & (ANI < 15.5 )	(STG < 6.9) & (ANI < 31.3)
Limit Level	[(STG < 2.4) & (ANI <8.9)] AND [ (STG < 3.9)& (ANI < 17.9)]	



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

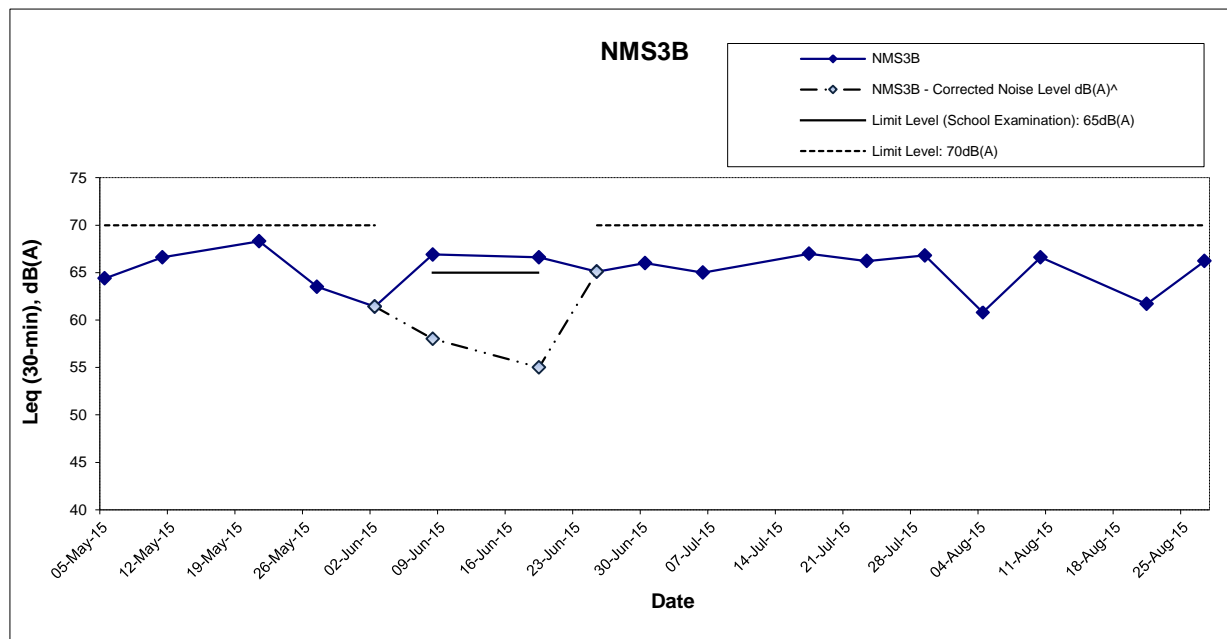
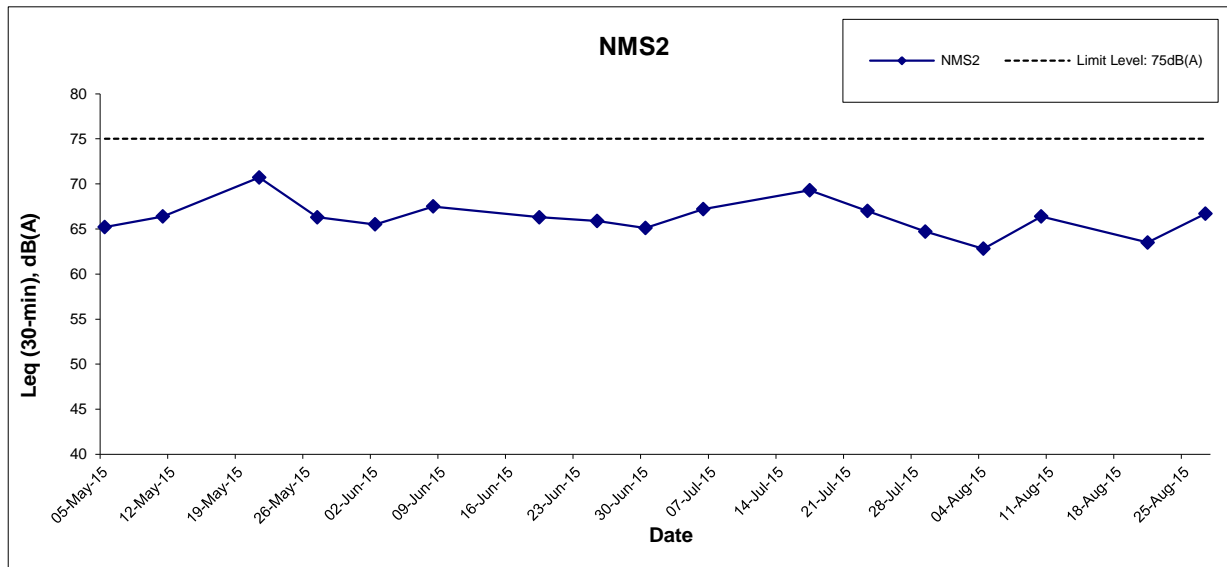
**Graphical Presentation of Impact 24-hour TSP  
 Monitoring Results**



Project No.: 60249820

Date: SEP 2015

Appendix E

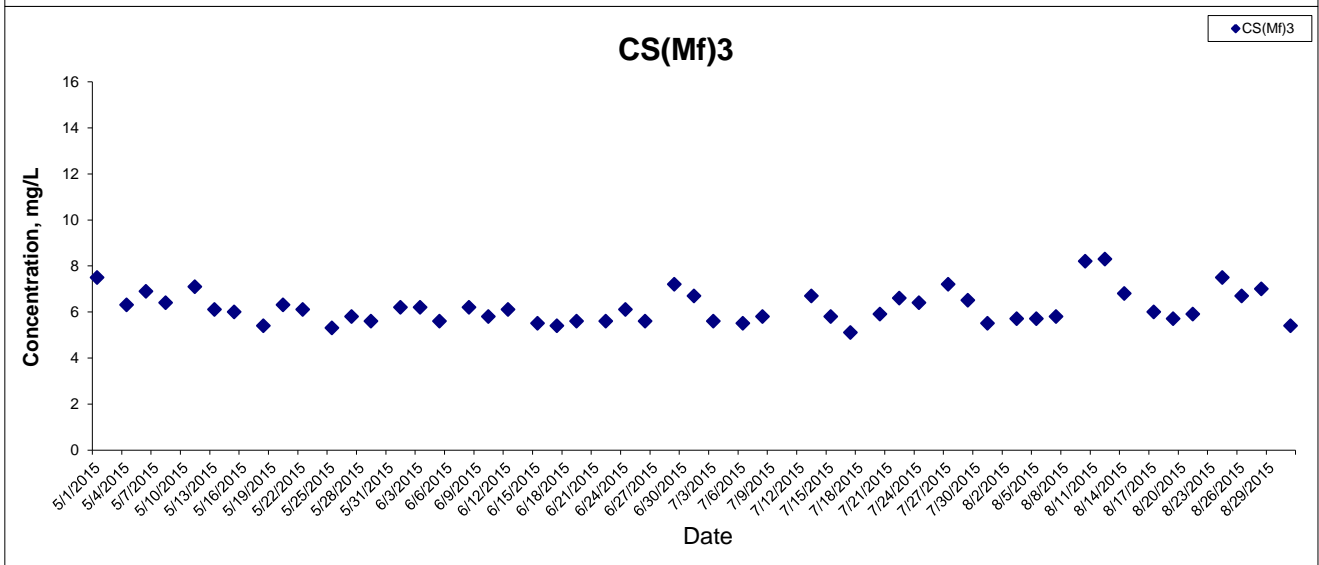
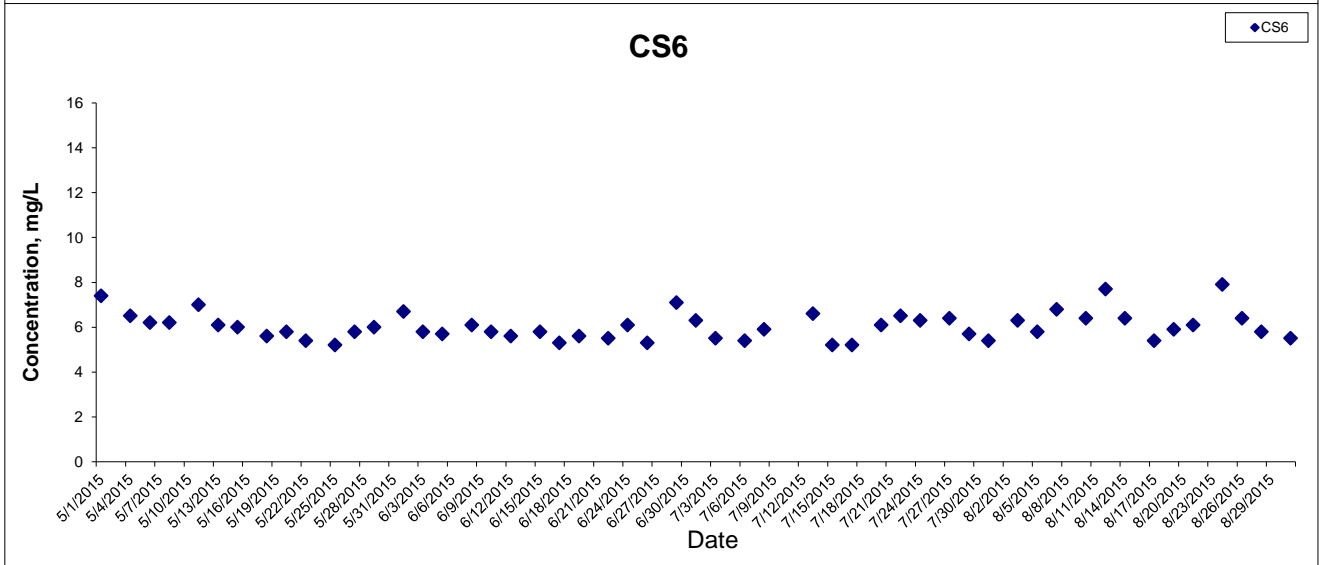
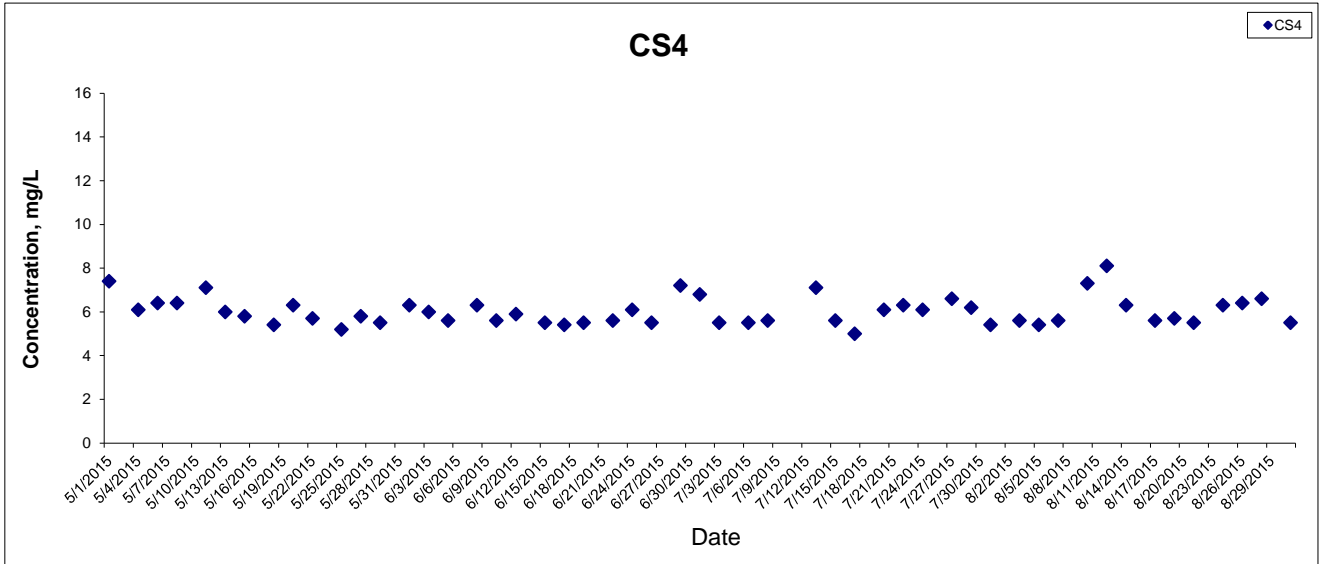


Remarks: Effective from July 2012, the Limit Level at NMS3A was revised to 70dB(A). Daytime noise Limit Level of 70 dB(A) applies to education institutions, while 65dB(A) applies during school examination period.

>The measured noise level on 8 and 19 June 2015 at NMS3B exceeded the noise level of 65dB(A) during examination period but it is higher than the baseline level. Therefore, baseline correction was carried out and the corrected noise level which solely represent the noise level of Construction works are 58.0 dB(A) and 54.8 dB(A) respectively which are lower than the exceedance level of 65dB(A) . As such the EAP was not triggered.

This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

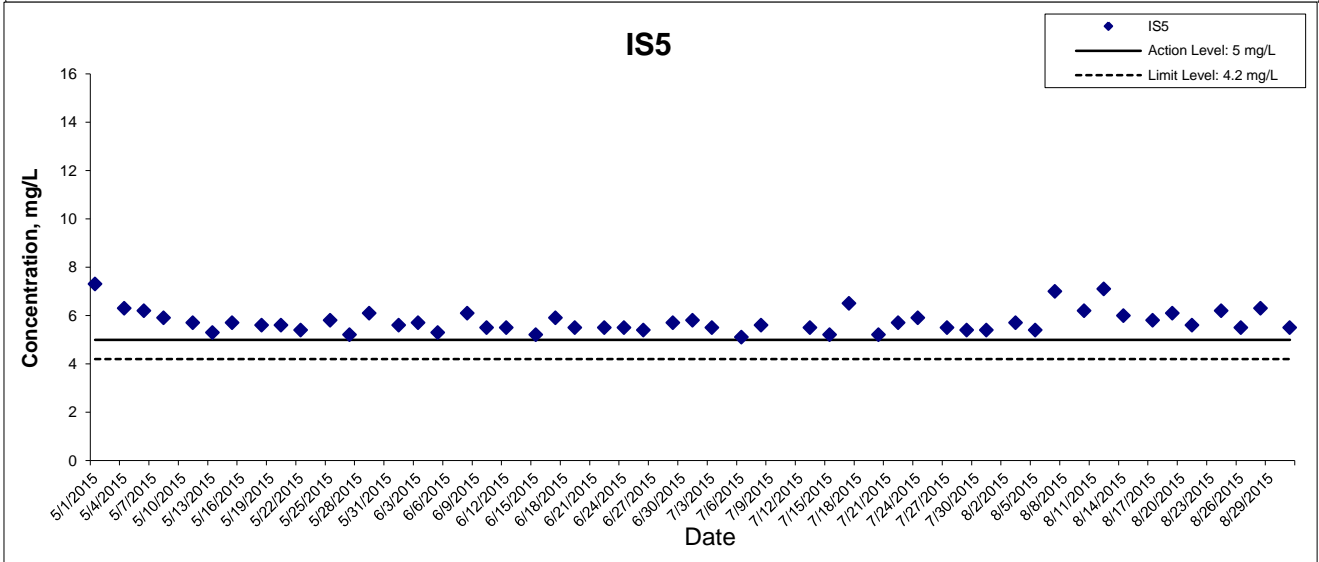
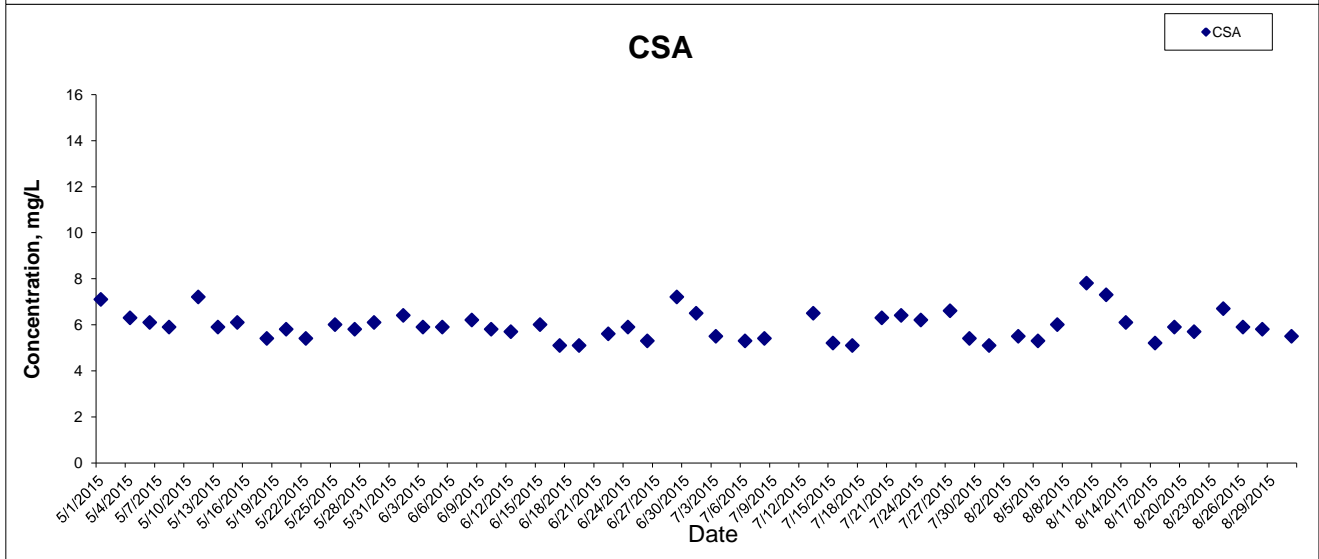
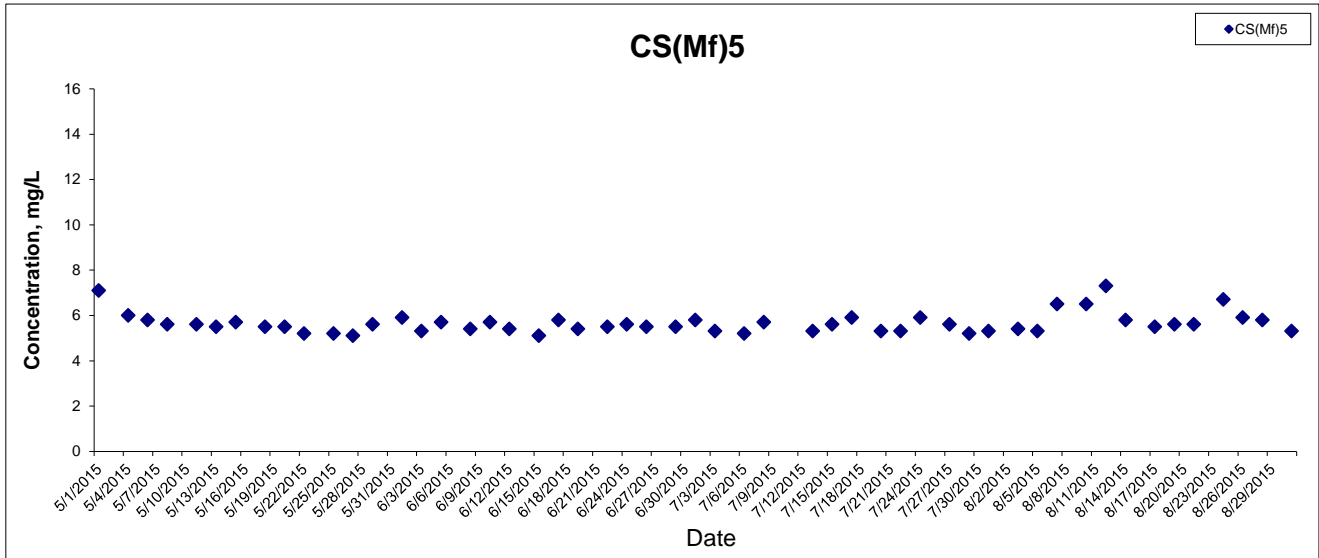
## Dissolved Oxygen (Surface & Middle) at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



## Dissolved Oxygen (Surface & Middle) at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE

HONG KONG BOUNDARY CROSSING FACILITIES

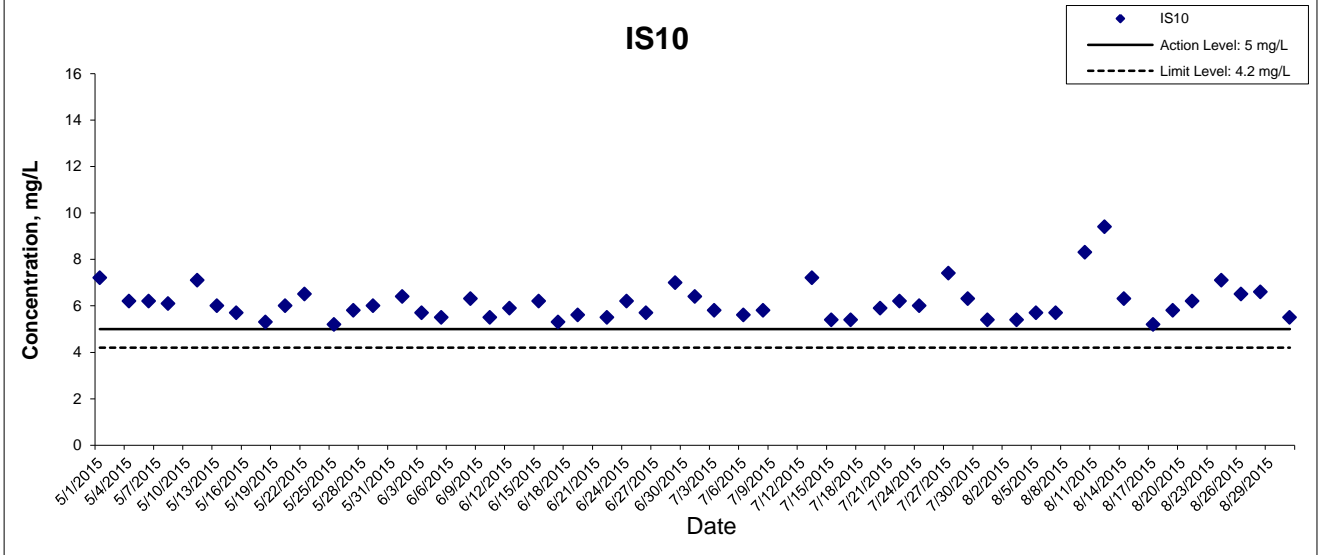
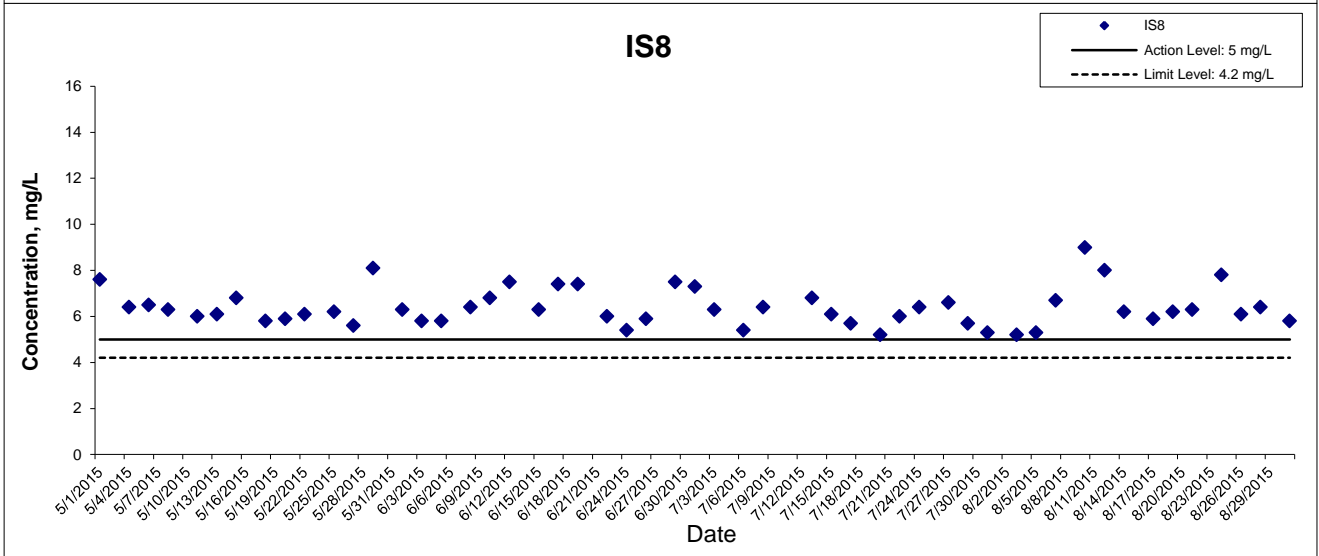
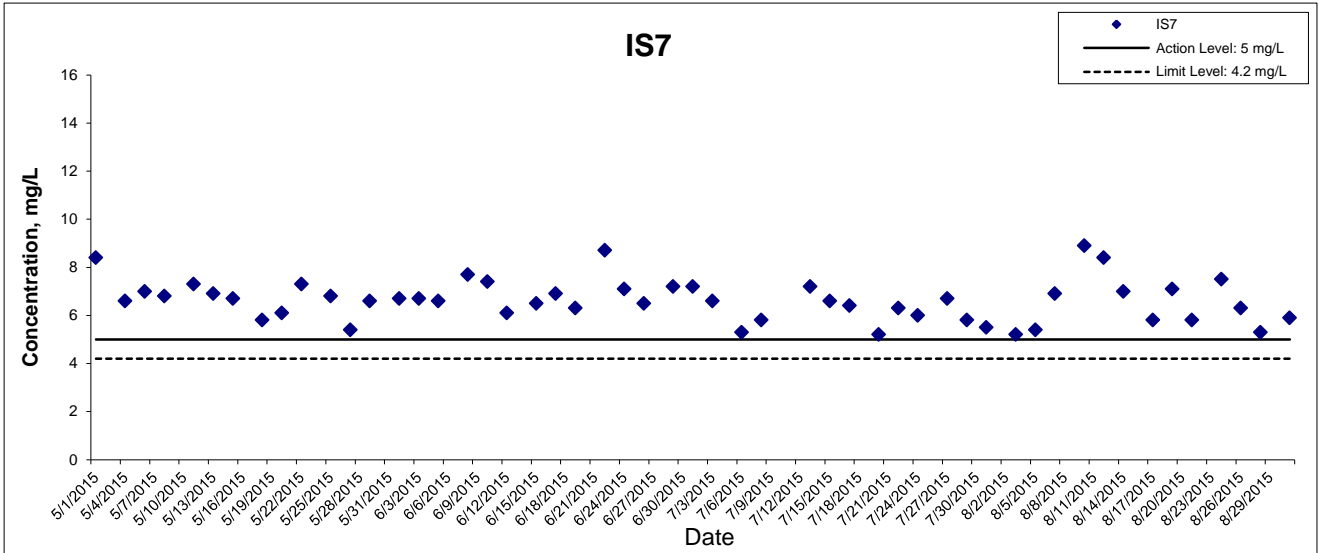
- RECLAMATION WORKS

Graphical Presentation of Impact Water Quality

Monitoring Results

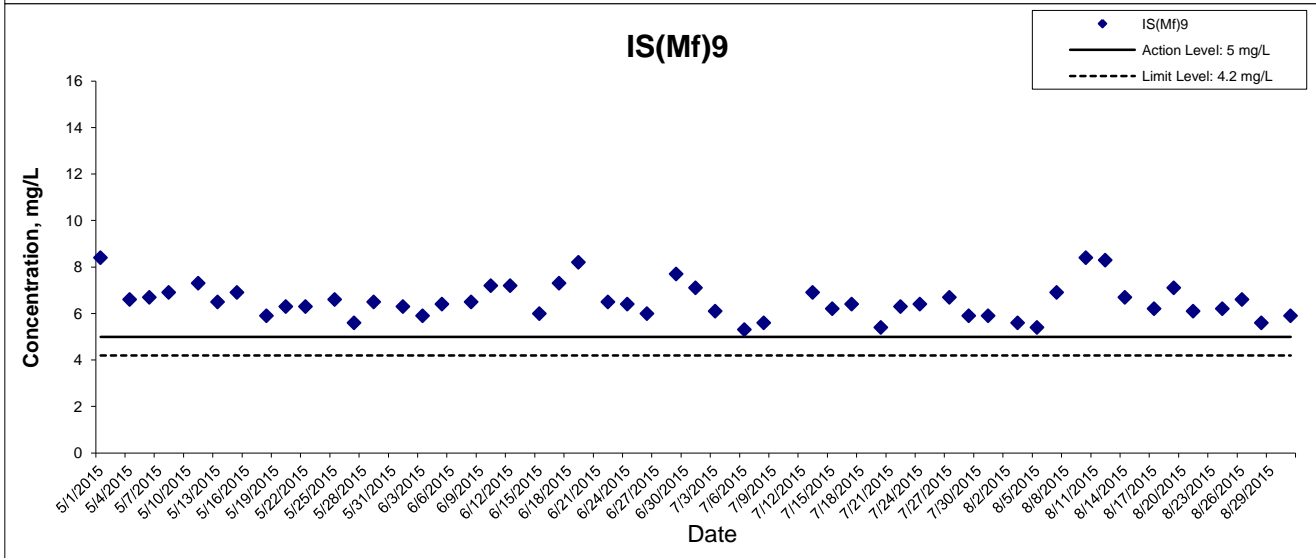
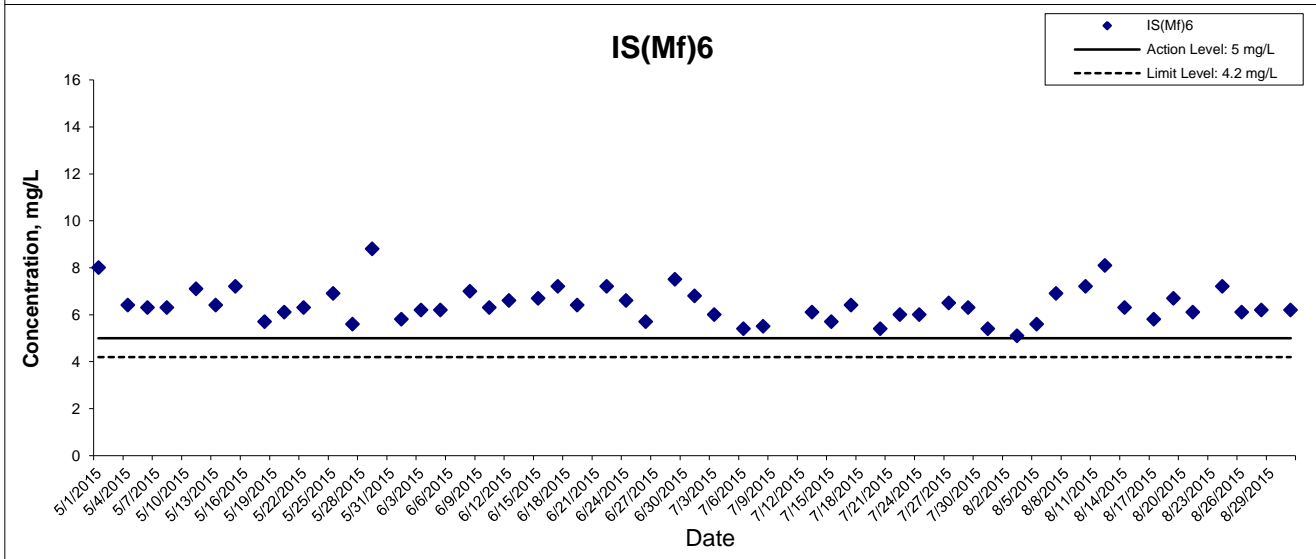
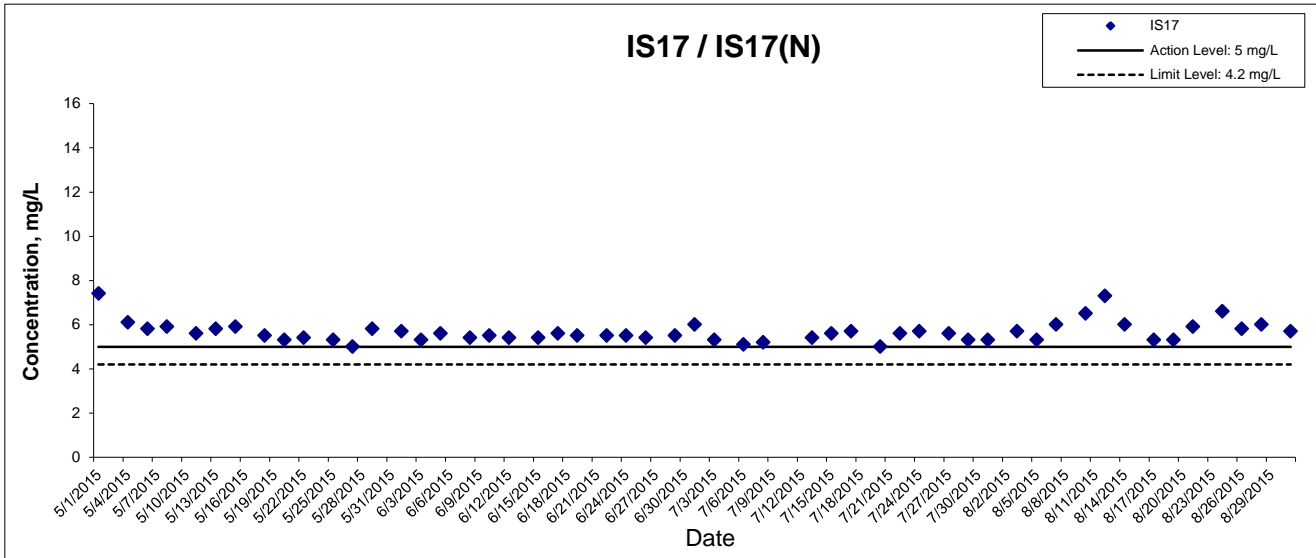


## Dissolved Oxygen (Surface & Middle) at Mid-Ebb Tide



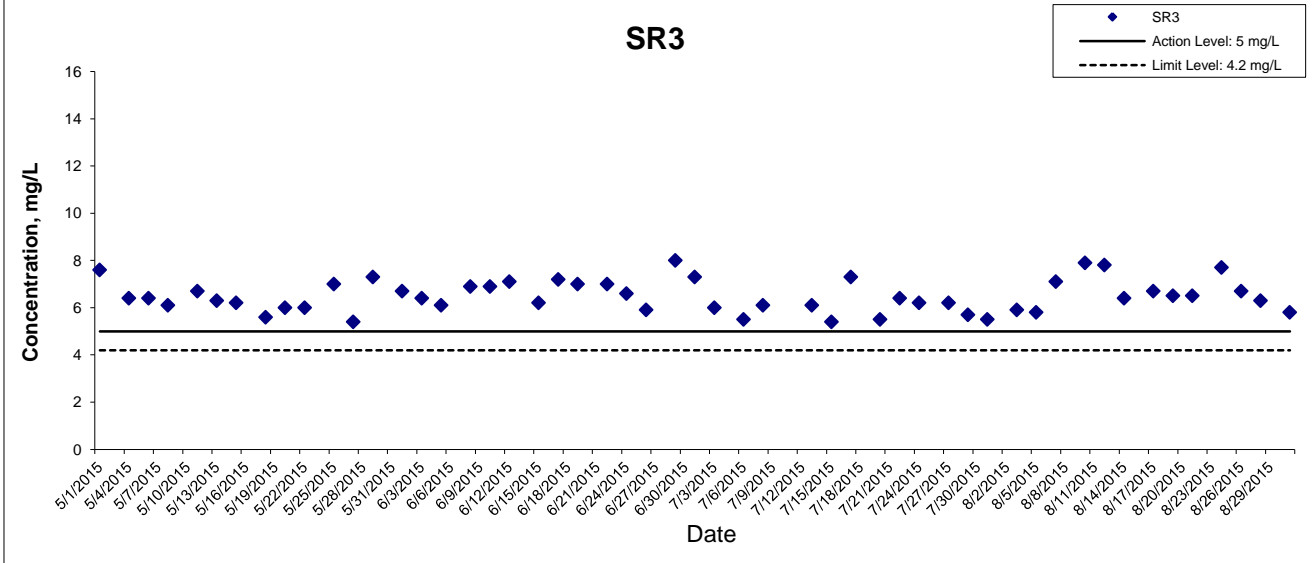
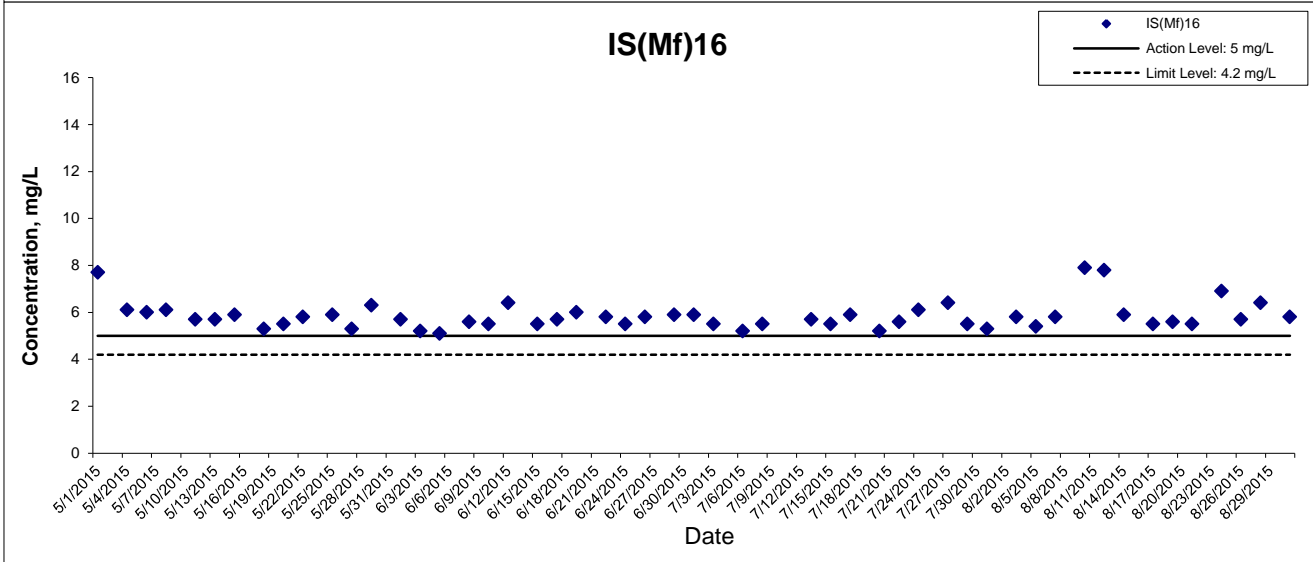
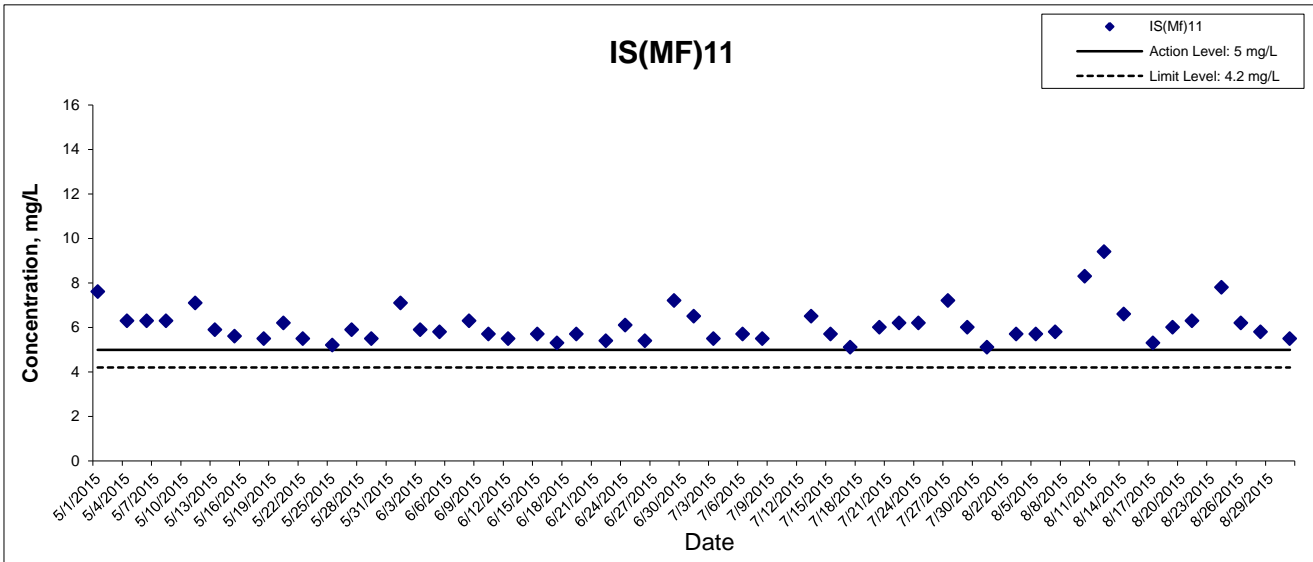
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Surface & Middle) at Mid-Ebb Tide



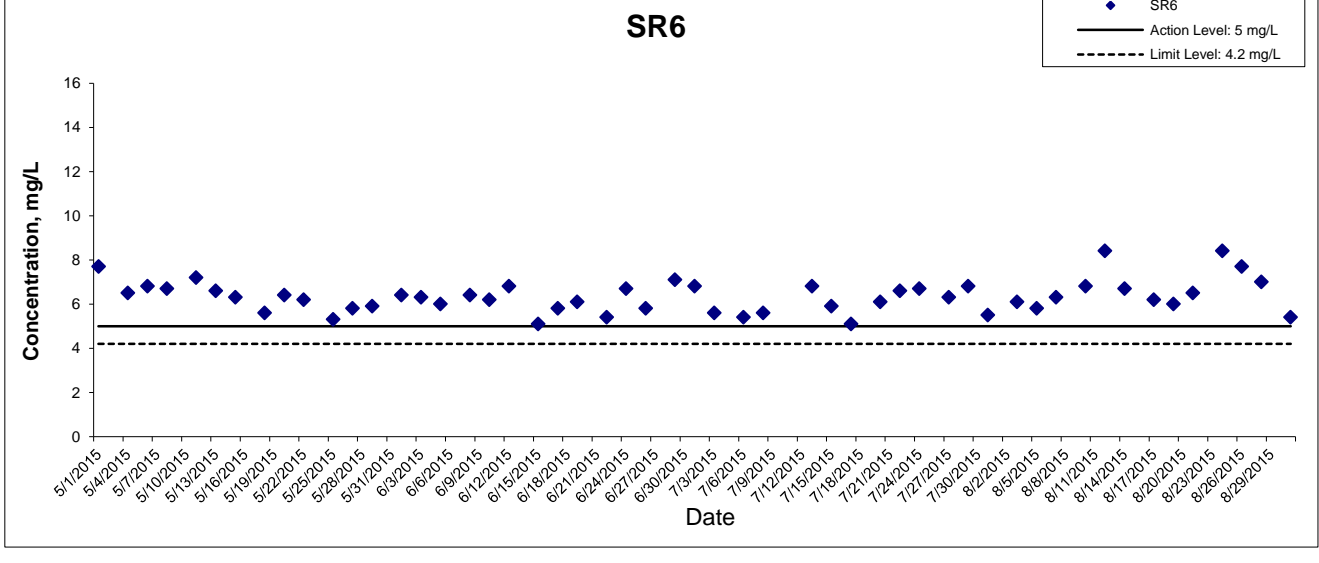
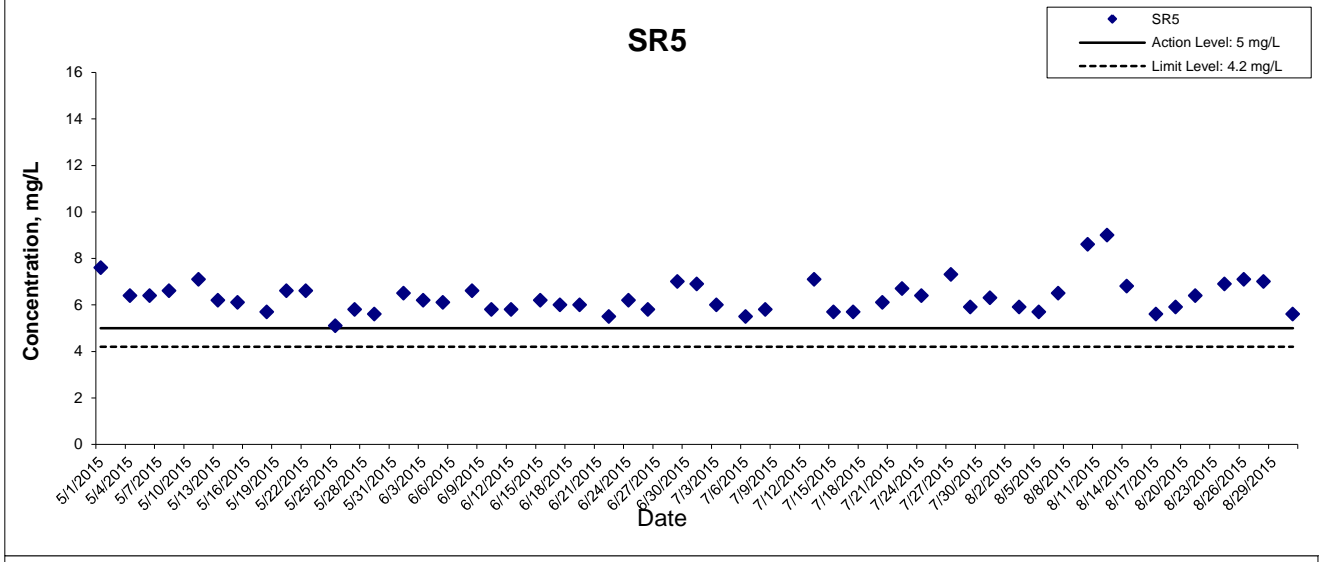
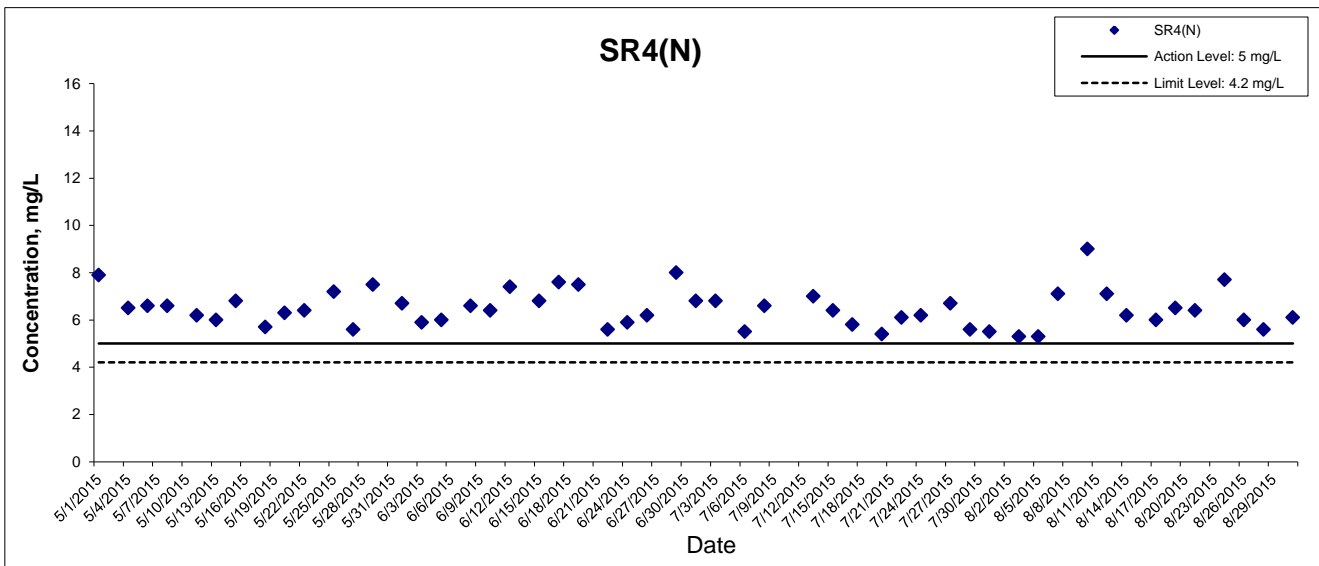
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.





This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



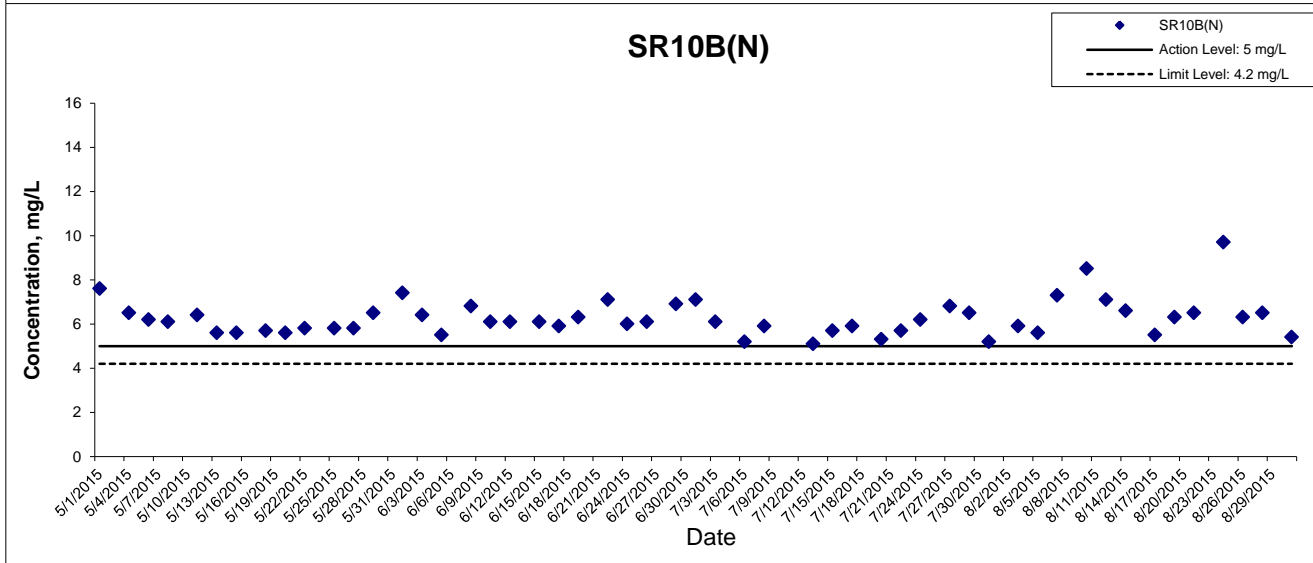
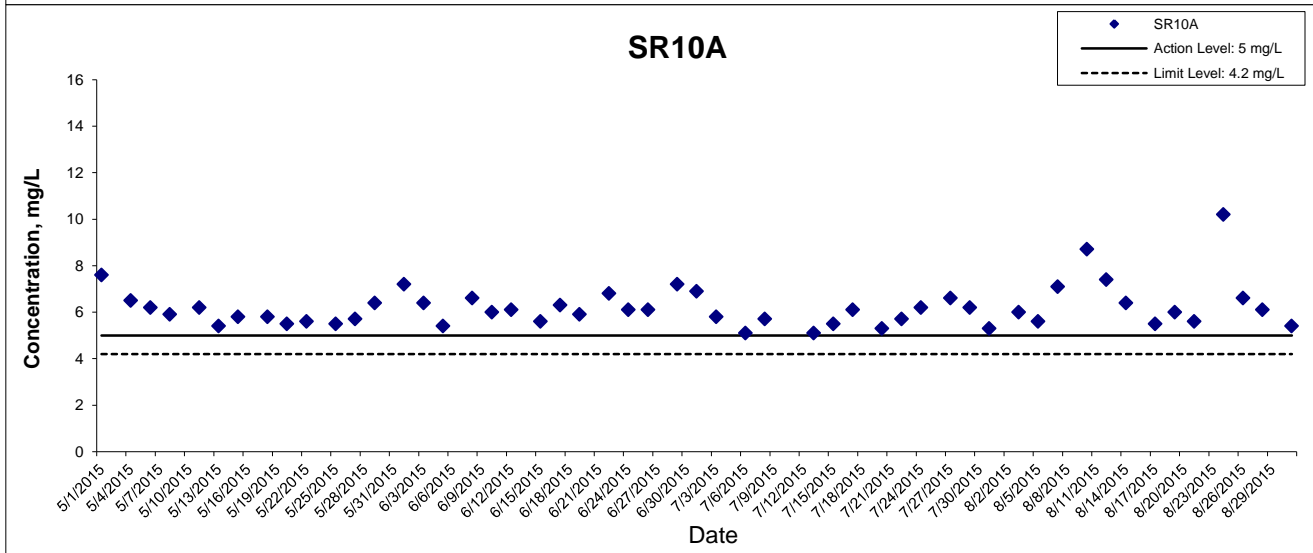
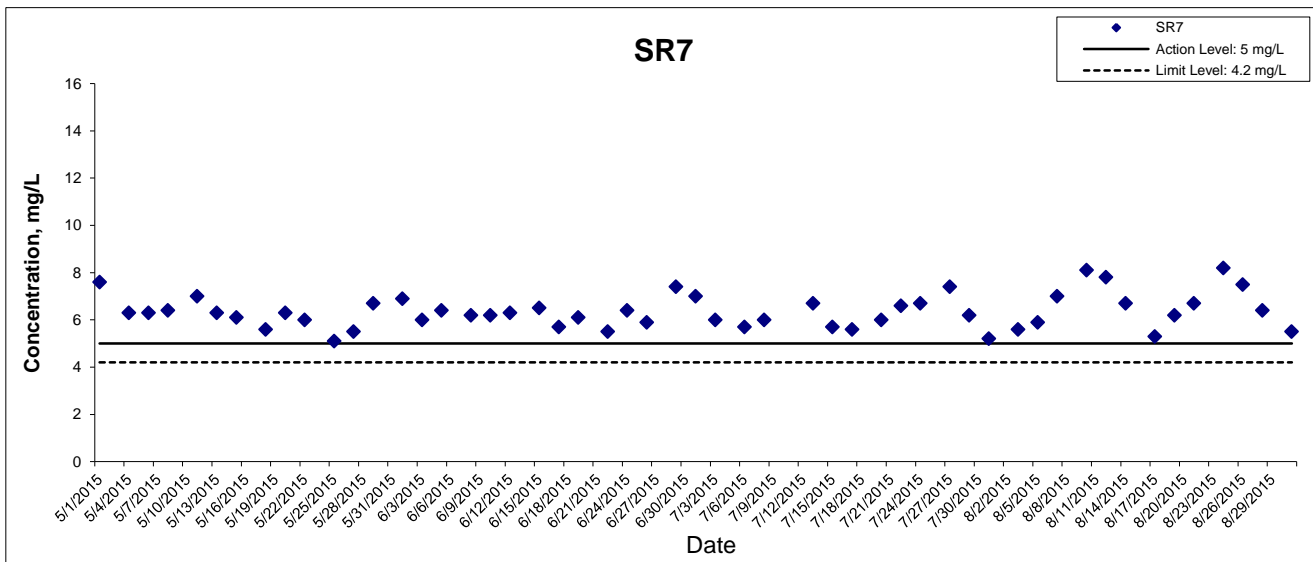


This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results

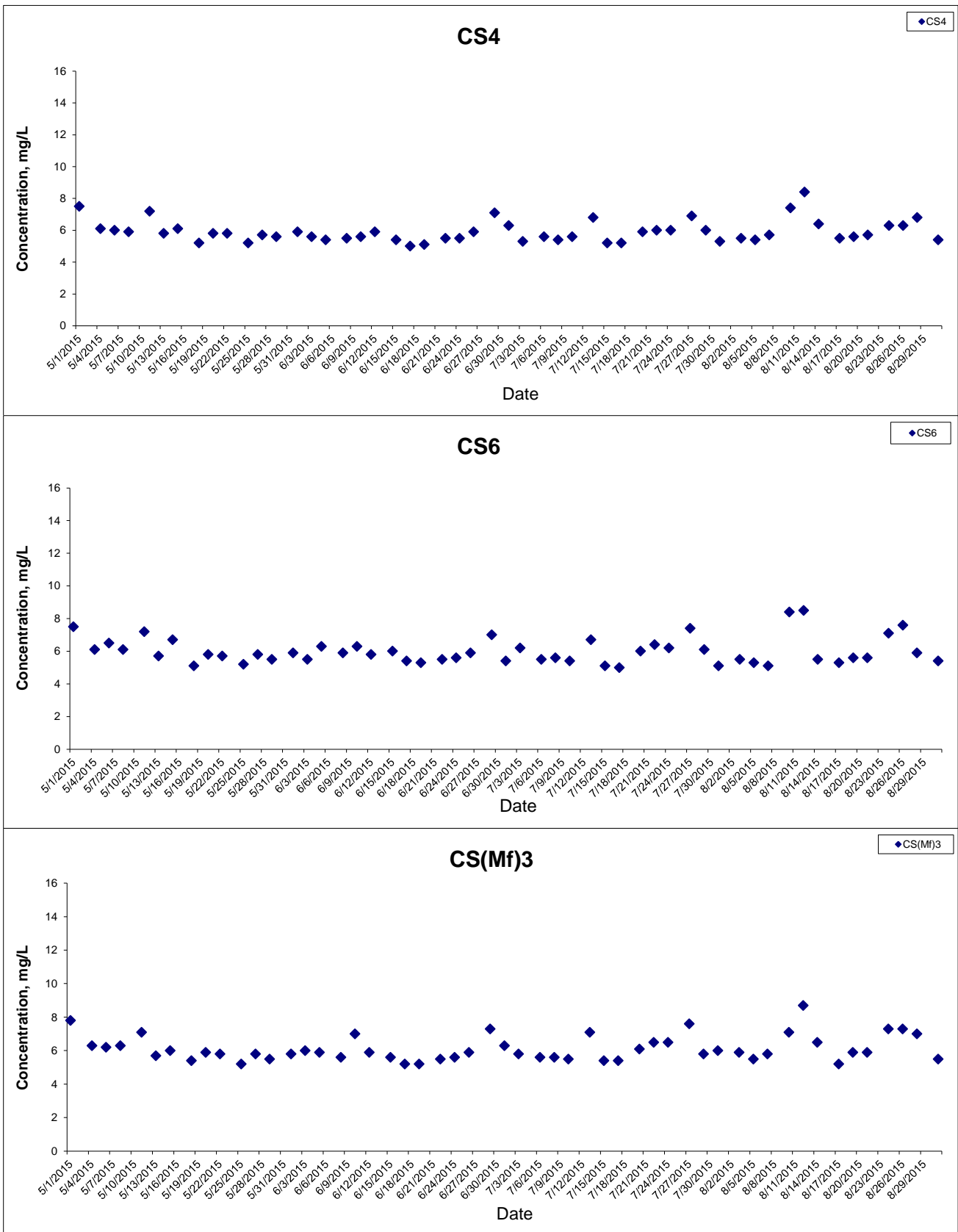




This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



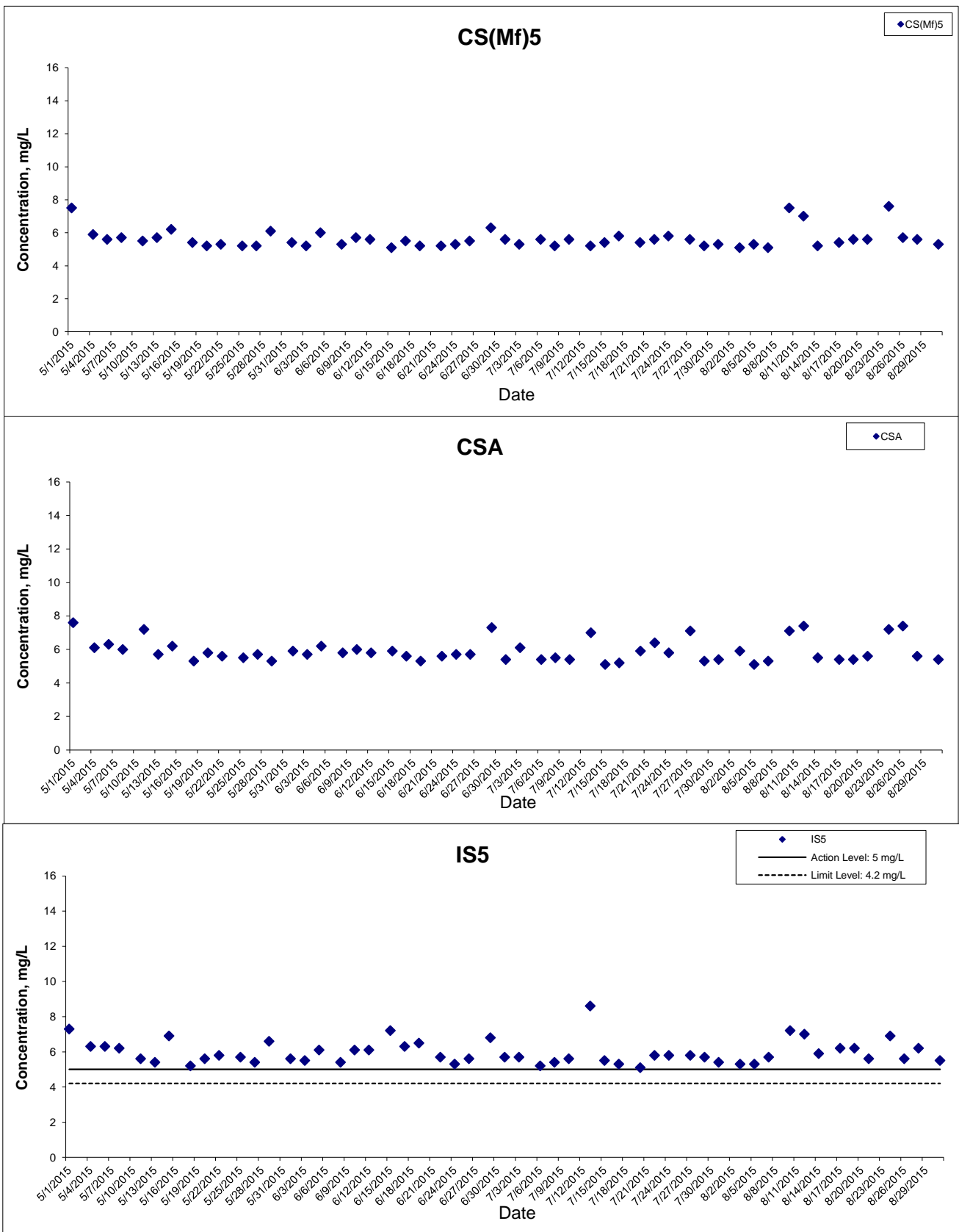
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results



## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide

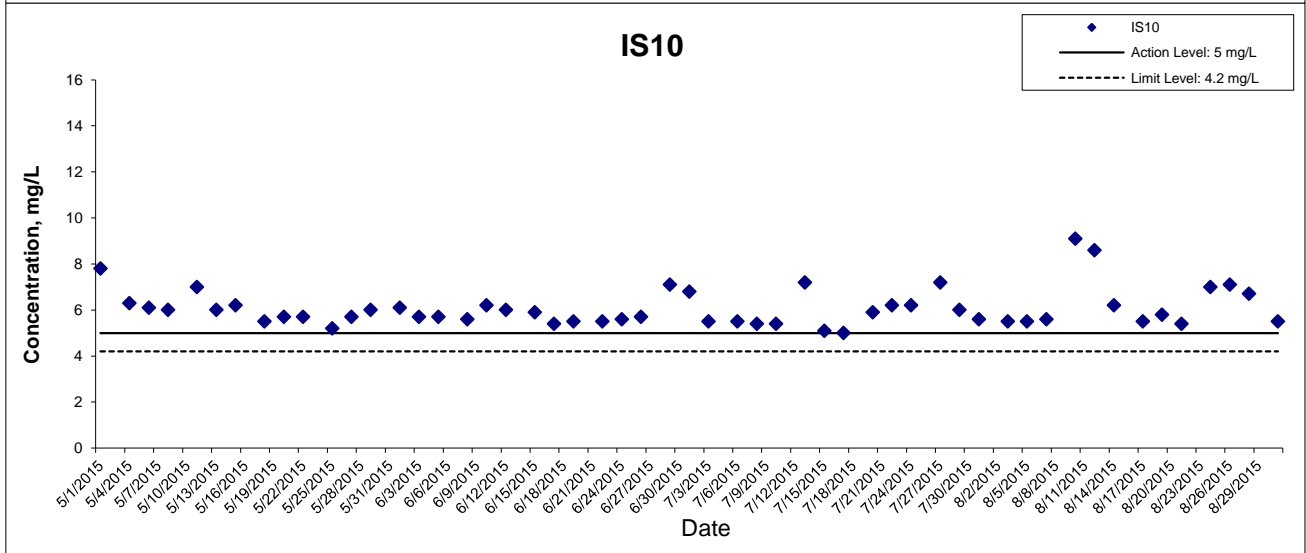
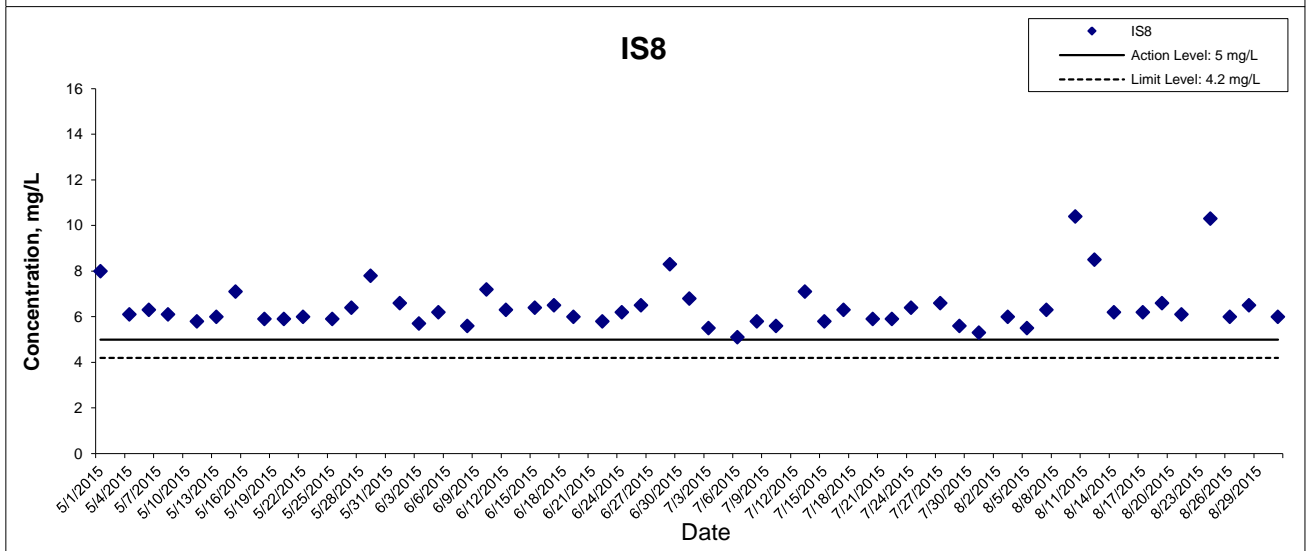
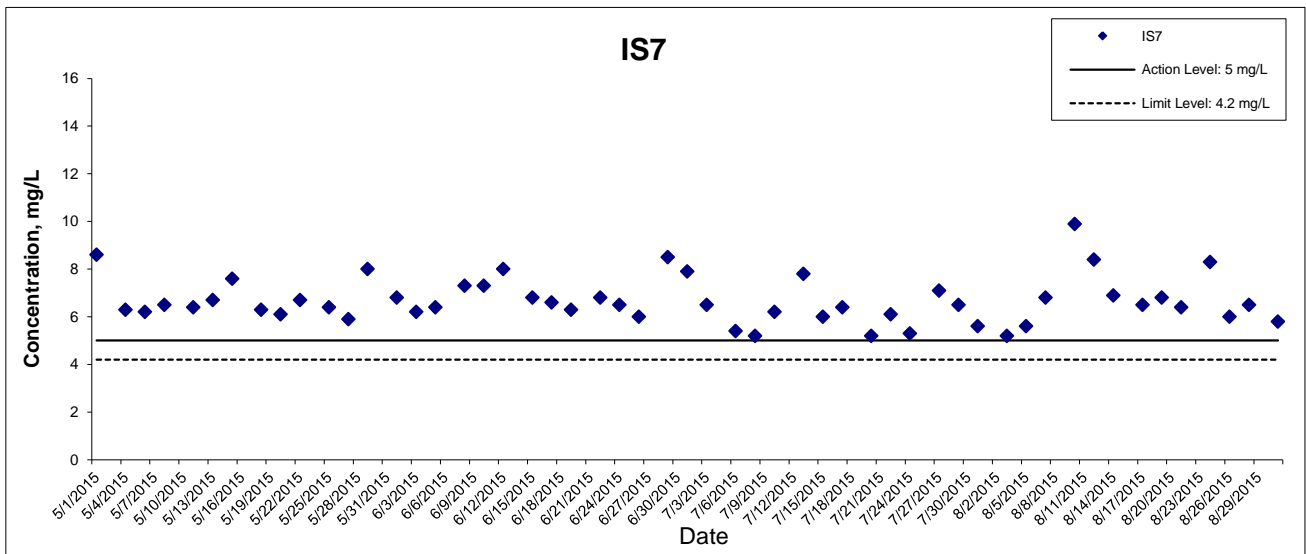


This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



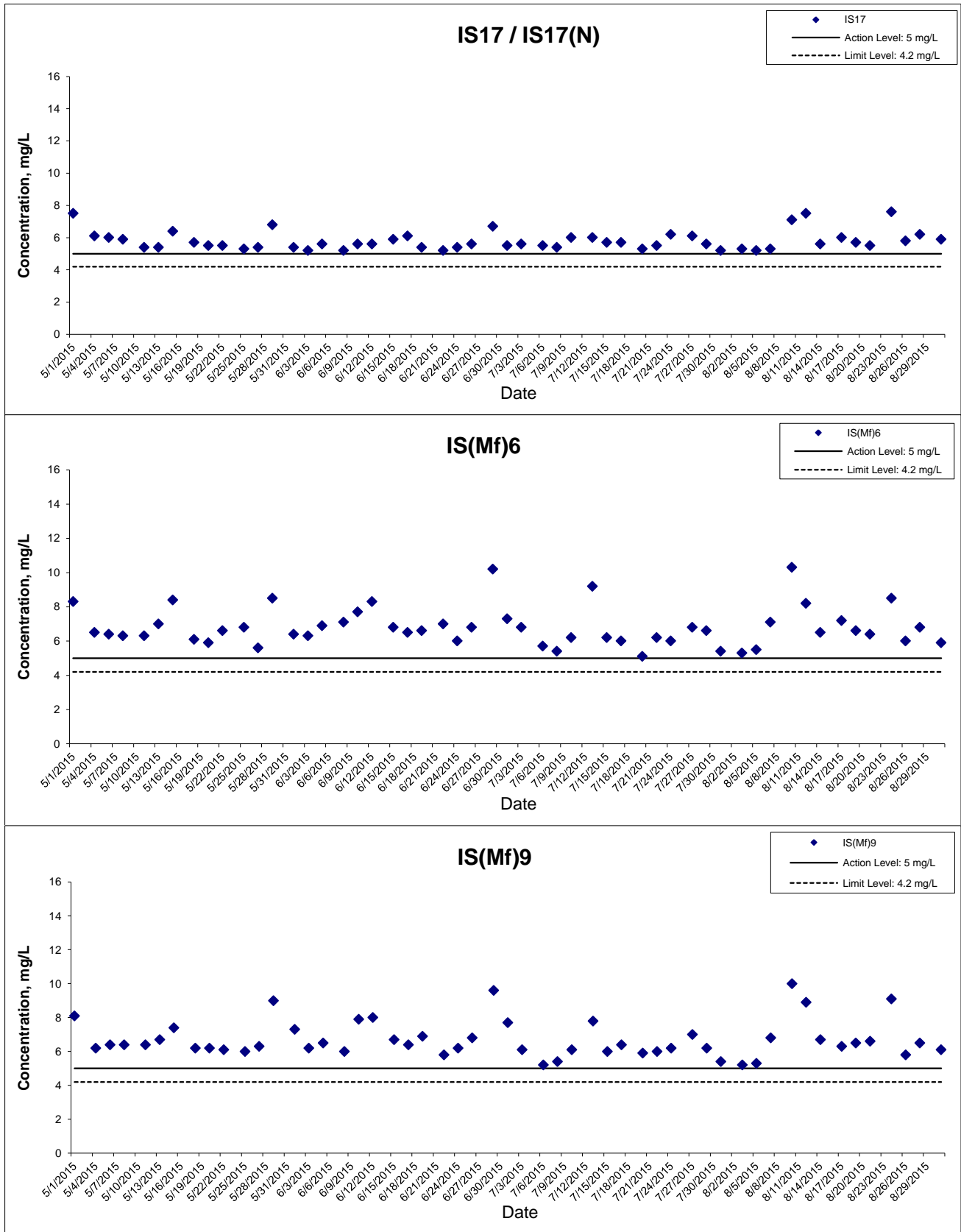


## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

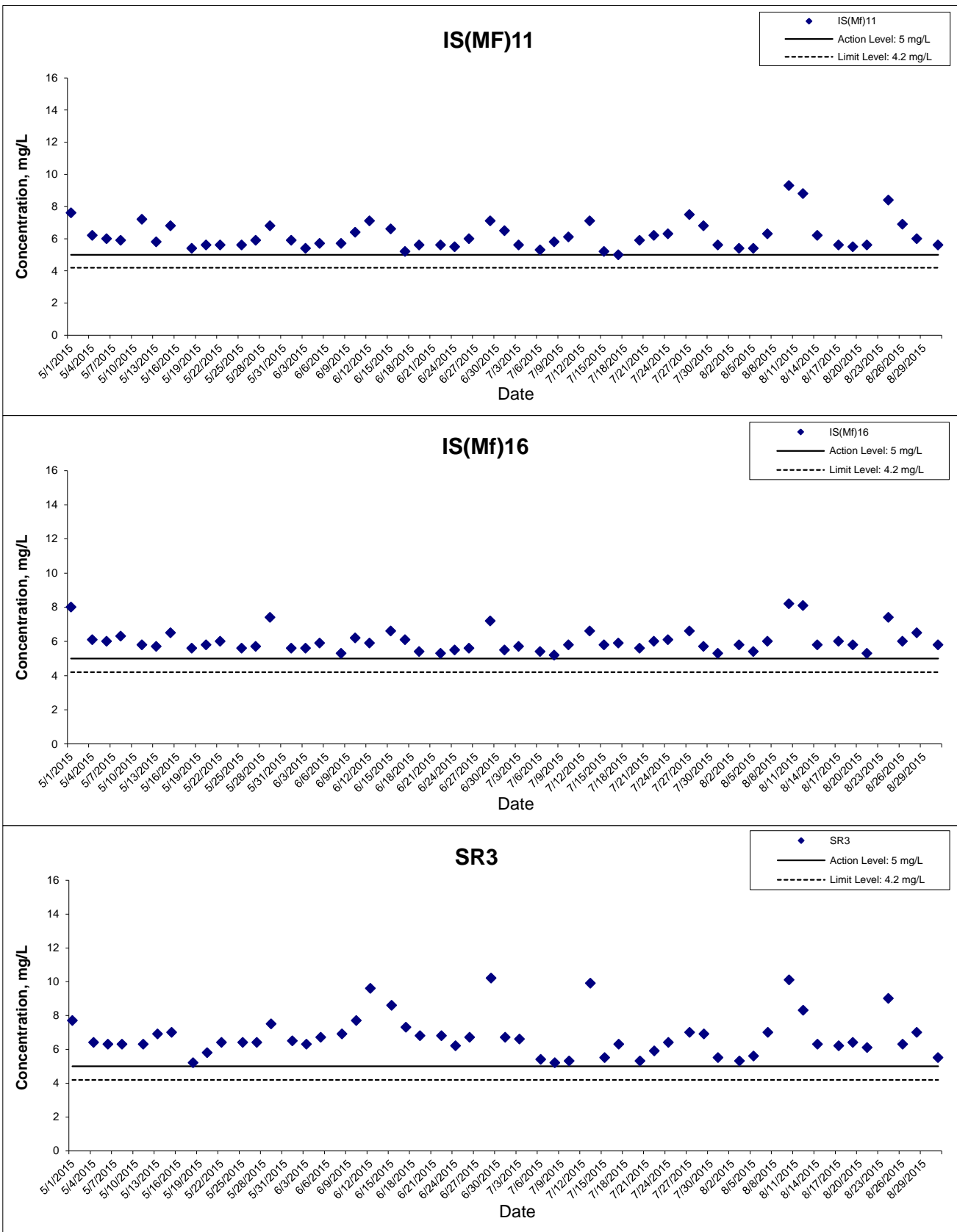
## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



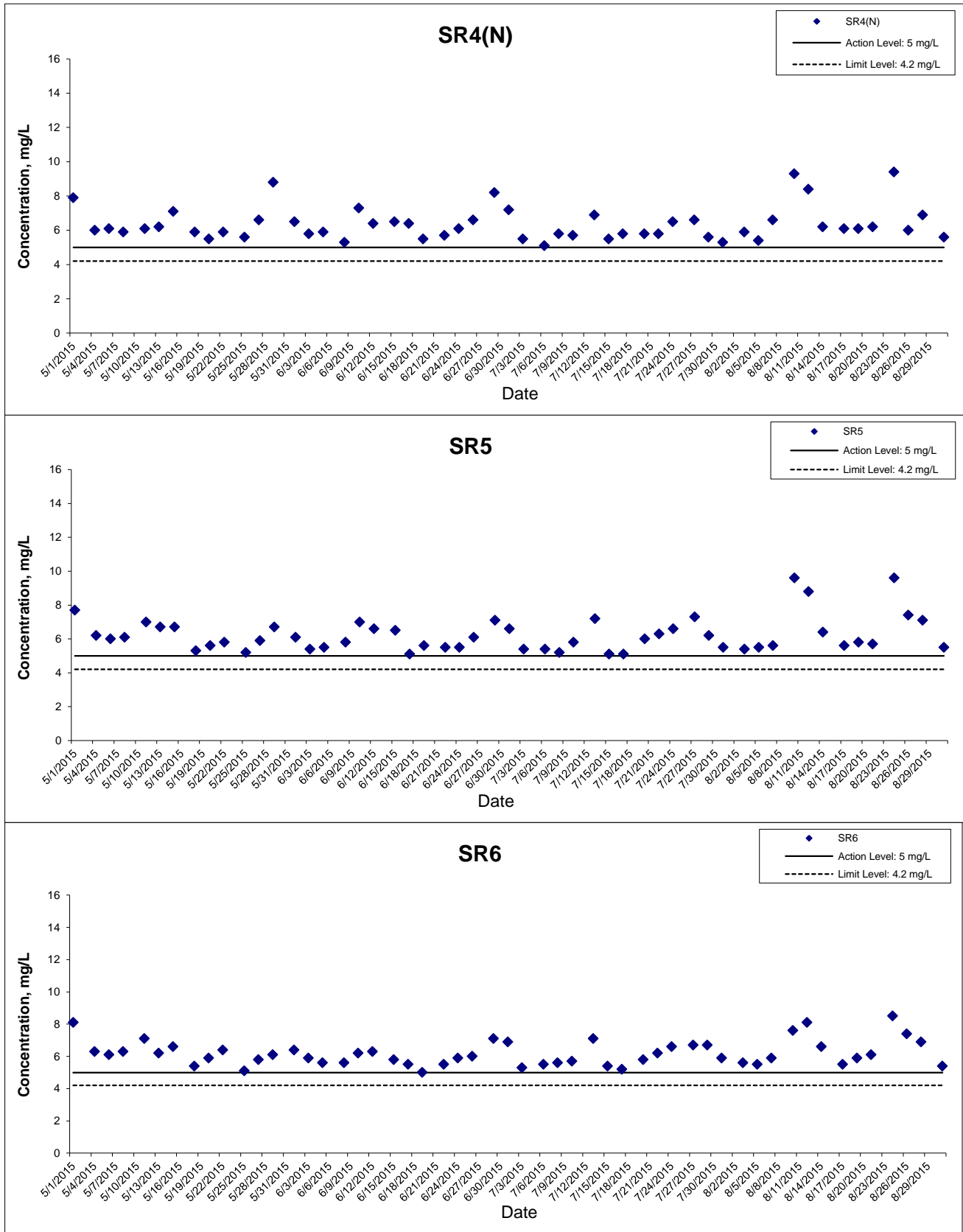
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results



## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



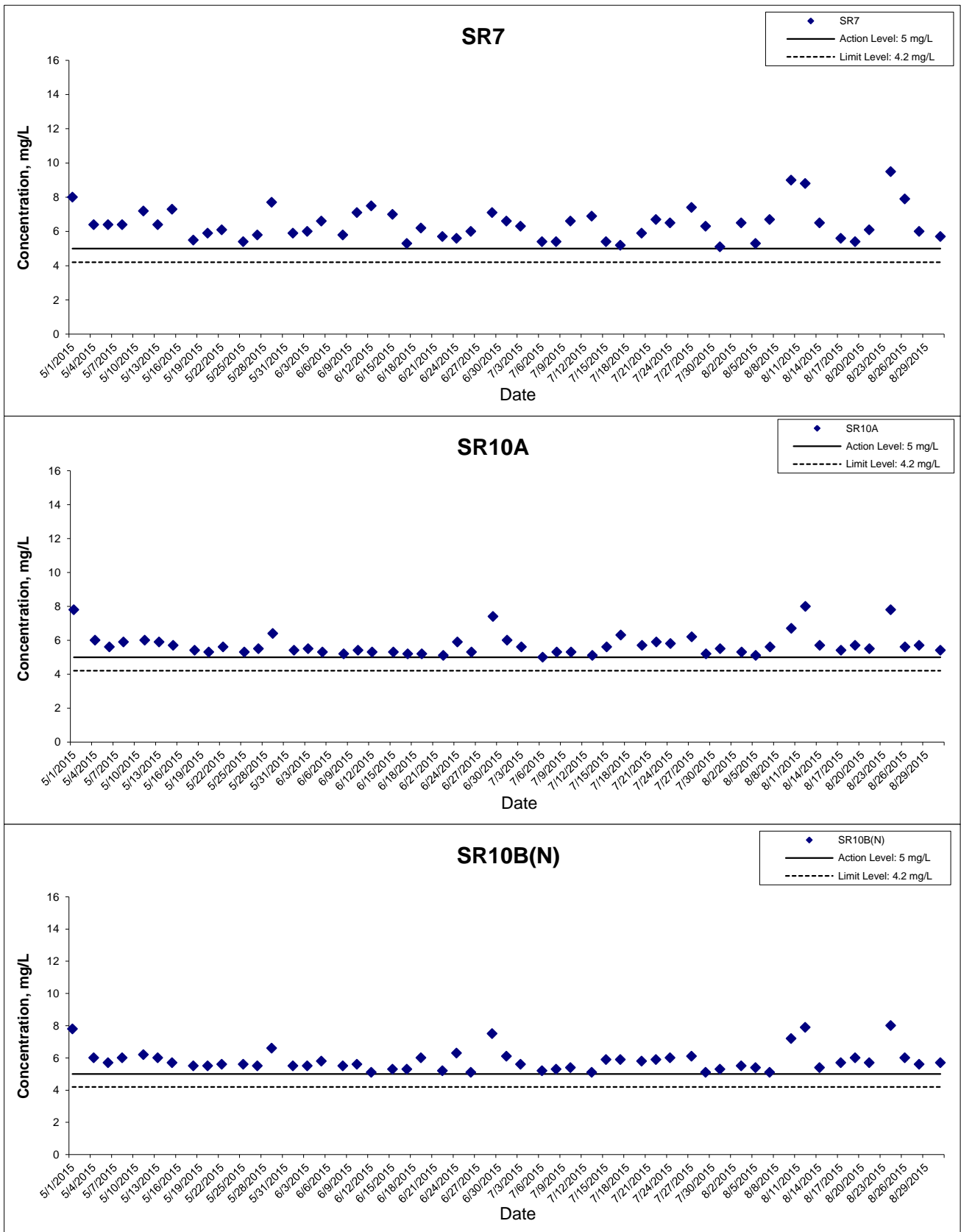
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results

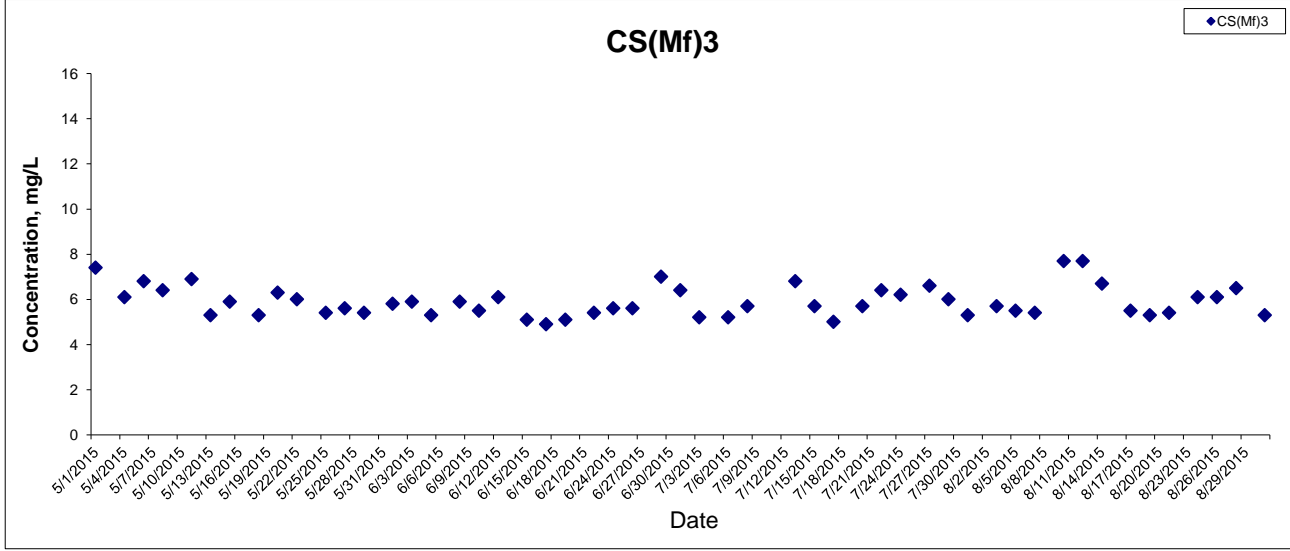
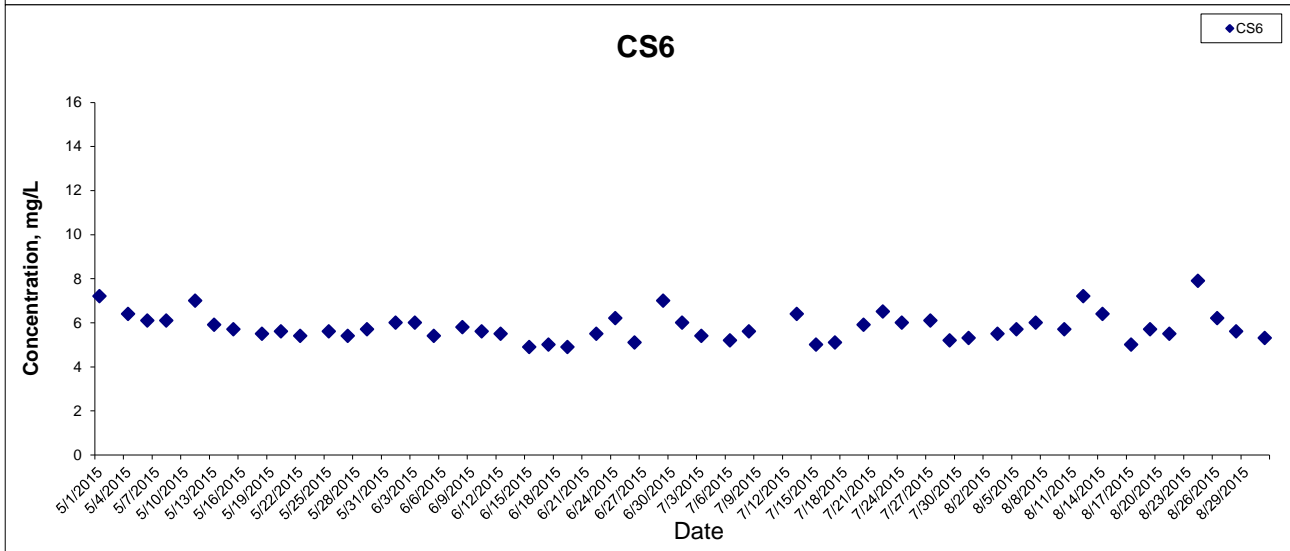
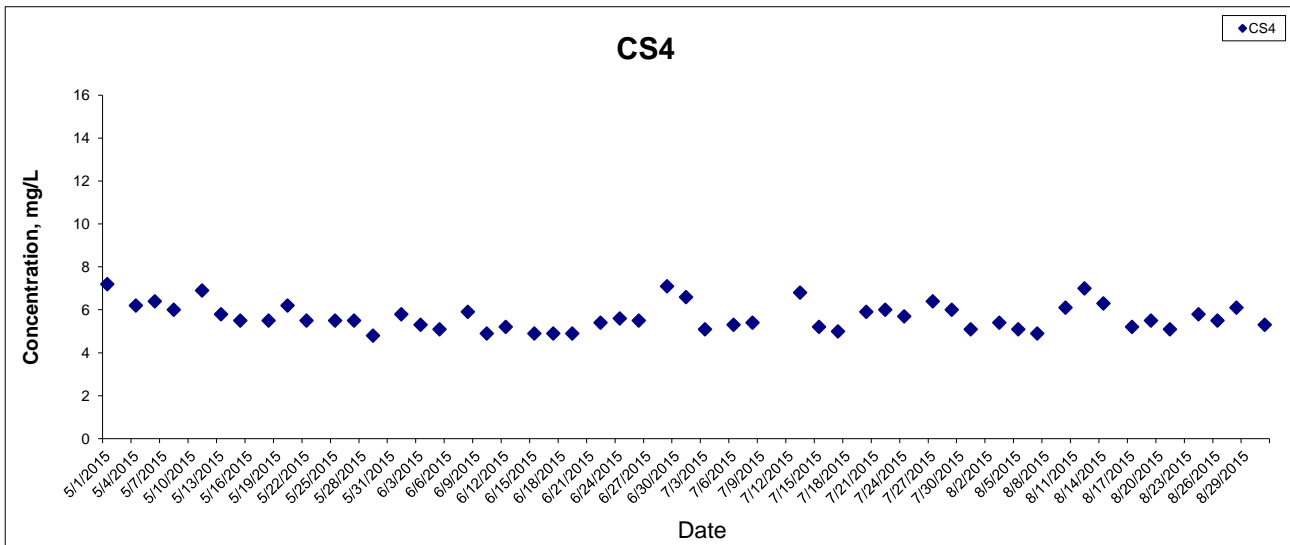


## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



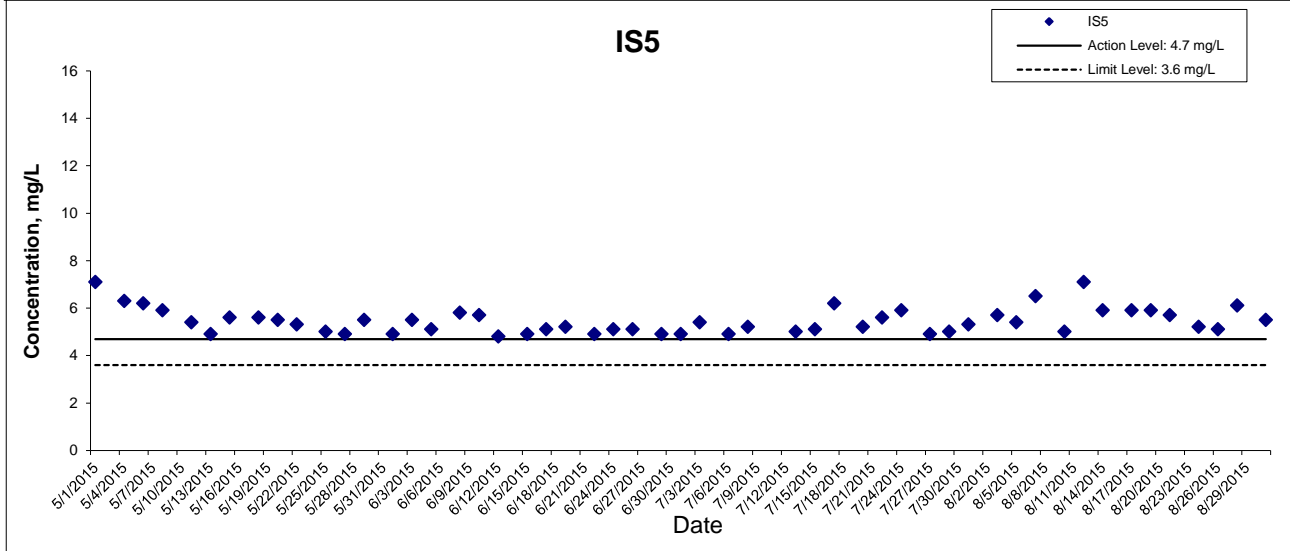
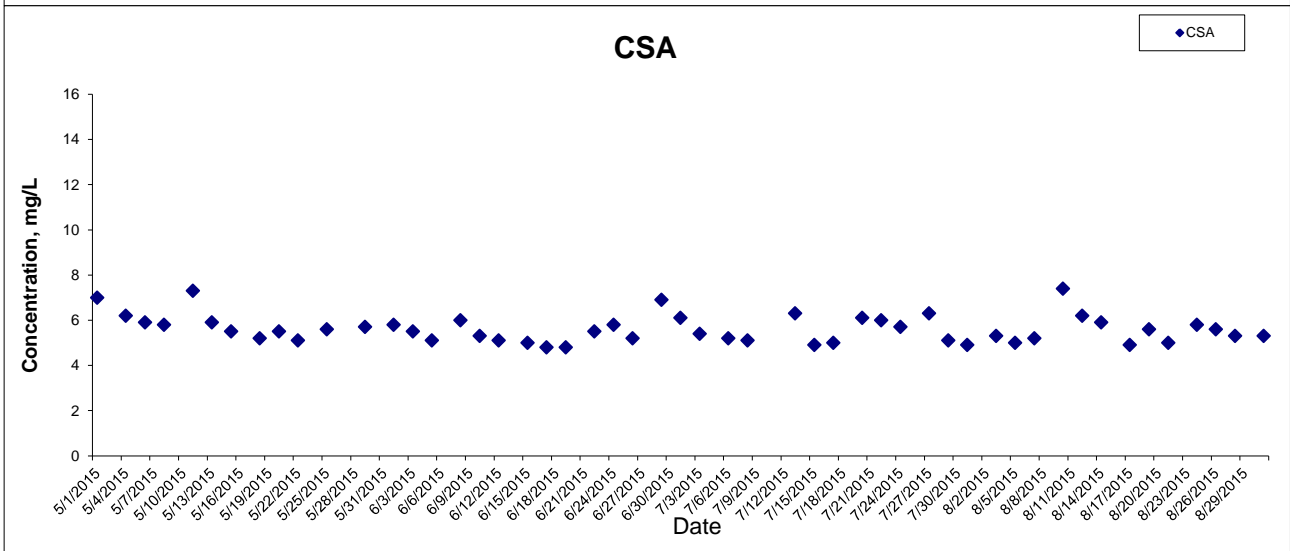
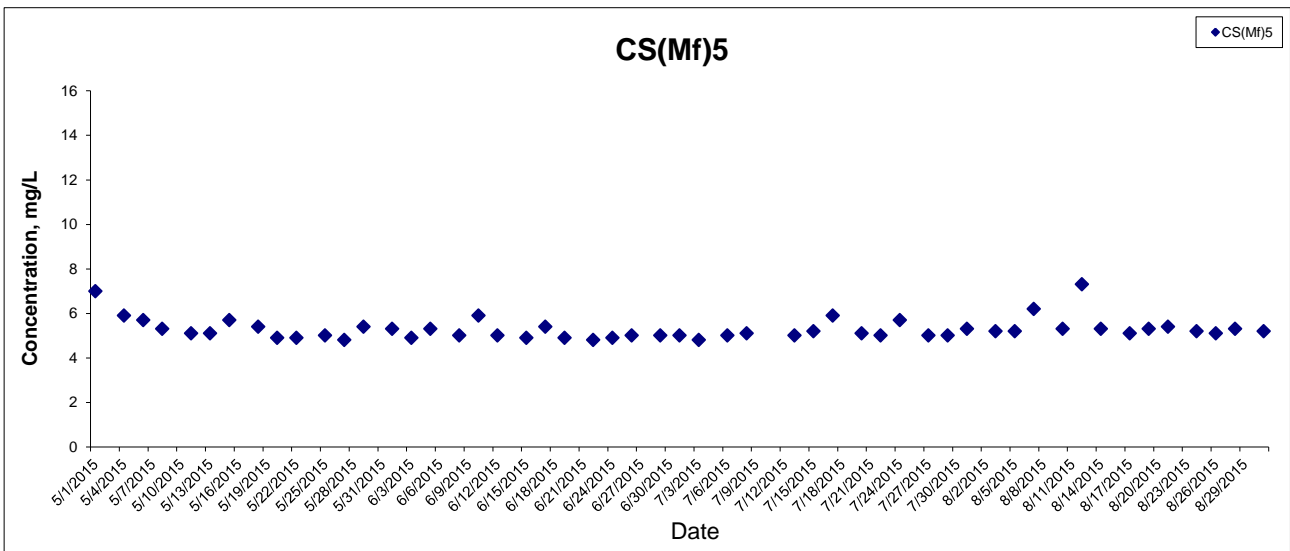
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



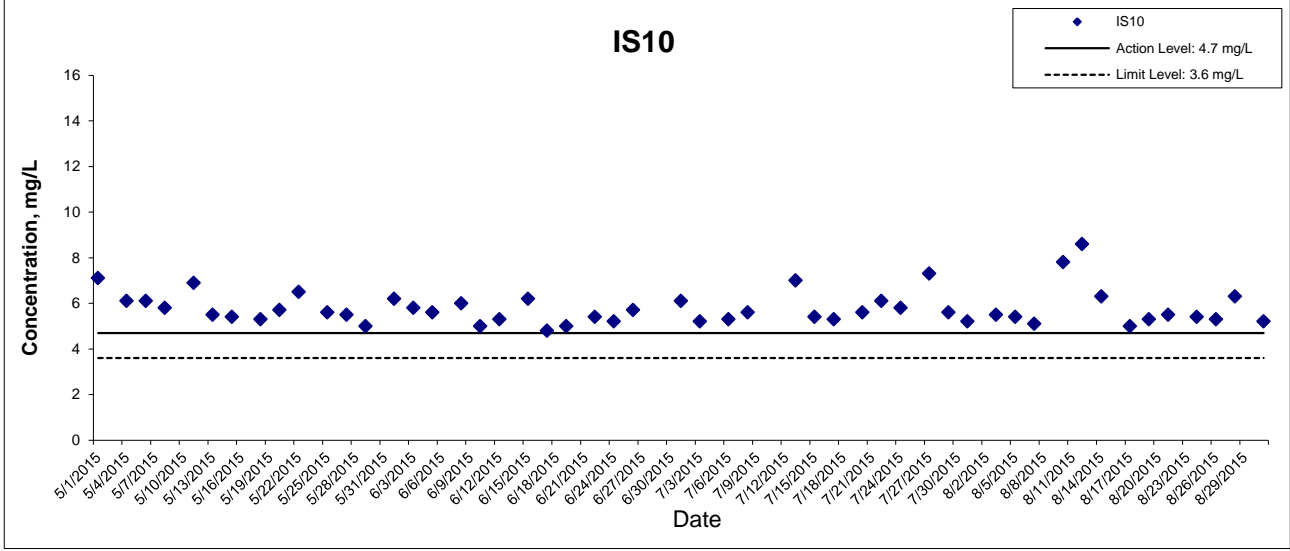
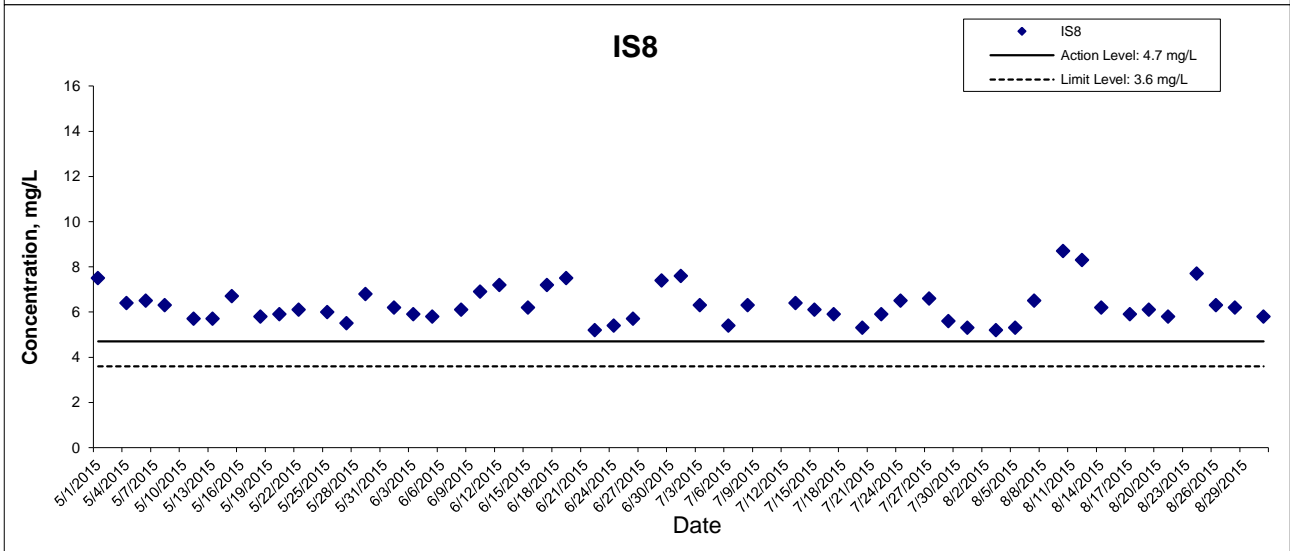
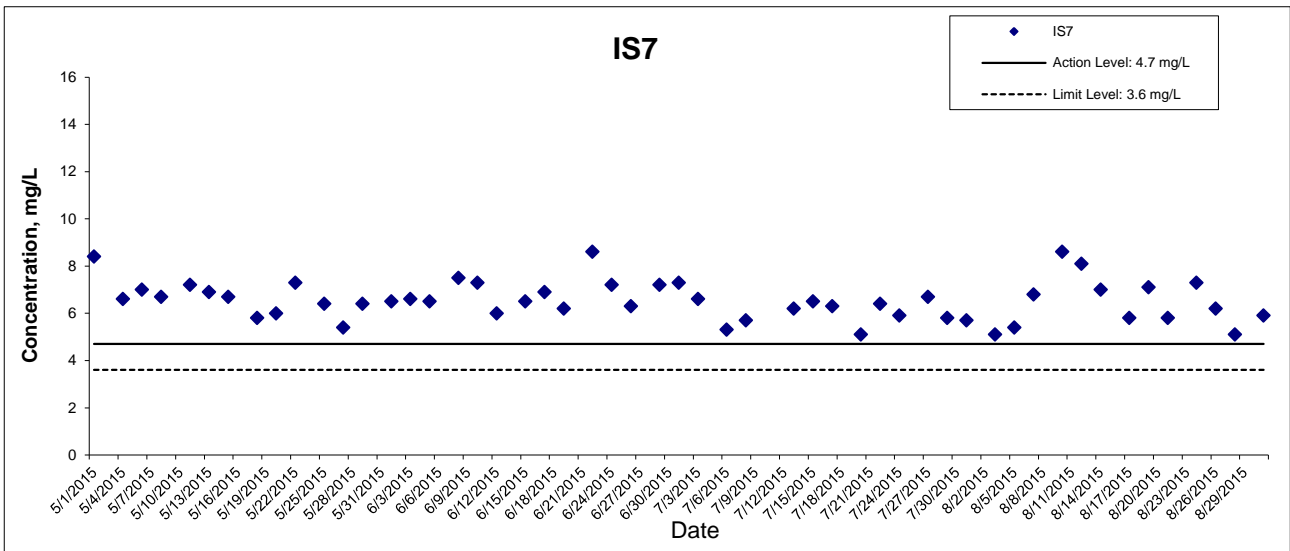
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

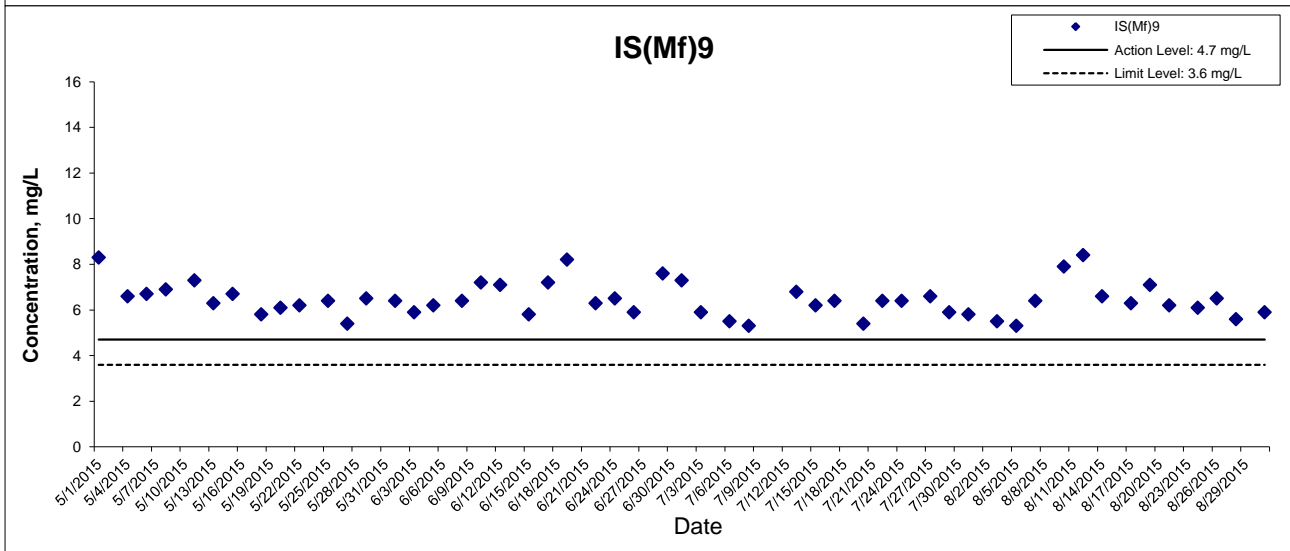
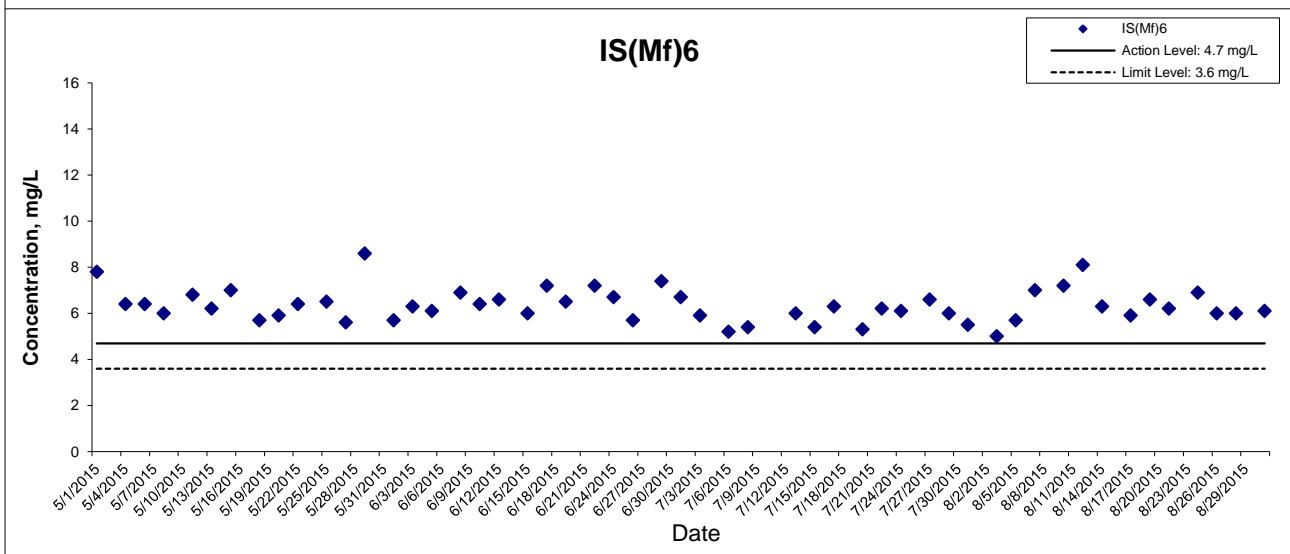
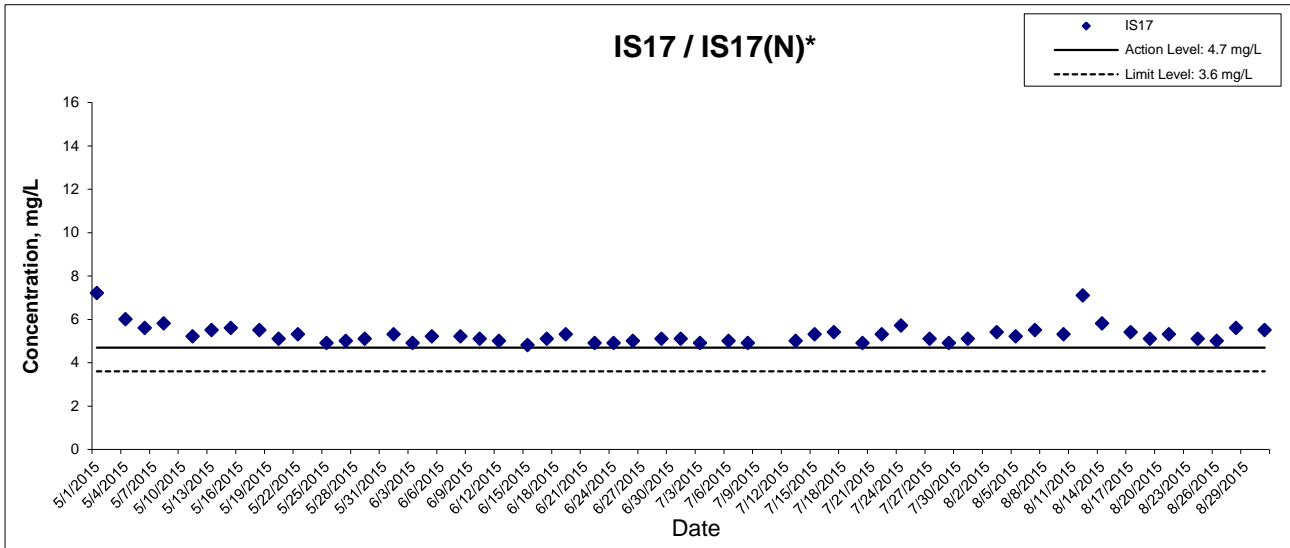
### Dissolved Oxygen (Bottom) at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

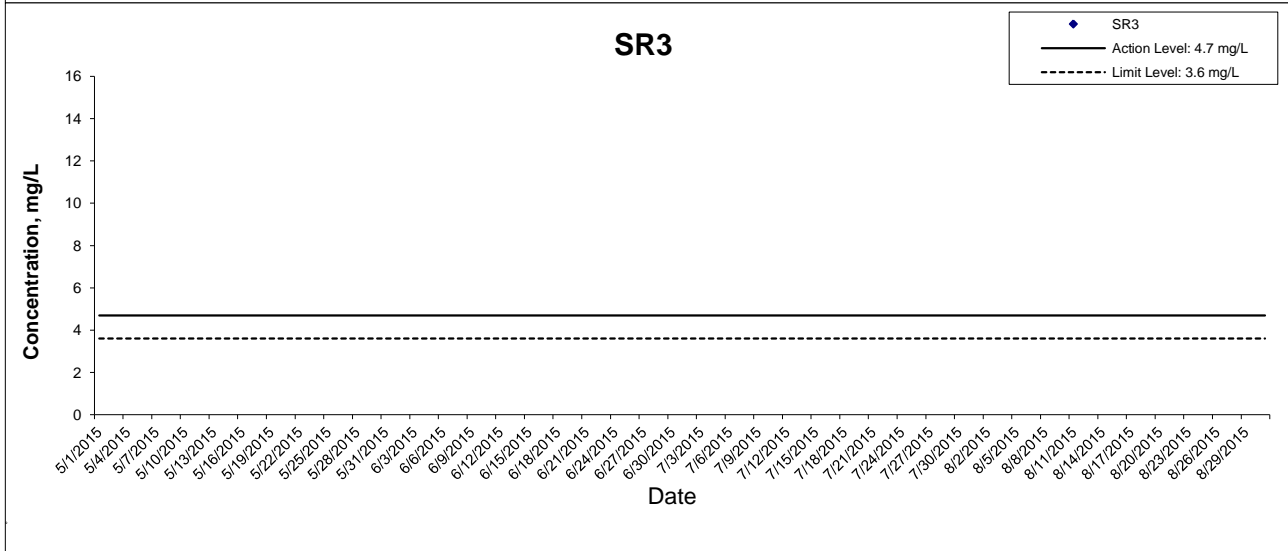
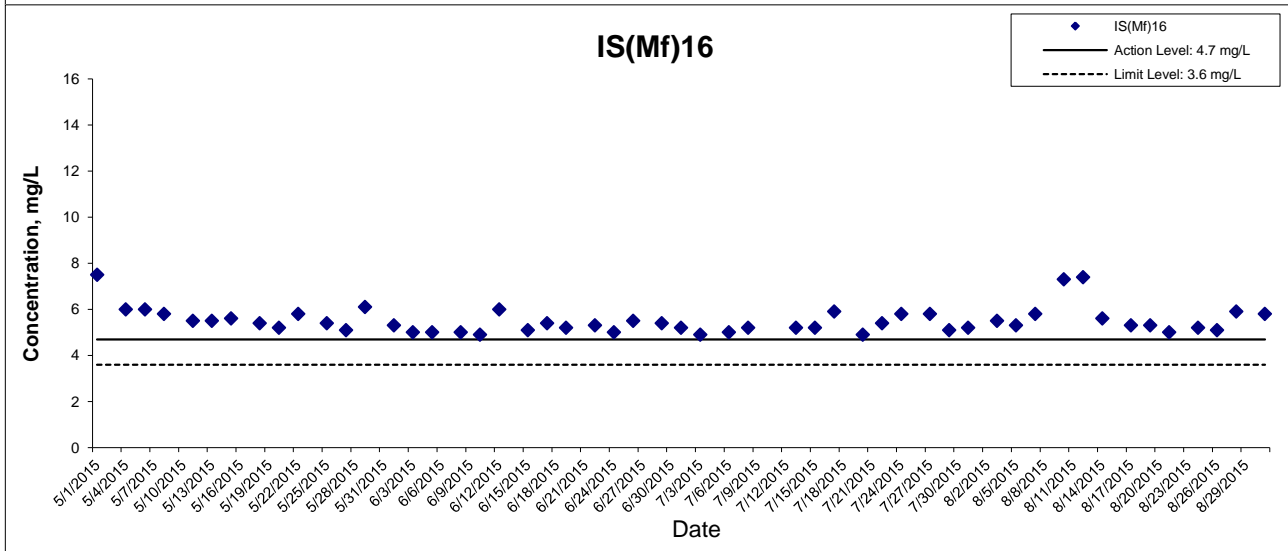
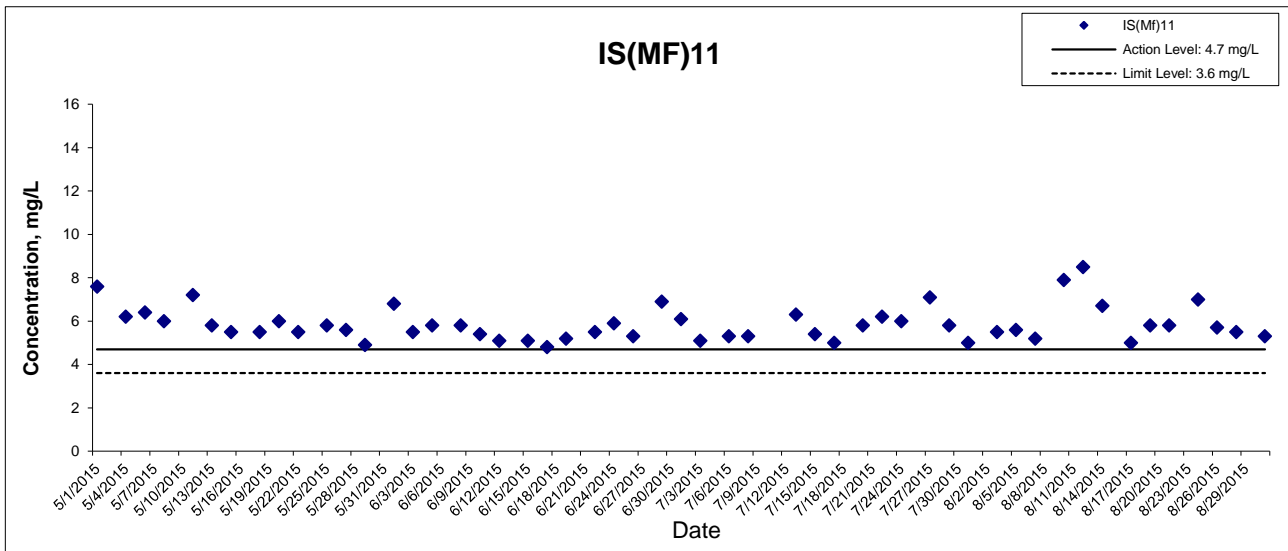


## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



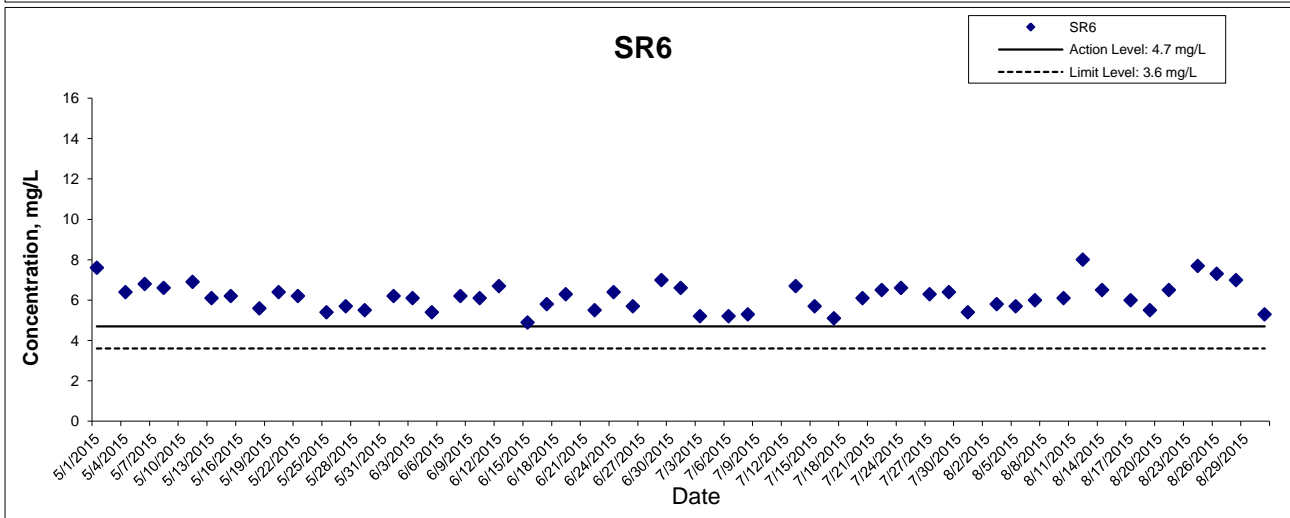
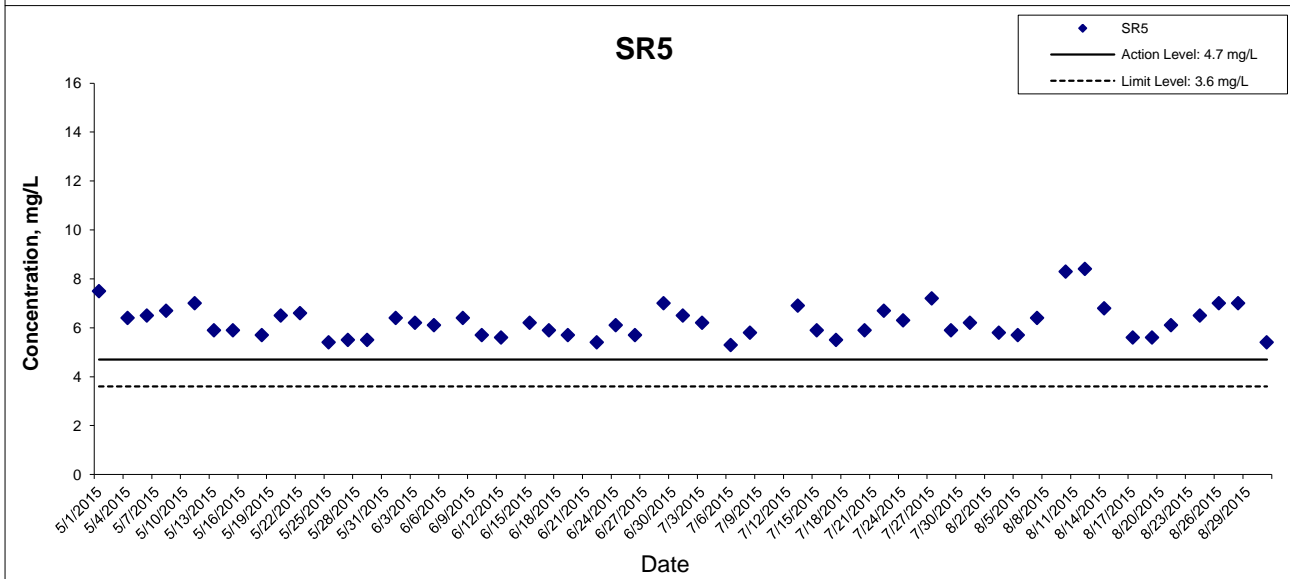
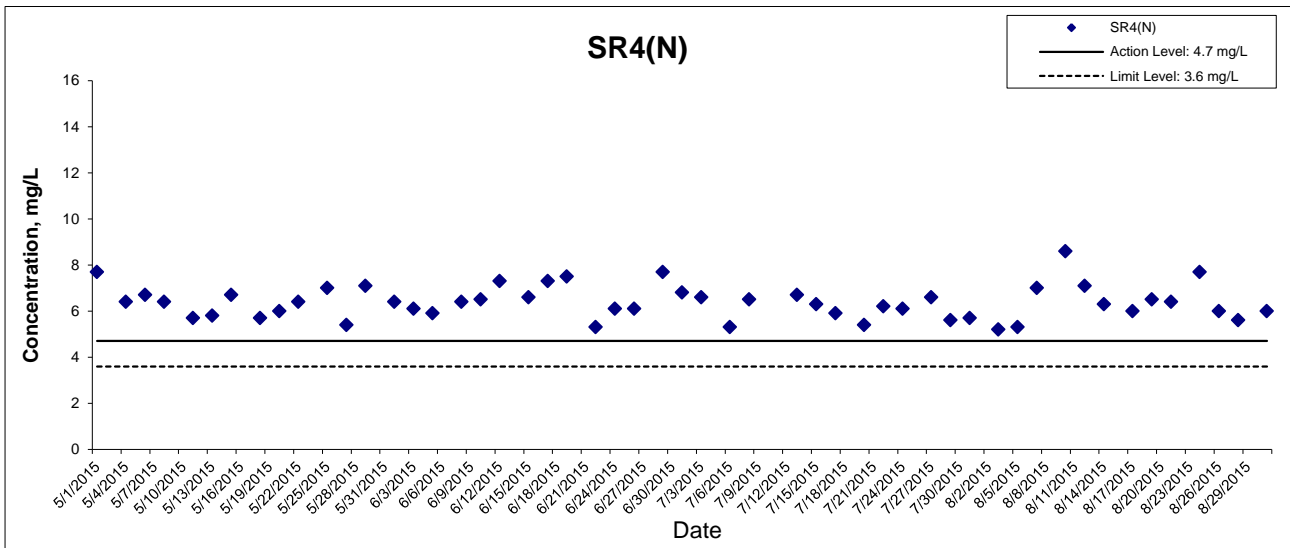
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



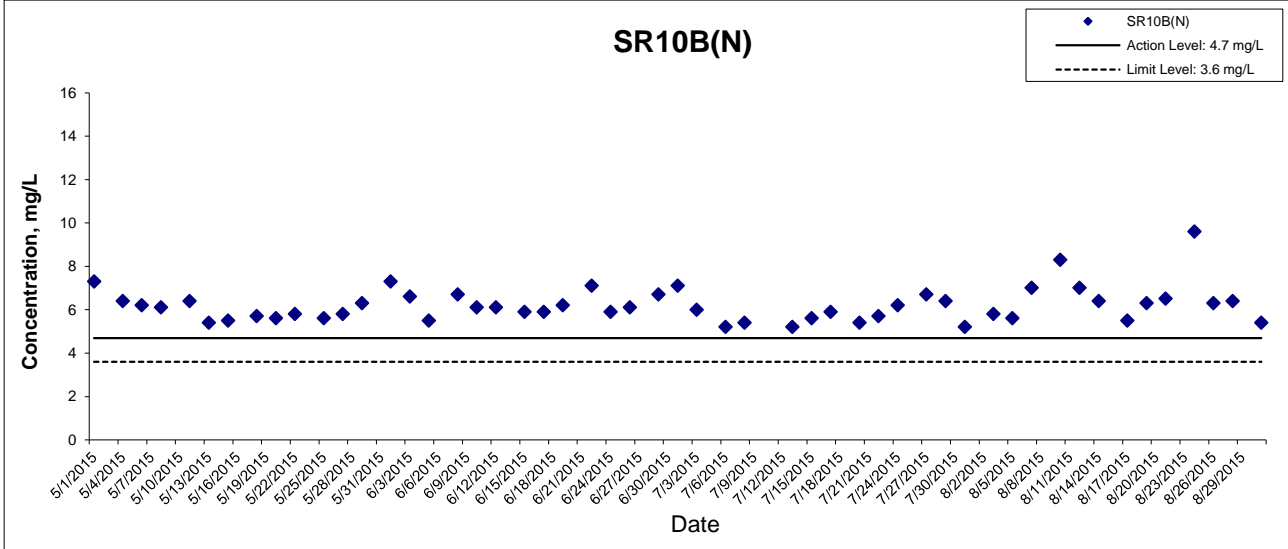
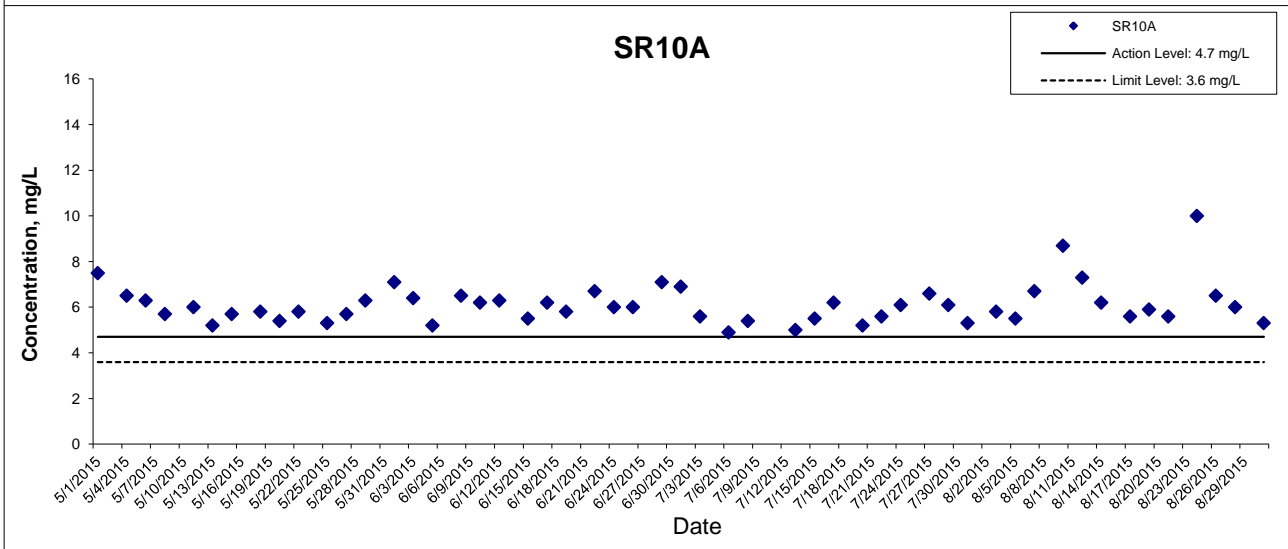
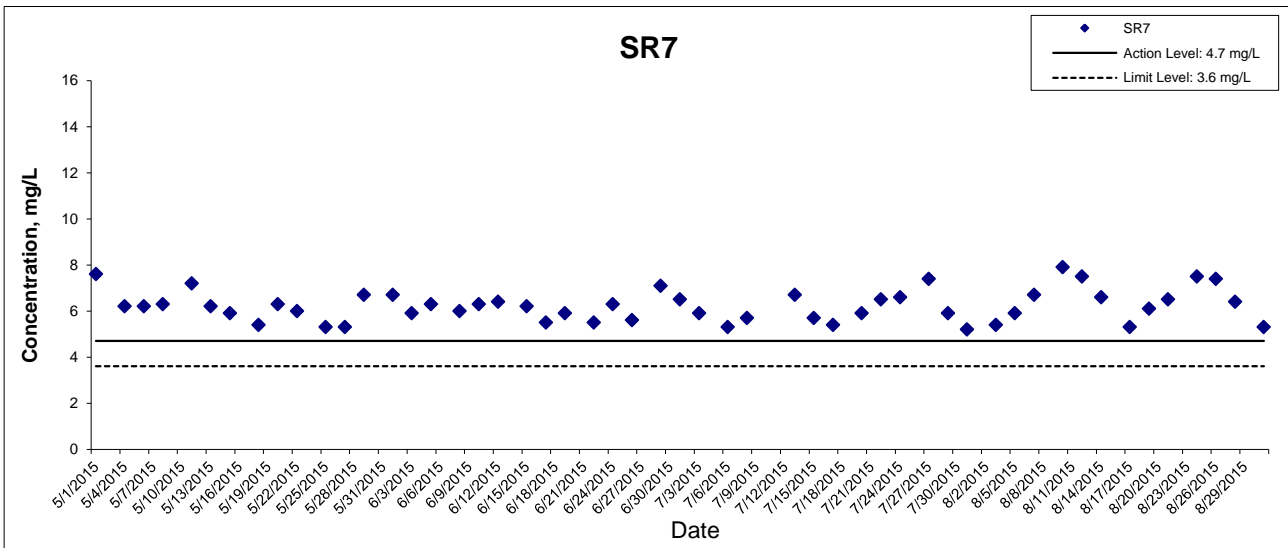
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



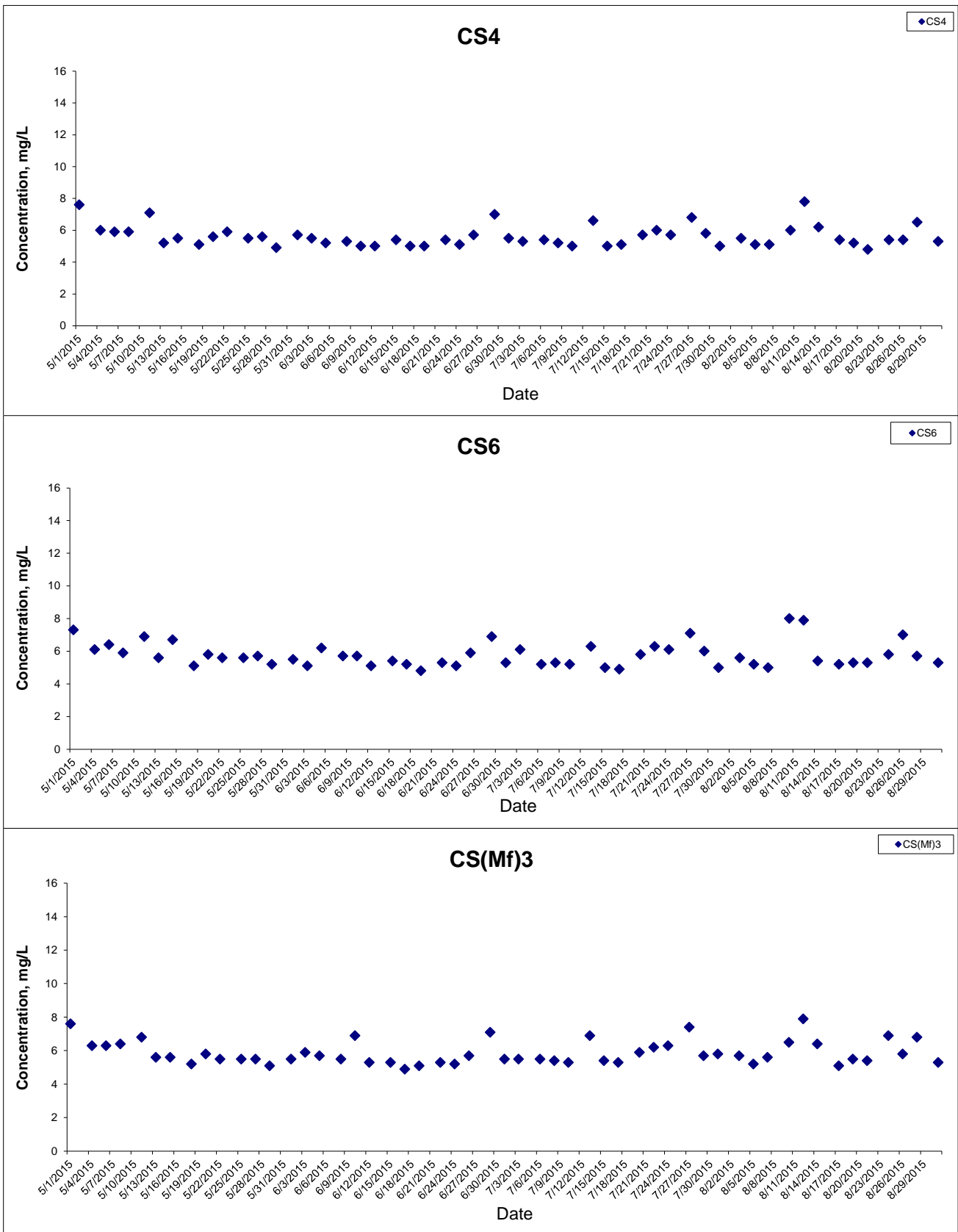
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Flood Tide



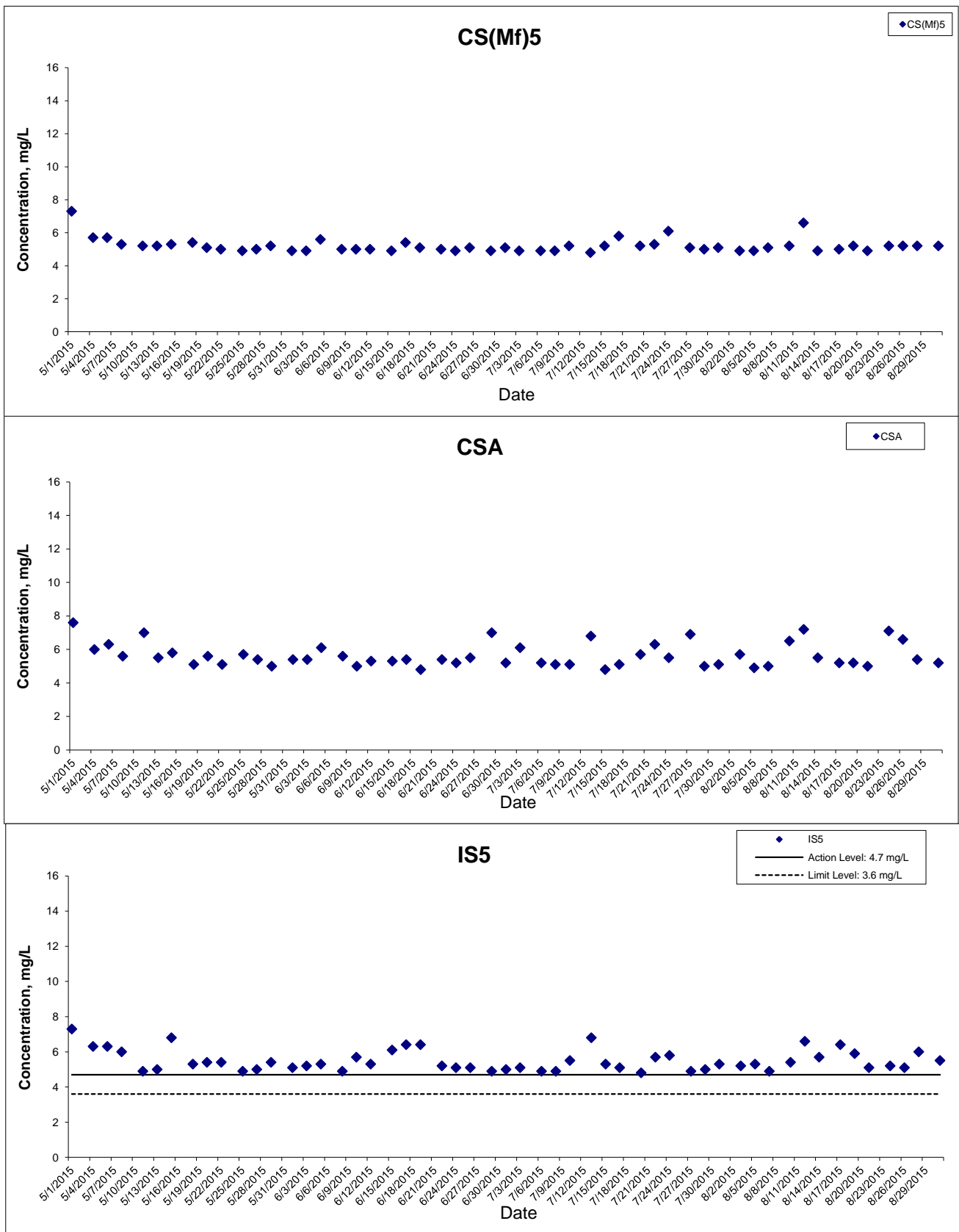
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results

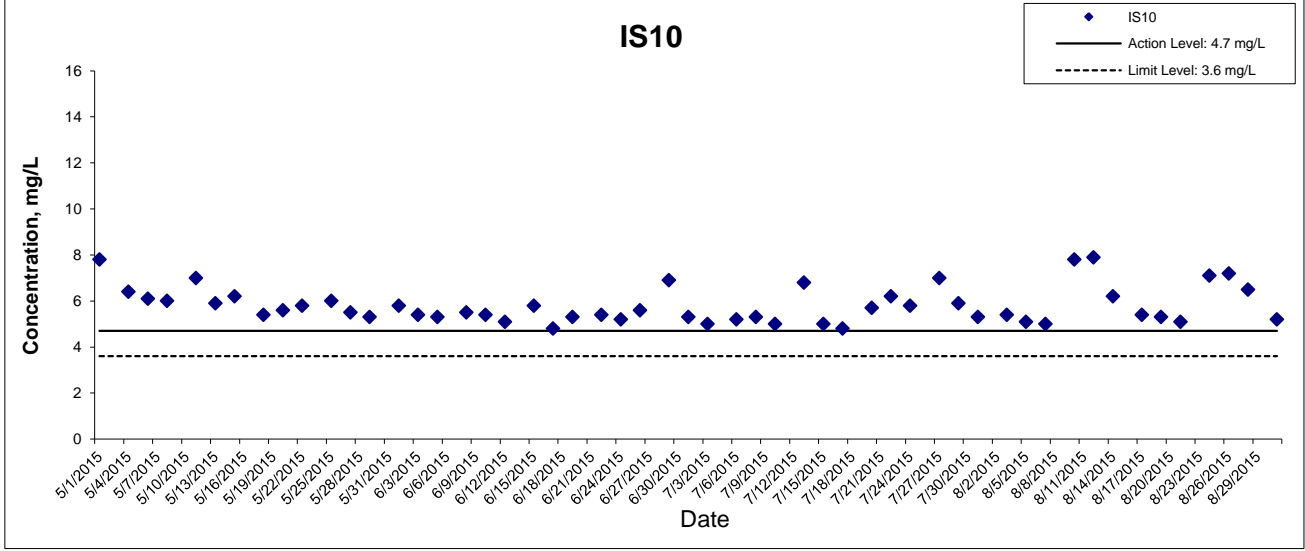
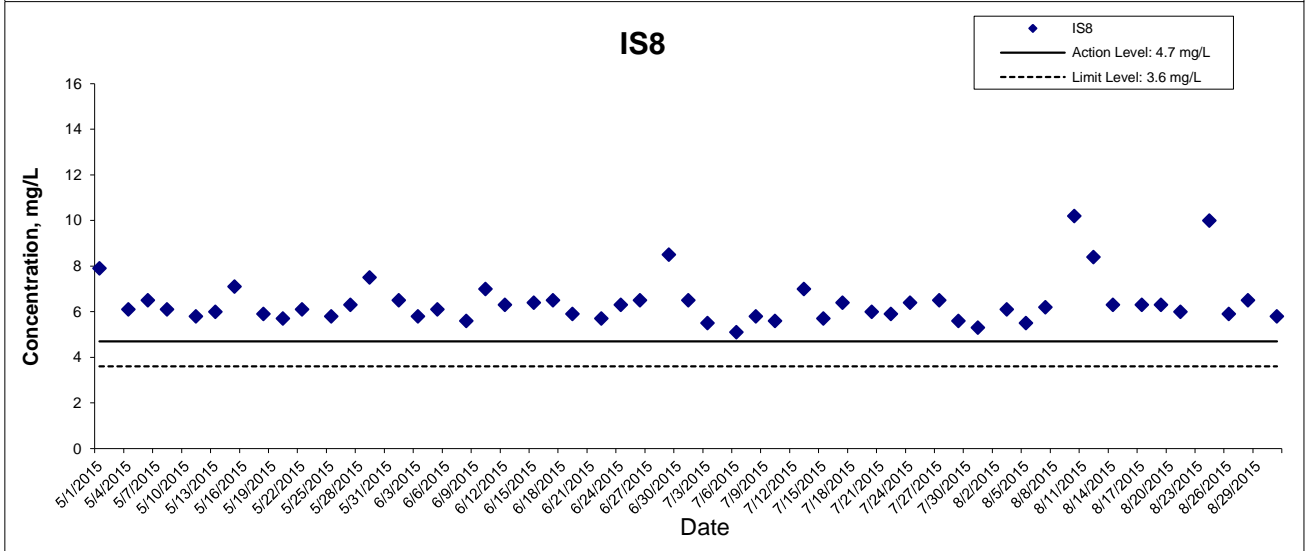
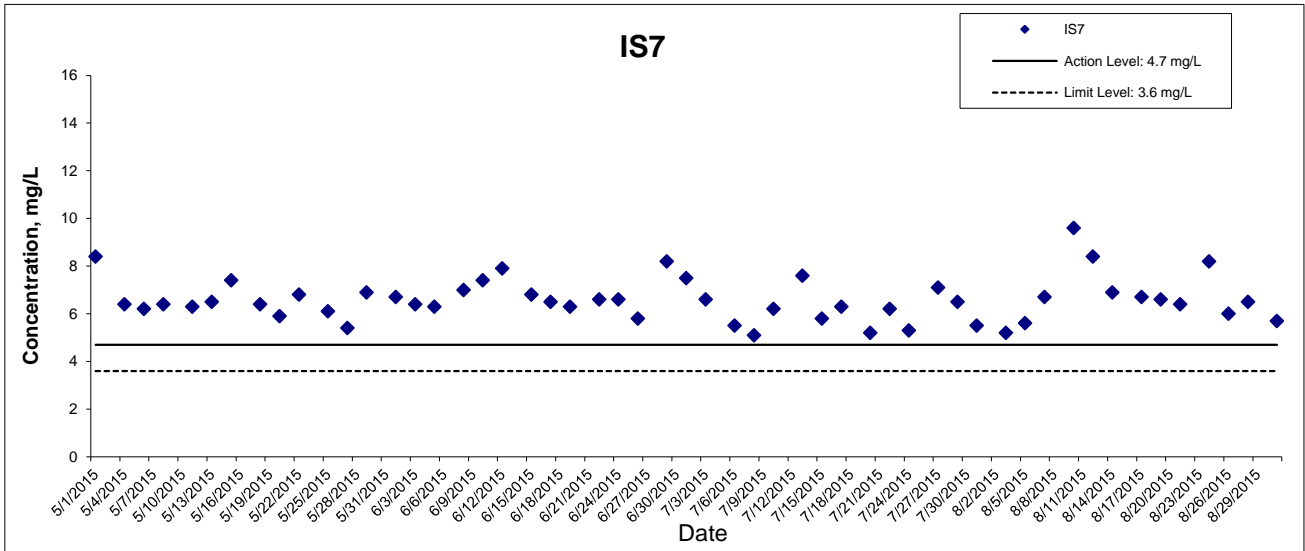


## Dissolved Oxygen (Bottom) at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

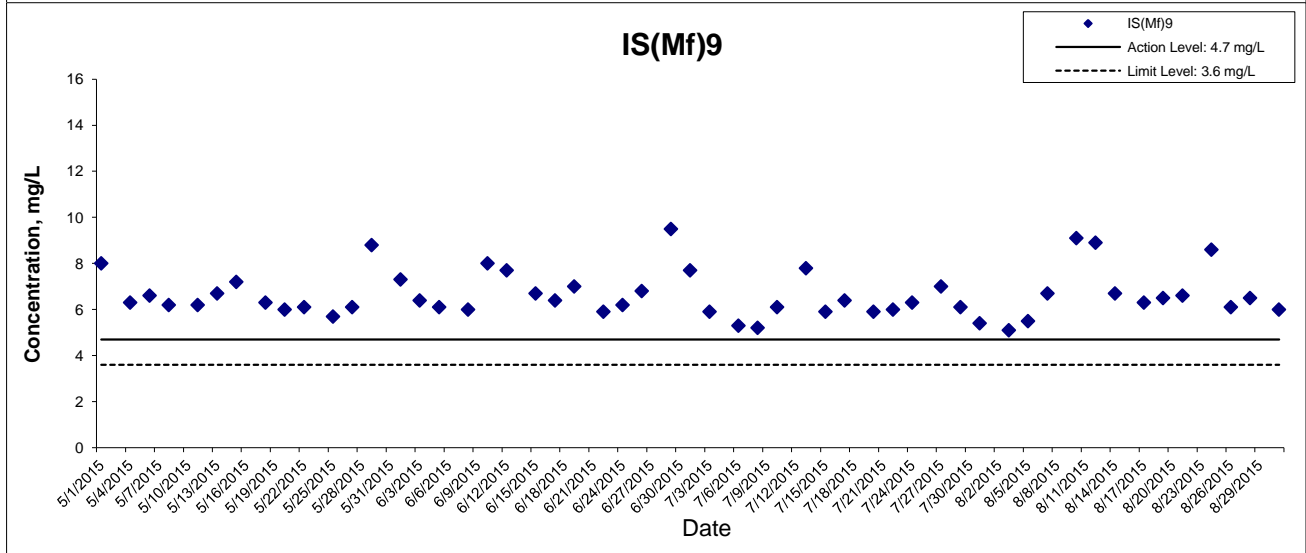
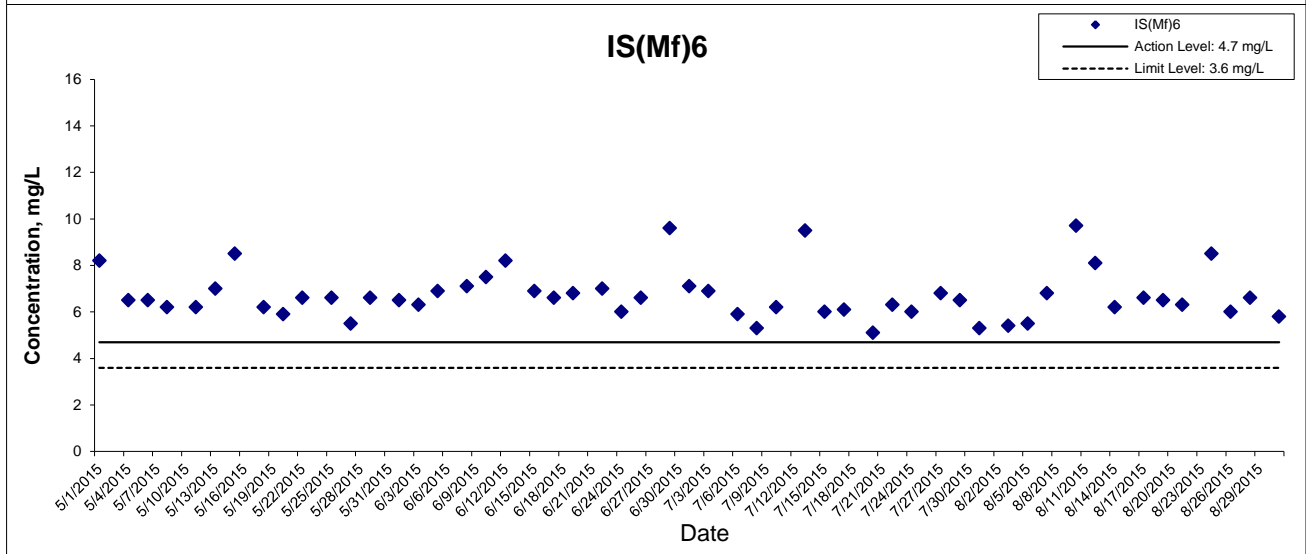
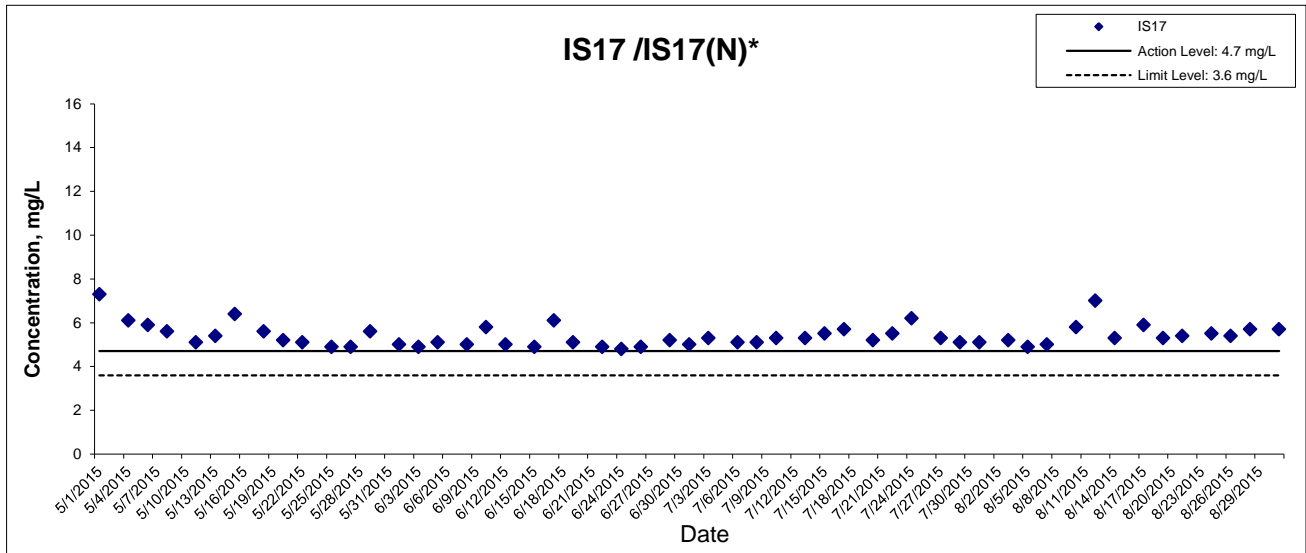
### Dissolved Oxygen (Bottom) at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



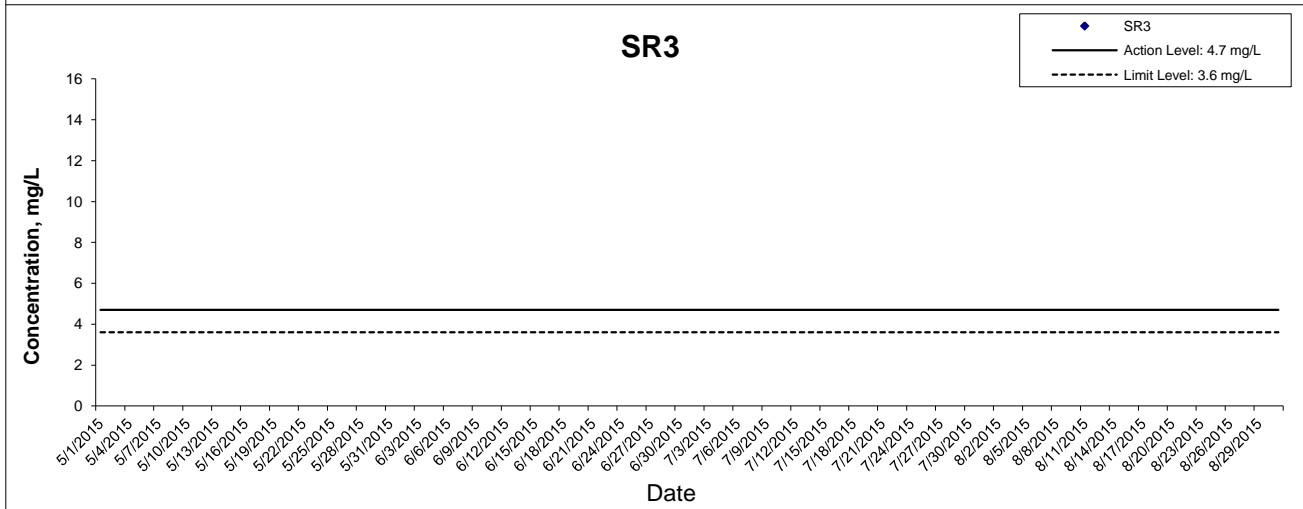
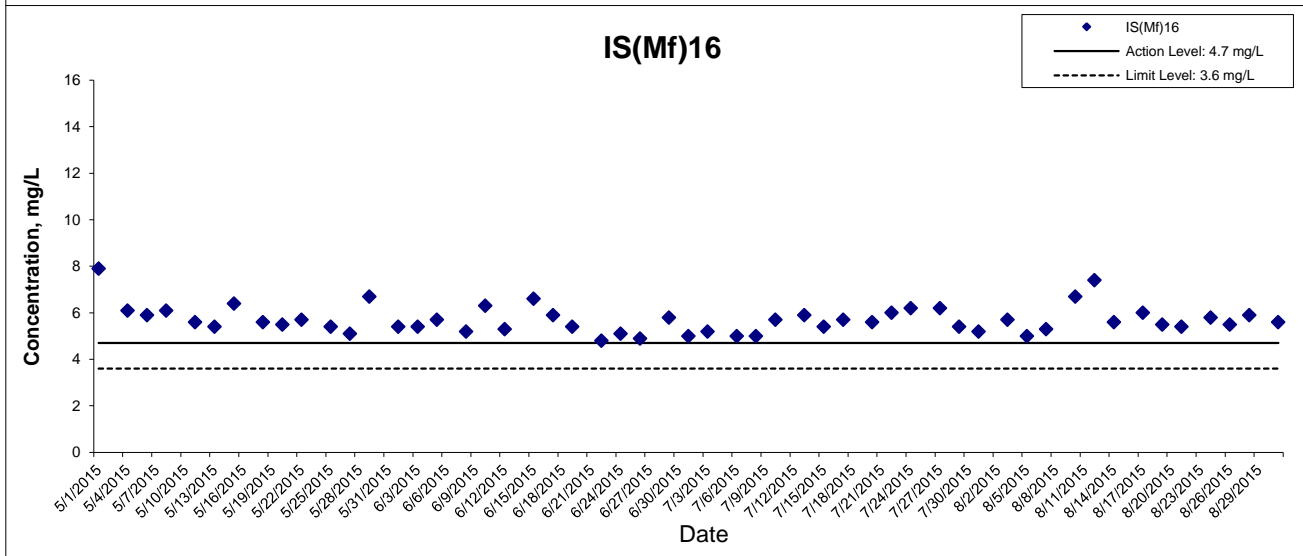
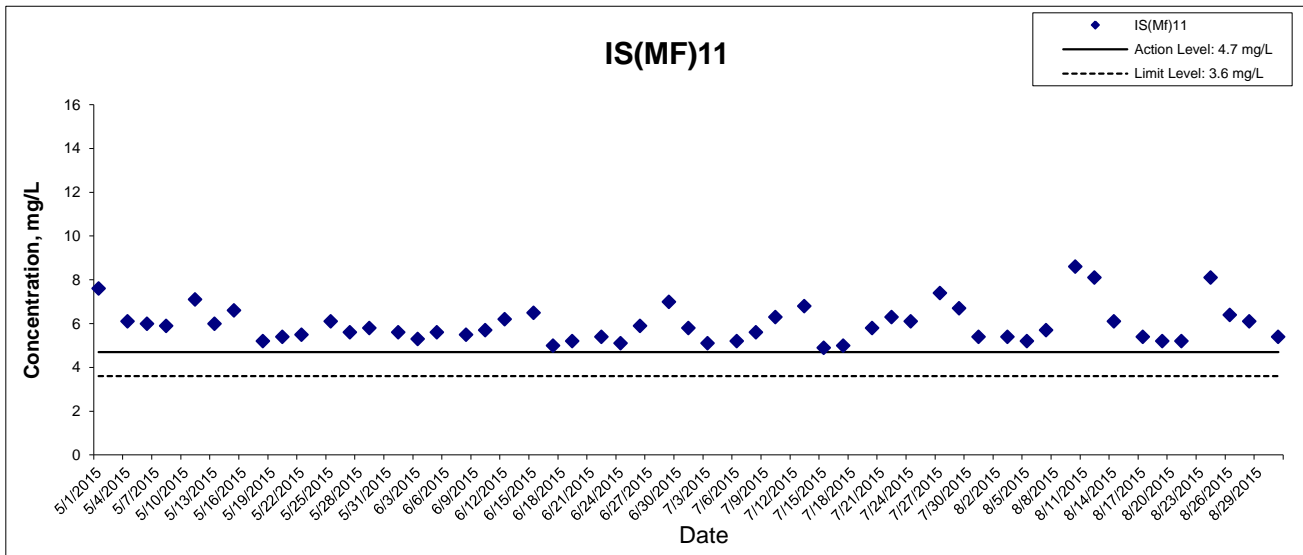
## Dissolved Oxygen (Bottom) at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



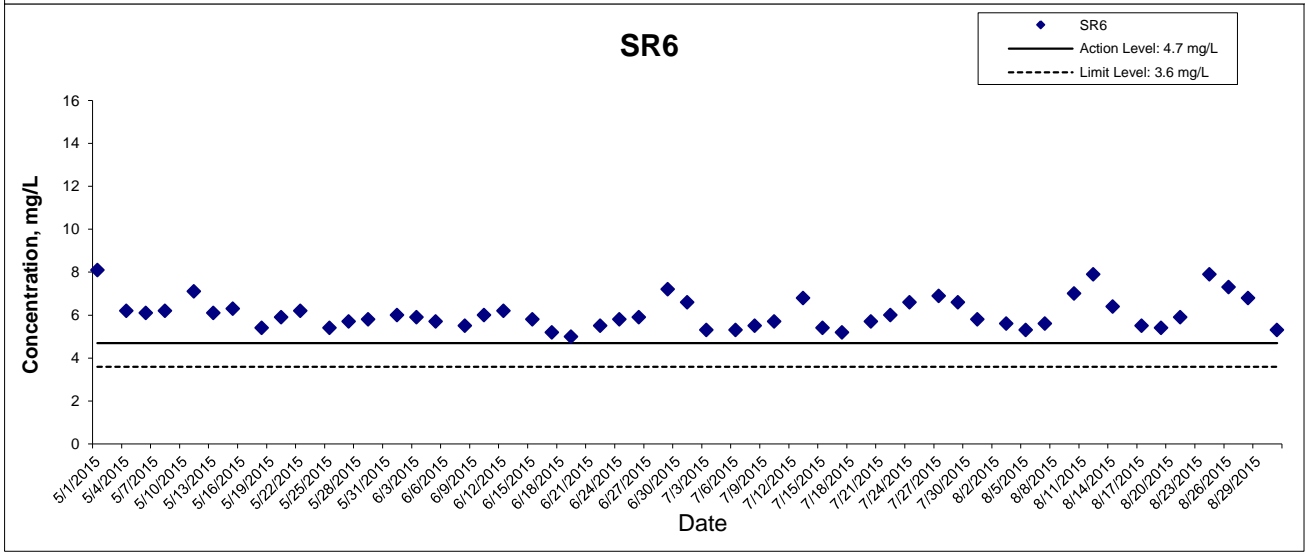
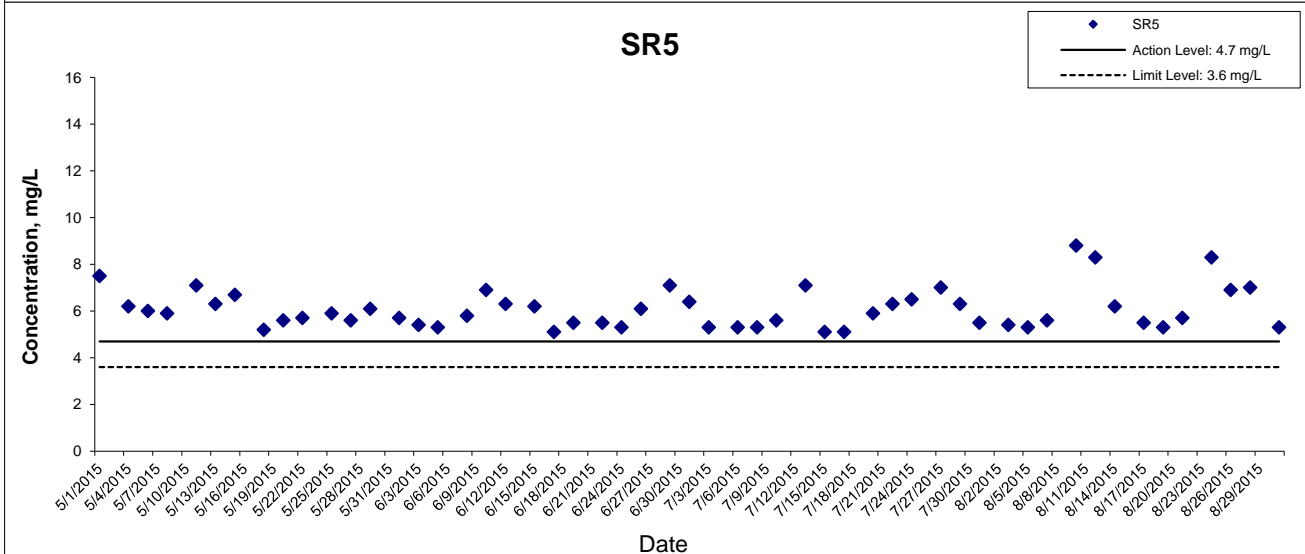
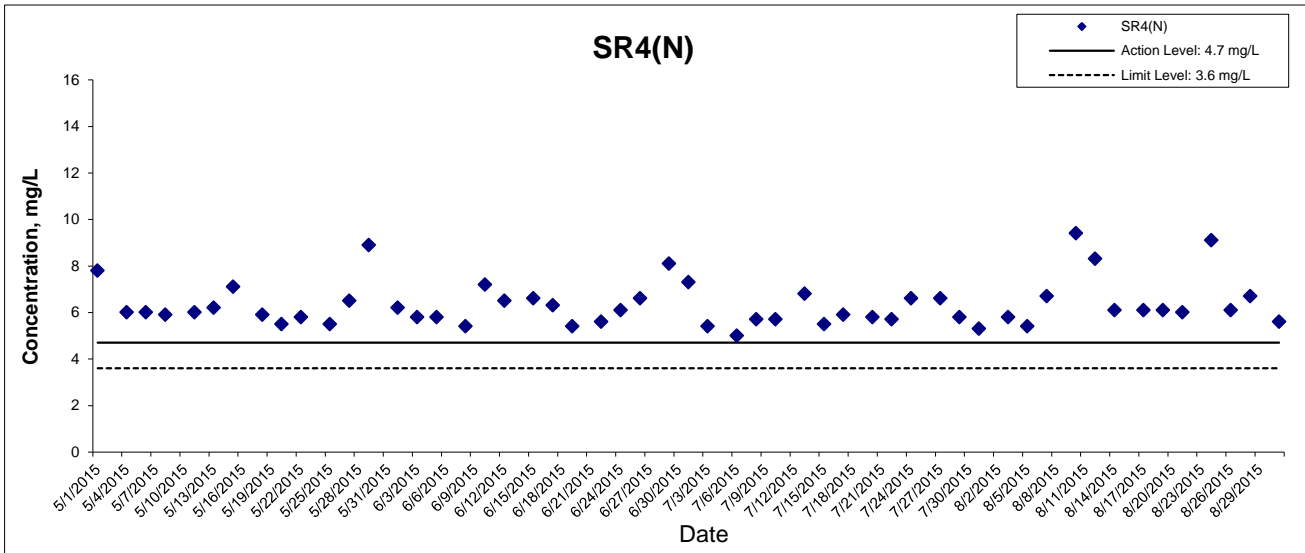
## Dissolved Oxygen (Bottom) at Mid-Flood Tide



As the measured water depths were less than 3 m during all monitoring days, water samples are collected at mid-depth only .

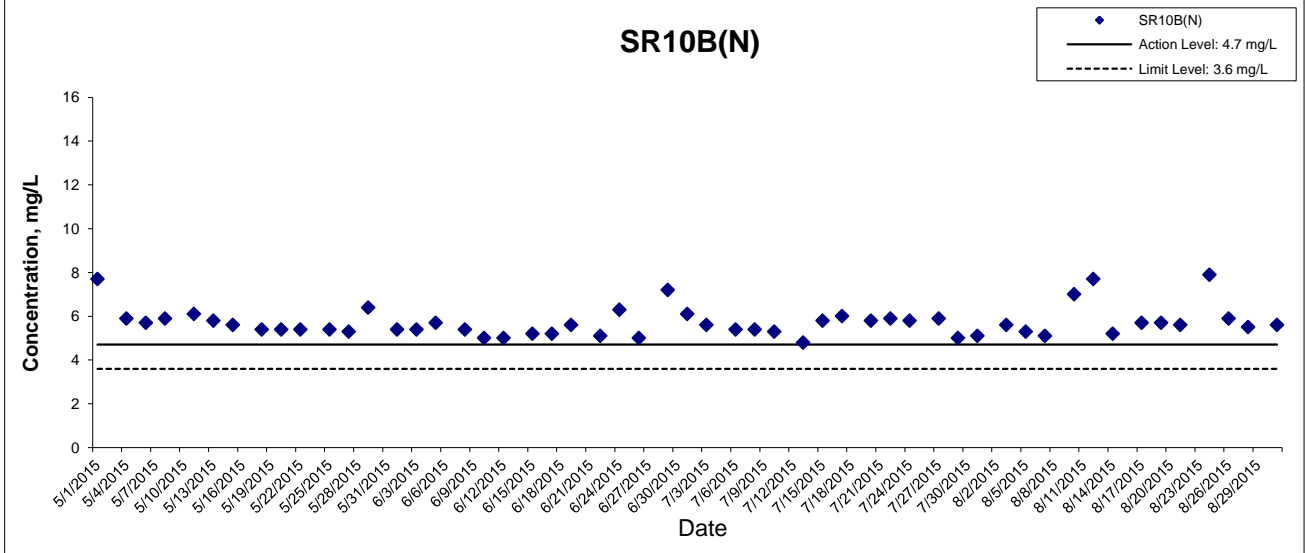
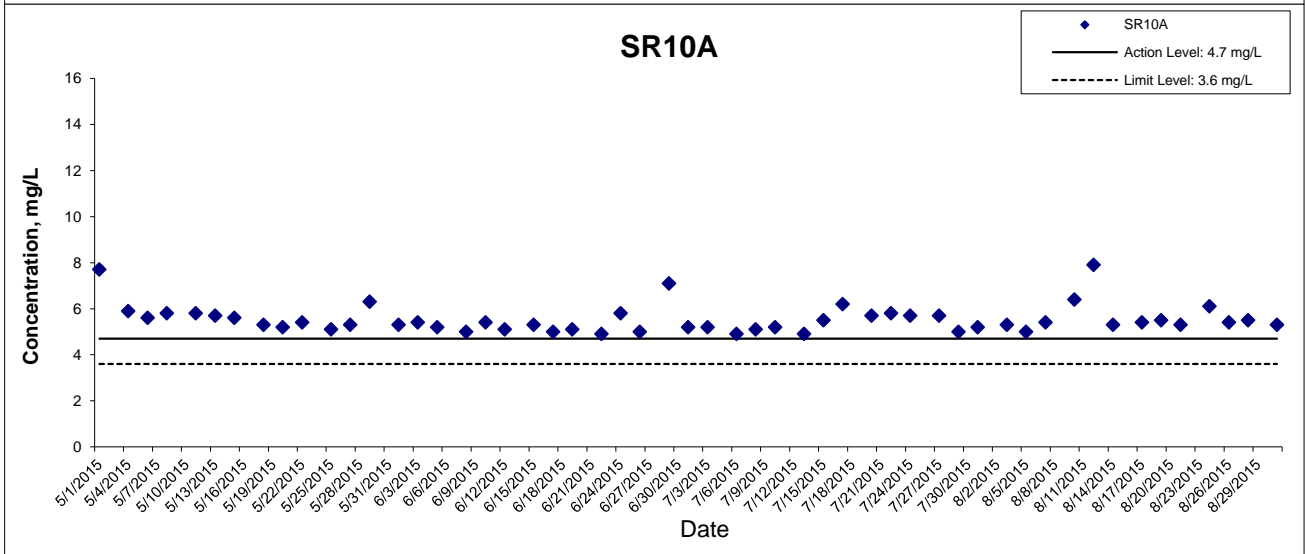
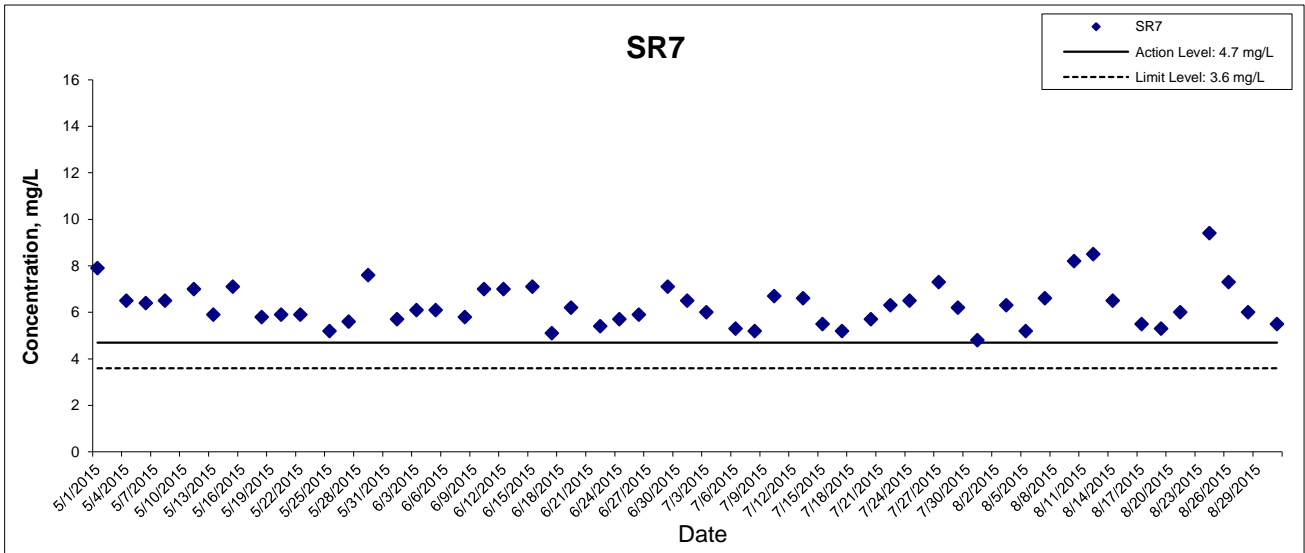
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Flood Tide



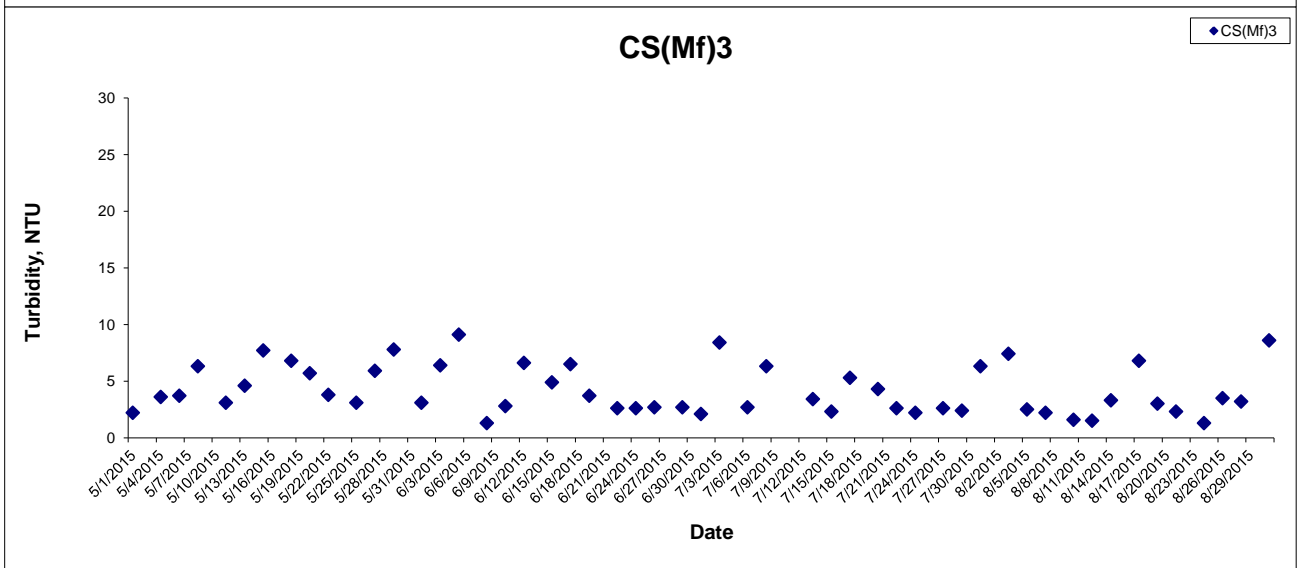
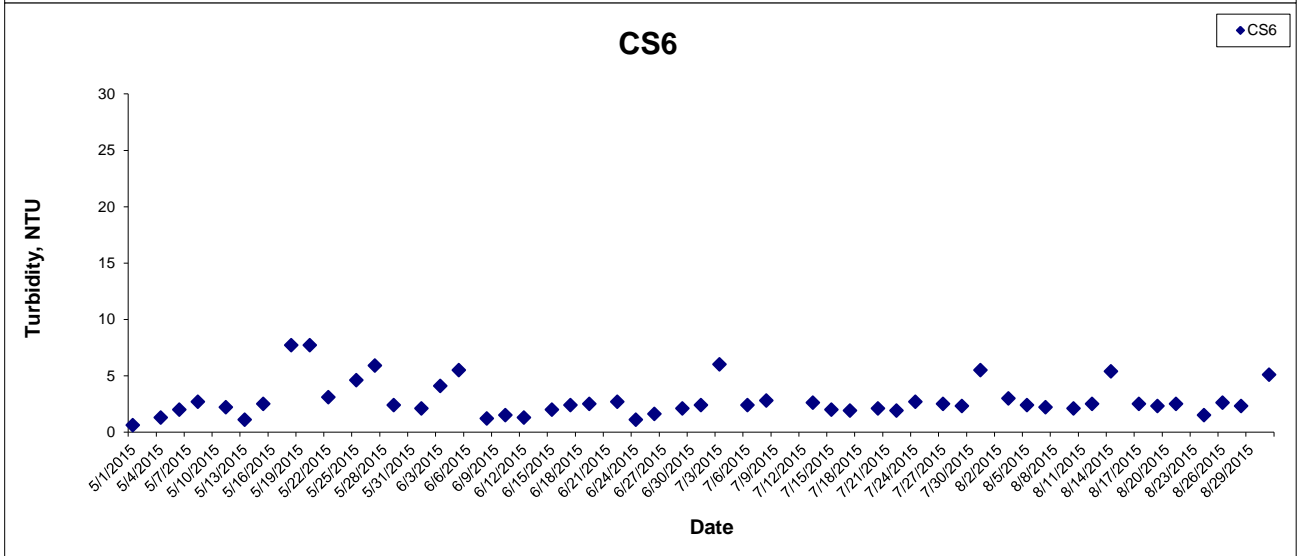
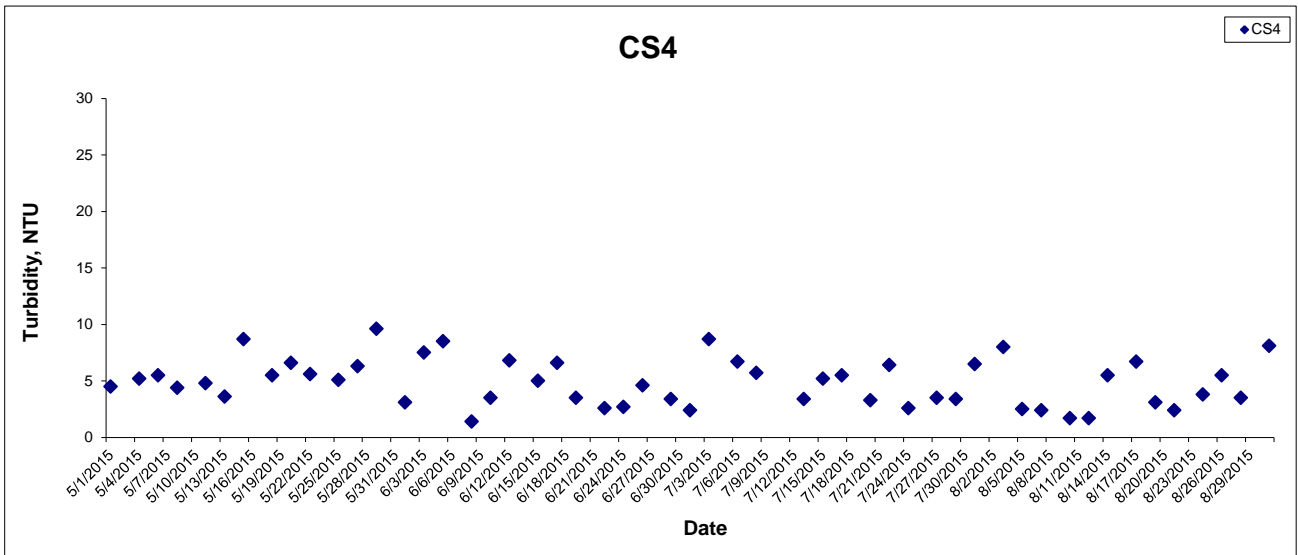
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Dissolved Oxygen (Bottom) at Mid-Flood Tide



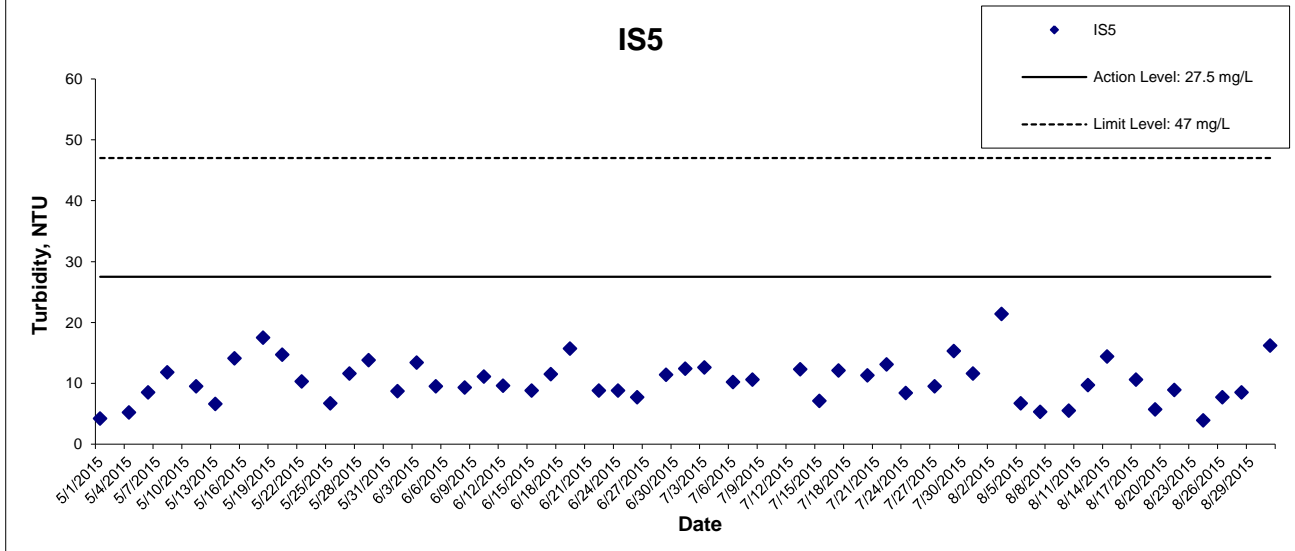
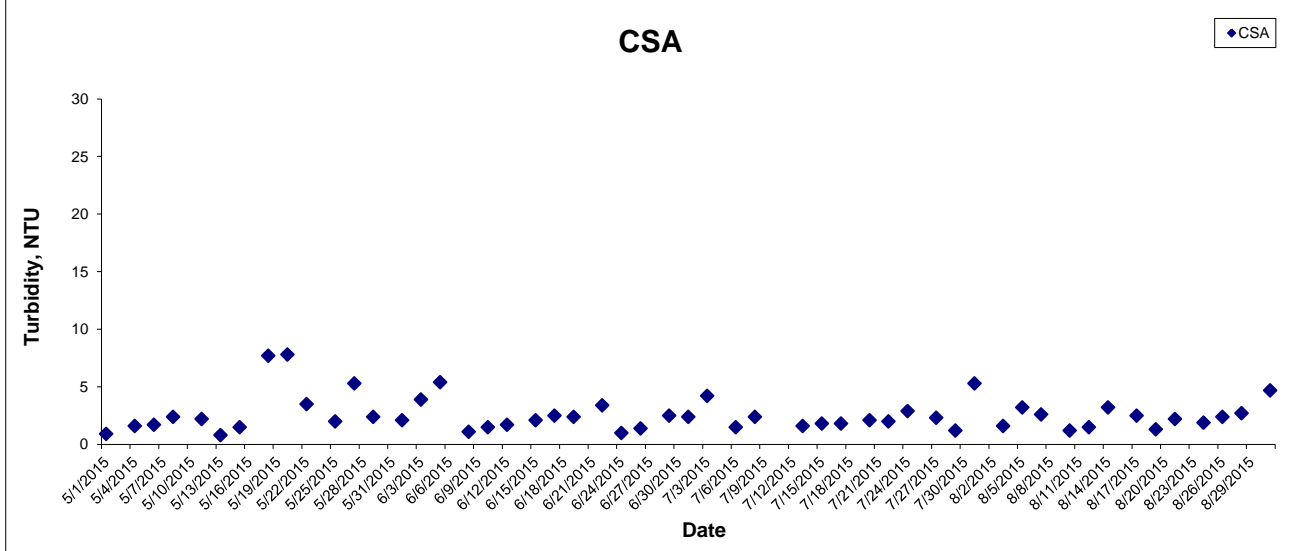
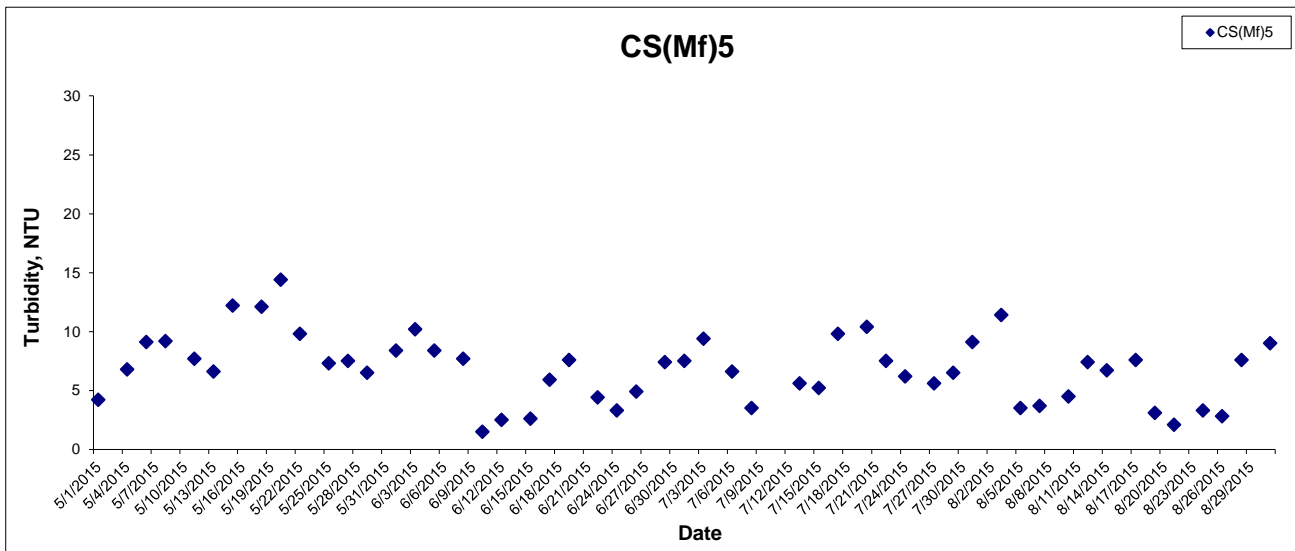
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Turbidity at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

### Turbidity at Mid-Ebb Tide



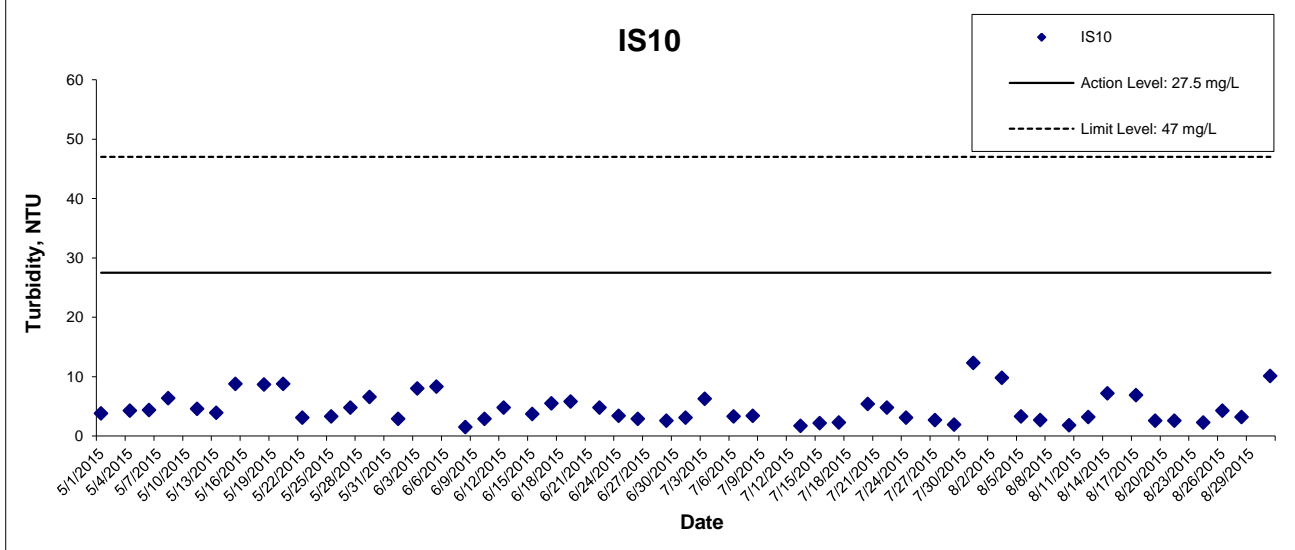
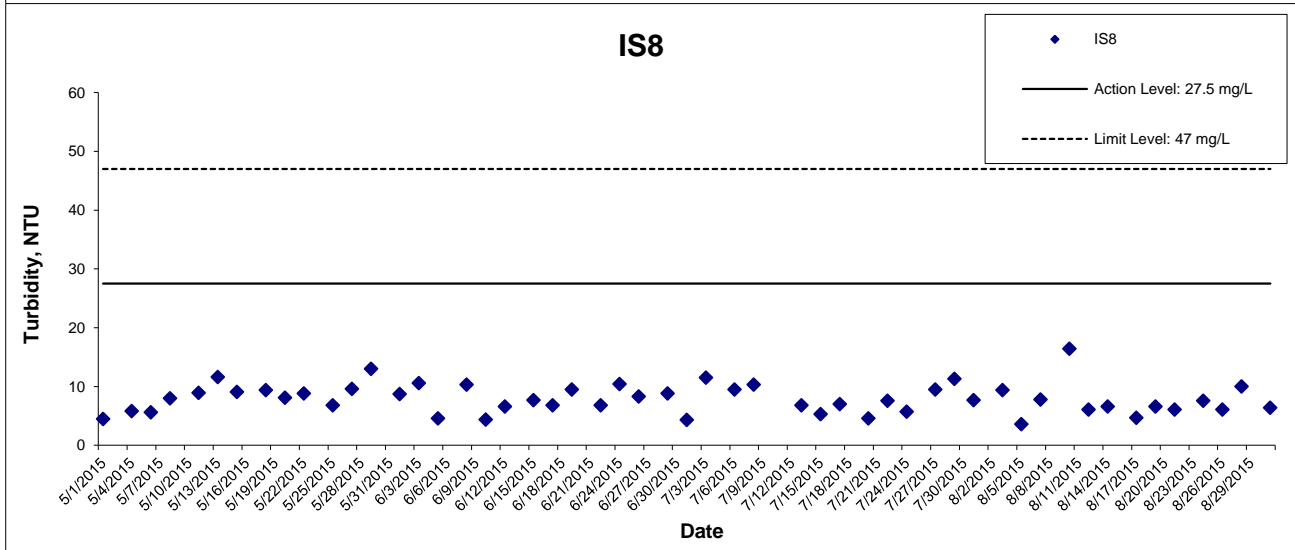
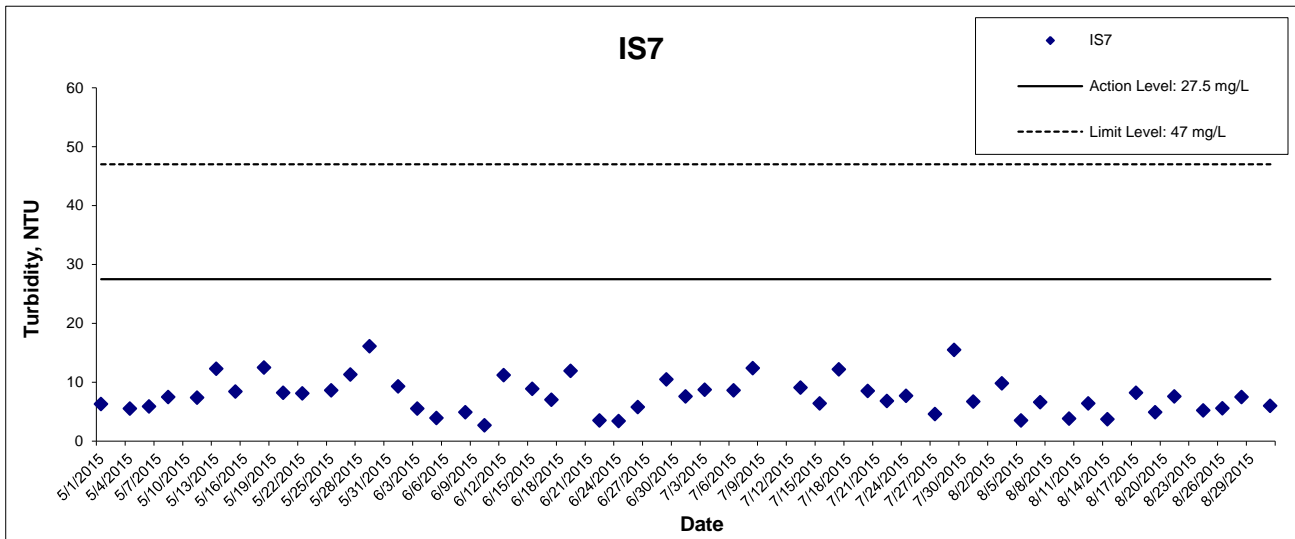
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results



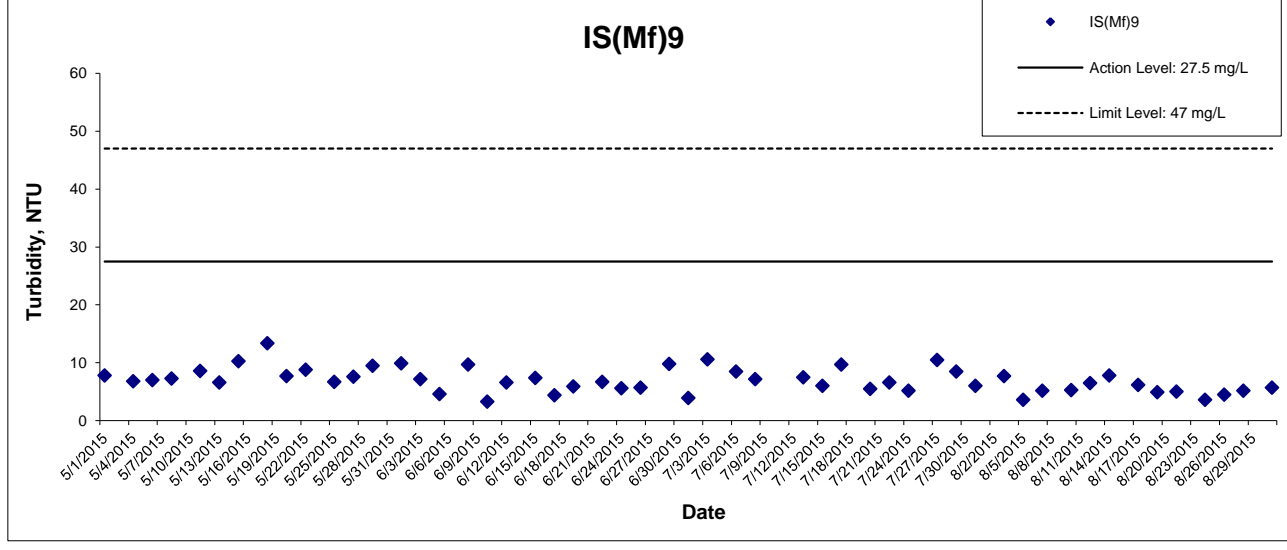
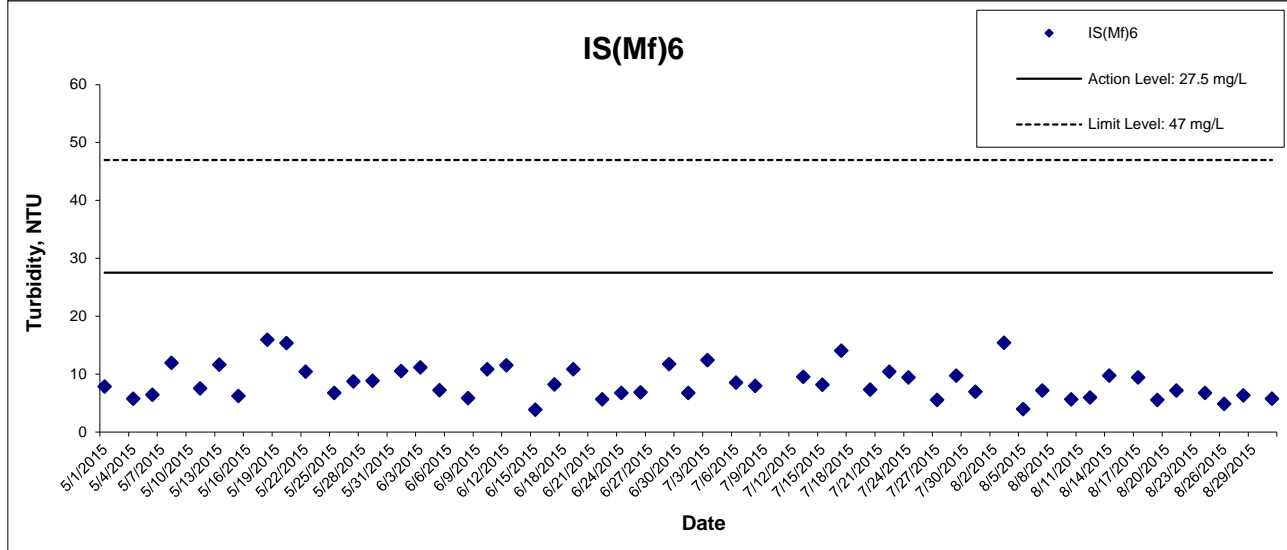
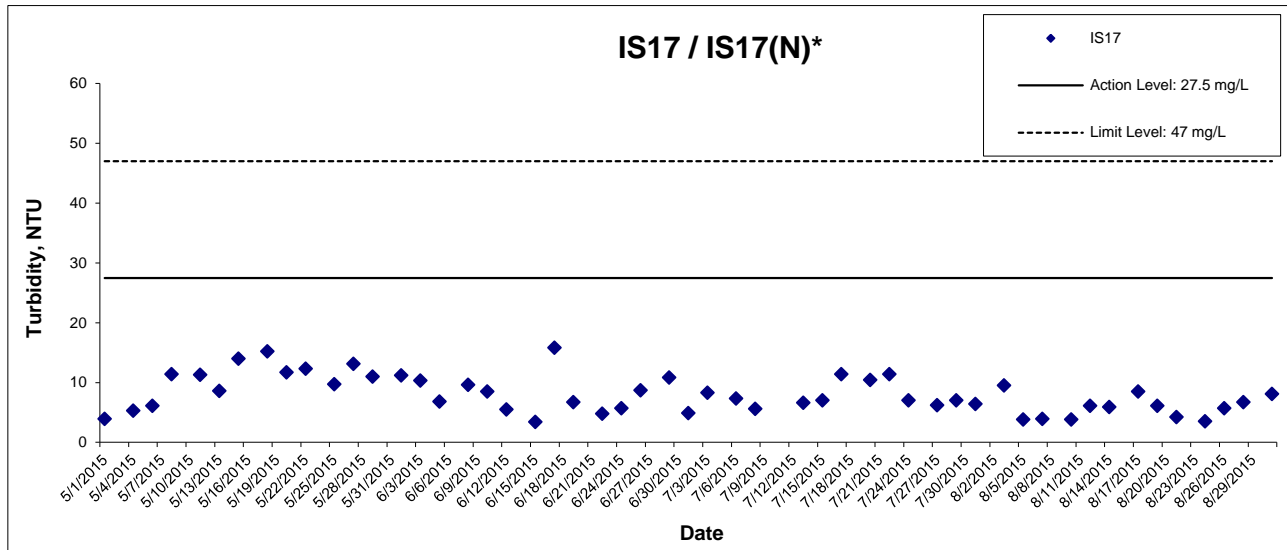
## Turbidity at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



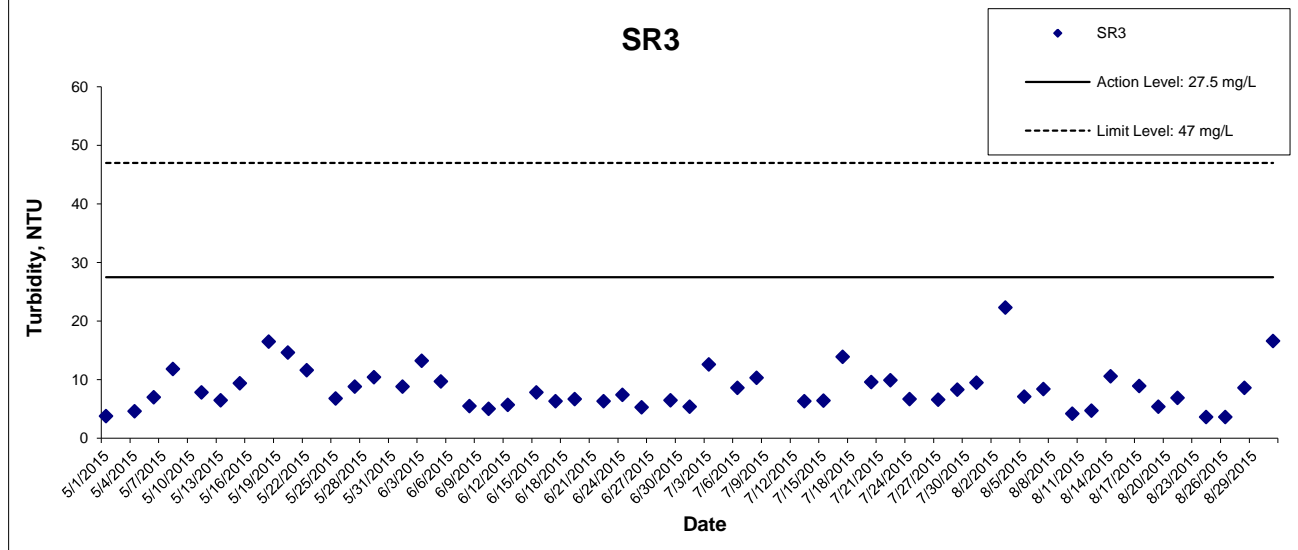
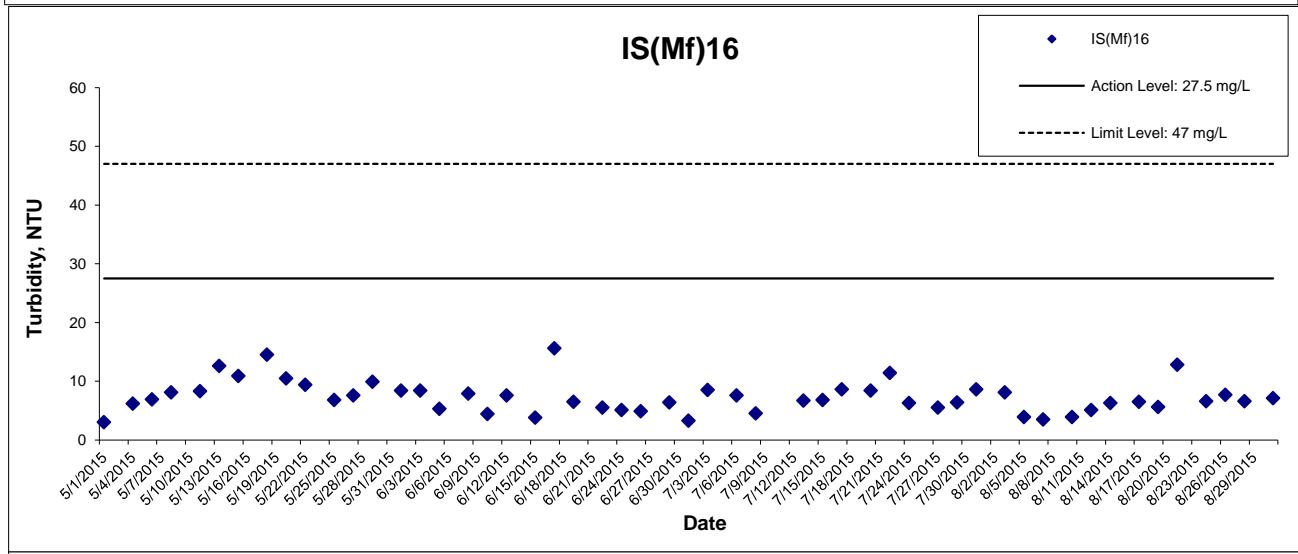
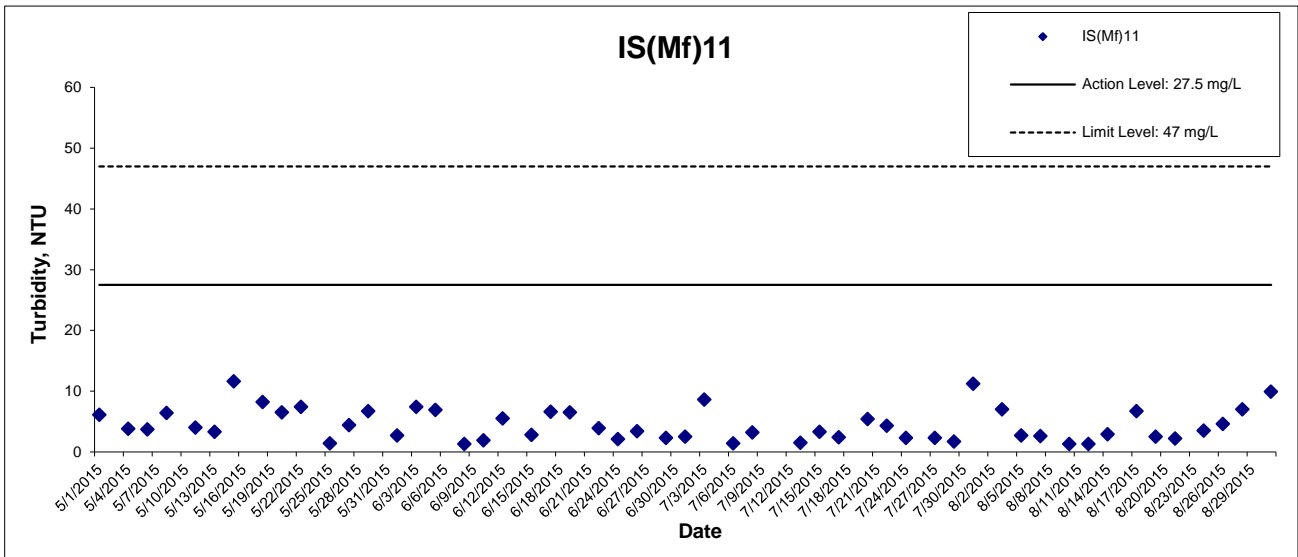
### Turbidity at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



## Turbidity at Mid-Ebb Tide

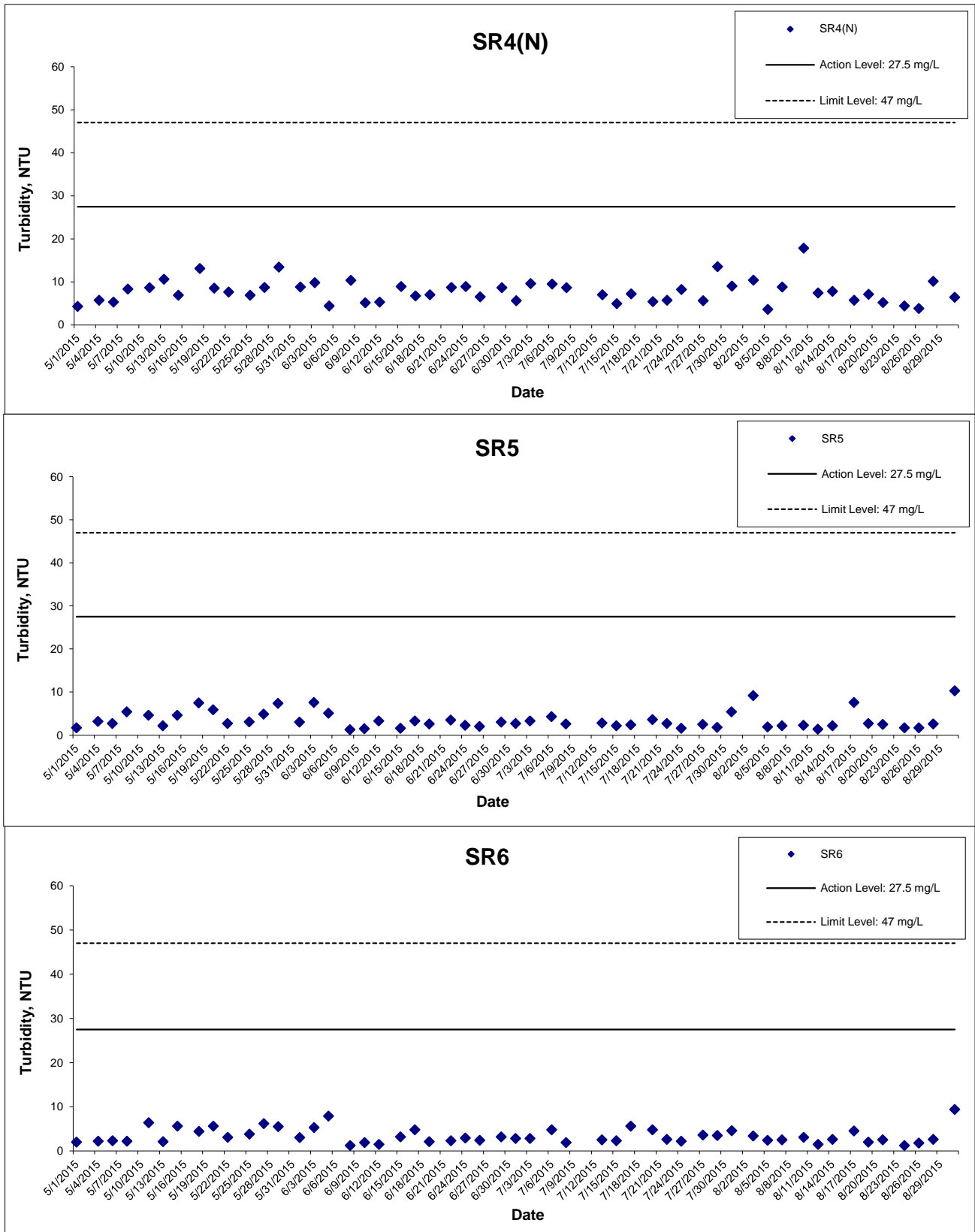


This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.



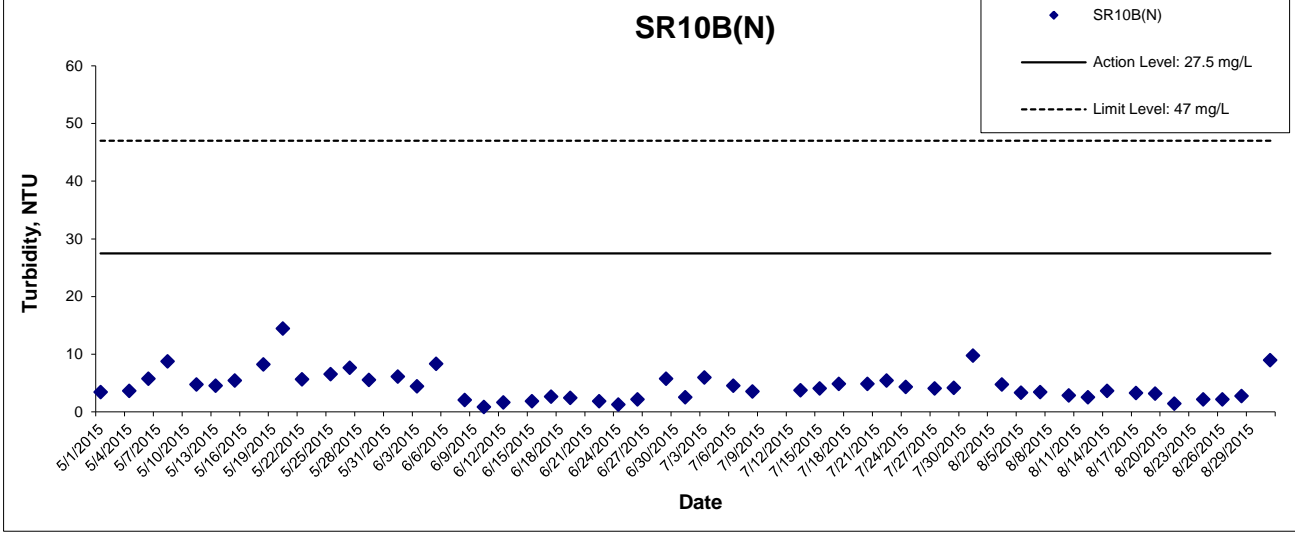
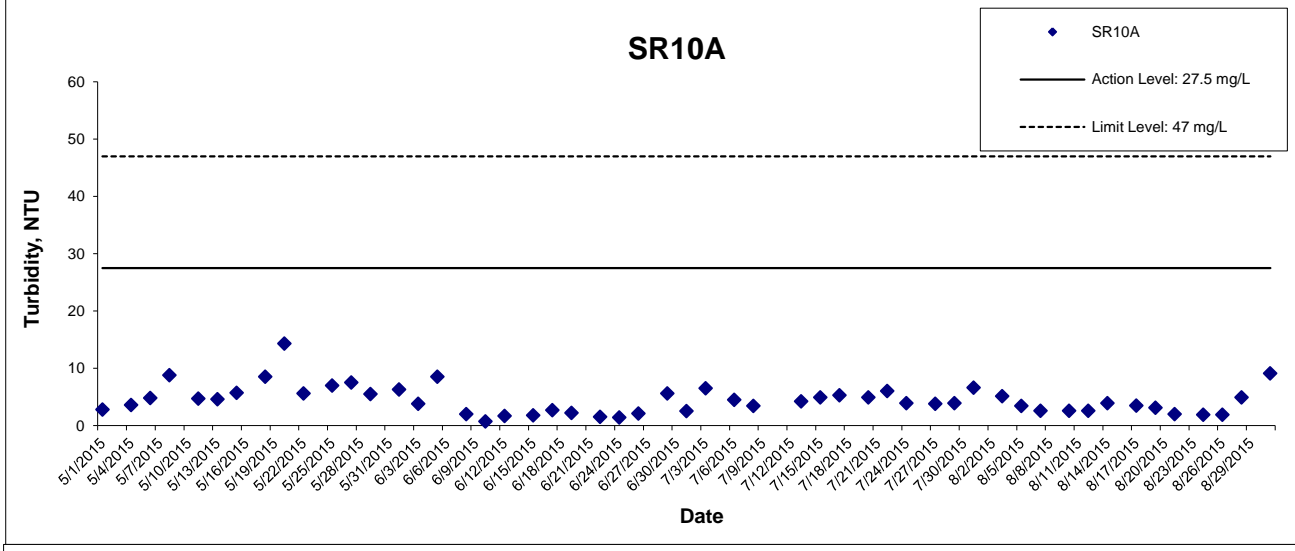
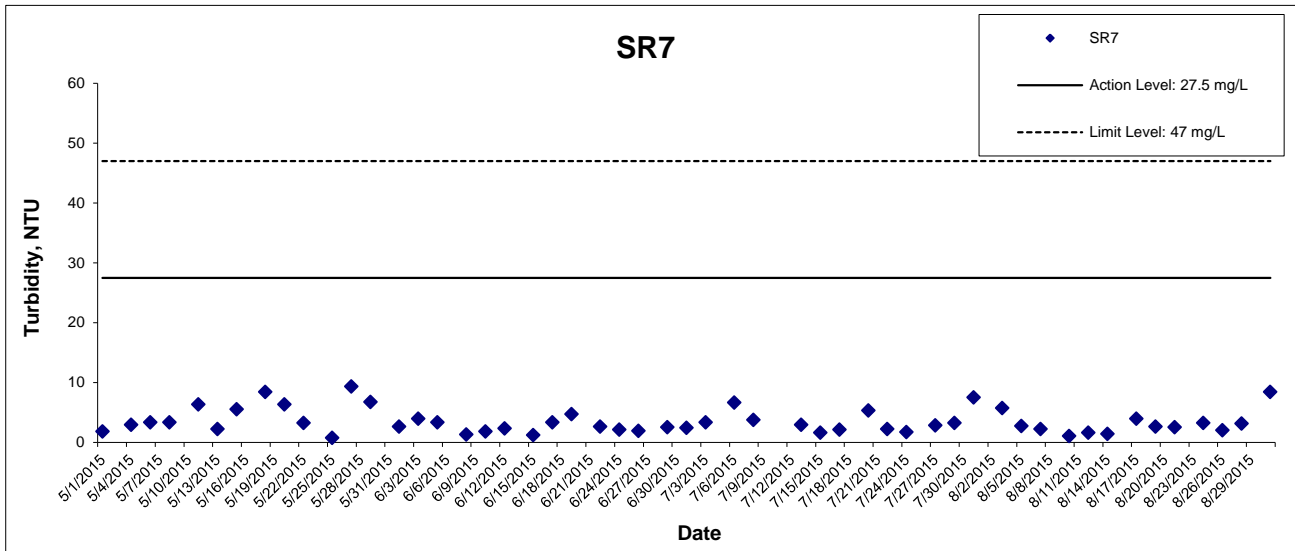


## Turbidity at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

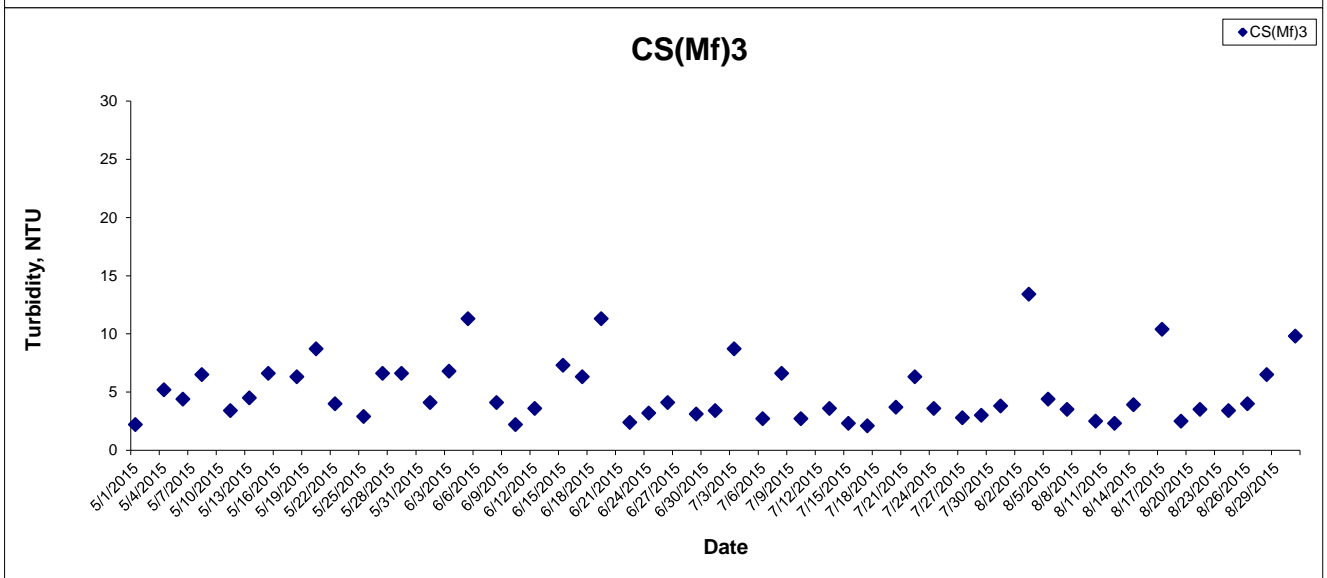
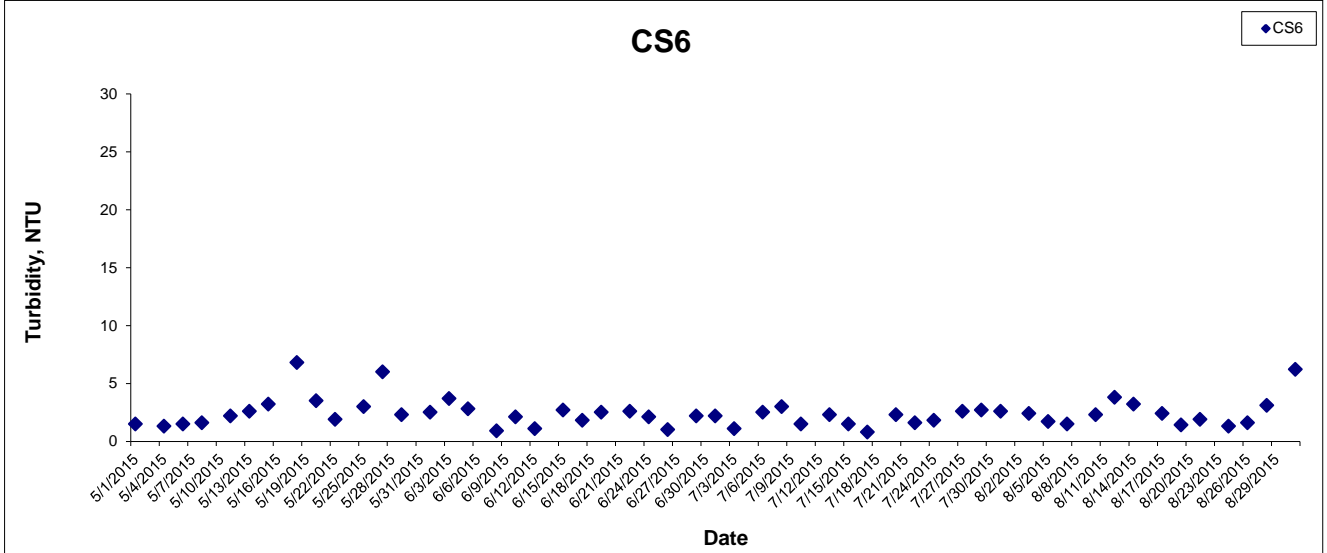
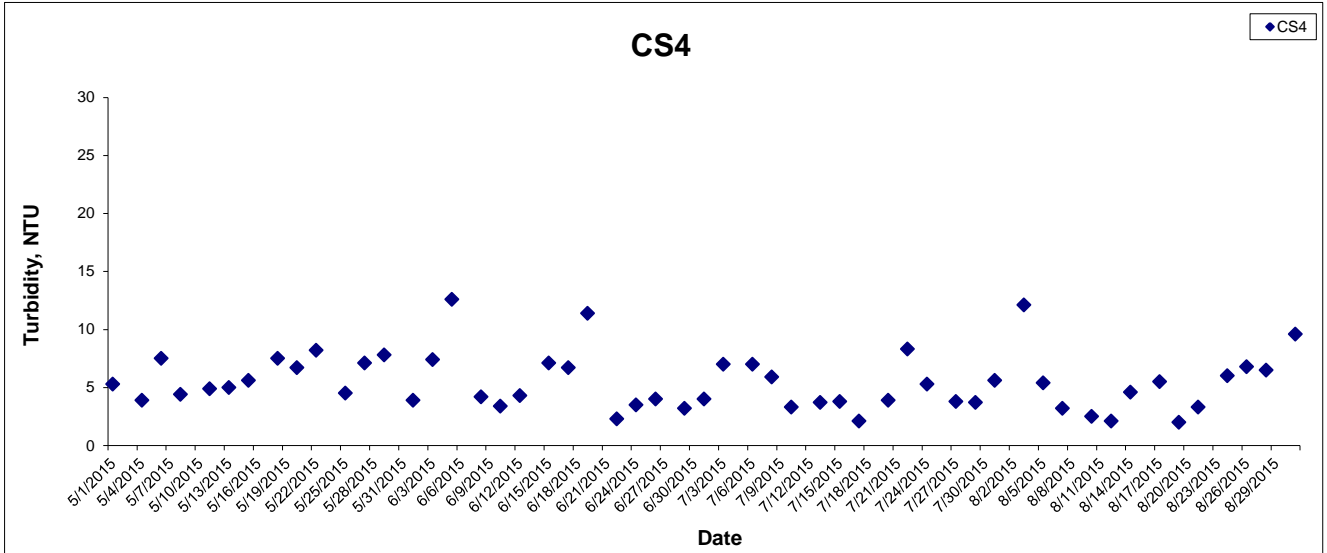
### Turbidity at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

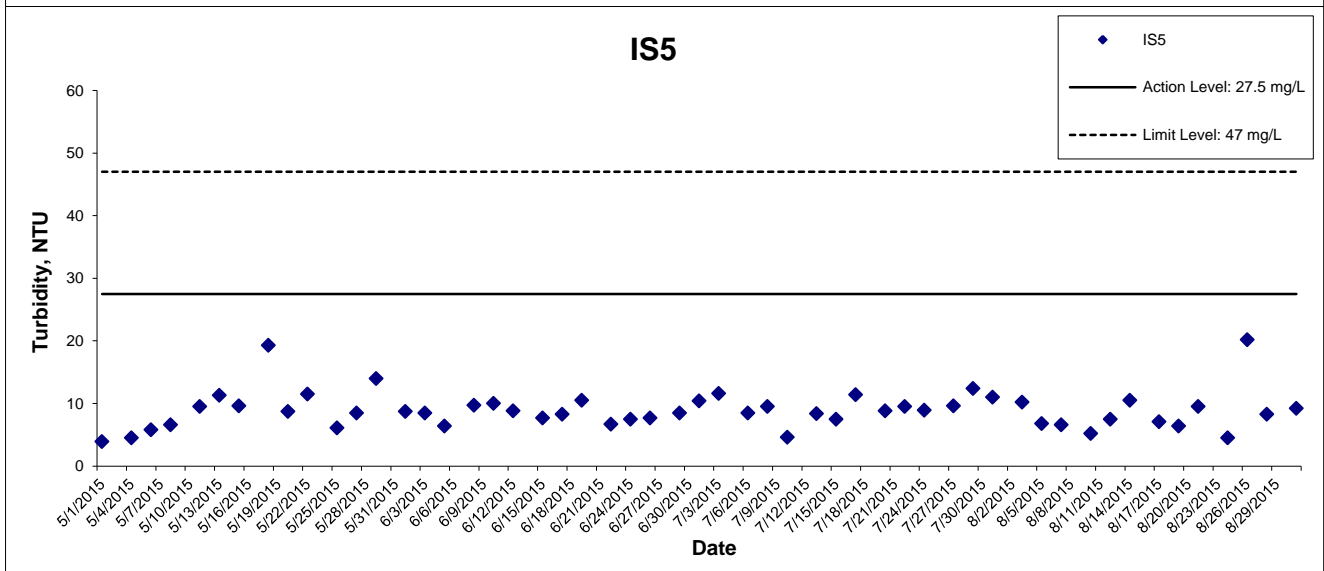
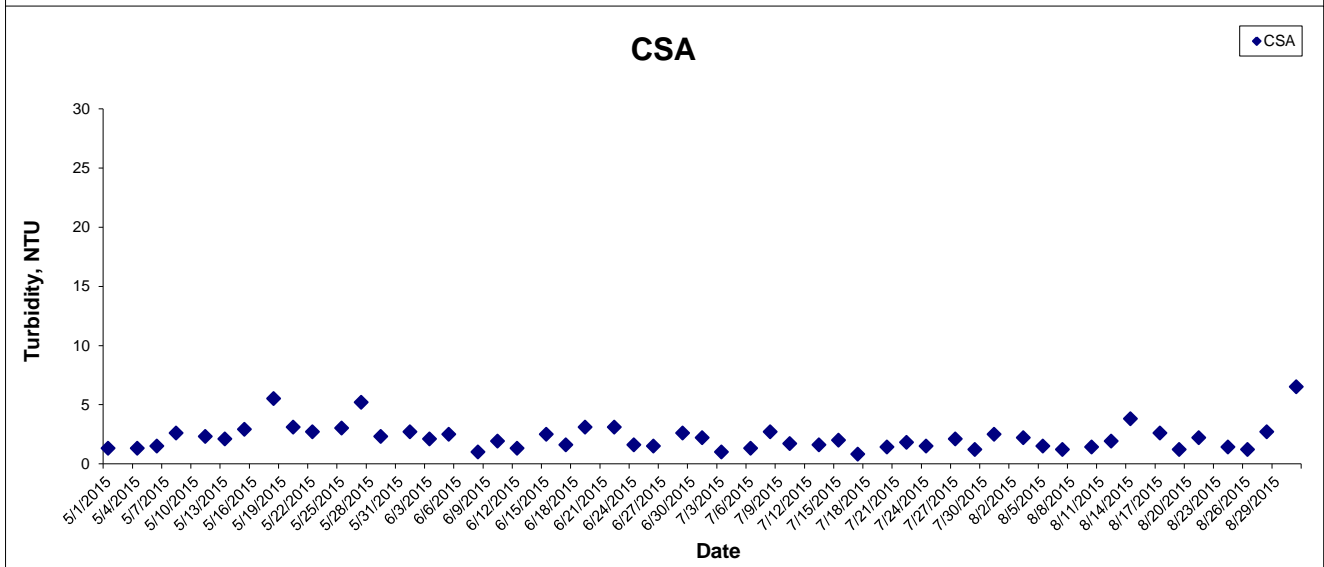
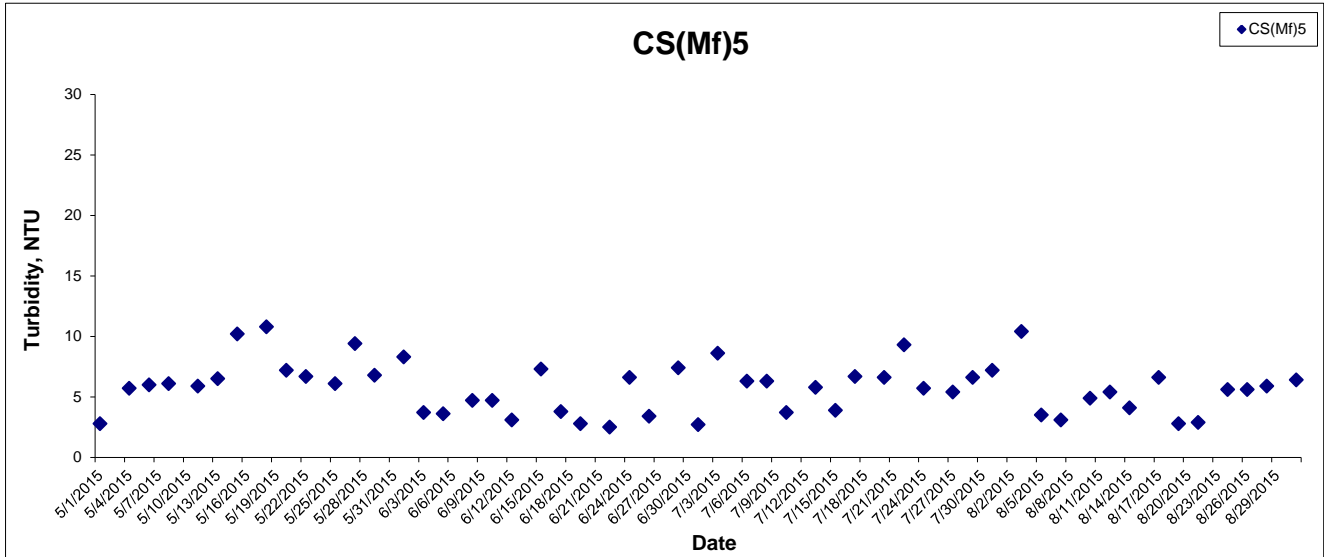


## Turbidity at Mid-Flood Tide



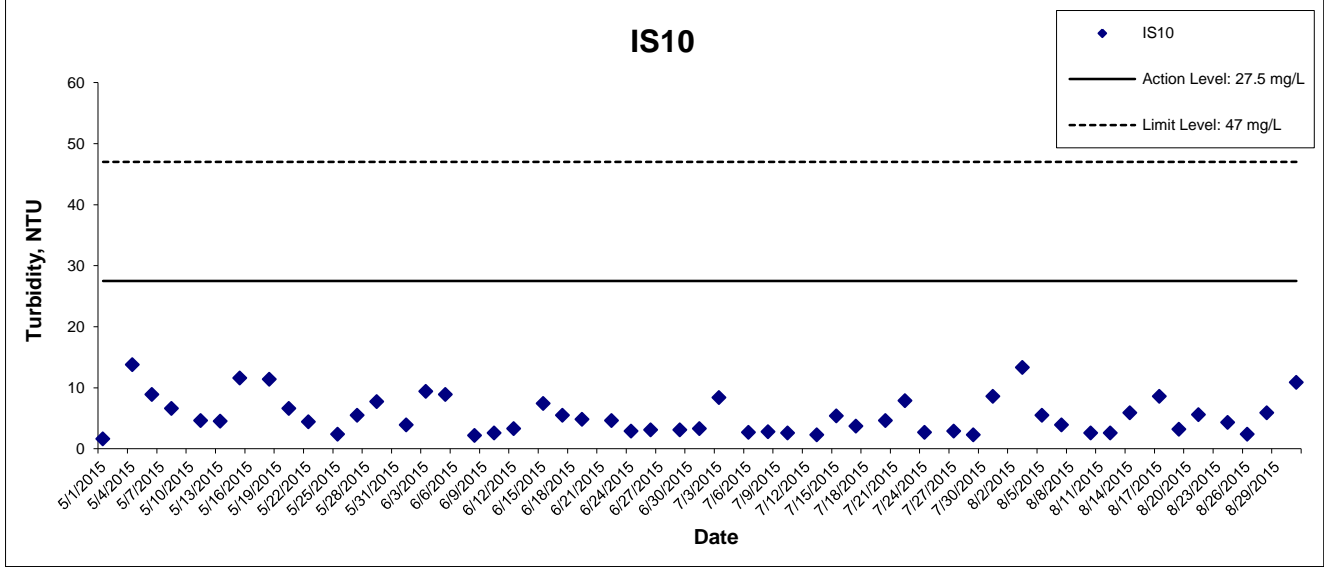
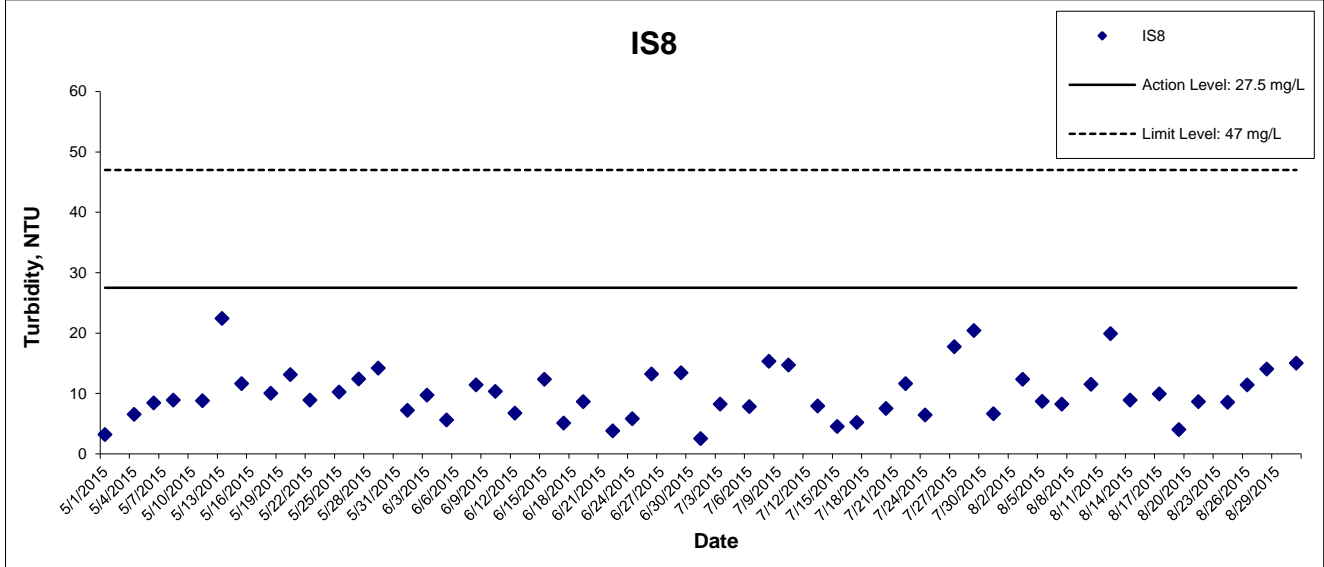
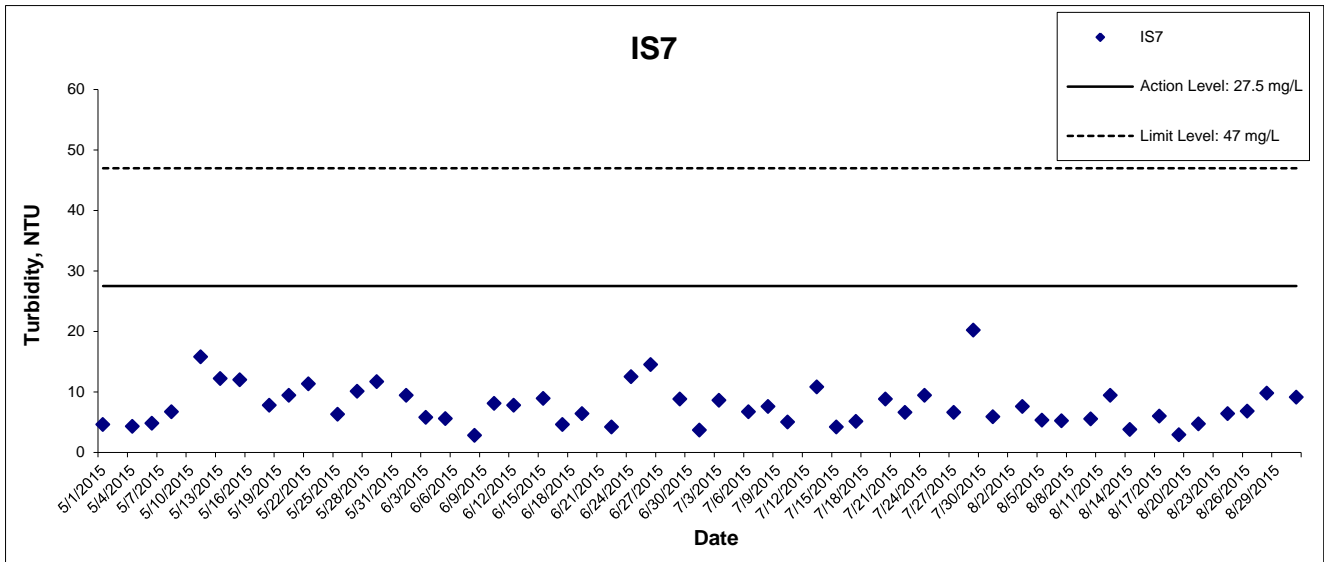
This Drawing has been prepared for the use of AECOM's client. It Dec not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Turbidity at Mid-Flood Tide



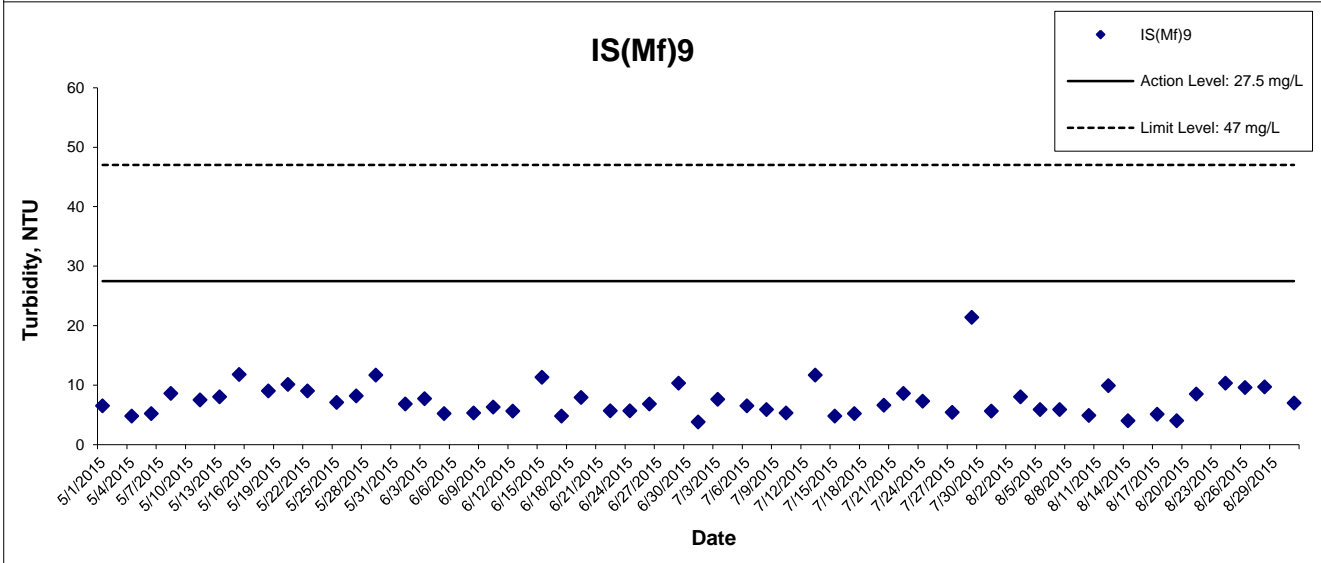
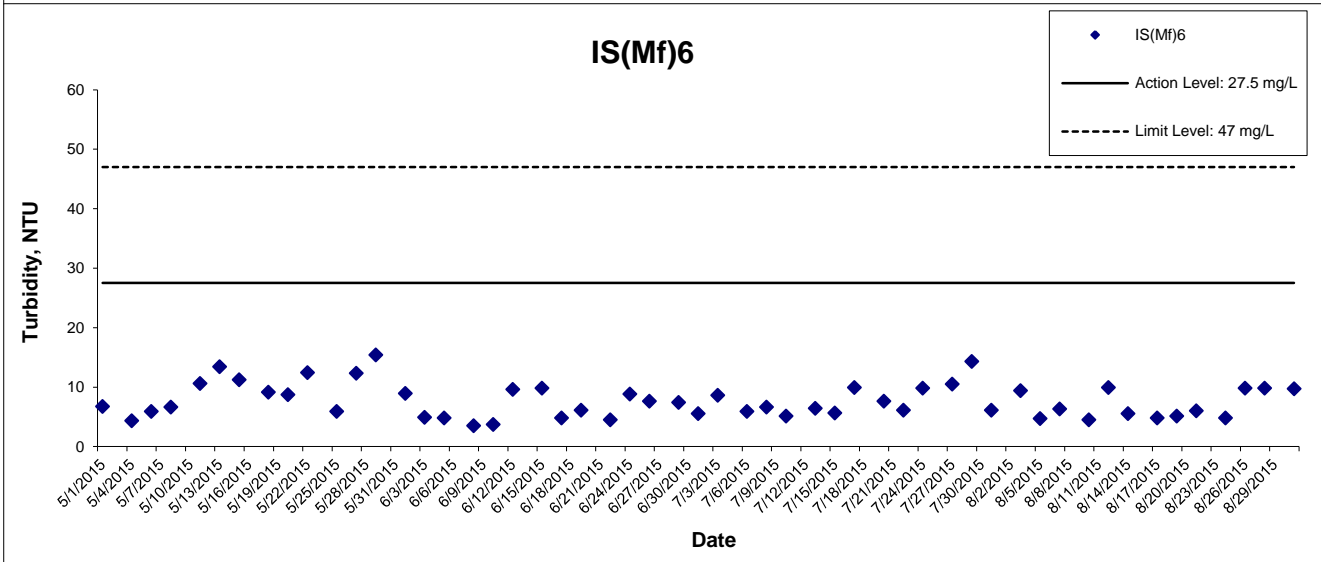
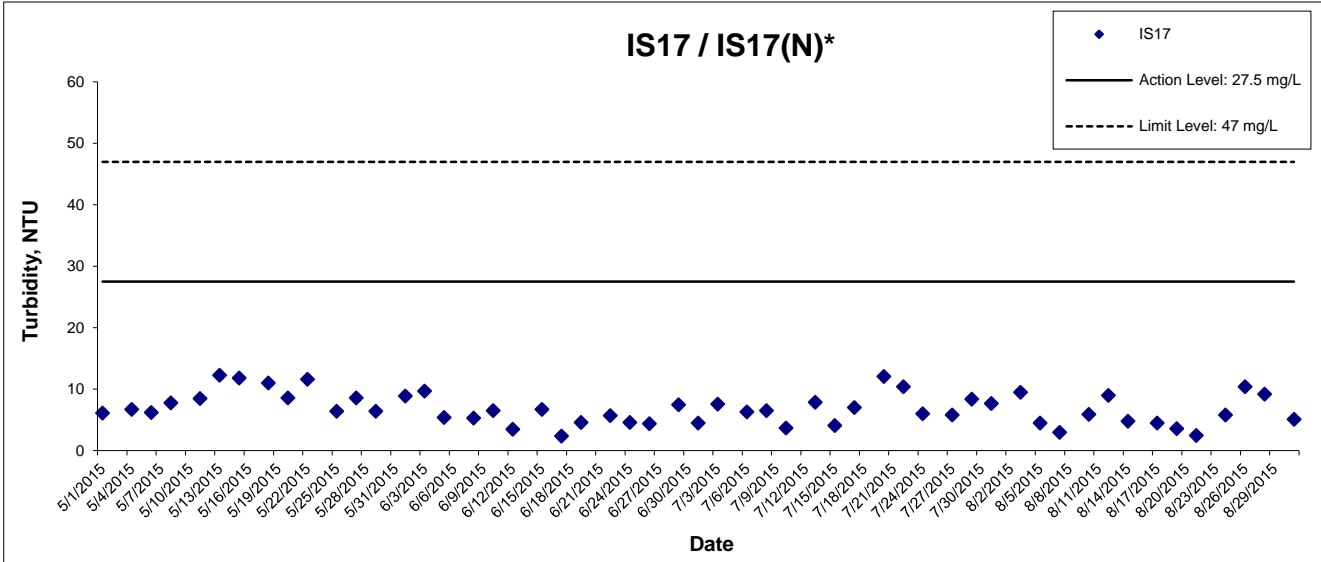
This Drawing has been prepared for the use of AECOM's client. It Dec not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Turbidity at Mid-Flood Tide



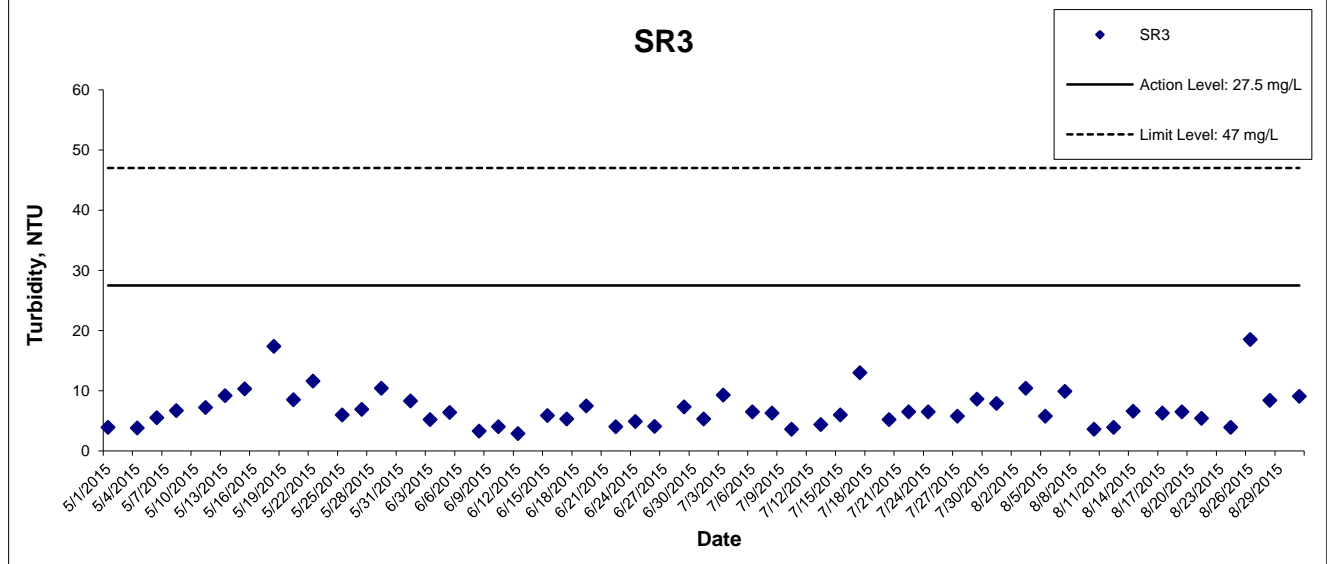
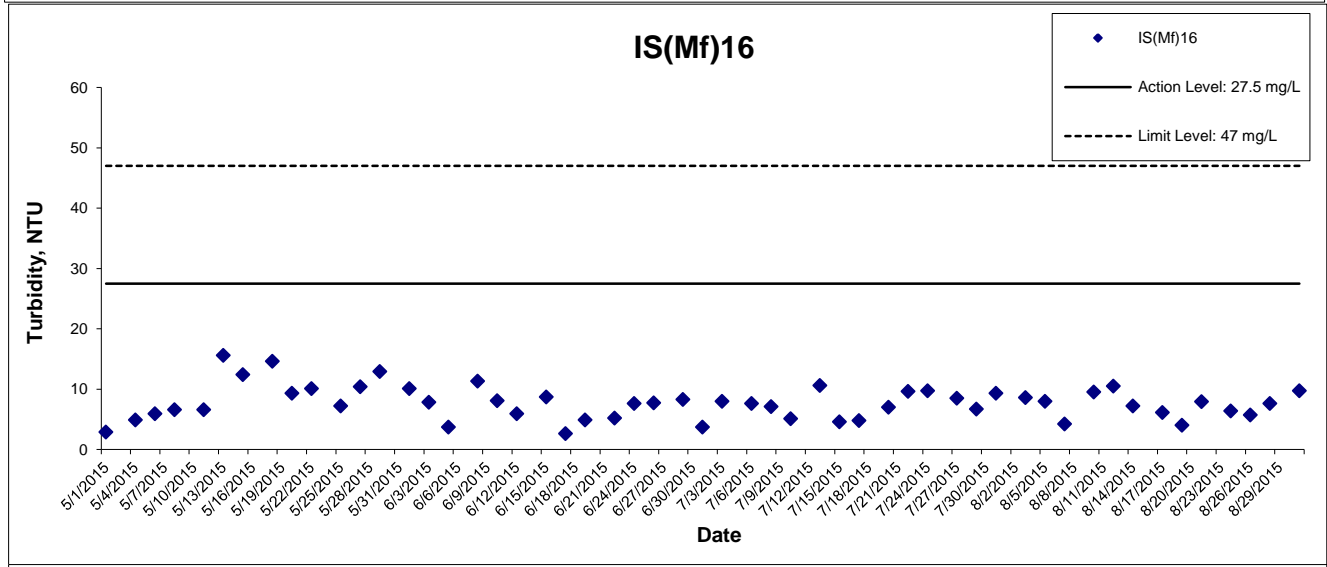
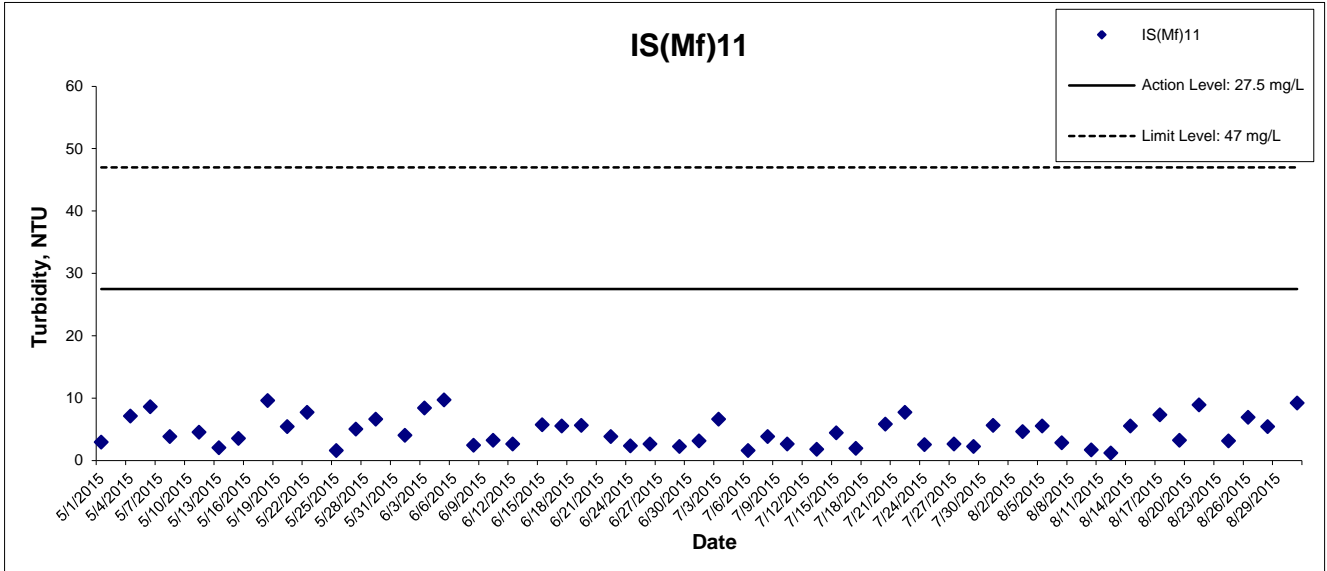
This Drawing has been prepared for the use of AECOM's client. It Dec not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Turbidity at Mid-Flood Tide



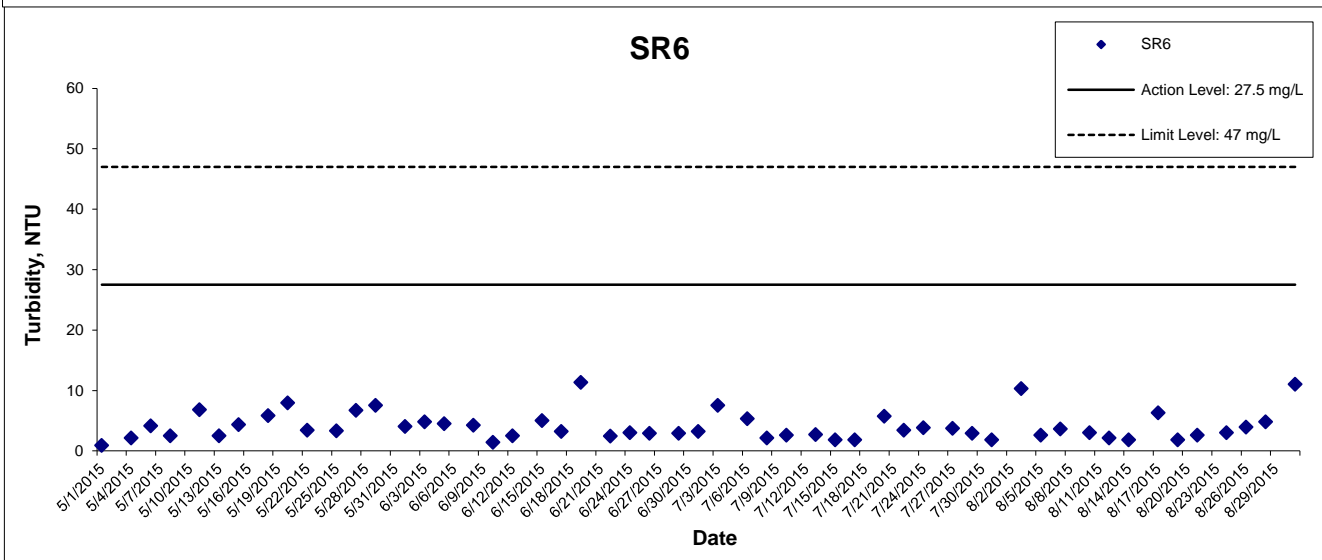
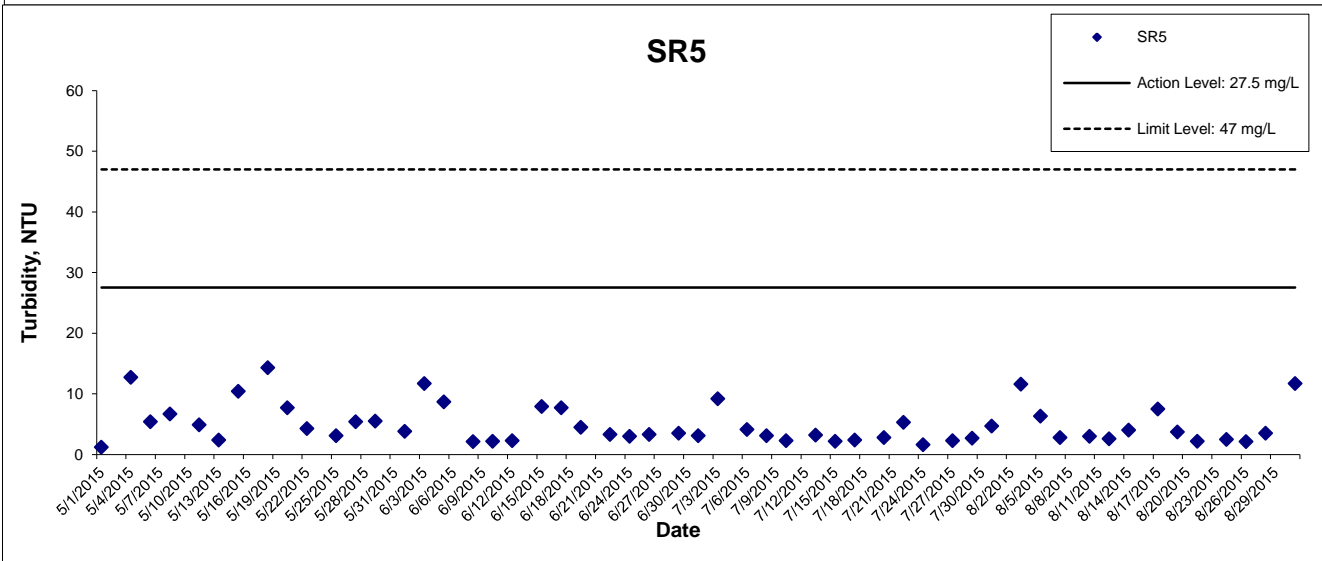
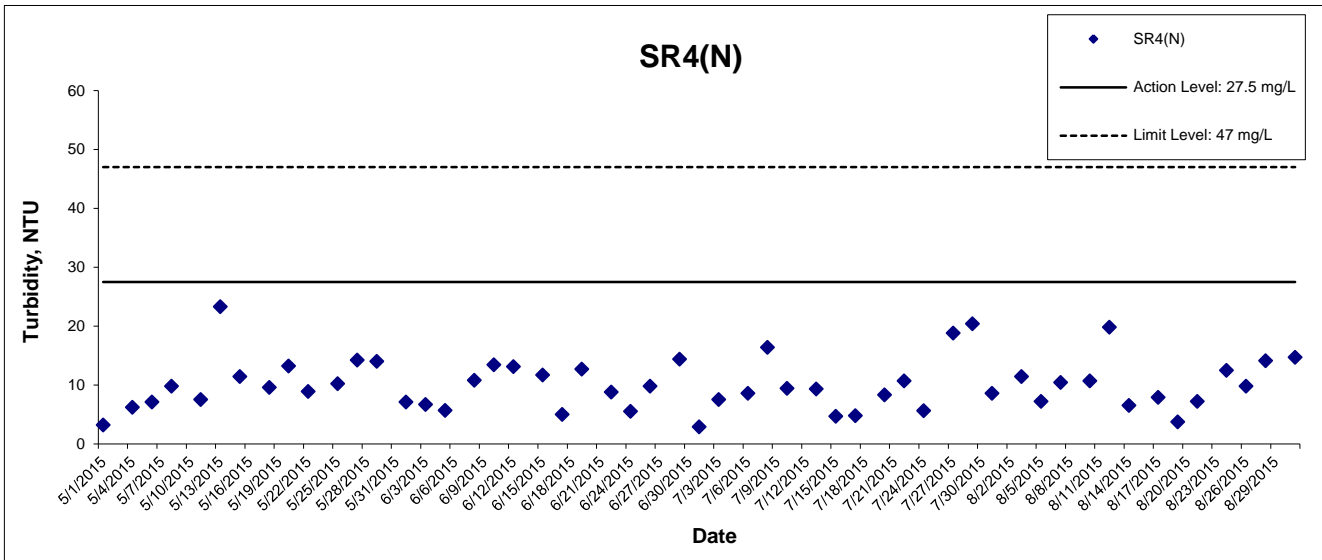
This Drawing has been prepared for the use of AECOM's client. It Dec not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Turbidity at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It Dec not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Turbidity at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It Dec not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

**HONG KONG - ZHUHAI - MACAO BRIDGE**

**HONG KONG BOUNDARY CROSSING FACILITIES**

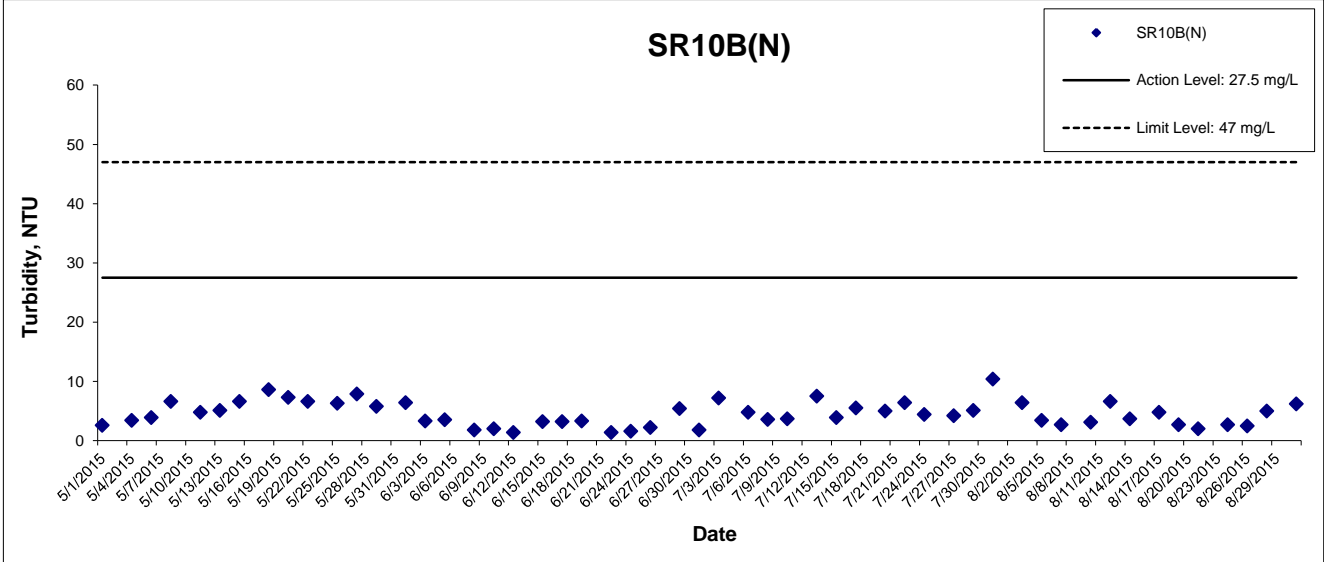
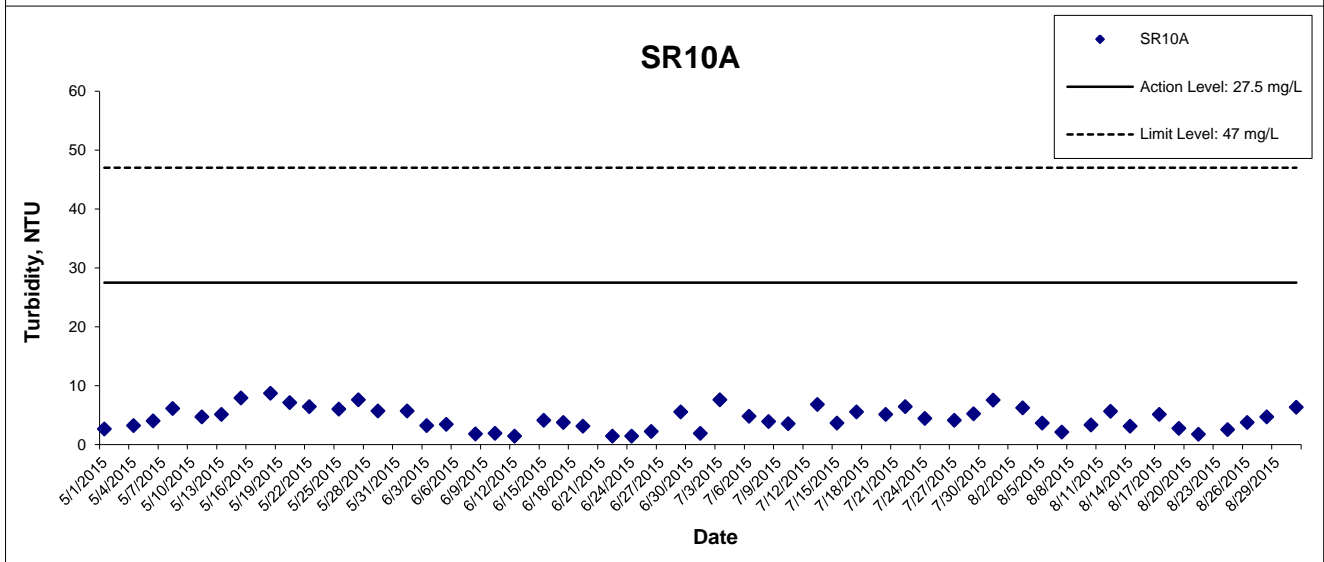
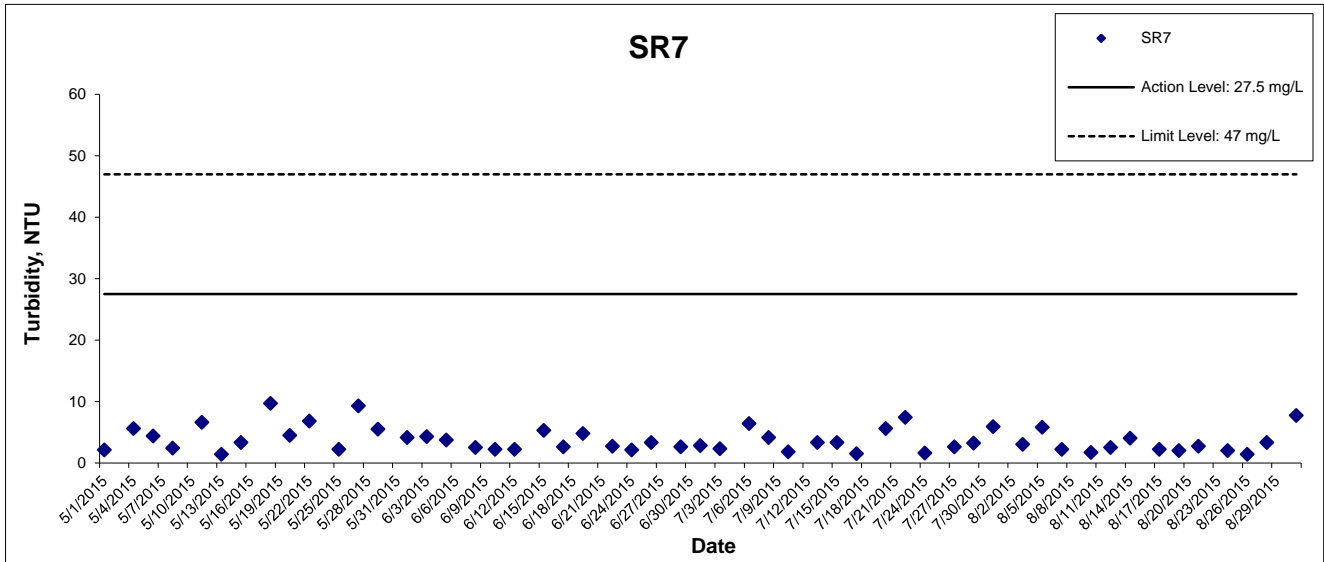
**- RECLAMATION WORKS**

**Graphical Presentation of Impact Water Quality  
Monitoring Results**



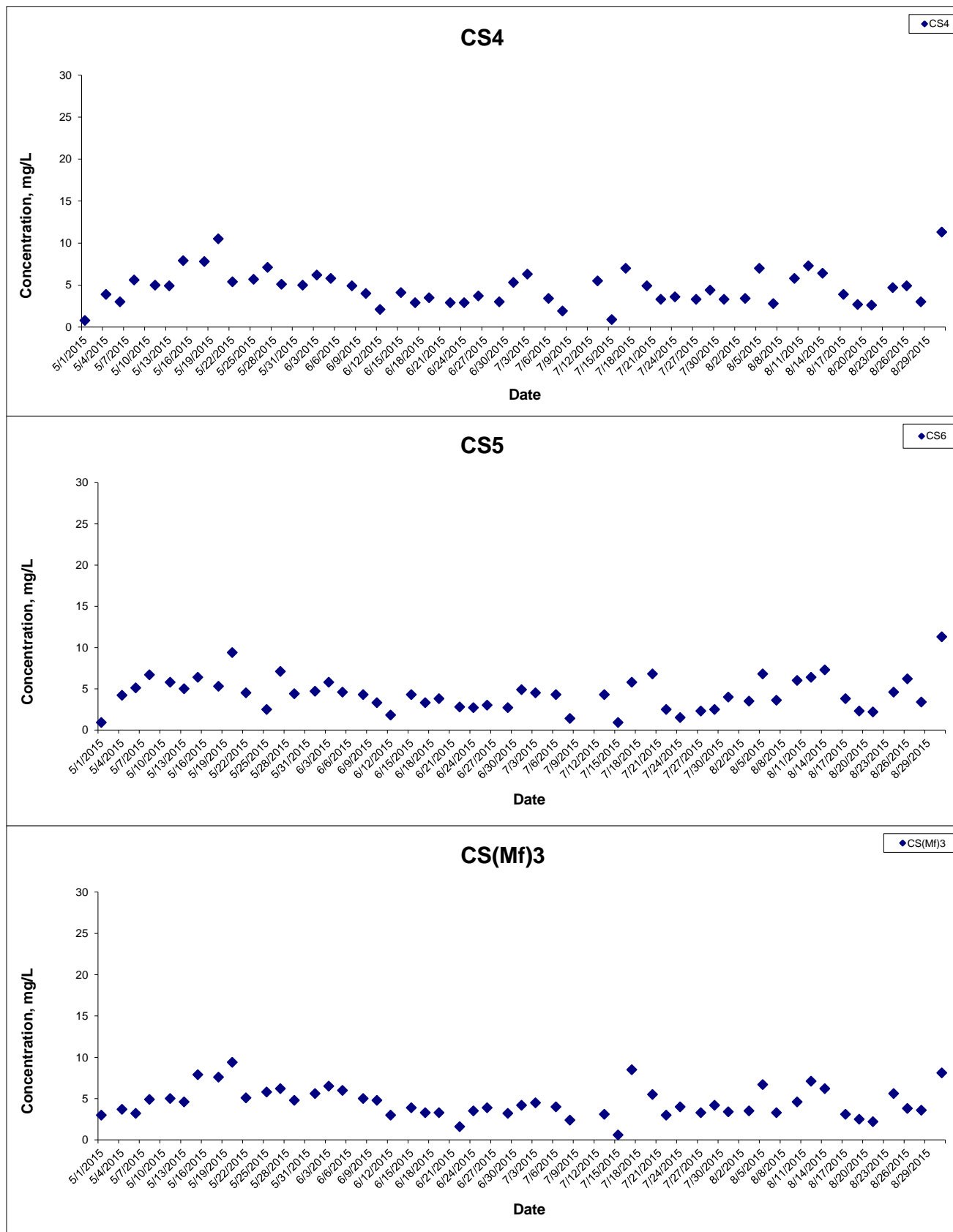


## Turbidity at Mid-Flood Tide



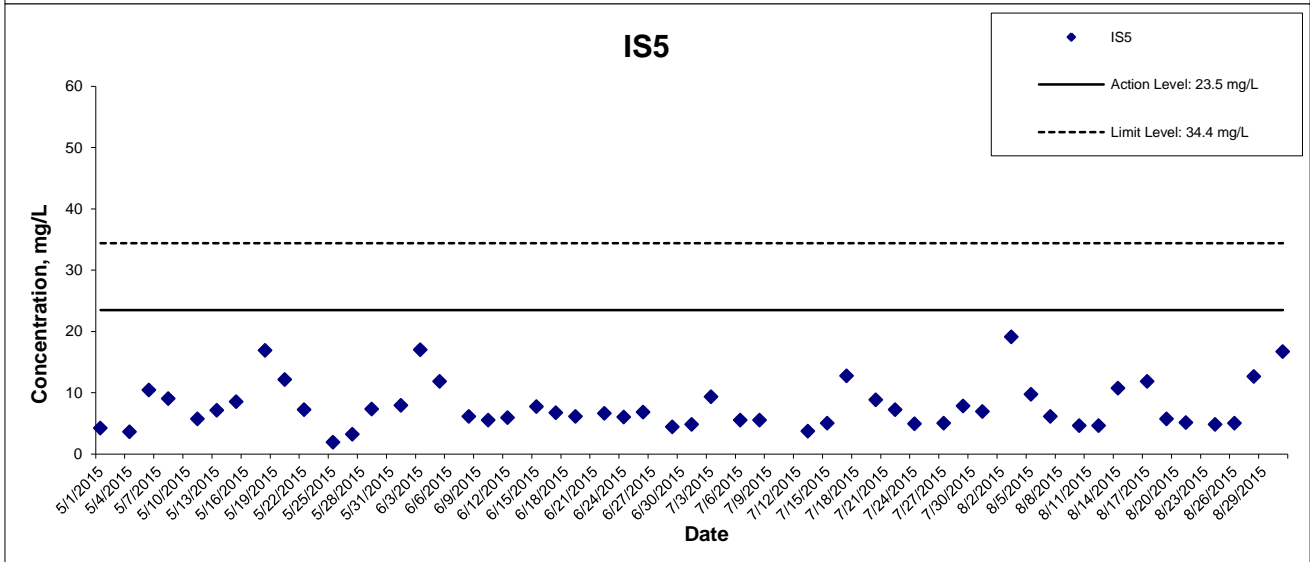
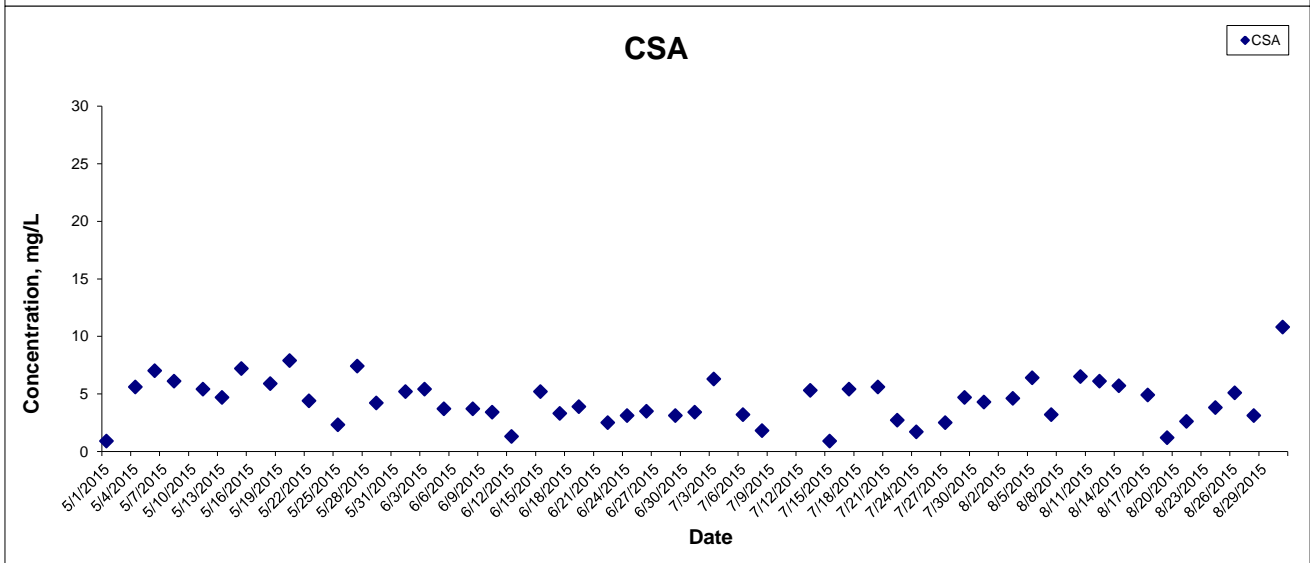
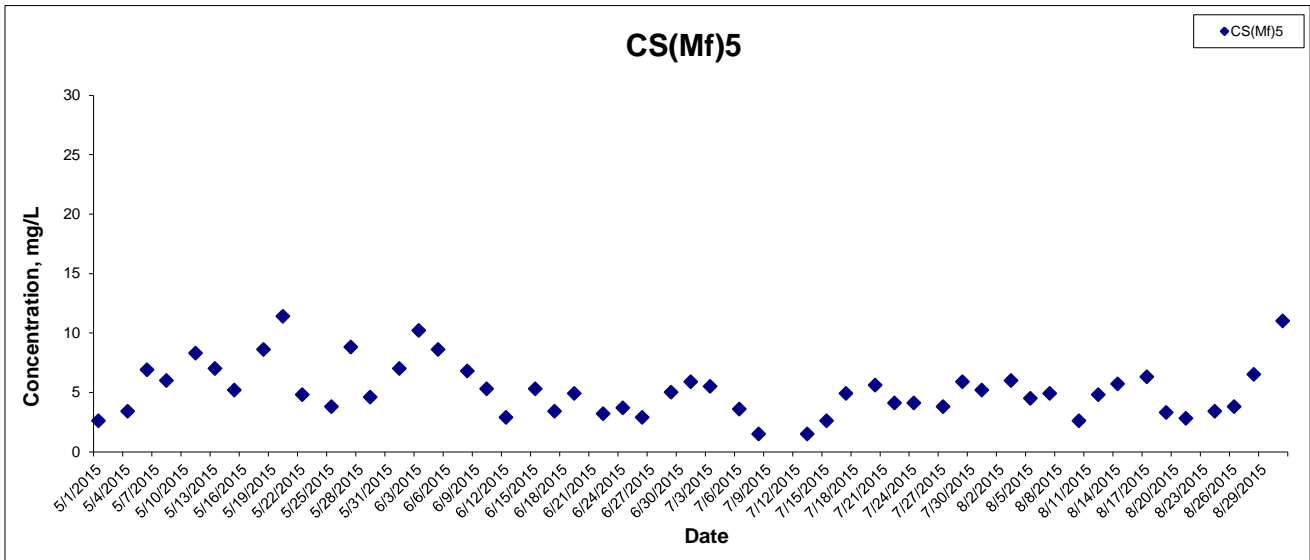
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Ebb Tide



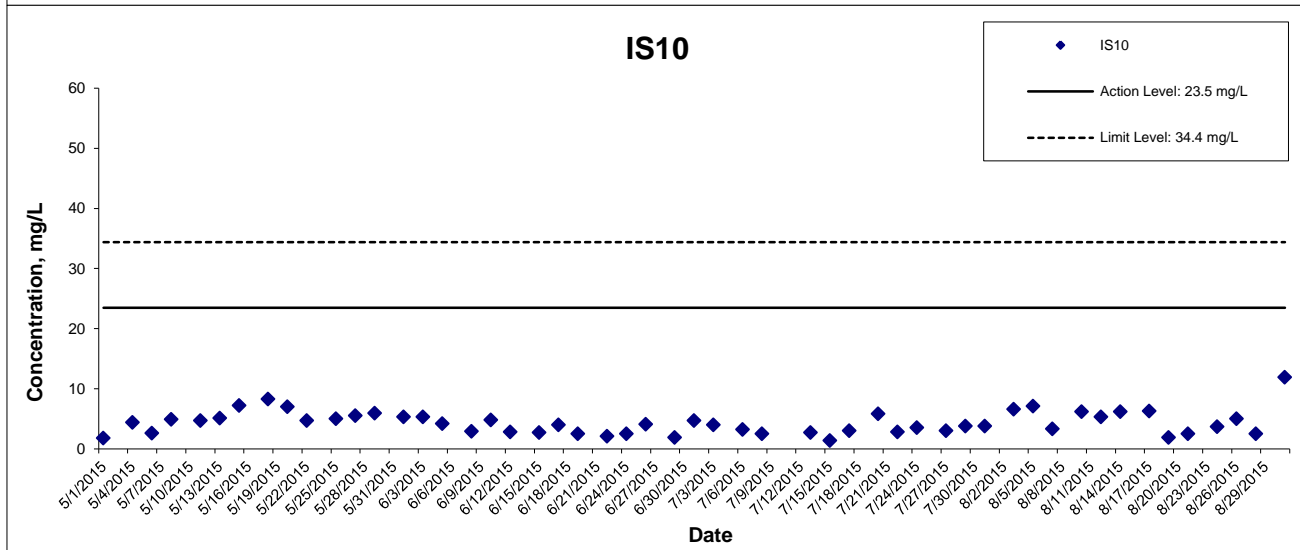
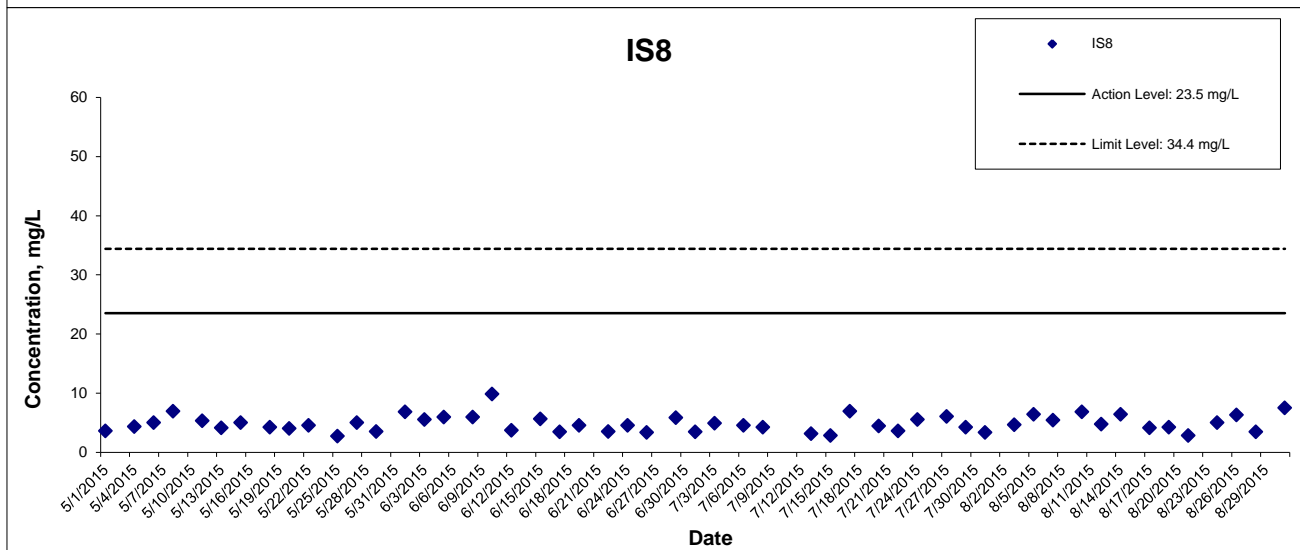
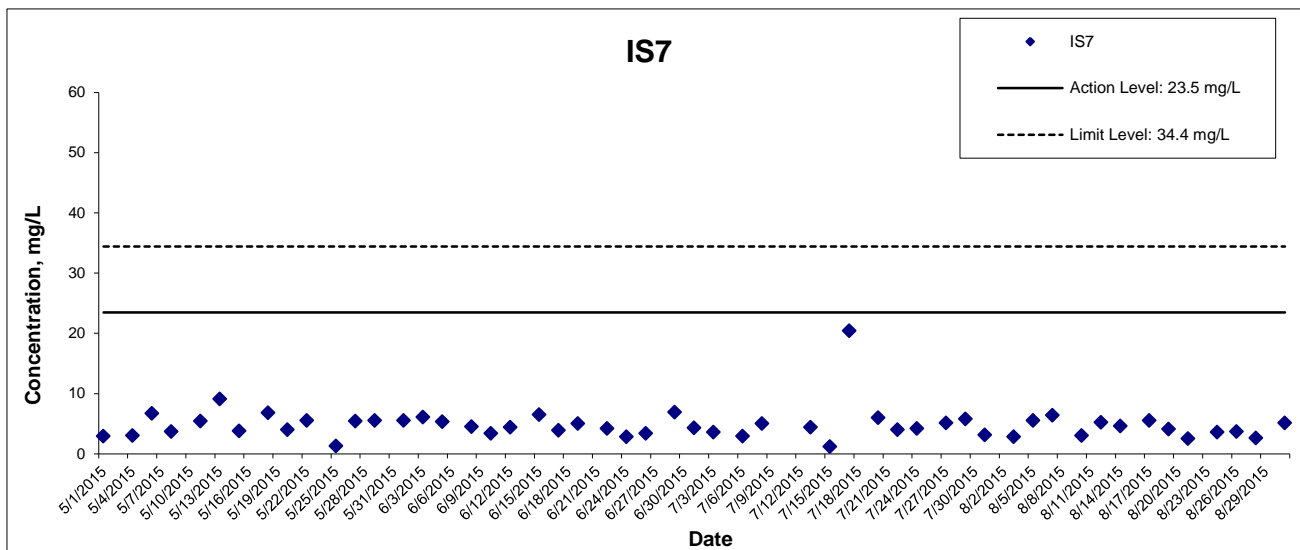
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Ebb Tide



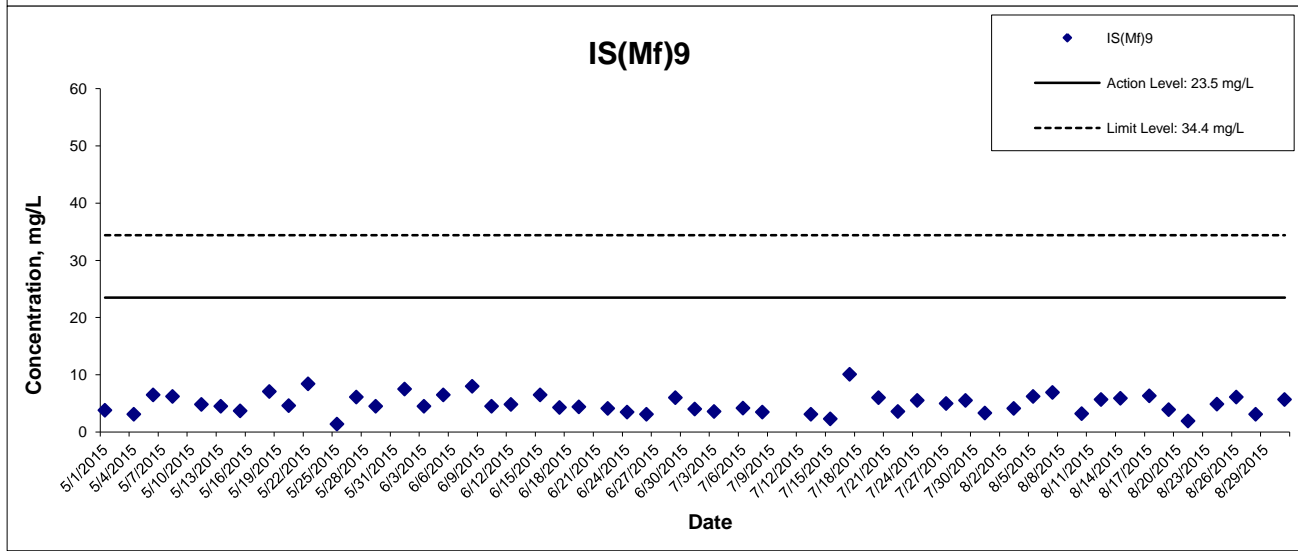
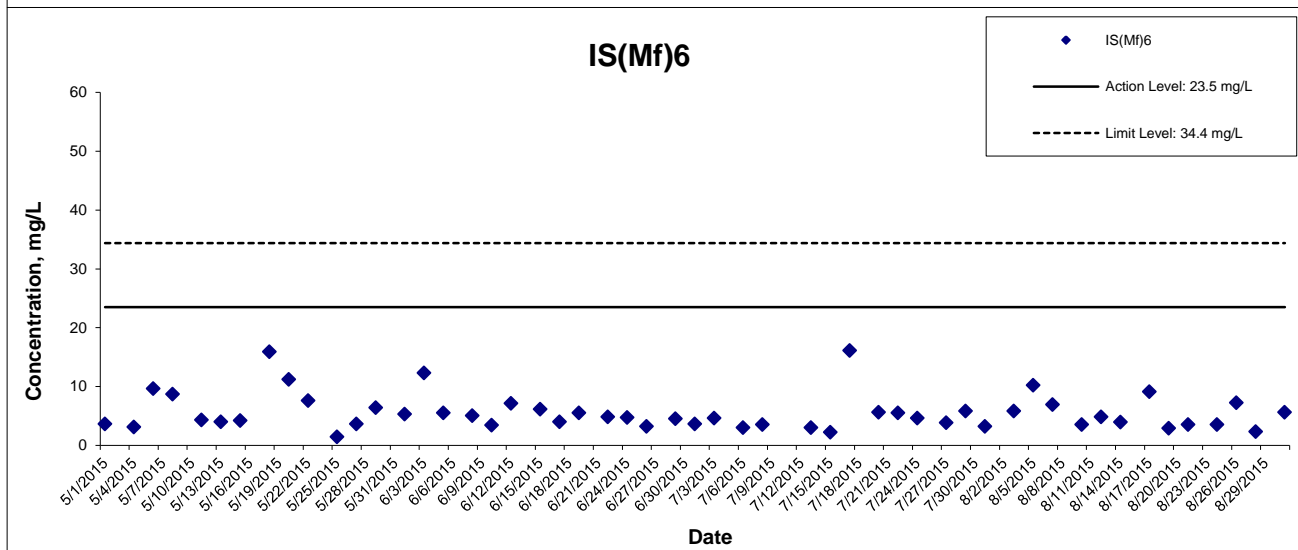
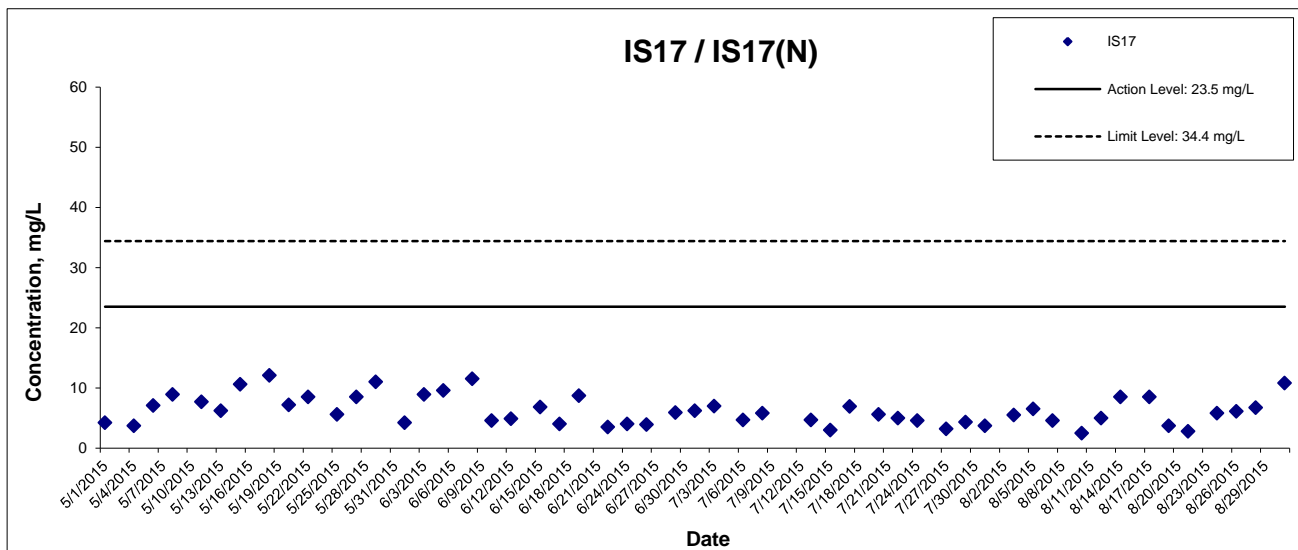
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Ebb Tide



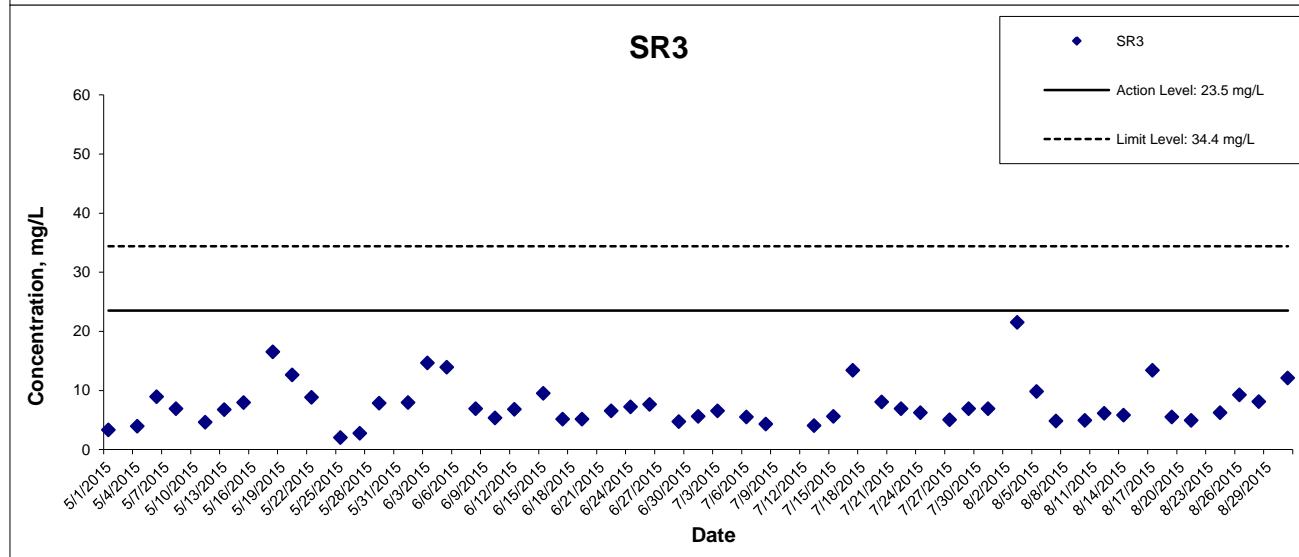
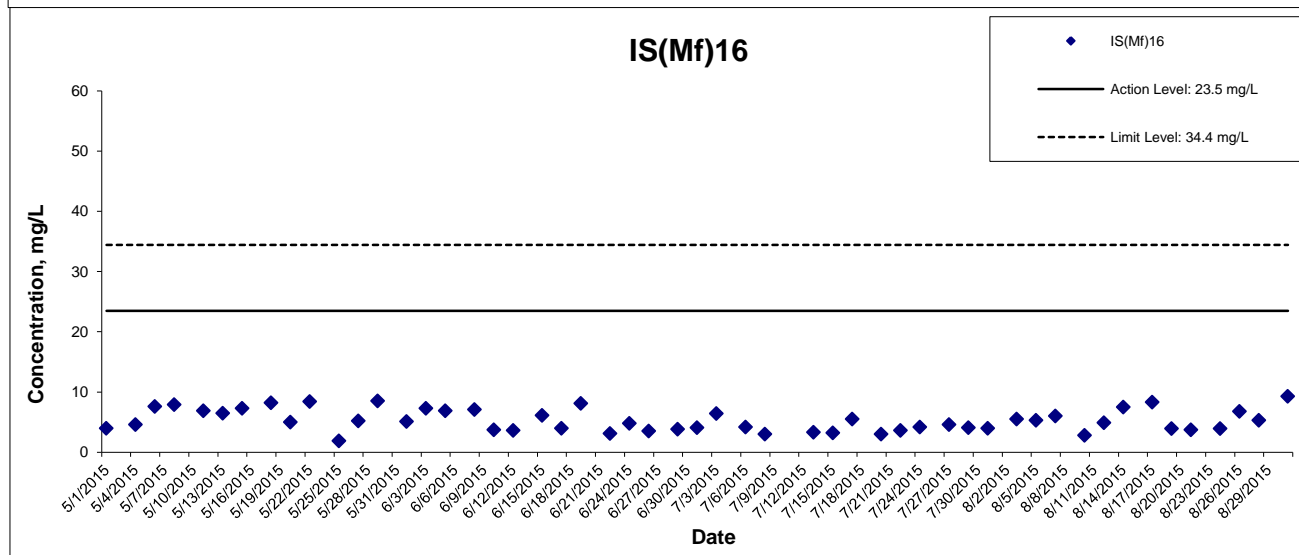
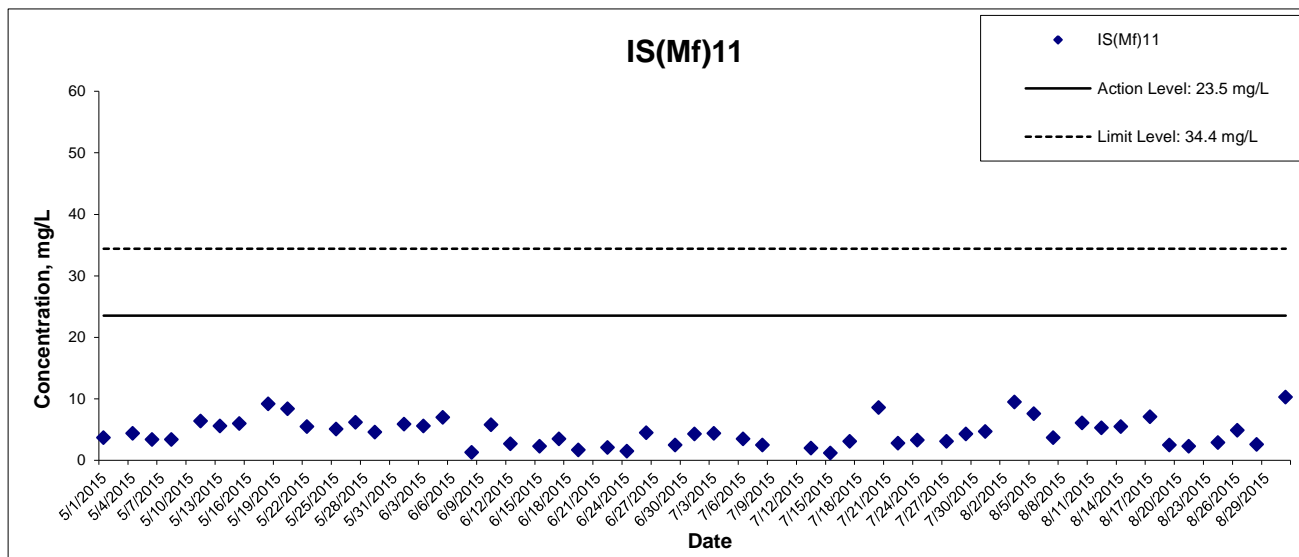
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Ebb Tide



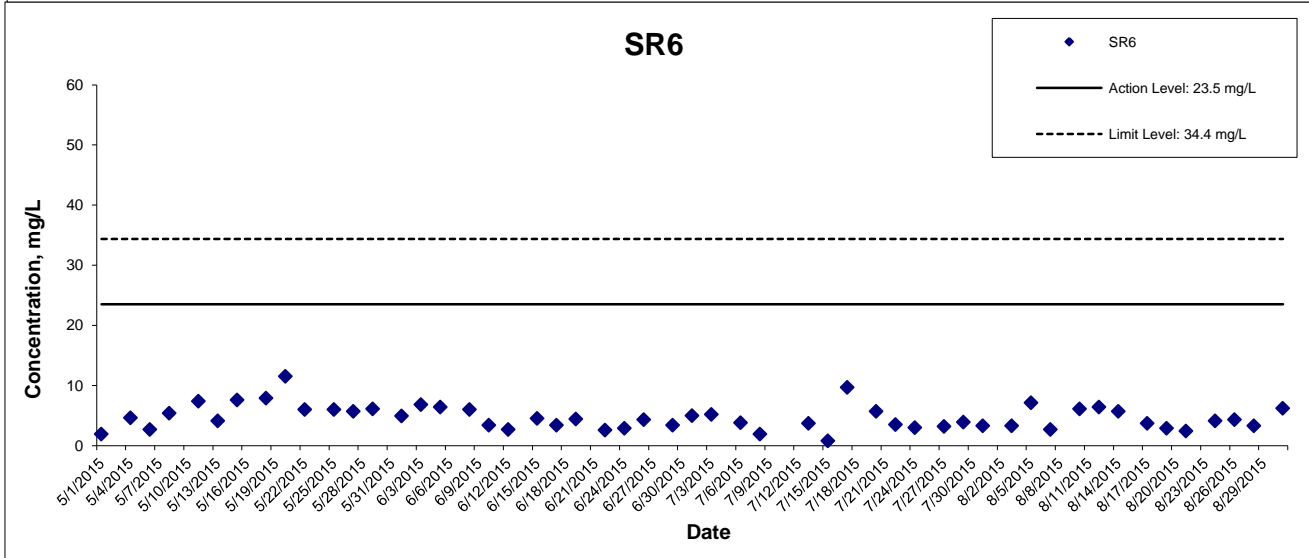
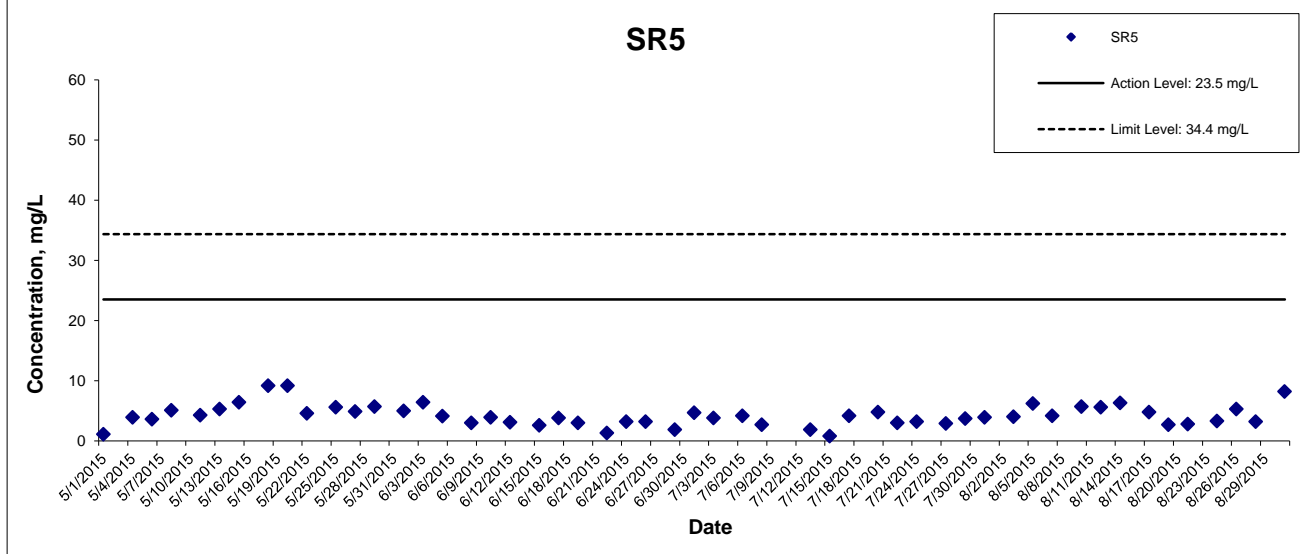
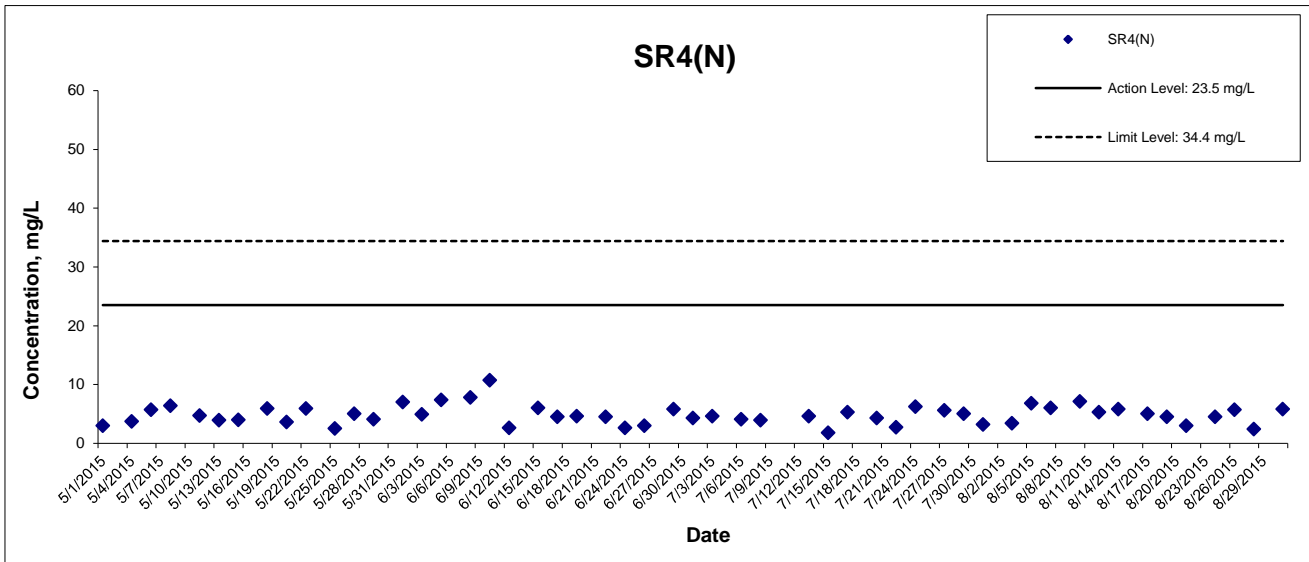
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Ebb Tide



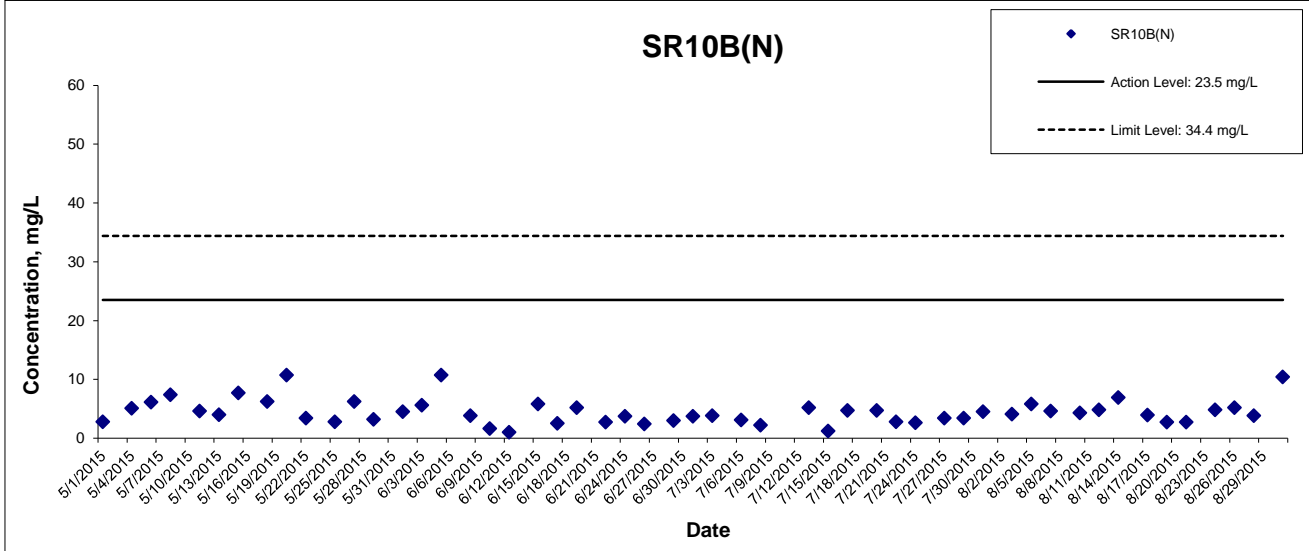
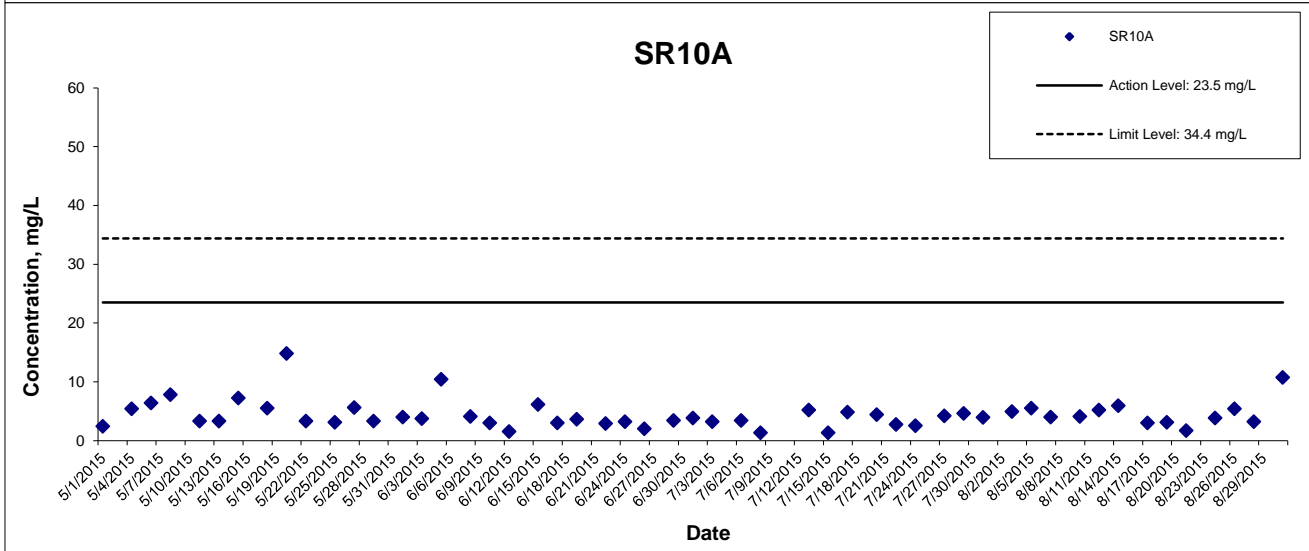
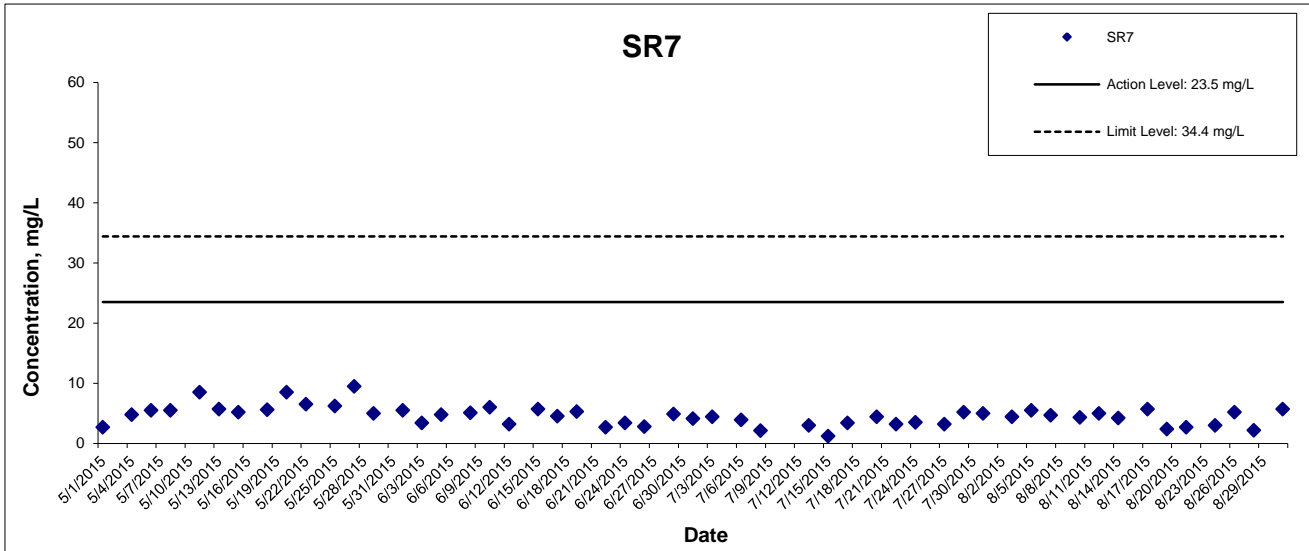
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

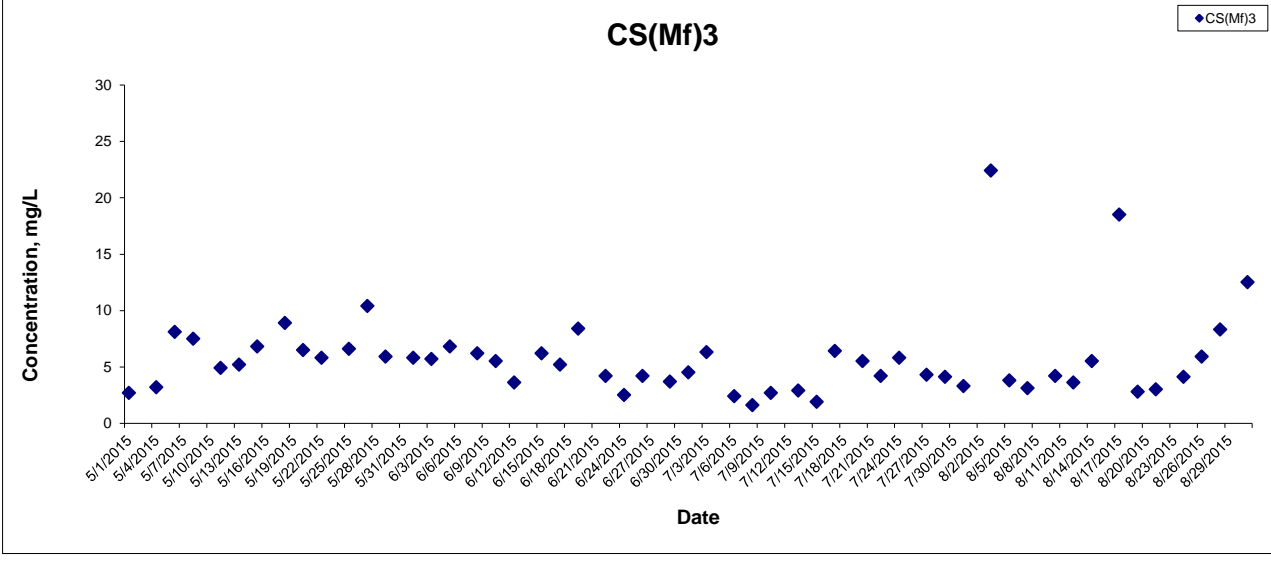
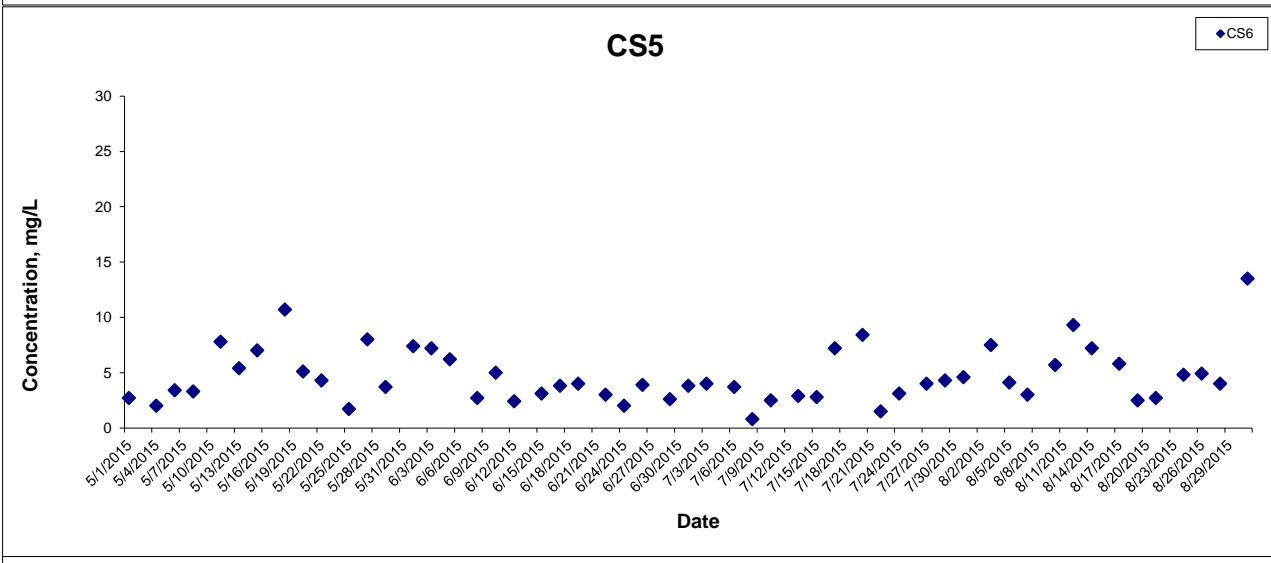
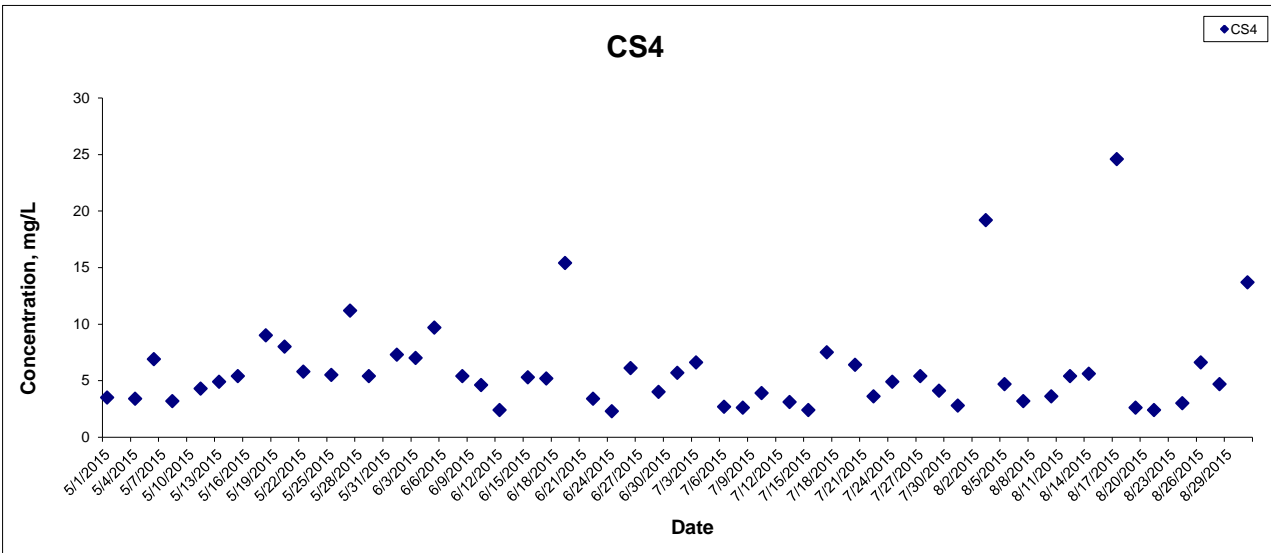
## Suspended Solids at Mid-Ebb Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

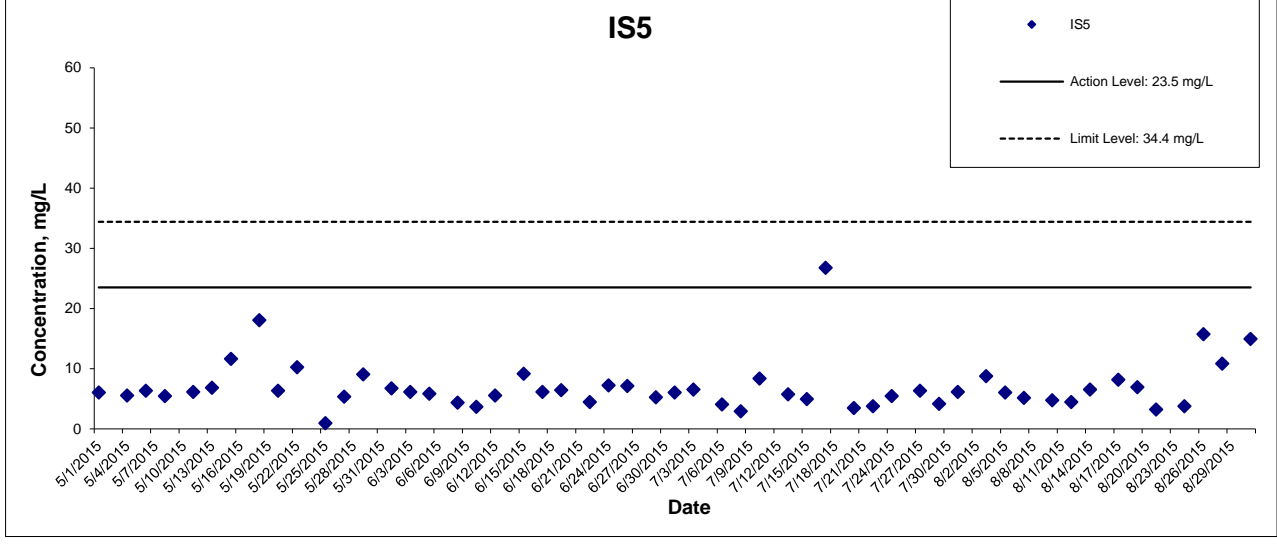
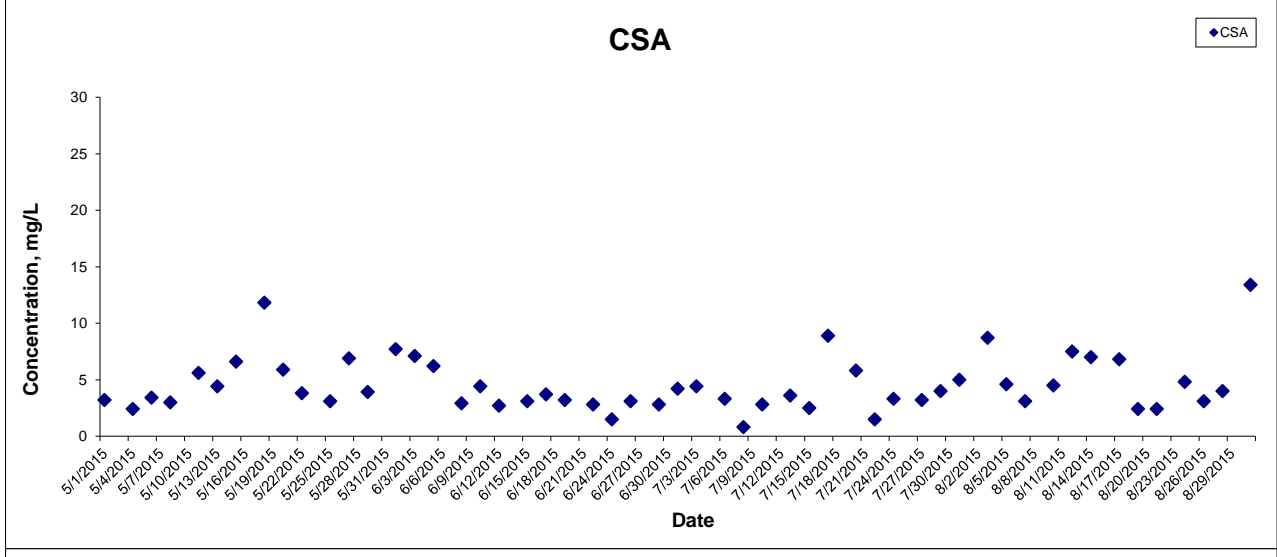
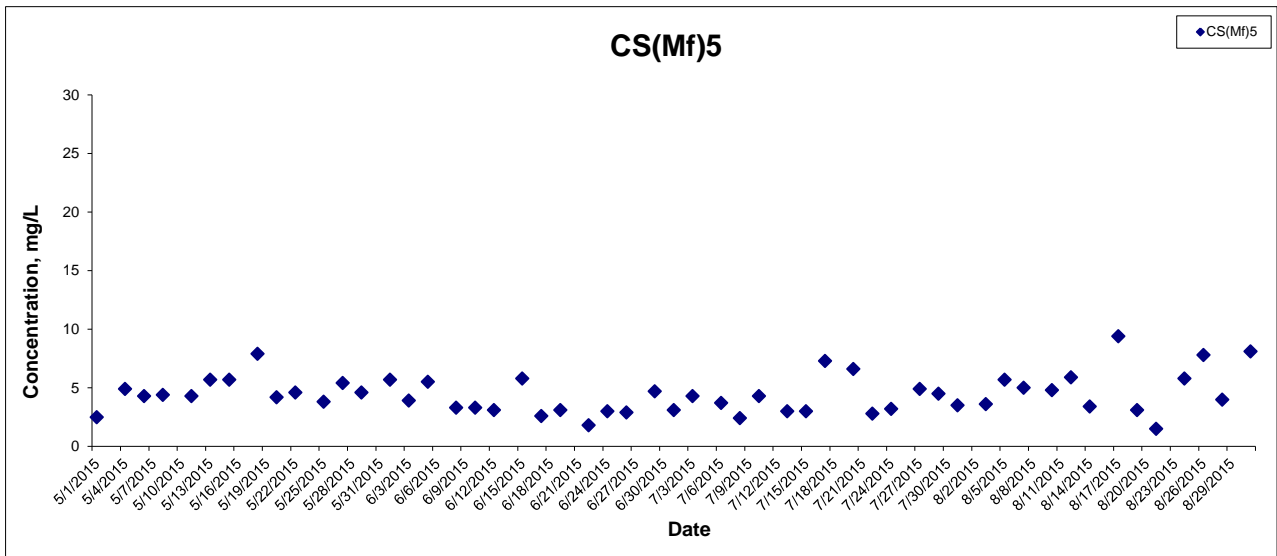


### Suspended Solids at Mid-Flood Tide



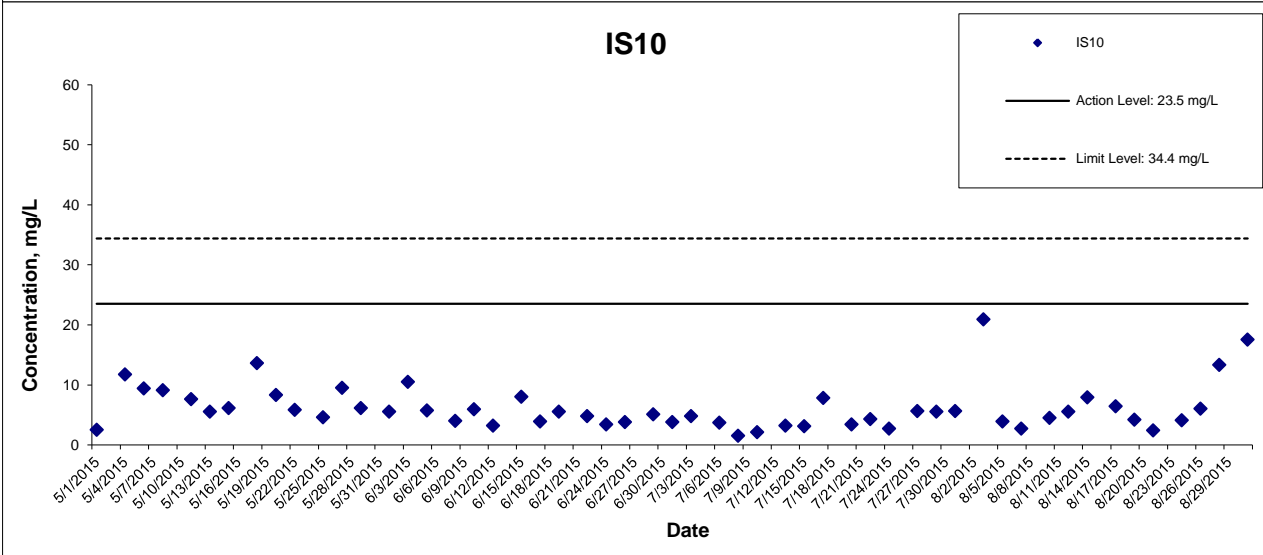
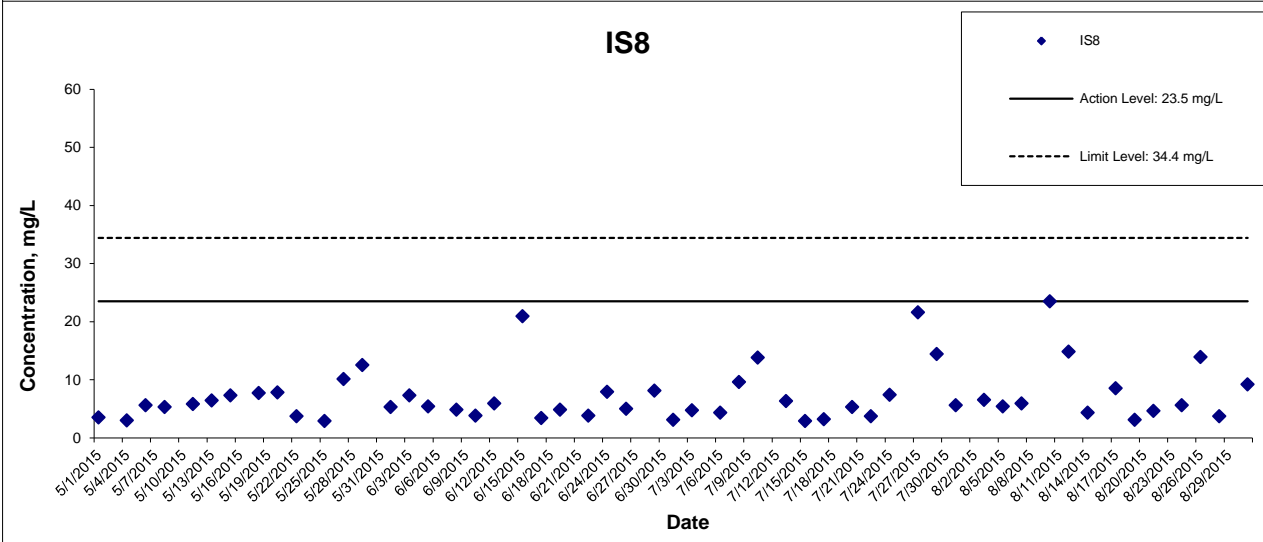
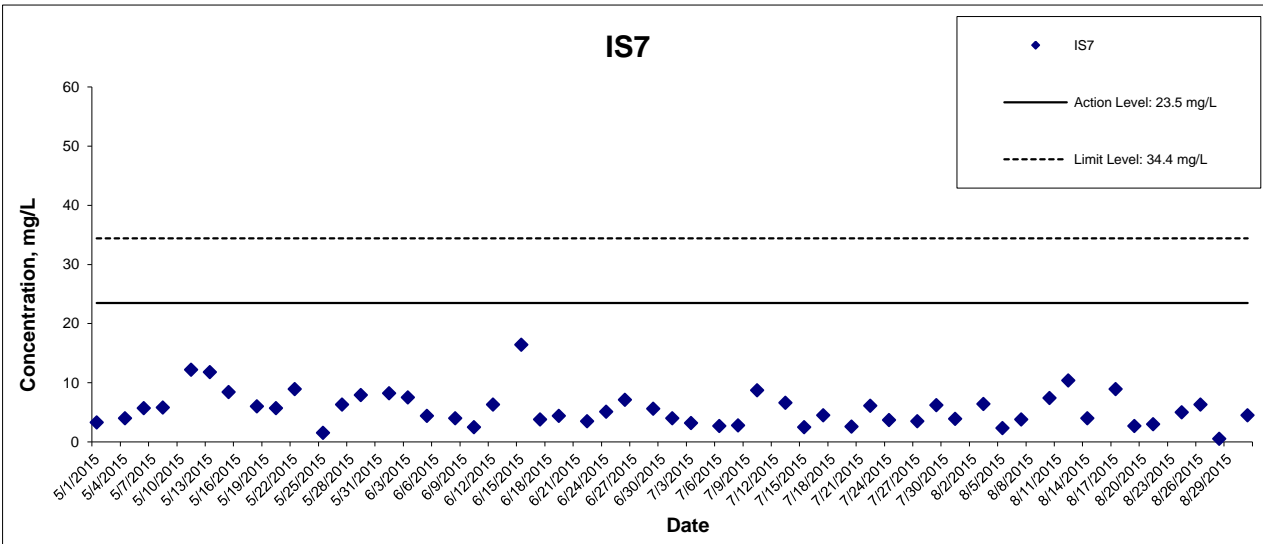
This Drawing has been prepared for the use of AECOM's client. It Dec not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Flood Tide



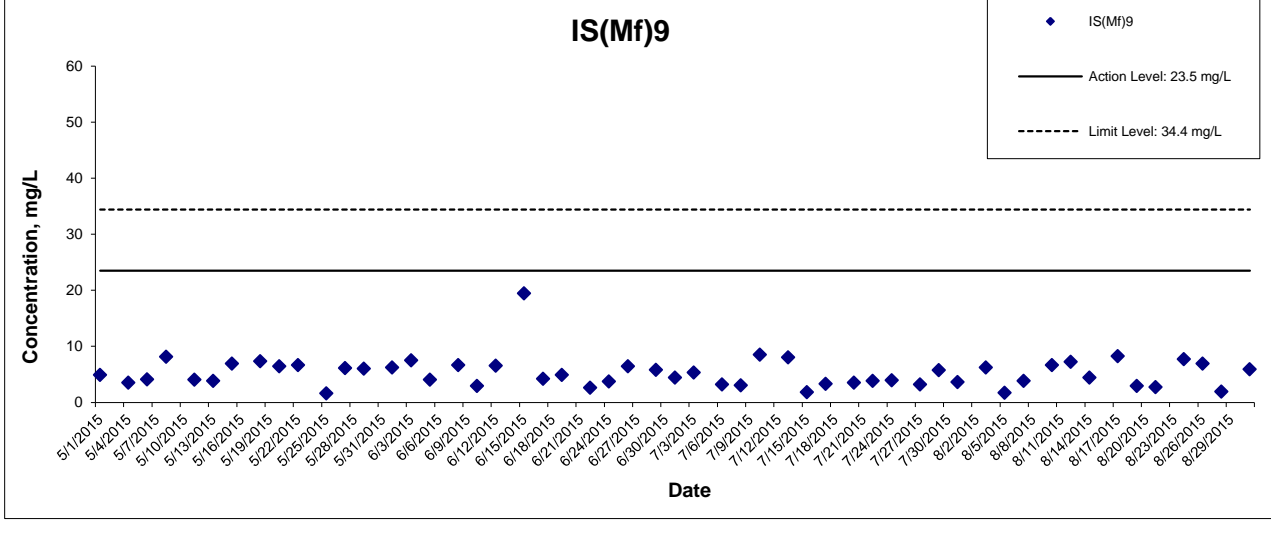
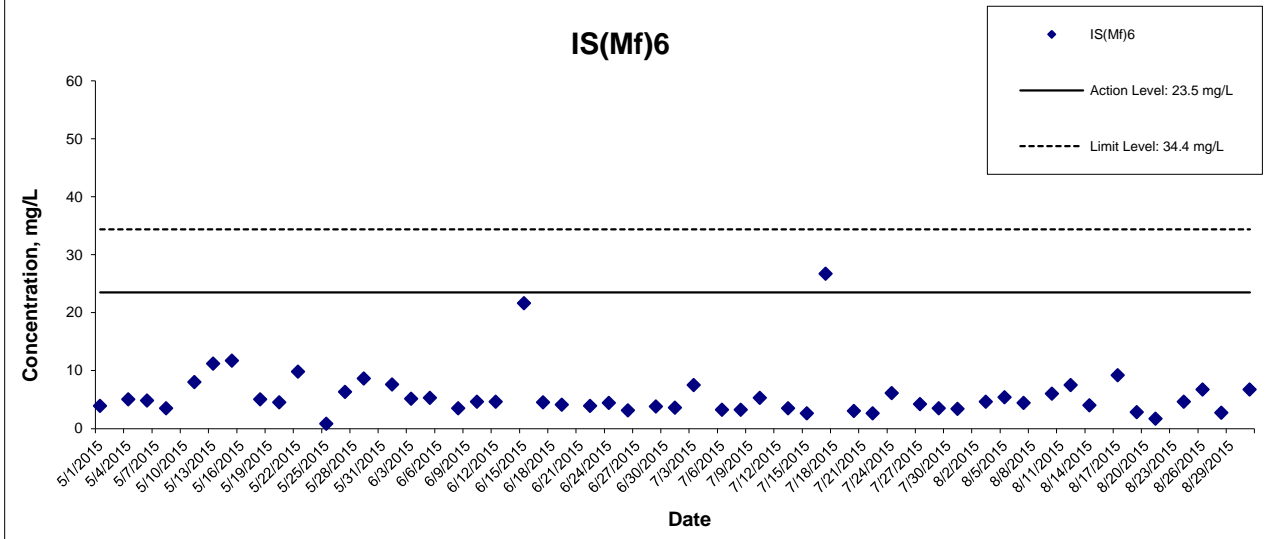
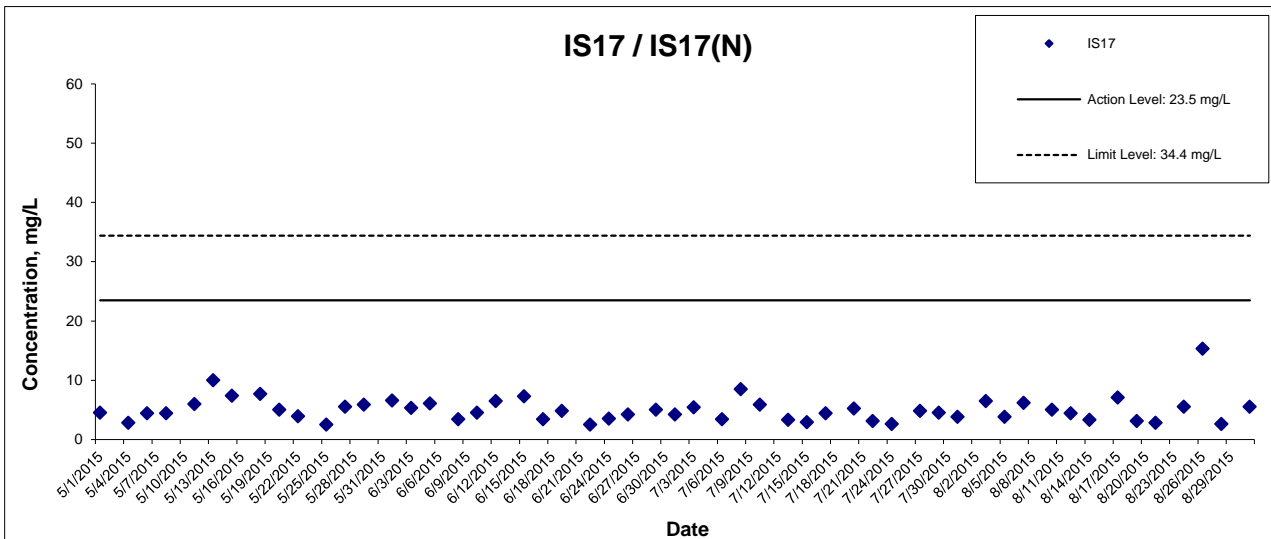
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Flood Tide



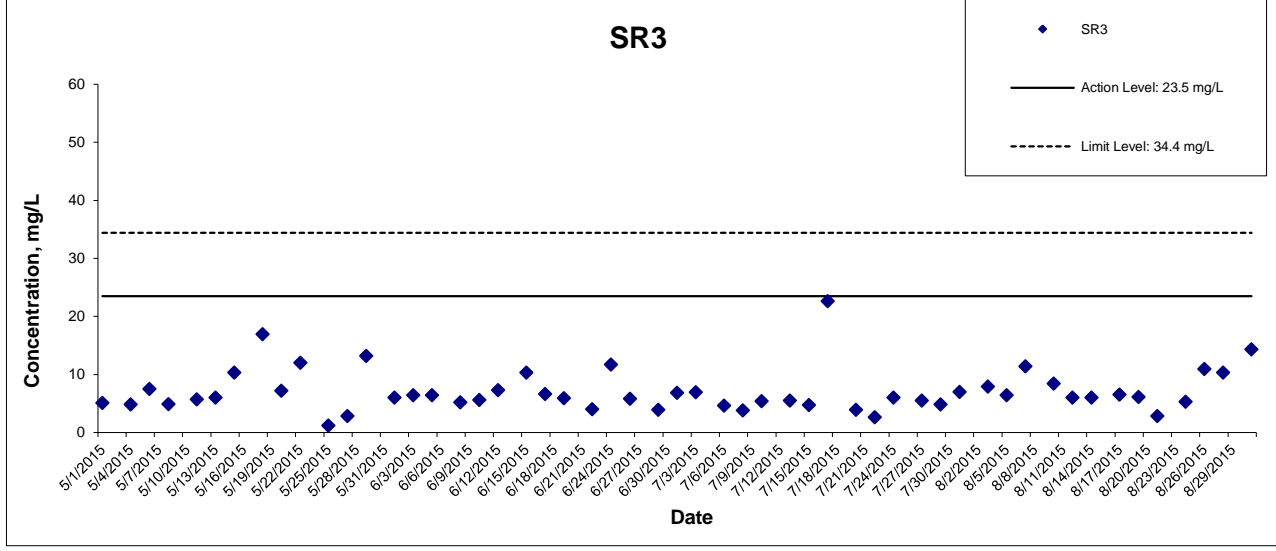
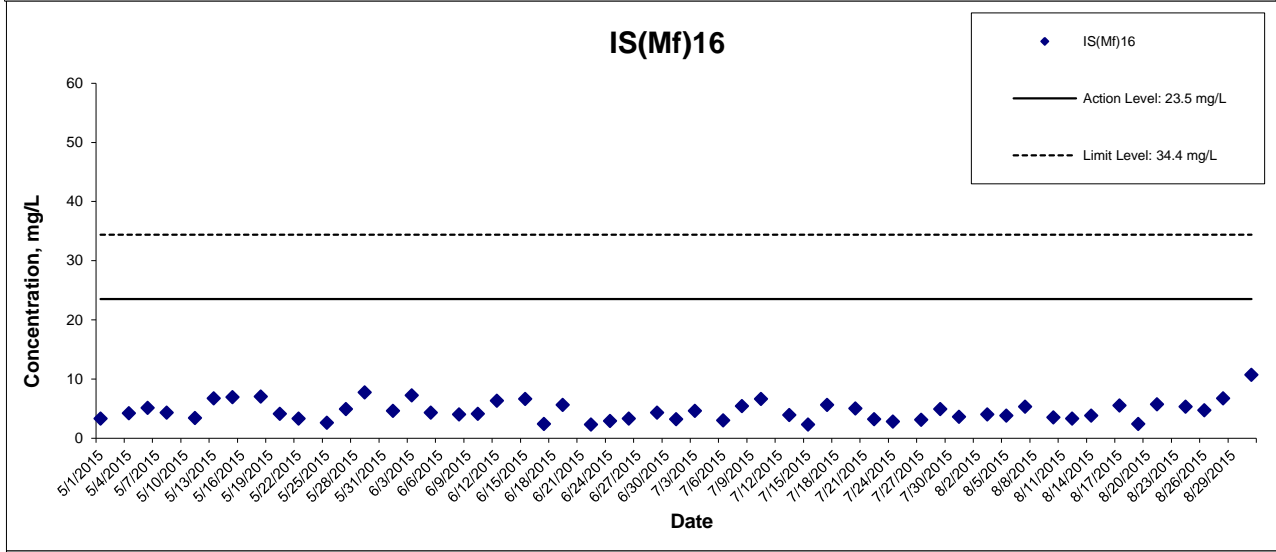
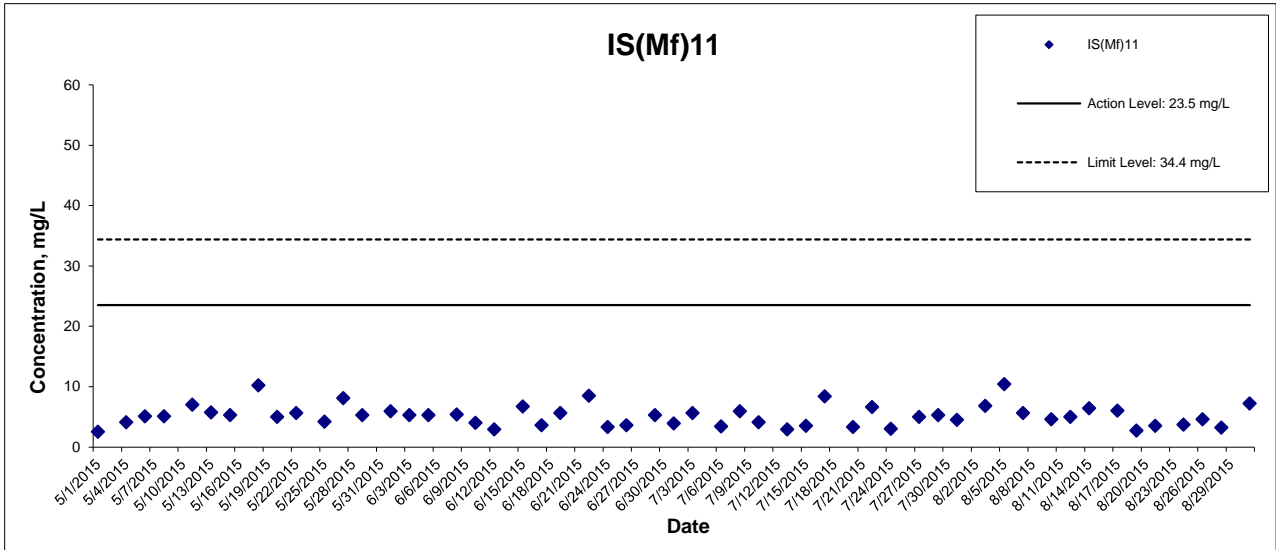
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Flood Tide



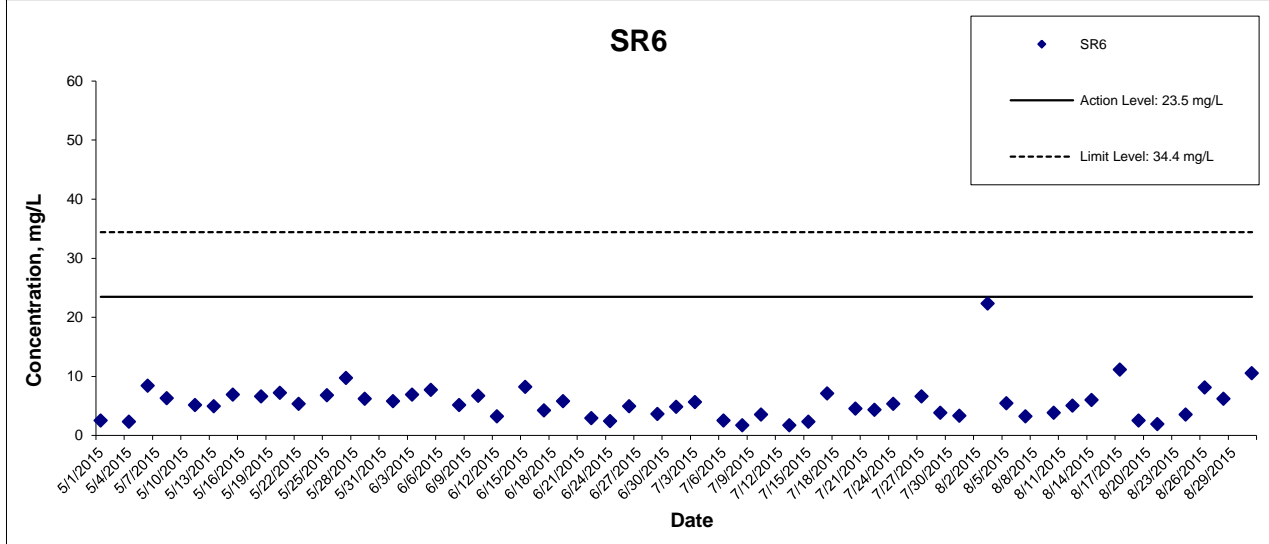
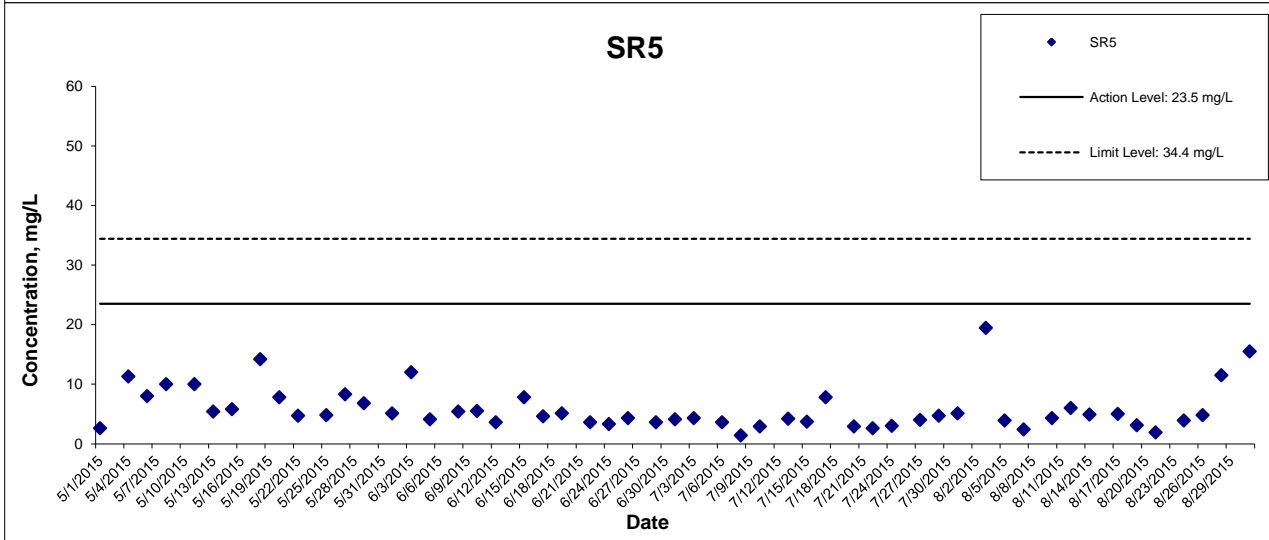
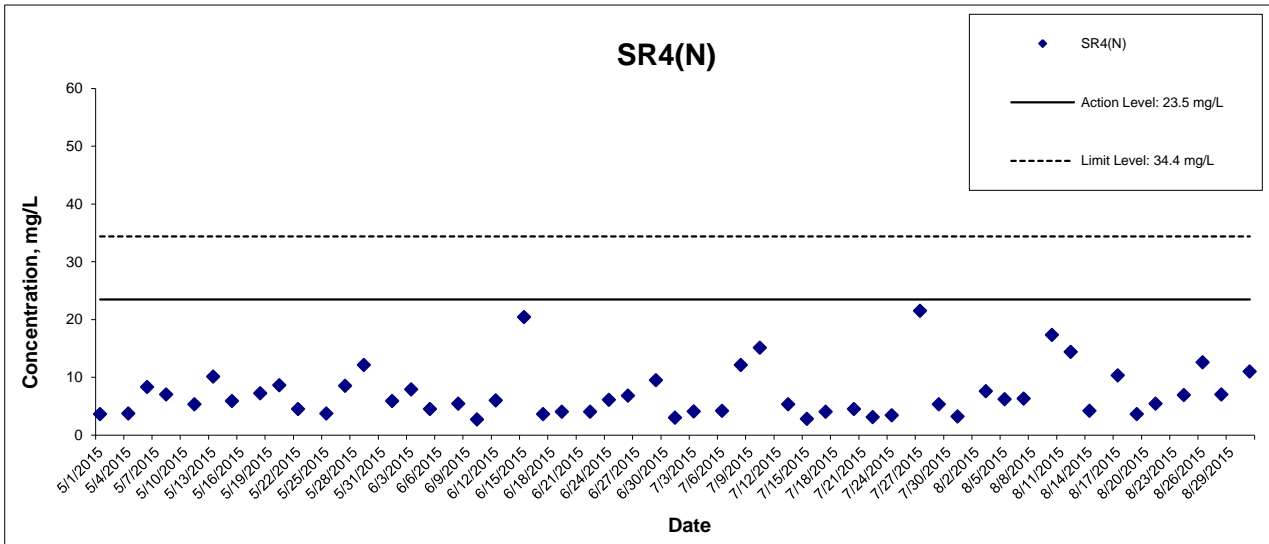
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Flood Tide



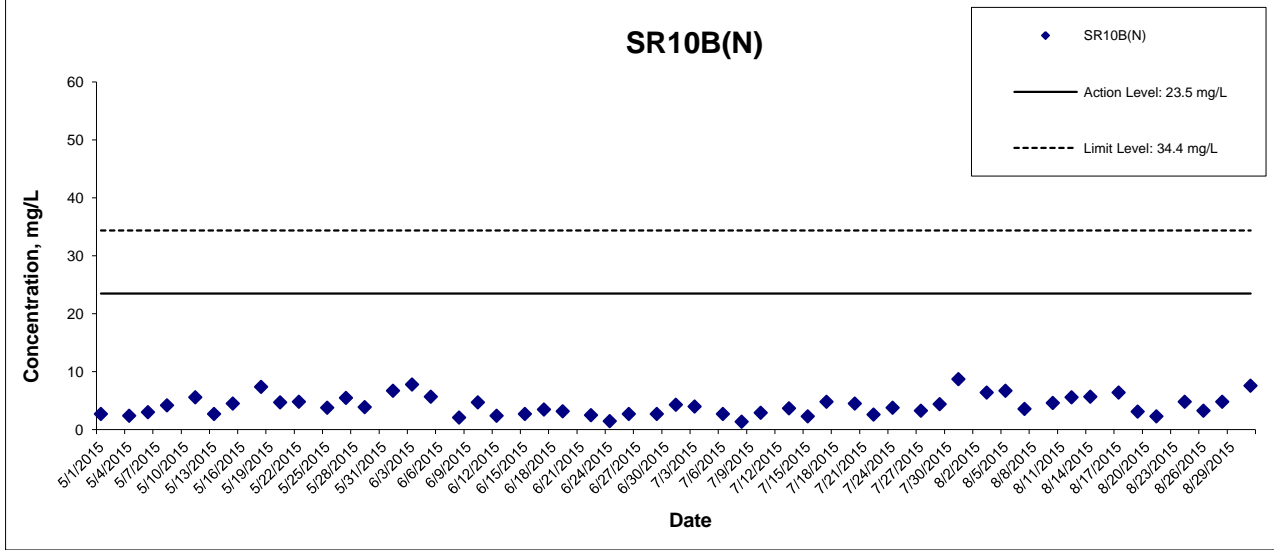
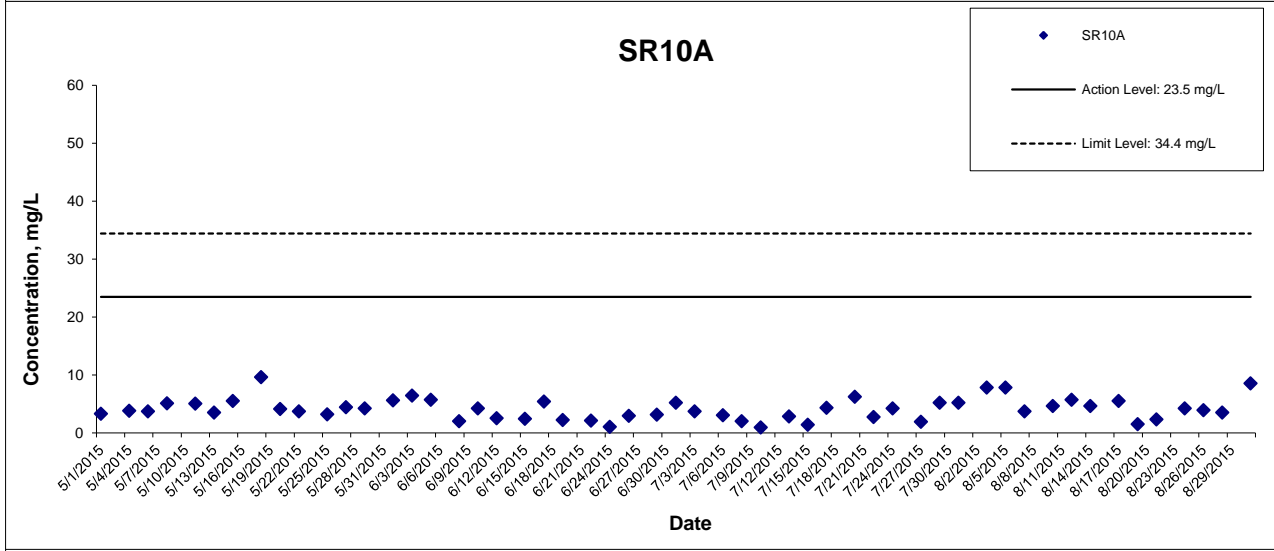
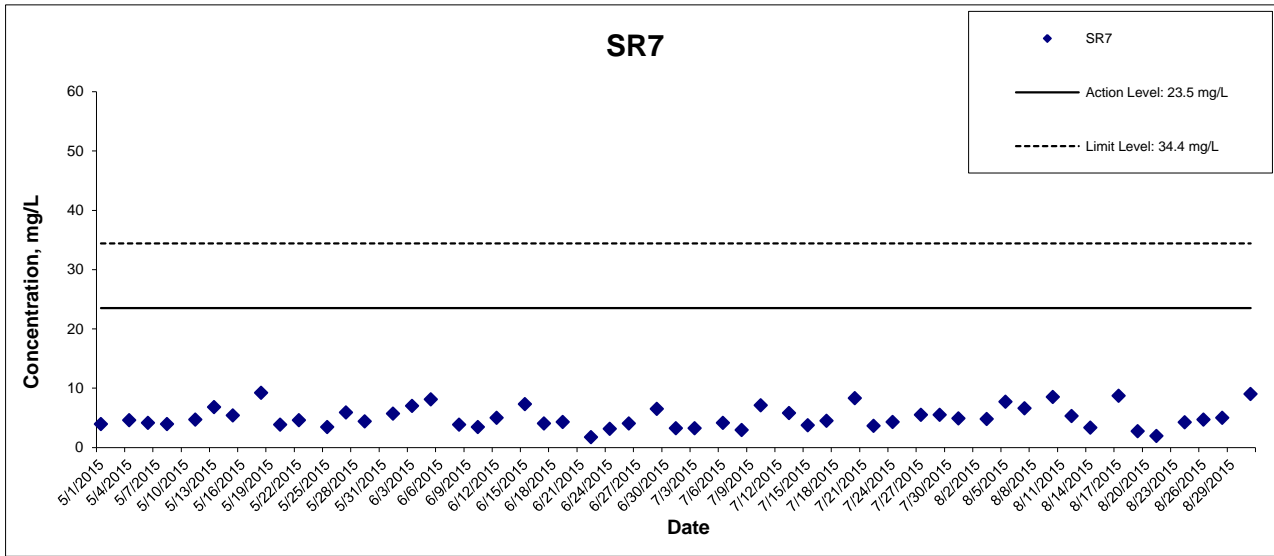
This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

## Suspended Solids at Mid-Flood Tide



This Drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent.

# Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities-Reclamation Works



June - August 2015  
Quarterly Report

**Dolphin Impact Monitoring**



## TABLE OF CONTENTS

<b>1. Introduction</b>	<b>1</b>
<b>2. Objectives and Methodology</b>	<b>2</b>
2.1. <i>Objectives of the Present Study</i>	2
2.2. <i>Line-transect Vessel Surveys</i>	2
2.2.1 Baseline Survey Data and Data from Impact Monitoring	3
2.3. <i>Photo-Identification</i>	6
2.4. <i>Data Analyses</i>	6
2.4.1. Distribution pattern analysis	6
2.4.2. Encounter rate analysis	6
2.4.3. Quantitative grid analysis on habitat use	6
2.4.4. Behavioural analysis	6
2.4.5. Ranging pattern analysis	7
<b>3. Results and Discussions</b>	<b>7</b>
3.1. <i>Summary of survey effort and dolphin sightings</i>	7
3.2. <i>Distribution</i>	9
3.3. <i>Encounter rate</i>	9
3.4. <i>Group size</i>	10
3.5. <i>Habitat use</i>	10
3.6. <i>Mother-calf pairs</i>	11
3.7. <i>Activities</i>	11
3.8. <i>Photo-identification work</i>	11
<b>4. Conclusions</b>	<b>12</b>
<b>5. References</b>	<b>14</b>

### Tables

Table 1	The Dolphin Monitoring Transect Co-Ordinates for HKBCF Monthly Monitoring	4
Table 2	A Comparison of Total Sightings Recorded in NEL and NWL Areas During Sep – Nov 2011, June – August 2011; 2012; 2013, 2014 and 2015	8
Table 3	A Comparison of “On Effort” Sightings Recorded in NEL and NWL Combined During Sep – Nov 2011 and June – August 2011; 2012; 2013, 2014 and 2015	8
Table 4	A Comparison of “On Effort” Sightings Recorded in NEL and NWL During Sep – Nov 2011, and June – August 2011; 2012; 2013, 2014 and 2015	9
Table 5	A Comparison of Encounter Rates <sup>†</sup> in NEL and NWL Areas for Baseline Period (Sept – Nov 2011), June – August 2011; 2012; 2013, 2014 and 2015	10
Table 6	A Comparison of Sightings Group Size Averages Recorded in NEL and NWL Areas During Sep – Nov 2011, June – August 2011; 2012; 2013, 2014 and 2015	11
Table 7.	Frequently Sighted Dolphins from Baseline, AFCD and Impact Monitoring	12

## **Figures**

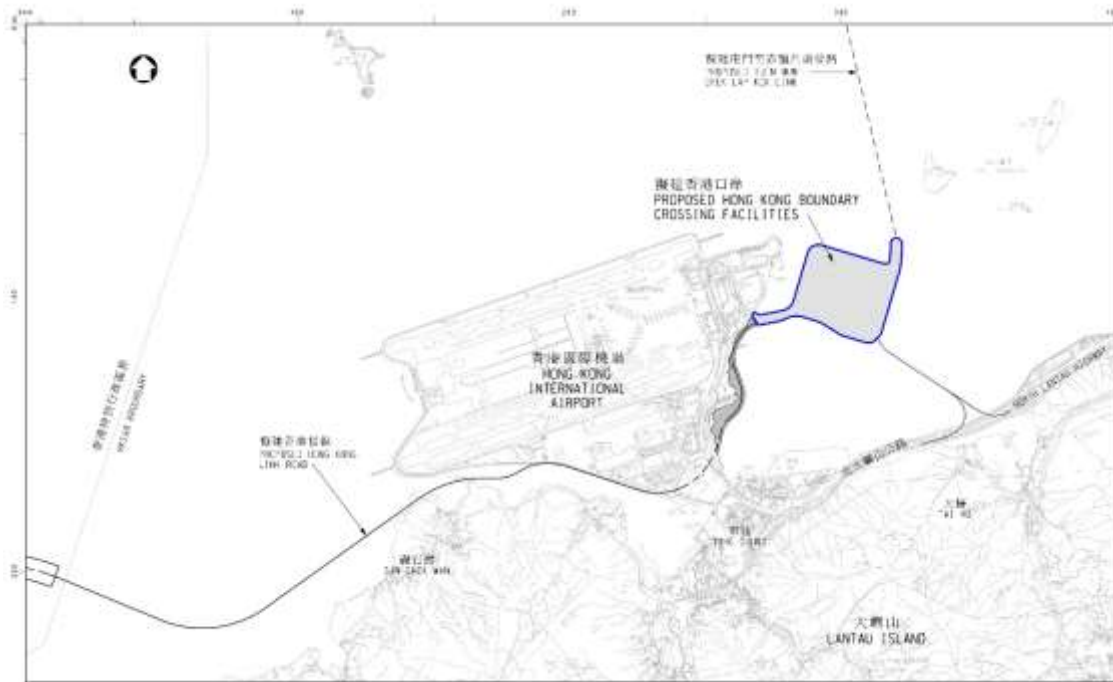
Figure 1.	The Hong Kong Boundary Crossing (HKBCF) Reclamation Sites, North Lantau, Hong Kong	1
Figure 2	Location of Transect Lines for Impact Monitoring during HKBCF (modification approved 19-08-2015)	5
Figure 3	Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (June 2015)	15
Figure 4	Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (July 2015)	16
Figure 5	Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (August 2015)	17
Figure 6	Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (June - August 2015)	18
Figure 7.	The Location of Dolphin Groups Numbering 5 and Above Individuals (June - August 2015)	19
Figure 8	Sighting density SPSE (number of on-effort sightings per 100 units of survey effort) for June - August 2015	20
Figure 9	Dolphin density DPSE (number of dolphins per 100 units of survey effort) for June - August 2015	21
Figure 10.	SPSE and DPSE Grid Analysis from periods June – August 2014 and June – August 2015	22
Figure 11.	Activity Budget for Dolphin Behaviour June - August 2015	23
Figure 12.	The Location of Different Behavioural Activities June - August 2015	24

## **ANNEXES**

Annex I	Impact Monitoring Survey Schedule and Details (June - August 2015)
Annex II	Impact Monitoring Survey Effort Summary (June - August 2015)
Annex III	Impact Monitoring Sighting Database (June - August 2015)
Annex IV	Photo ID Images (June - August 2015)

## 1. Introduction

In March 2012, construction for the Hong Kong-Zhuhai-Macao Bridge (HZMB) began in Hong Kong territorial waters. In Hong Kong, the HZMB comprises three projects; the Hong Kong Boundary Crossing Facilities (HKBCF) Project; the Hong Kong Link Road (HKLR) Project and; the Tuen Mun-Chek Lap Kok Link (TM-CLKL) Project. The HKBCF, the first of the HZMB projects to commence in Hong Kong, requires the total reclamation of approximately 149 hectares (ha); which consists of 130 ha for the HKBCF artificial island and 19 ha for the TM-CLKL southern landfall (Fig. 1).



**Figure 1. The Hong Kong Boundary Crossing (HKBCF) Reclamation Sites, North Lantau, Hong Kong ([http://www.hzmb.hk/eng/img/overview/about\\_overview03\\_p01l.jpg](http://www.hzmb.hk/eng/img/overview/about_overview03_p01l.jpg))**

The EM&A Manuals and Environmental Permits (EP) associated with all three projects have special provision for Chinese white dolphins (CWD) as they occur regularly in the waters which will be affected by the HZMB development. This report comprises the 14<sup>th</sup> quarterly (June-August 2015) summary of data associated with the impact monitoring conducted for contract HY/2010/02, HKBCF-Reclamation Works. The format of this report follows as closely as possible the outline provided for the Baseline Monitoring Report. The baseline monitoring was conducted during a different period from this quarter September to November (in 2011) and is thus not directly comparable as there is a documented seasonal variation of habitat use and behaviour within the Hong Kong habitat. Where appropriate, information from previous reports, data provided by the Hong Kong Highways Department (HyD) and data from the Agriculture, Fisheries and Conservation Department (AFCD) Marine Mammal Annual Monitoring reports have also been incorporated<sup>1</sup>

<sup>1</sup>[http://www.afcd.gov.hk/english/conservation/con\\_mar/con\\_mar\\_chi/con\\_mar\\_chi\\_chi/con\\_mar\\_chi\\_chi.html](http://www.afcd.gov.hk/english/conservation/con_mar/con_mar_chi/con_mar_chi_chi/con_mar_chi_chi.html)

## 2. OBJECTIVES AND METHODOLOGY

### 2.1. Objectives of the Present Study

The EM&A Manual for HZMB states that “A dolphin monitoring programme at North Lantau and West Lantau waters, in particular the dolphin sighting hotspots (e.g. Brothers Islands) and areas where juveniles have been sighted (e.g. West Lantau waters), should be set up to verify the predictions of impacts and to ensure that there are no unforeseen impacts on the dolphin population during construction phase”. For HKBCF the study area known as West Lantau was not included in the site specific EM&A Manual for construction phase survey work. As such, for HKBCF, vessel-based dolphin surveys to monitor impact are conducted in the areas known as Northeast Lantau (NEL) and Northwest Lantau (NWL). These surveys are conducted twice monthly and for the duration of the construction phase of HKBCF. The HZMB baseline study (incorporating HKBCF, TM-CLK and HKLR phases of the bridge development), indicates that the data gathered from these surveys are intended to monitor impacts by;

- providing ongoing assessment of the spatial and temporal distribution patterns and habitat use of CWD during the construction phase of the HKBCF project.
- identifying individual CWD by their natural marks, coloration and scars for comparison with the baseline data and to assess individual distribution patterns and habitat use.
- comparing impact survey data to that gathered during the baseline data period so that any changes deemed to be of a significant nature can be assessed and mitigated appropriately.

The baseline monitoring report includes distribution analysis, encounter rate analysis, behavioural analysis, quantitative grid analysis and ranging pattern analysis. Protocols for data interpretation and analyses methods were provided in the baseline monitoring report and are used herein solely for comparative purposes.

### 2.2. Line-transect Vessel Surveys

The co-ordinates for the transect lines and layout map were provided by AFCD, however, these have been modified as the construction works at HKBCF has shortened one of the transect lines. The study area now incorporates 23 transects (totalling ~108 km) which are surveyed twice per month by boat (Table 1; Figure 2). As HZMB construction works have progressed, some transect lines have been temporarily blocked either by the working vessels or the bridge structure itself. These are detailed in monthly submissions to ENPO. Extensive HZMB works in NWL have resulted in the permanent blockages of some lines. Line transect surveys should be conducted systematically (Buckland *et al* 2001). When the start of a transect line is reached, “on effort” survey begins. When the vessel is travelling between transect lines and to and from the study area, it is deemed to be “off effort”. As per EM&A protocols, the boat travels at a speed of 7-8 knots (13-15 km/hr), except during some periods when tide and current flow exceeds 7 knots and thus the vessel travels at the same speed as the current. A minimum of four marine mammal observers (MMOs) are present on each survey, rotating through four positions; observers (2), data recorder (1) and rest (1). Rotations occur every 30 minutes or at the end of dolphin sightings. The data recorder enters vessel effort, observer effort, weather and sightings information directly onto the programme Logger<sup>2</sup> and is not part of the observer team. This is not ideal line transect survey procedure, however, the baseline study was conducted this way thus it has been requested that only two observers be used for impact surveys.

---

<sup>2</sup> Logger is purpose built software which automatically collects and stores GPS data and contains a user configurable interface for the manual entry of the data required for line transect and other cetacean research studies (Gillespie *et al* 2010).

When the boat is travelling along the transect line (“on effort”), observers search the area in front of the boat between 90° and 270° abeam (bow being 0°). When a group of dolphins is sighted, position, bearing and distance data are recorded immediately onto Logger and, after a short observation, an estimate is made of group size<sup>3</sup>. This is an “on effort” sighting. These input parameters are linked to the time-GPS-ships data which are automatically stored in Logger throughout the survey period. In this manner, information on heading, position, speed, weather, effort and sightings are stored in an interlinked database which can be subsequently used in a variety of analytical software packages.

Once the vessel leaves the transect line, it is deemed to be “off-effort”. The dolphins are approached with the purpose of taking high resolution images. Then the vessel returns to the transect line at the point of departure and is again “on effort”. If another group of dolphins is seen while travelling back to the transect line, or when with the first group of dolphins, the sightings are considered as “opportunistic” and noted accordingly.

### *2.2.1 Baseline Survey Data and Data from Impact Monitoring*

Data from the baseline was provided by the Highways Department (January 2013). These data were extracted from the original baseline survey as the baseline survey encompassed a wider area than that stipulated in the EM&A Manual for the HKBCF Project, as such, a subset of the baseline data set was provided and appropriate rates and densities recalculated from the data provided. For impact monitoring, detailed datasets are available online via the ENPO website. A summary of the survey schedule and transects completed is referenced in Annex I.

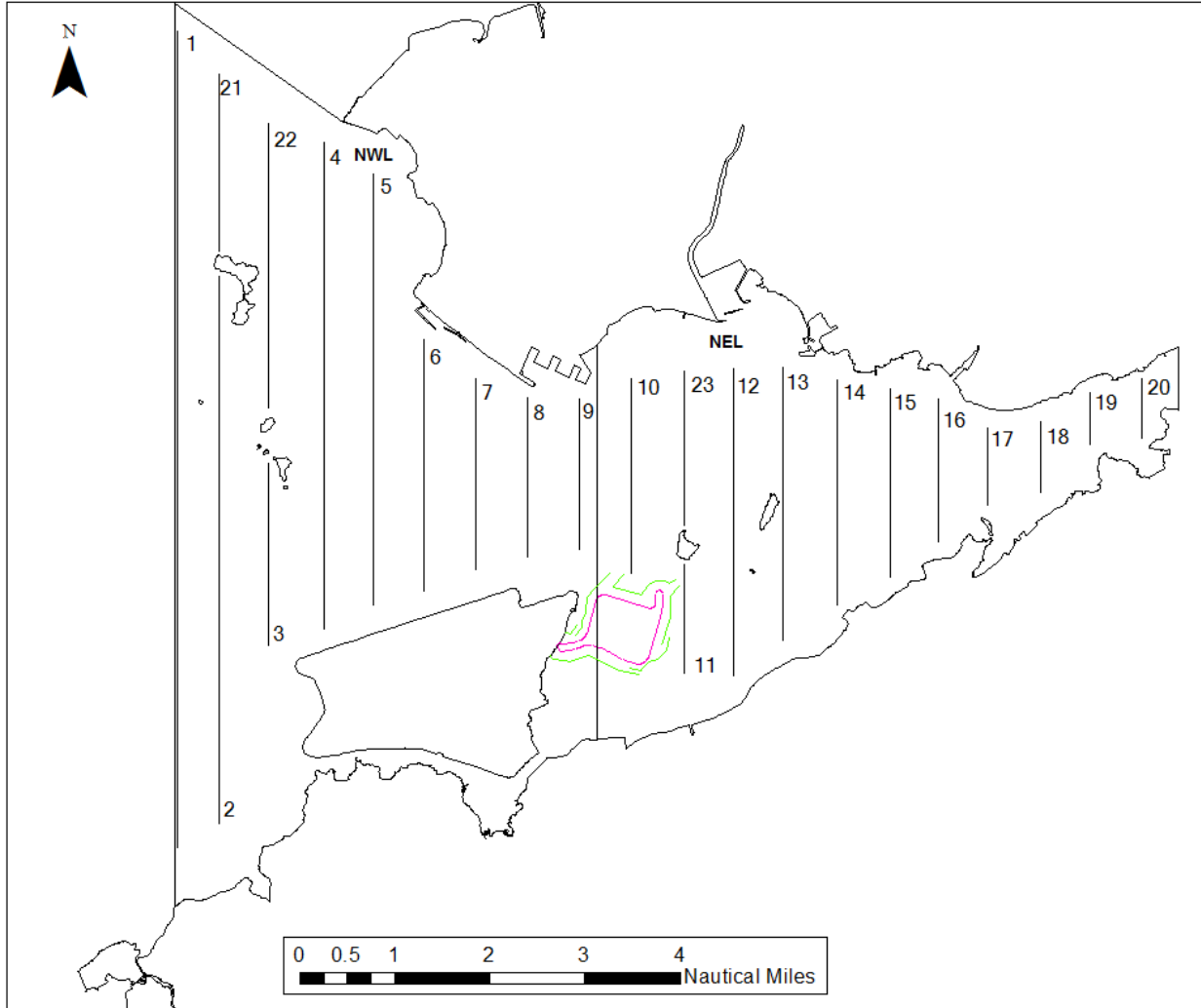
---

<sup>3</sup> Group size is defined as an aggregation of dolphins within 100m of each other involved in similar behaviour (Connor *et al* 1998).

**Table 1. The Dolphin Monitoring Transect Co-Ordinates for HKBCF Monthly Monitoring**

<b>ID</b>	<b>X</b>	<b>Y</b>	<b>Long</b>	<b>Lat</b>	<b>ID</b>	<b>X</b>	<b>Y</b>	<b>Long</b>	<b>Lat</b>
1	804671	815456	113.87029	22.2777	12	815542	824882	113.97565	22.3630
1	804671	831404	113.86998	22.4217	13	816506	819480	113.98507	22.3142
2	805475	815913	113.87808	22.2818	13	816506	824859	113.98501	22.3628
2	805477	826654	113.87790	22.3788	14	817537	820220	113.99507	22.3209
3	806464	819435	113.88762	22.3136	14	817537	824613	113.99502	22.3606
3	806464	822911	113.88755	22.3450	15	818568	820735	114.00507	22.3256
4	807518	819771	113.89783	22.3167	15	818568	824433	114.00503	22.3589
4	807518	829230	113.89766	22.4021	16	819532	821420	114.01442	22.3317
5	808504	820220	113.90740	22.3208	16	819532	824209	114.01439	22.3569
5	808504	828602	113.90725	22.3965	17	820451	822125	114.02333	22.3381
6	809490	820466	113.91697	22.3230	17	820451	823671	114.02332	22.3521
6	809490	825352	113.91688	22.3671	18	821504	822371	114.03356	22.3404
7	810499	820880	113.92675	22.3268	18	821504	823761	114.03354	22.3529
7	810499	824613	113.92669	22.3605	19	822513	823268	114.04334	22.3485
8	811508	821123	113.93654	22.3290	19	822513	824321	114.04333	22.3580
8	811508	824254	113.93649	22.3572	20	823477	823402	114.05270	22.3497
9	812516	821303	113.94632	22.3306	20	823477	824613	114.05269	22.3606
9	812516	824254	113.94628	22.3573	21	805476	827081	113.87788	22.3827
10	813525	820827	113.95611	22.3263	21	805476	830562	113.87781	22.4141
10	813525	824657	113.95607	22.3609	22	806464	824033	113.88752	22.3552
11	814556	818853	113.96616	22.3049	22	806464	829598	113.88742	22.4054
11	814556	820992	113.96613	22.3278	23	814559	821739	113.96614	22.3346
12	815542	818807	113.97573	22.3081	23	814559	824768	113.96610	22.3619

The total transect length for NEL and NWL combined is 108km (approved 19-08-2015)



**Figure 2** Location of Transect Lines for Impact Monitoring during HKBCF (modification approved 19-08-2015)

### 2.3. Photo-identification

When a dolphin(s) is sighted, the vessel leaves the transect line and slowly approaches the group or individual. Attempts are made to photograph every individual sighted although close approaches to mother and calf pairs are not attempted. Digital SLR cameras (Nikon D90; D7100) using long lenses (Nikor 80-400mm and fixed length 300mm) are used to obtain high resolution images. Effort is made to ensure consistency of image quality, e.g., no shadow and at an angle perpendicular to the dorsal fin. Polarising filters are used to minimise glare. In this manner, the best image clarity is achieved and image sorting and matching is more consistent. Images are sorted according to clarity and presence/absence of identifying features (nicks /cuts/deformities/injury/pigmentation). Only images deemed to be of suitable quality and as containing sufficient markings for unambiguous identification are included in the photo-identification catalogue. A recent review of photo identification techniques was referred to ensure that current protocols for this monitoring conform to internationally recognised best practises. Recommendations from this review will be considered for future analyses (Urian *et al* 2014).

### 2.4. Data Analyses

#### 2.4.1. Distribution pattern analysis

Dolphin sightings data are mapped in the Geographic Information System (GIS) ArcView© 10.1.

#### 2.4.2. Encounter rate analysis

For this report, the baseline encounter rates were re-calculated using the revised data provided rather than quoting directly from the baseline report. Calculation followed the EM&A Manuel methodology (“on-effort” sightings made during favourable weather and good visibility conditions).

#### 2.4.3. Quantitative grid analysis of habitat use

Quantitative grid analysis is performed by mapping both sighting and dolphin densities plotted onto 1kmx1km grid squares. Only “on effort” sightings made while on a transect line and under favourable conditions should be included in grid analyses. These densities are standardised by effort by calculating survey coverage in each line transect survey to determine the number of times the grid has been surveyed. Densities are calculated using the following formulae;

SPSE and DPSE:

$$SPSE = (S/E \times 100)/SA\%$$

$$DPSE = (D/E \times 100)/SA\%$$

Where;

S= total number “on effort” sightings

D = total number dolphins from “on effort” sightings

E = total number units survey effort

SA% = percentage of sea area

#### 2.4.4. Behavioural analysis

When dolphins are sighted during vessel surveys, their behaviour is observed. Different activities are categorised (i.e. feeding, traveling, socialising, surface active, associated with boats, unknown) and recorded in the sighting data form of Logger. The sightings form is integrated with survey effort and positional data and can be subsequently mapped to examine distribution and behavioural trends. All sightings data (“on-effort” and “opportunistic”) are used in this analysis.



#### 2.4.5. Ranging pattern analysis

In the baseline monitoring report, the program Animal Movement Analyst Extension, created by the Alaska Biological Science Centre, USGS was used in conjunction with ArcView© 3.1 and Spatial Analyst 2.0. Using the fixed kernel method, kernel density estimates and kernel density plots are created using all sightings. In the baseline monitoring, data from other studies and from outside the baseline monitoring period were used to map individual ranges. It is important to maximize the number of sightings used as there has been discussion on the number of independent resightings required to conduct kernel analyses before it has accuracy (Wauters et al 2007; Kauhala and Auttila 2010). A "rule of thumb" is applied by many cetacean ecologists to utilise 20 or more resightings as a basis for home range analysis. Recently, recognising that there was no published consensus on this value, De Faria et al (2016) conducted home range analysis on a delphinid population which occurs in a habitat similar to that of Hong Kong. Extensive modelling of these authors photo-identification database established that a minimum ideal sample size varied between 20 and 100 independent locations per individual to ensure independence between samples and the estimated home range. AFCD Annual Reports use a minimum of 15 resightings for kernel analyses (AFCD 2012). For the purposes of reporting on this project, 15 or more independent resightings per individual will be used to map utilisation densities using the fixed kernel method. At the time of this report, only 12 independent resightings have been recorded for one dolphin since impact monitoring began. Home range analysis shall be conducted once 15 resightings have been recorded so that results can be compared directly to the AFCD Annual Reports.

### 3. RESULTS AND DISCUSSIONS

#### 3.1. Summary of survey effort and dolphin sightings

From June – August 2015, 12 vessel surveys were conducted in the NEL and NWL survey areas. A total of 655.1 km of “on-effort” transect lines were conducted, 644.6km (98%) of which was conducted under favourable conditions (Annex I; Annex II). Only those periods of “on-effort” survey conducted under favourable conditions were included in quantitative analyses. During June – August 2015, 13 groups of dolphins, numbering 43 (min 43; max 48<sup>4</sup>) individuals, were sighted from the vessel surveys. Of these, seven groups were “on-effort” and the remaining six were “opportunistic” (Annex III).

Of the 13 sightings, all groups were located in NWL. The baseline report, conducted during September-November 2011, notes a total of 44 groups, 34 of which occurred in NWL and 10 in NEL. This was conducted during a different season to this quarterly report. For the period June – August 2011 (advanced monitoring), a total of 37 groups were sighted, 25 of which were located in NWL and 12 in NEL. After construction had commenced, for the period June – August 2012, a total of 62 groups were sighted, 42 of which were located in NWL and 20 in NEL; for the period June – August 2013, a total of 45 groups were sighted, 38 of which were located in NWL and 7 in NEL; and for the period June – August 2014, a total of 27 groups were sighted, 26 of which were located in NWL and 1 in NEL. There are differences between the number of sightings made during baseline compared to the summer periods of this reporting quarter, however, there is known to be seasonal variation of dolphin occurrence in north Lantau, indeed within Hong Kong (AFCD 2012). When a comparison is made between June – August 2011; 2012; 2013; 2014 and the same period in 2015, the numbers of dolphin groups seen in NWL in 2012 and 2013 (both years when HKBCF was a working site) are similar. A decline is noted in the total number of NWL sightings observed in the same period for 2014 and again in 2015. In NEL, when a comparison is made between June – August 2011; 2012; 2013, 2014 and the same period in 2015, there is a marked decline from 2013 onwards

---

<sup>4</sup> During sightings a minimum, maximum and best estimate of group size is noted; the range stated represents the minimum and maximum numbers estimated)

(Table 2). These data have not been corrected for effort. Maps depicting location of sightings, also not corrected for effort, are included as Figs. 3;4;5;6.

**Table 2. A Comparison of Total Sightings Recorded in NEL and NWL Areas During Sep – Nov 2011, June – August 2011; 2012; 2013 and 2014**

Monitoring Period	Total Dolphin Sighting in NWL	Total Dolphin Sighting in NEL
	Number of Groups	Number of Groups
Jun – Aug 2011* (Advanced Monitoring)	25	12
Sep – Nov 2011 (Baseline Monitoring)	34	10
Jun – Aug 2012 (Impact Monitoring)	42	20
Jun – Aug 2013 (Impact Monitoring)	38	7
Jun – Aug 2014 (Impact Monitoring)	26	1
Jun – Aug 2015 (Impact Monitoring)	13	0

\* Surveys conducted once per month

As per the EM&A manual, only “on effort” sightings can be used for some analyses therefore, the combined number of “on effort” sightings for the baseline and the months June – August 2011, 2012, 2013, 2014 and 2015 were compared. The baseline study had considerably more “on effort” sightings compared to the June – August period prior to works commencement. The period June – August during the first year of construction had more “on effort” than both the baseline and the advanced monitoring conducted in the summer of 2011. There is a decrease in absolute numbers of “on effort” groups seen between the June – August from 2014 onwards, with the period June – August 2013 having similar numbers of “on effort” sightings to the same period during advanced monitoring (Table 3). No correction for effort is made with these numbers, this is calculated in section 3.3.

**Table 3. A Comparison of “On Effort” Sightings Recorded in NEL and NWL Combined During Sep – Nov 2011 and June – August 2011; 2012; 2013 and 2014.**

Monitoring Period	Groups of Dolphin sighted in NEL and NWL
June – August 2011 (Advanced Monitoring)	30
Sep - Nov 2011 (Baseline Monitoring)	44
June – August 2012 (Impact Monitoring)	47
June – August 2013 (Impact Monitoring)	29
June – August 2014 (Impact Monitoring)	17
June – August 2015 (Impact Monitoring)	7

### 3.2. Distribution

During the baseline survey, ~77% of all “on effort” sightings were made in NWL. During the June – August periods 2011, 2012, 2013, 2014 and 2015, 63%, 64%, 86%, 94% and 100% of all sightings were made in NWL, respectively. There is a notable trend of increased use of NWL habitat when comparing the period June to August. Again, there is no correction for effort for these group sightings (Table 4). The sightings in NWL occurred at its southern edge and around the Sha Chau Lung Kwu Chau Marine Park area (SCLKCMP) (Fig 6).

**Table 4. A Comparison of “On Effort” Sightings Recorded in NEL and NWL During Sep – Nov 2011, June – August 2011; 2012; 2013, 2014 and 2015.**

Monitoring Period	No. of Dolphin Groups sighted in NWL	No. of Dolphin Groups sighted in NEL
June – August 2011 (Advanced Monitoring)	19	11
Sep - Nov 2011 (Baseline Monitoring)	34	10
June – August 2012 (Impact Monitoring)	30	17
June – August 2013 (Impact Monitoring)	25	4
June – August 2014 (Impact Monitoring)	16	1
June – August 2015 (Impact Monitoring)	8	0

### 3.3. Encounter rate

As some of the survey periods have different transect lengths, variation in sightings occurrence was quantified by correcting for effort (distance of transect lines surveyed, i.e., km spent “on-effort”), to obtain an encounter rate. The baseline study (Sep-Nov 2011) reports that a total of 545.6km<sup>5</sup> of survey effort was conducted under favourable conditions in the NEL and NWL survey areas. In NEL, a decrease in encounter rates has been documented before construction activities started at HKBCF and this has been attributed, largely, to the fast ferries which traverse this area (Marcotte *et al* 2015). Since commencement of the HKBCF, a marked decrease from baseline rates was noted in 2013. In NWL, looking only at the period June – August, 2012 and 2013 have similar encounter rates which are less than advanced monitoring, and a marked decreased in encounter rates is noted from 2014 (Table 5).

<sup>5</sup> Updated data set provided April 2013

**Table 5. A Comparison of Encounter Rates\* in NEL and NWL Areas for Baseline Period (Sept – Nov 2011), June – August 2011; 2012; 2013, 2014 and 2015.**

Monitoring Period	Encounter Rate NEL	Encounter Rate NWL
June – August 2011 (Advanced Monitoring)	7.0	11
Sept-Nov 2011 (Baseline Monitoring)	5.4	9.5
June – August 2012 (Impact Monitoring)	5.2	5.1
June – August 2013 (Impact Monitoring)	1.8	5.7
June – August 2014 (Impact Monitoring)	0.5	3.6
June – August 2015 (Impact Monitoring)	0	1.6

The AFCD Annual Reports describe variation in spatial distribution between areas and between seasons in NEL and NWL. Until 2012, it is reported that overall **annual encounter rate** for NEL varies between 1.6 and 6.2 and the **annual encounter rate** for NWL varies between 5.8 and 17.0. Both the encounter rates for NEL and NWL for this quarter (June – August 2015) are lower than the yearly average. Historically, there have been both up and down movements within **yearly** encounter rate limits, however, the general trend in yearly encounter rate for dolphins in all areas of Hong Kong is that of significant decline over the last decade, prior to new development projects in the Lantau area (AFCD 2013). The known decline in the population, in addition to the highly variable encounter rate noted historically, makes it problematic to discern any additional influence individual projects, such as HKBCF and others, may have on the dolphin population encounter rate. What is clear that during the last two June – August periods, the encounter rate has declined markedly in NWL and, since project inception, the decrease in NEL is noted from 2013. It has been noted that in addition to HZMB activities, dredging and other new marine works have also been ongoing in both NEL and NWL. It is likely that all activities contribute to the ongoing decline in dolphin numbers from Hong Kong areas NEL and NWL.

#### *3.4. Group size*

For baseline monitoring, the NWL average group size was 4.5 and in June – August 2011; 2012; 2013, 2014 and 2015 it was 4.3, 2.8, 2.9, 3.3 and 3.3, respectively. For baseline monitoring, the NEL average group size was 3.5 and in June – August 2011; 2012; 2013 and 2014, it was 2.8, 3.8, 2.3 and 1.0, respectively, and no sightings noted in 2015 (Table 6). There is a smaller group size noted during impact monitoring in NWL. There is no apparent trend in NEL, until 2014 when the numbers of groups encountered decreased. A map depicting group size distribution shows that larger groups, i.e., more than 5 individuals, occur at the southern edge of NWL (Fig. 7). ). It has been noted previously that significantly larger groups are noted behind active fishing trawlers (Jefferson 2000). As trawlers no longer operate in Hong Kong waters, group size averages may have decreased due to this.

**Table 6. A Comparison of Sightings Group Size Averages Recorded in NEL and NWL Areas During Sep – Nov 2011, June – August 2011; 2012, 2013, 2014 and 2015**

Monitoring Period	Average Group Size (NWL)	Average Group Size (NEL)
June – August 2011 (Advanced Monitoring)	4.3	2.8
Sep - Nov 2011 (Baseline Monitoring)	4.5	3.5
June – to August 2012 (Impact Monitoring)	2.8	3.8
June – August 2013 (Impact Monitoring)	2.9	2.3
June – August 2014 (Impact Monitoring)	3.3	1.0
June – August 2015 (Impact Monitoring)	3.3	-

### 3.5. *Habitat use*

Quantitative grid analyses indicates that the most often frequented areas in NWL were the SCLKCOMP and the southern limit of NWL (Figs. 8; 9). When compared to the same period in 2014, the grid analyses show a shift in distribution from the east to the west of the NEL/NWL habitats with fewer cells of higher use (Fig. 10). These areas of high use have been consistent in the long term and continue to be so.

### 3.6. *Mother-calf pairs*

No mother and calf pairs were sighted during this period. During the same period in 2014, 5.7% of dolphins sighted were calves.

### 3.7. *Activities*

Of the 13 groups sighted (using all sightings), three (23%) were engaged in feeding activities; six (46%) were travelling; two (15%) were feeding/travelling/socialising; and two were unknown (15%). Travelling was the predominant activity during daylight hours in June to August (Fig. 11). There were no areas which showed a specific behavioural preference (Fig. 12).

### 3.8. *Photo-identification work*

The photo-identification catalogue was regularly updated and re-sightings of dolphins previously identified were recorded. The project specific photo-identification catalogue for the impact monitoring period is presented in Annex IV. All dolphins including those sighted only in the baseline are included. Not all dolphins sighted have sufficient scarring, injury or pigmentation uniqueness to be unambiguously identified. During the baseline survey, 96 individuals were noted in the NEL, NWL and WL areas. Of these, 57 were noted in the NEL and NWL area. One new dolphin has been identified in the last quarter and the catalogue stands at 118 individuals. To report date (31 August 2015), the HZMB catalogue has identified 14 dolphins that were seen in both baseline and the impact monitoring study period. Two further dolphins have been identified during impact monitoring which have been matched to the AFCD photo ID data held on the AFCD website.

There are 15 dolphins which have been sighted on six days or more during impact monitoring, nine (9) of which are known from the AFCD catalogue (HZMB 001 [WL46]; HZMB 002 [WL111]; HZMB 011 [EL01]; HZMB 041 [NL24]; HZMB 044 [NL98]; HZMB 51 [NL213]; HZMB 054 [CH34]; HZMB 083 [NL136]; HZMB 098 [NL104]) (Table 7). The highest number of re-sightings recorded during impact monitoring surveys is 12 (HZMB 002), excluding multiple sightings made on the same day (Annex IV).

**Table 7. Dolphins Frequently Recorded During Impact Monitoring Surveys.**

HZMB ID	AFCD ID	SEEN IN BASELINE	No. DAYS SIGHTED IMPACT MONITORING
HZMB 002	WL111	Y	12
HZMB 054	CH34	Y	11
HZMB 044	NL98	Y	10
HZMB 023	unknown	*	9
HZMB 051	NL213	N	9
HZMB 098	NL104	Y	8
HZMB 005	unknown	*	7
HZMB 041	NL24	Y	7
HZMB 001	WL46	N	6
HZMB 011	EL01	Y	6
HZMB 040	unknown	*	6
HZMB 064	unknown	*	6
HZMB 074	unknown	*	6
HZMB 083	NL136	Y	6
HZMB 094	unknown	*	6

\* cannot be determined

#### **4. CONCLUSION**

The data from June – August 2015, shows some consistencies with the baseline data (conducted during a different season) and with the same periods in 2011, 2012, 2013 and 2014. Habitat use and behavioural trends all fall within those reported in AFCD Long Term Monitoring reports although as sightings numbers decrease, such patterns are difficult to compare. The quarterly encounter rates for both NEL and NWL is lower than that reported for **annual** rates published previously and the seasonal trend for these two areas is of a declining encounter rate. Density distribution maps depict key areas of higher use within NWL, in particular, SCLKMP. Areas to the south of SCLKMP and Tai O have seen diminished use since 2013 and this trend continues to 2015. In general, the encounter rate, habitat use and group size information suggests that more dolphins are using the northern area of NWL and less dolphins using southern NWL. It has been some time since any dolphin was sighted in NEL. These observations are only for the period June – August, however, these trends have been apparent throughout 2015. No calves were recorded in the study area between June – August.

The decreases in encounter rates in both NEL and NWL are noted. HKBCF monthly reporting notes that the conditions of EM&A Manuel have been consistently upheld and that all measures stipulated to minimise disturbance to dolphins remain in place. Although it is likely that the increase in HKBCF activities is having an effect on dolphin encounter rates in NEL, it is also noted that other HZMB projects have increased activities over the last quarter throughout NEL and NWL. In addition, extensive marine works which are not part of HKBCF have been ongoing in NEL and also in parts of NWL throughout this current quarter period. Further, new projects have been initiated along the airport platform area. Some collaboration with cross border authorities has been initiated, with regards to sharing photo ID catalogues, and at recent meetings held between all environmental teams for HZMB, it was noted that some of the dolphins previously recorded in Hong Kong waters but which have been absent recently, have been recorded in adjacent waters. Therefore, the information current to this project indicates that the

dolphins have shifted distribution, to the west, which was noted as a likely impact in the EIA.

At this stage, the intensity of in water marine works associated with the HKBCF is decreasing, however, the drivers behind the population decline stated in the AFCD long term monitoring programme for Hong Kong waters and independent studies for adjacent Pearl River Estuary (PRE) waters (Huang *et al* 2012) remain uncertain. Recent work indicates that habitat abandonment of NEL waters prior to HKBCF initiation was partially driven by the increase in high speed ferry traffic (Marcotte *et al* 2015). Therefore, the HZMB Project was initiated at a time when there was already a widespread and long term reduction in the number of dolphins within what is believed to be their entire range of the PRE. The strict mitigation initiatives at HKBCF aim to minimize the localised impact of HKBCF construction, however, this in itself will not be sufficient to ameliorate the myriad of other impacts throughout the dolphins habitat.

## References

Agriculture, Fisheries and Conservation Department (AFCD) 2012;2013. *Annual Marine Mammal Monitoring Programme April 2011-March 2012.* ) The Agriculture, Fisheries and Conservation Department, Government of the Hong Kong SAR.

Buckland, S., Burnham, K., Laake, J., Borchers, D. and Thomas, L. 2001. Introduction to Distance Sampling. Oxford University Press.

Connor, R. Mann, J., Tyack, P. and Whitehead, H. 1998. Social Evolution in Toothed Whales. *Trends in Ecology and Evolution* 13, 228-232

de Faria Oshima, J. E., & de Oliveira Santos, M. C. 2016. Guiana dolphin home range analysis based on 11 years of photo-identification research in a tropical estuary. *Journal of Mammalogy*, (4) p207.

Gillespie, D., Leaper, R., Gordon, J. and Macleod, K. 2010. An integrated data collection system for line transect surveys. *J. Cetacean Res. Manage.* 11(3): 217–227.

Huang, S., Karczarski, Chen, J, Zhou, R, Lin, W., Zhang, H., Li., H. and Wu, Y. 2012 Demography and Population Trends of the Largest Population of Indo-Pacific Humpback Dolphins. *Biological Conservation* 147: 234-242

Kauhala, K. & Auttila, M. 2010: Estimating habitat selection of badgers - a test between different methods. - *Folia Zoologica* 59: 16-25.

Marcotte, D., Hung, S. K., & Caquard, S. 2015. Mapping cumulative impacts on Hong Kong's pink dolphin population. *Ocean & Coastal Management*, 109, 51-63.

Wauters, L., Preatoni, D., Molinari, A. and Tosi, G. 2007. Radio-tracking squirrels: Performance of home range density and linkage estimators with small range and sample size. *Ecological Modelling* 202(10):333-44

Worton, B. 1989. Kernel Methods for Estimating Utilization Distribution in Home Range Studies. *Ecology* 70(1):164-8



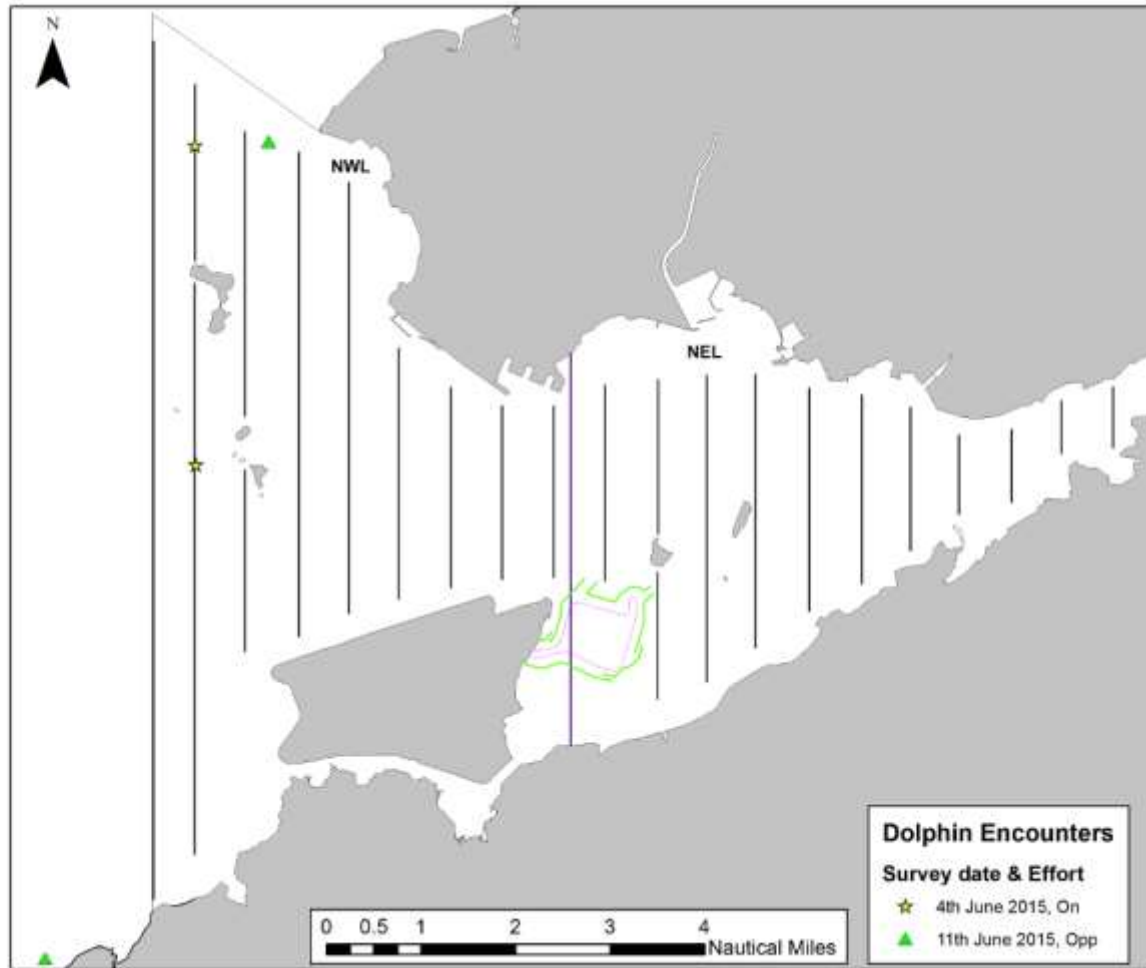


Figure 3 Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (June 2015)

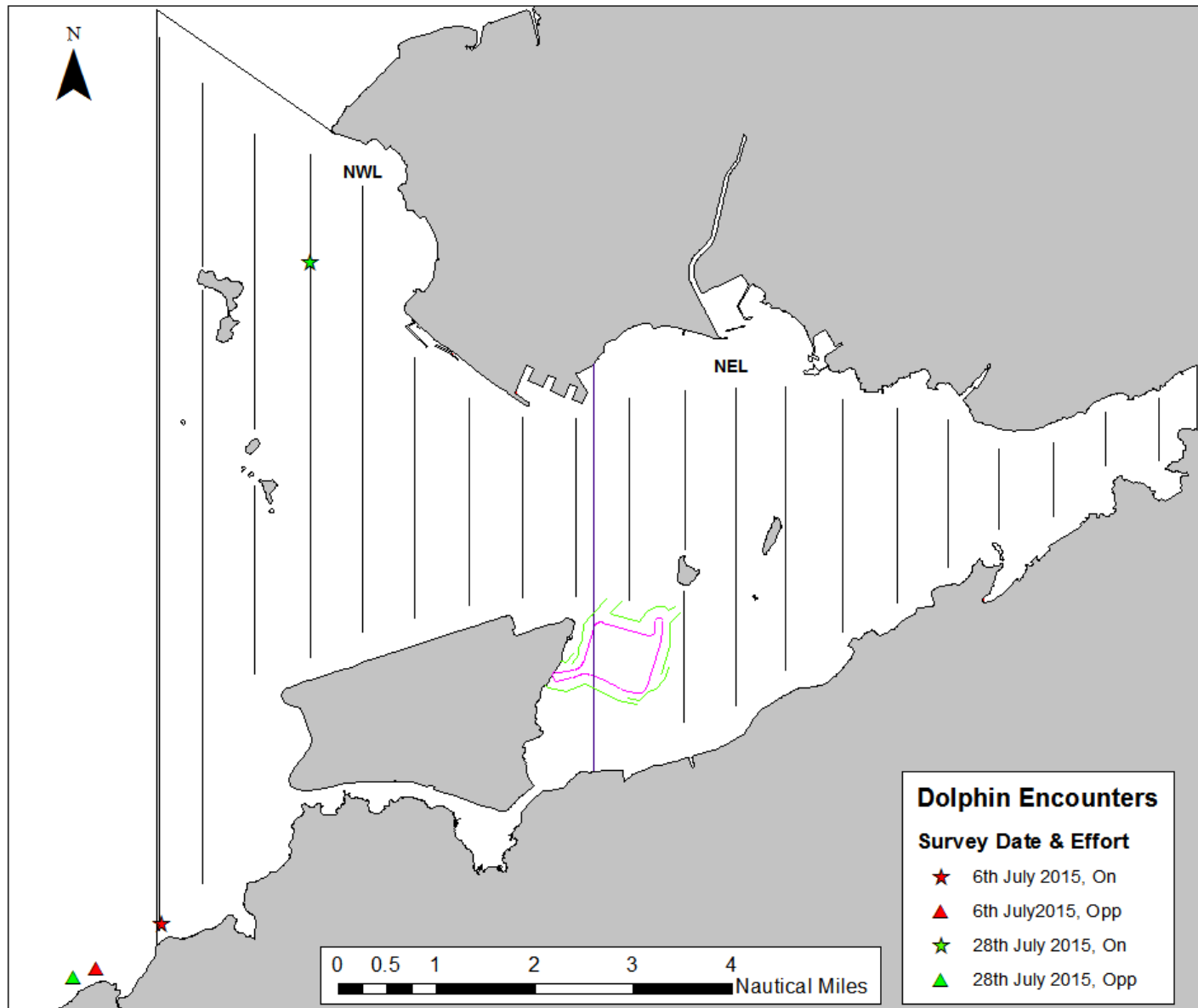


Figure 4 Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (July 2015)

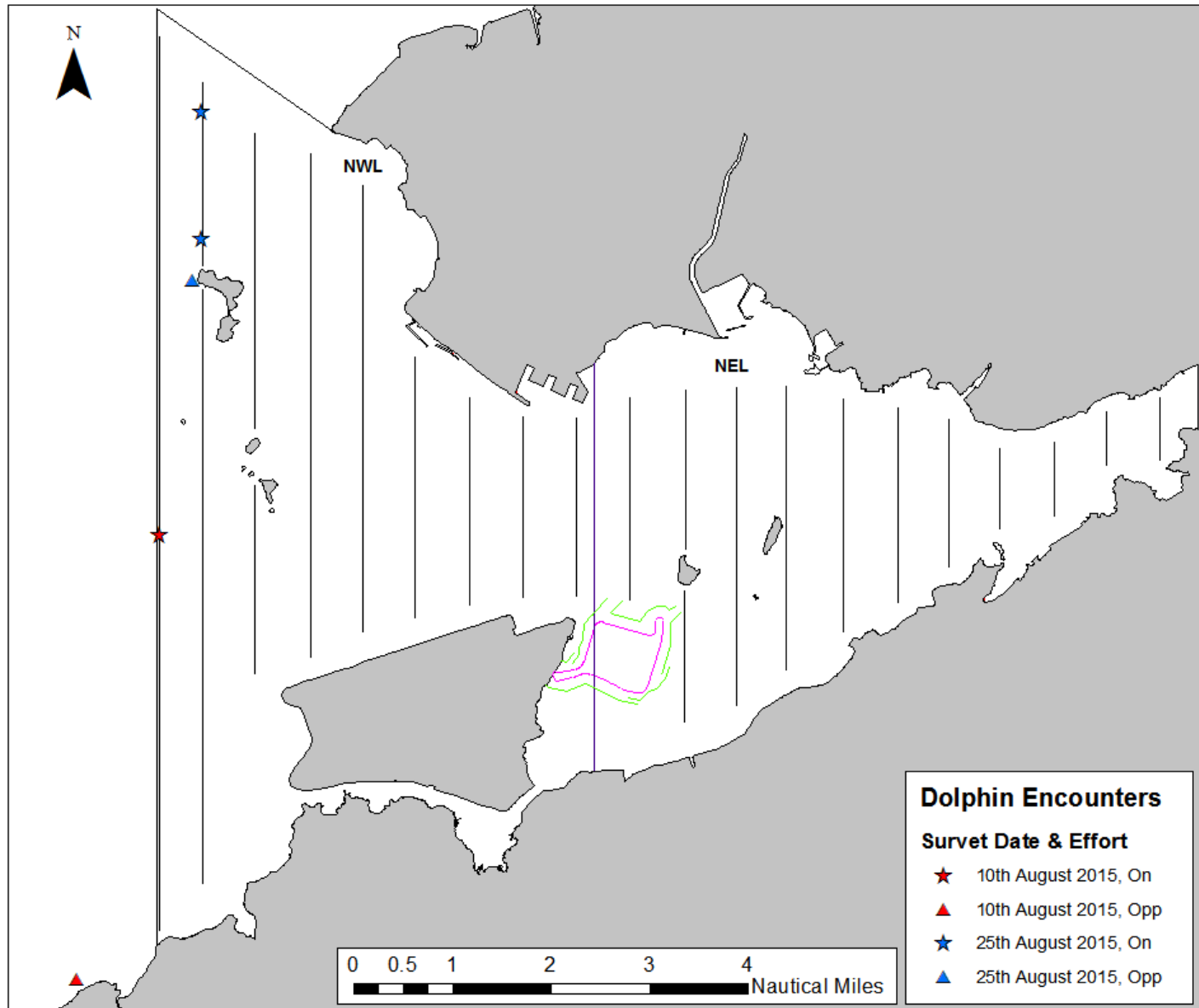


Figure 5 Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (August 2015)

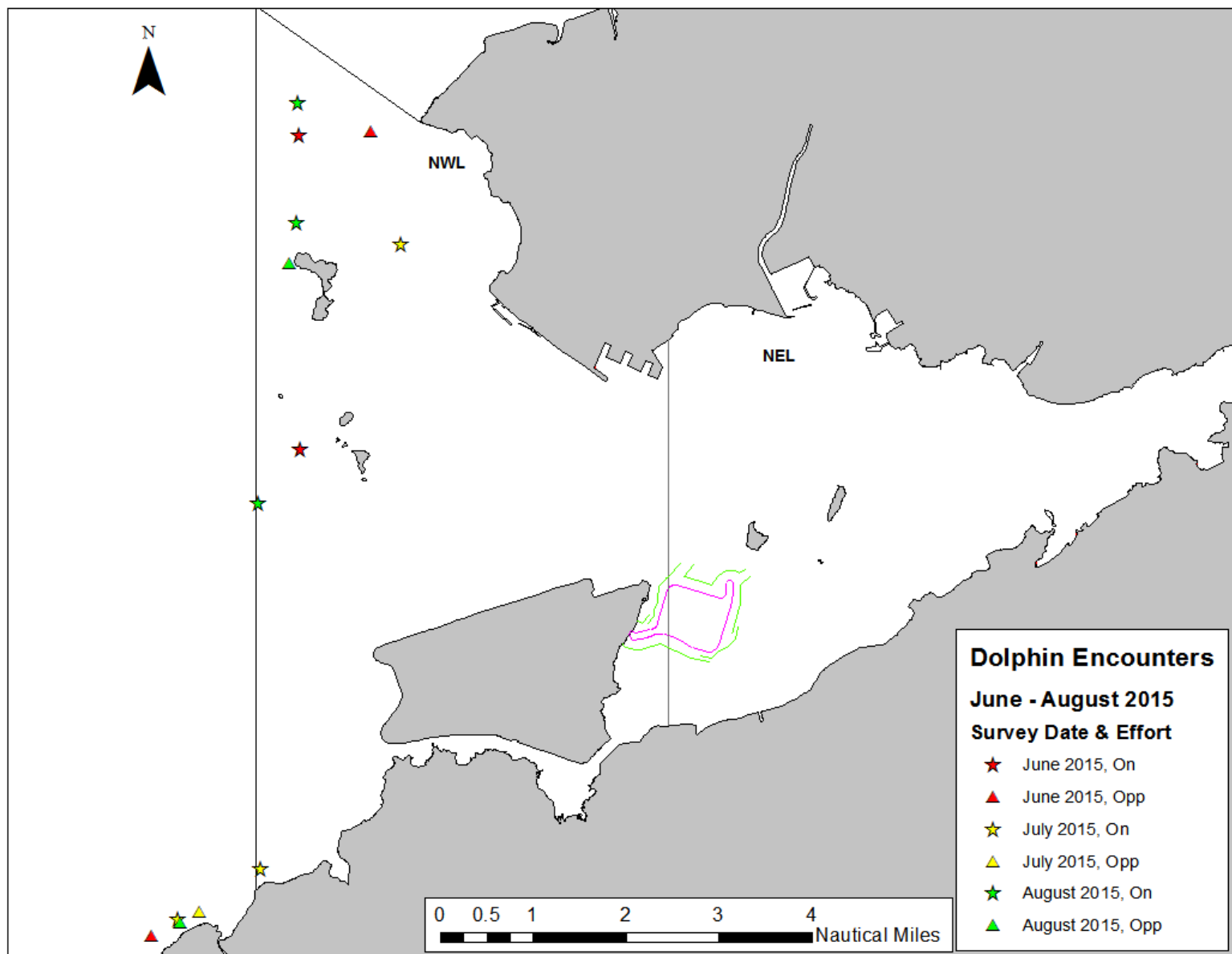


Figure 6. Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (June-August 2015)

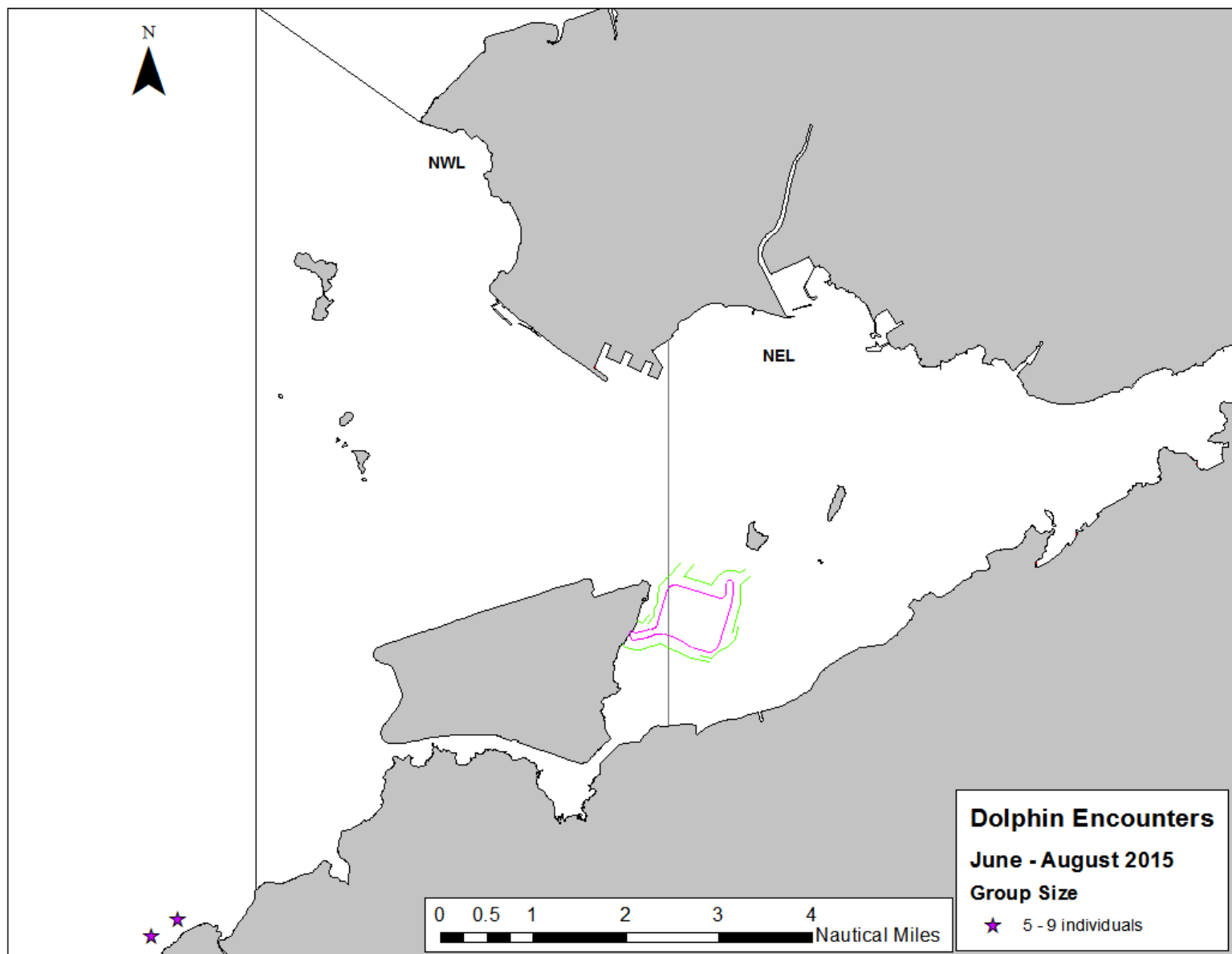


Figure 7. The Location of Dolphin Groups Numbering 5 and Above Individuals (June-August 2015)

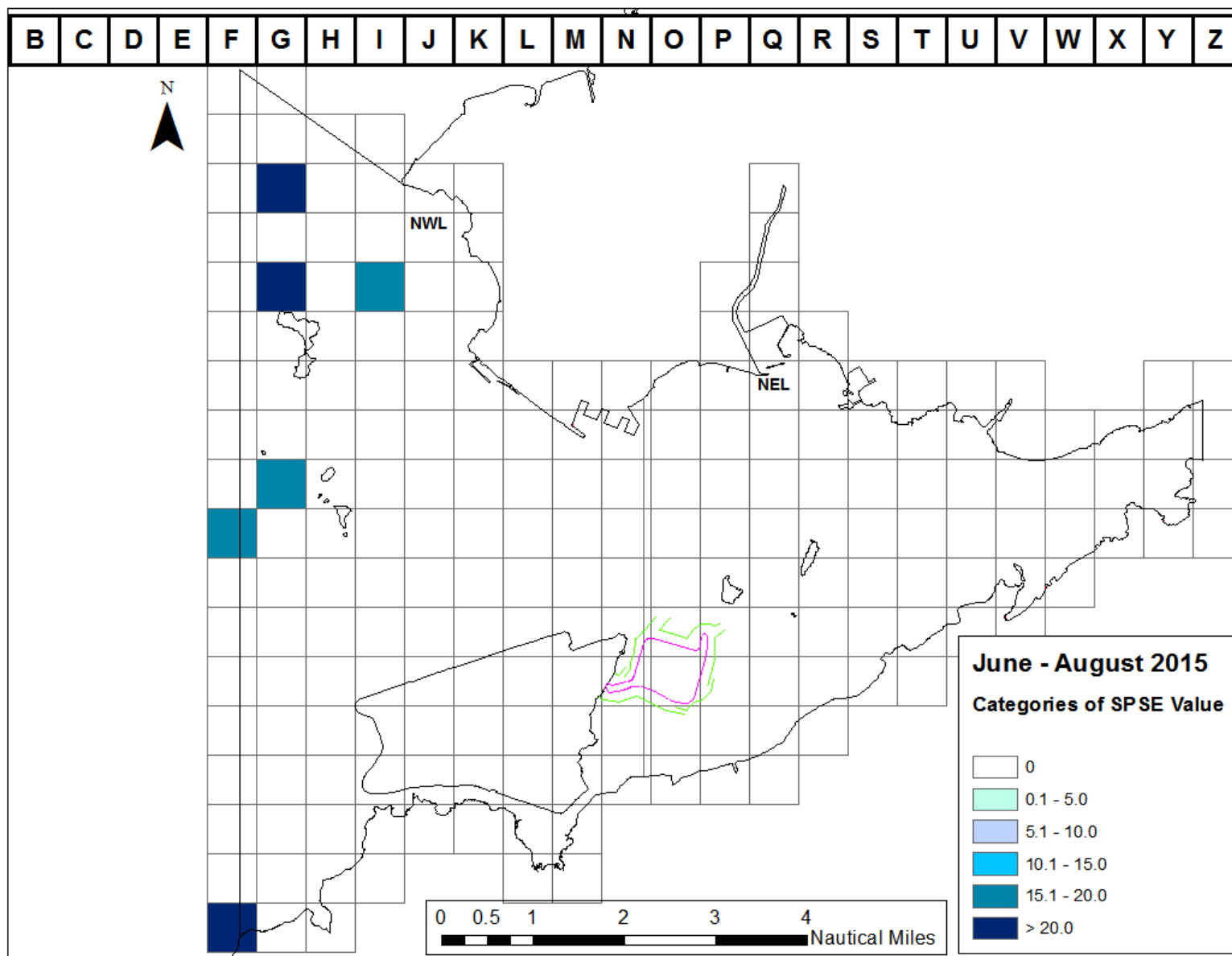


Figure 8. Sighting density SPSE (number of on-effort sightings per 100 units of survey effort) for June - August 2015.

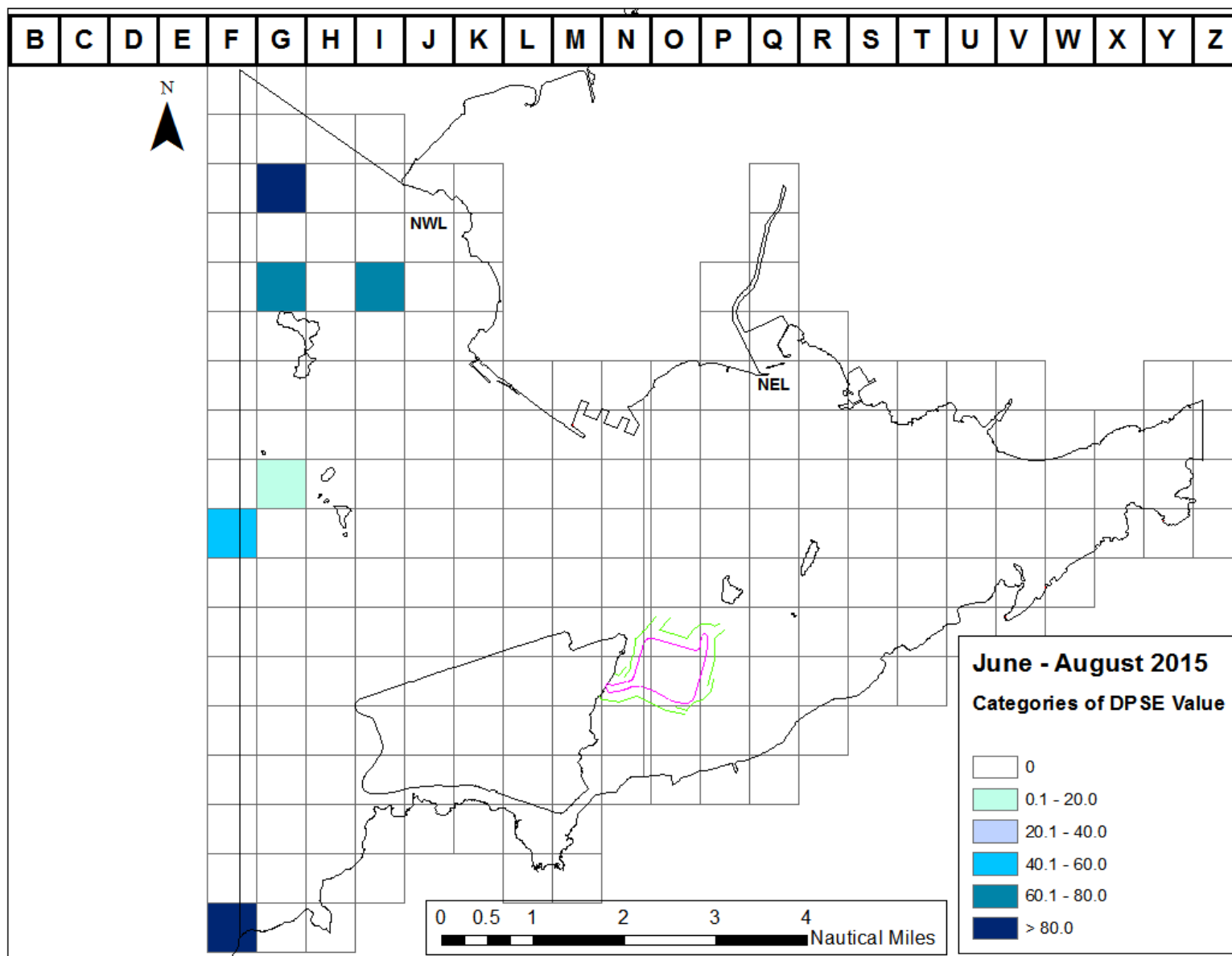
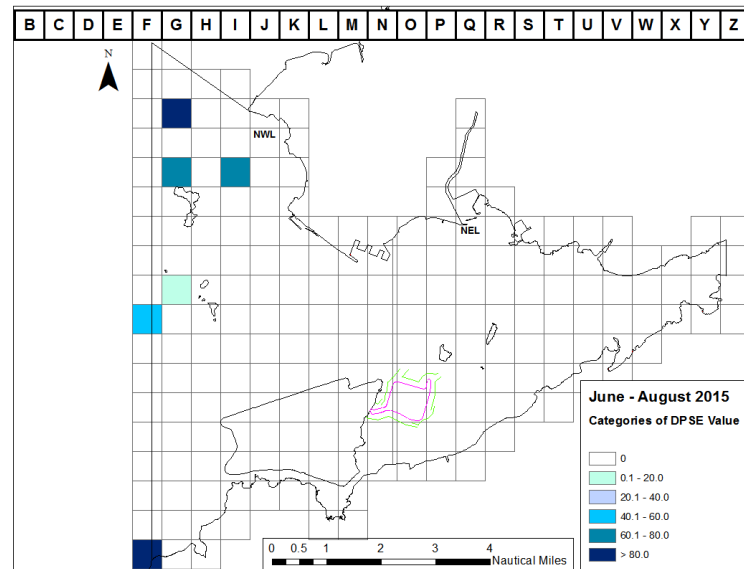
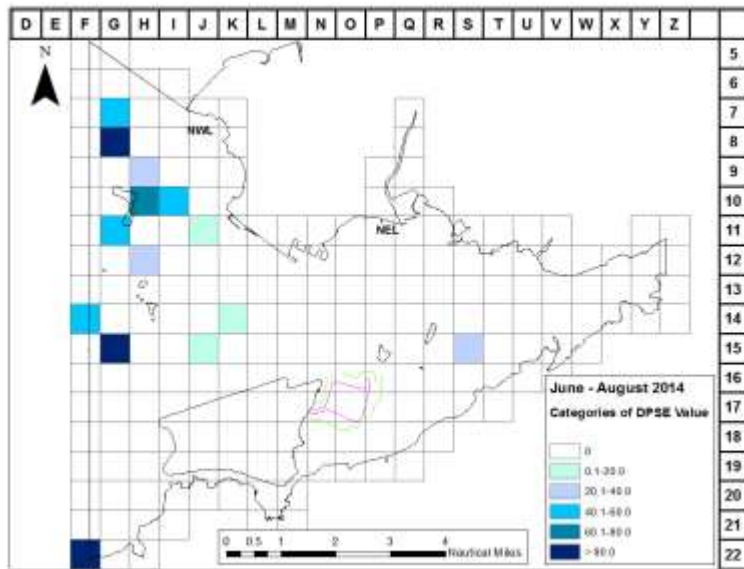
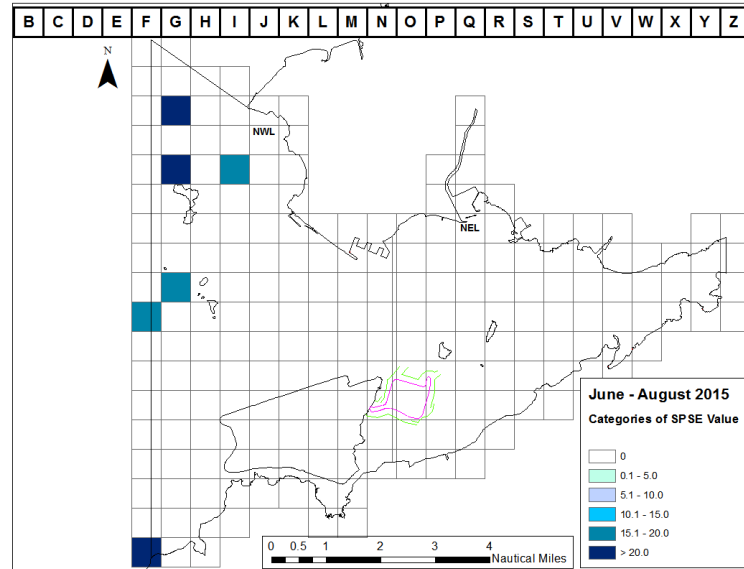
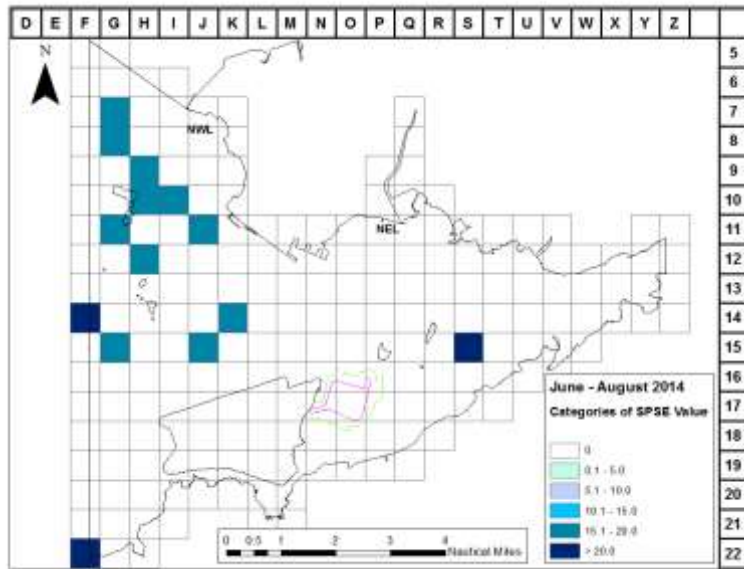
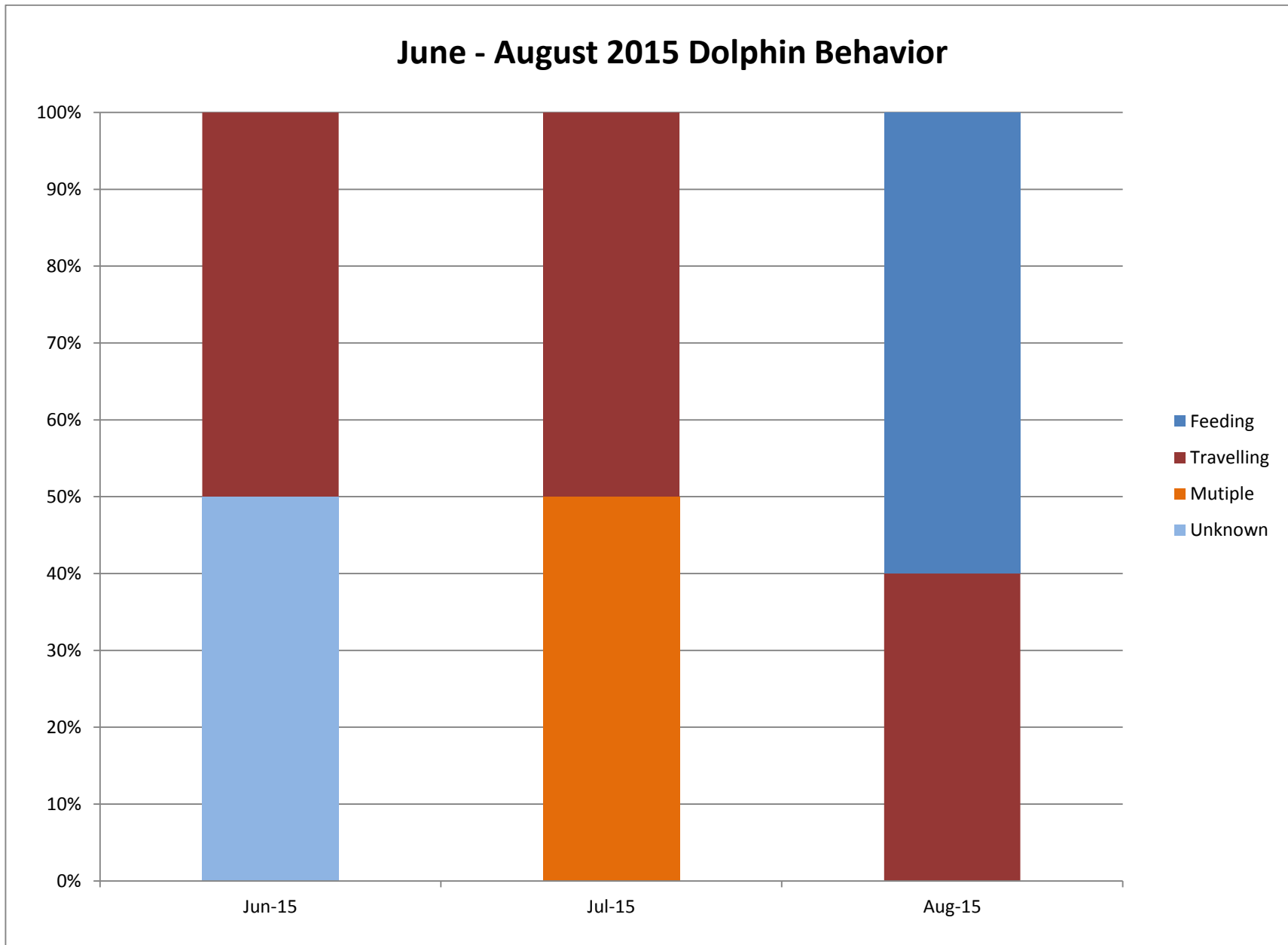


Figure 9. Dolphin density DPSE (number of dolphins per 100 units of survey effort) for June to August 2015.



**Figure 10. SPSE and DPSE Grid Analysis from periods June – August 2014 and June – August 2015.**





**Figure 11. Activity Budget for Dolphin Behaviour June to August 2015.**

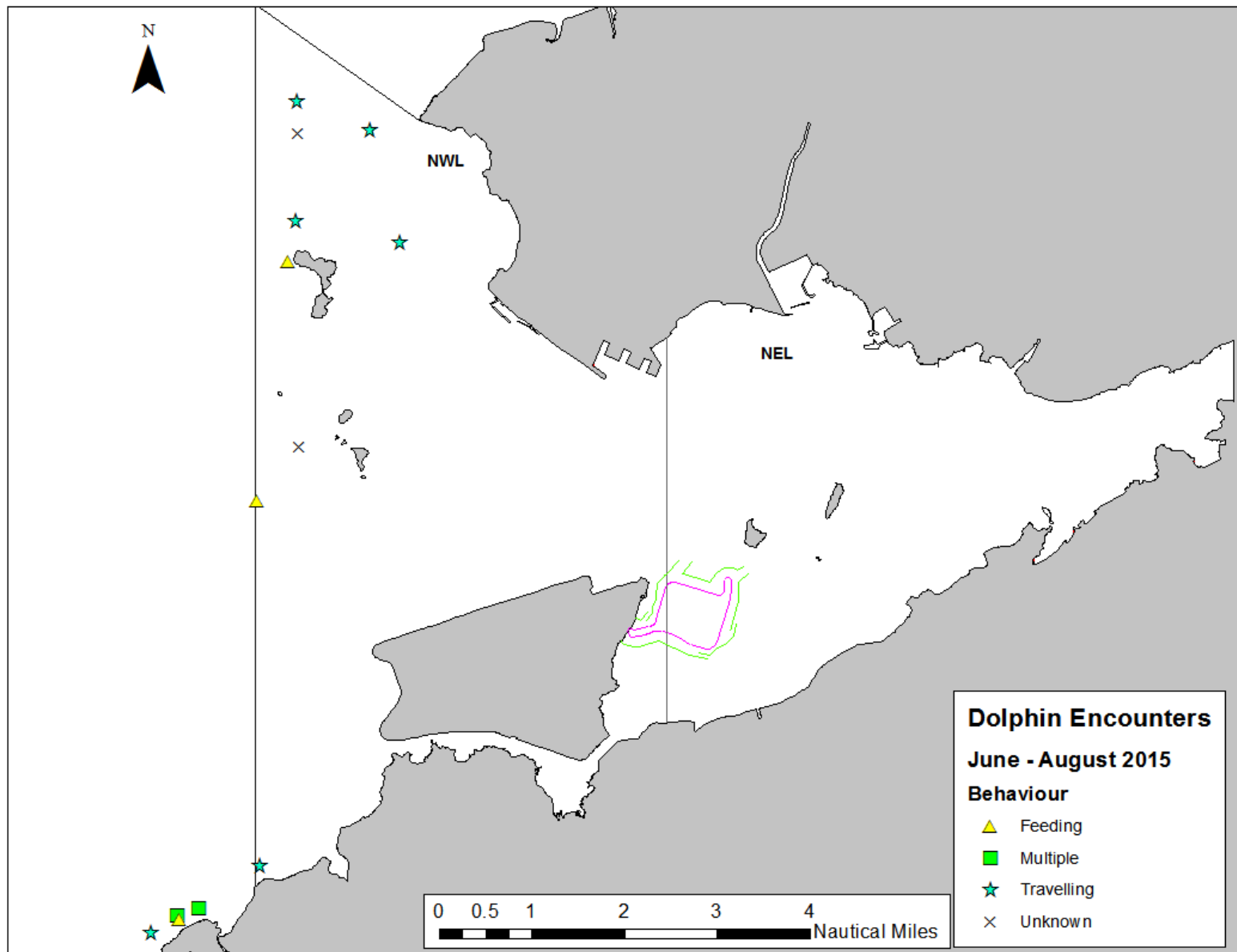


Figure 12. The Location of Different Behavioural Activities June to August 2015

## Annex I. Impact Monitoring Survey Schedule and Details (June – August 2015)

Date	Location of Survey	No. Sightings ON	No. Sightings Opp	Total km ON EFFORT (favourable conditions)
06/03/2015	NE and NW Lantau (4-20,23)	0	0	69.5
06/04/2015	NWL (1-3,21,22)	2	0	39.5
06/11/2015	NWL (1-6,21,22)	0	2	63.0
06/12/2015	NE and NW Lantau (7-20,23)	0	0	46.0
07/06/2015	NE and NW Lantau (1-6,21,22)	1	1	63.2
07/07/2015	NWL (7-20,23)	0	0	46.6
07/28/2015	NE and NW Lantau (1-6,21,22)	1	1	62.6
07/29/2015	NWL (7-20,23)	0	0	46.9
08/10/2015	NWL (1-7, 21, 22)	1	1	66.9
08/11/2015	NE and NW Lantau (8-20,23)	0	0	42.5
08/24/2015	NE and NW Lantau (5-20, 23)	0	0	59.8
08/25/2015	NWL (1-4, 21, 22)	2	1	48.6

## Annex II. Impact Monitoring Survey Effort Summary (June – August 2015)

Date	Area	Sea State (on effort)	Effort (km)	Season	Vessel	Type
06/03/2015	NWL	1	7.6	SUMMER	HKDW	IMPACT
06/03/2015	NWL	2	21.2	SUMMER	HKDW	IMPACT
06/03/2015	NWL	3	4	SUMMER	HKDW	IMPACT
06/03/2015	NEL	1	35.4	SUMMER	HKDW	IMPACT
06/03/2015	NEL	2	1.3	SUMMER	HKDW	IMPACT
06/04/2015	NWL	2	18.7	SUMMER	HKDW	IMPACT
06/04/2015	NWL	3	13.4	SUMMER	HKDW	IMPACT
06/04/2015	NWL	4	7.4	SUMMER	HKDW	IMPACT
06/11/2015	NWL	2	13.7	SUMMER	HKDW	IMPACT
06/11/2015	NWL	3	46.2	SUMMER	HKDW	IMPACT
06/11/2015	NWL	4	3.1	SUMMER	HKDW	IMPACT
06/12/2015	NWL	2	4.2	SUMMER	HKDW	IMPACT
06/12/2015	NWL	3	5.7	SUMMER	HKDW	IMPACT
06/12/2015	NEL	1	21.3	SUMMER	HKDW	IMPACT
06/12/2015	NEL	2	13.7	SUMMER	HKDW	IMPACT
06/12/2015	NEL	3	1.1	SUMMER	HKDW	IMPACT
07/06/2015	NWL	1	4.6	SUMMER	HKDW	IMPACT
07/06/2015	NWL	2	46.7	SUMMER	HKDW	IMPACT
07/06/2015	NWL	3	11.9	SUMMER	HKDW	IMPACT
07/07/2015	NWL	1	0.3	SUMMER	HKDW	IMPACT
07/07/2015	NWL	2	5.8	SUMMER	HKDW	IMPACT
07/07/2015	NWL	3	4	SUMMER	HKDW	IMPACT
07/07/2015	NEL	1	30.1	SUMMER	HKDW	IMPACT
07/07/2015	NEL	2	6.4	SUMMER	HKDW	IMPACT
07/28/2015	NWL	1	29	SUMMER	HKDW	IMPACT
07/28/2015	NWL	2	19.4	SUMMER	HKDW	IMPACT
07/28/2015	NWL	3	14.2	SUMMER	HKDW	IMPACT
07/29/2015	NWL	2	7.2	SUMMER	HKDW	IMPACT
07/29/2015	NWL	3	3.4	SUMMER	HKDW	IMPACT
07/29/2015	NEL	1	15	SUMMER	HKDW	IMPACT
07/29/2015	NEL	2	21.3	SUMMER	HKDW	IMPACT
08/10/2015	NWL	1	28.7	SUMMER	HKDW	IMPACT
08/10/2015	NWL	2	28.8	SUMMER	HKDW	IMPACT
08/10/2015	NWL	3	9.4	SUMMER	HKDW	IMPACT
08/11/2015	NWL	1	6.3	SUMMER	HKDW	IMPACT
08/11/2015	NEL	1	28.8	SUMMER	HKDW	IMPACT
08/11/2015	NEL	2	7.4	SUMMER	HKDW	IMPACT
08/24/2015	NWL	1	23.5	SUMMER	HKDW	IMPACT
08/24/2015	NEL	1	33.8	SUMMER	HKDW	IMPACT
08/24/2015	NEL	2	2.5	SUMMER	HKDW	IMPACT
08/25/2015	NWL	1	48.6	SUMMER	HKDW	IMPACT

### Annex III. Impact Monitoring Sighting Database (June – August 2015)

Date	Sighting No.	Time	Group Size	Area	Beaufort	PSD	Effort	Type	Latitude	Longitude	Season	Boat Association
4-Jun-15	1114	3:25:31 PM	1	NWL	3	120	On	Impact	22.3467	113.8782	Summer	No
4-Jun-15	1116	4:11:29 PM	4	NWL	2	236	On	Impact	22.40326	113.8779	Summer	No
11-Jun-15	1118	9:32:58 AM	8	NWL	3	N/A	Opp	Impact	22.25912	113.8497	Summer	No
11-Jun-15	1119	1:50:50 PM	1	NWL	3	N/A	Opp	Impact	22.40392	113.8919	Summer	No
6-Jul-15	1122	9:21:16 AM	3	WL	1	N/A	Opp	Impact	22.26343	113.8589	Summer	No
6-Jul-15	1123	9:49:11 AM	2	NWL	1	410	On	Impact	22.27109	113.8708	Summer	No
28-Jul-15	1126	9:23:57 AM	9	WL	2	N/A	Opp	Impact	22.26206	113.8547	Summer	No
28-Jul-15	1127	2:11:57 PM	4	NWL	2	38	On	Impact	22.38366	113.8978	Summer	No
10-Aug-15	1130	9:12:17 AM	1	NWL	1	N/A	Opp	Impact	22.26151	113.8552	Summer	No
10-Aug-15	1132	10:13:42 AM	3	NWL	1	9	On	Impact	22.33713	113.8701	Summer	No
25-Aug-15	1138	12:43:38 PM	1	NWL	1	N/A	Opp	Impact	22.38025	113.876	Summer	No
25-Aug-15	1139	12:58:48 PM	3	NWL	1	243	On	Impact	22.38754	113.8776	Summer	No
25-Aug-15	1140	1:38:46 PM	3	NWL	1	180	On	Impact	22.40915	113.8777	Summer	No

**Annex IV**  
**March 2012– August 2015**  
**(and Baseline September – November 2011)**  
**Photo Identification Information**

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 129		2015/08/25	1138	NWL
HZMB 128		2015/01/03	1056	NWL
HZMB 127		2015/01/03	1056	NWL
HZMB 126		2015/02/23	1068	NWL
		2015/01/03	1054	NWL
HZMB 125		2014/10/13	1019	NWL
HZMB 124		2014/09/22	1005	NWL
HZMB 123		2014/08/25	998	NWL
HZMB 122		2014/08/04	989	NWL
HZMB 121		2014/07/14	968	NWL
HZMB 120		2014/05/31	951	NWL
HZMB 119		2014/04/19	940	NWL
HZMB 118		2014/01/06	890	NWL
HZMB 117		2014/06/17	964	NWL
		2014/01/06	888	NWL
HZMB 116		2014/08/25	999	NWL
HZMB 115		2014/07/14	972	NWL
		2014/07/14	971	NWL
		2013/12/26	879	NWL
		2013/12/26	879	NWL
HZMB 114		2013/10/24	827	NWL
HZMB 113		2013/10/24	827	NWL
HZMB 112		2013/10/15	815	NWL
HZMB 111		2013/10/15	815	NWL
HZMB 110		2013/10/15	812	NWL
HZMB 108		2015/06/11	1118	NWL
		2013/08/30	780	NEL
HZMB 107		2015/07/28	1126	NWL
		2014/10/13	1019	NWL
		2014/05/31	951	NWL
		2013/08/21	770	NWL
HZMB 106		2013/08/21	769	NWL
HZMB 105		2014/05/31	951	NWL
		2013/07/08	711	NWL
HZMB 104		2013/07/08	711	NWL
HZMB 103		2013/07/08	711	NWL
HZMB 102		2013/07/08	706	NWL
HZMB 101		2013/07/08	706	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 100		2013/07/08	706	NWL
HZMB 099		2013/06/13	681	NWL
		2013/06/13	680	NWL
HZMB 098	NL104	2015/02/23	1077	NWL
		2014/12/18	1044	NWL
		2014/08/04	992	NWL
		2014/01/06	888	NWL
		2013/11/02	849	NWL
		2013/11/02	845	NWL
		2013/10/24	831	NWL
		2013/07/08	711	NWL
		2013/05/24	659	NWL
		2011/11/07	Baseline	NWL
		2011/11/05	Baseline	NWL
		2011/11/05	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/10/28	Baseline	NWL
2011/09/23	Baseline	NWL		
2011/09/16	Baseline	NWL		
HZMB 097		2013/05/09	647	NWL
HZMB 096		2013/04/01	621	NWL
HZMB 095		2013/08/30	780	NEL
		2013/06/25	697	NWL
		2013/06/13	682	NWL
		2013/04/01	621	NWL
HZMB 094		2014/10/13	1019	NWL
		2014/05/31	954	NWL
		2014/02/17	910	NWL
		2013/06/26	703	NWL
		2013/06/25	698	NWL
		2013/03/18	601	NWL
HZMB 093		2013/05/24	657	NWL
		2013/02/21	587	NWL
HZMB 092		2015/04/20	1097	NWL
		2013/02/21	589	NWL
		2013/02/15	581	NWL
HZMB 091		2013/02/15	579	NWL
HZMB 090		2013/06/25	697	NWL
		2013/06/13	682	NWL
		2013/02/15	579	NWL



Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 089		2013/02/15	579	NWL
HZMB 088		2013/02/15	579	NWL
HZMB 087		2013/02/15	579	NWL
HZMB 086	NL242	2015/03/19	1086	NWL
		2013/05/09	642	NWL
		2013/02/15	579	NWL
		2011/10/10	Baseline	NWL
HZMB 085		2014/10/13	1019	NWL
		2014/05/31	954	NWL
HZMB 084		2013/06/26	703	NWL
		2013/02/15	579	NWL
		2013/02/14	575	NWL
HZMB 083	NL136	2015/05/11	1104	NWL
		2013/12/19	863	NWL
		2013/03/28	607	NWL
		2013/02/15	579	NWL
		2013/01/28	568	NWL
		2013/01/28	564	NWL
		2012/04/19	267	NWL
		2011/10/28	Baseline	NWL
		2011/10/28	Baseline	NWL
		2011/10/10	Baseline	NEL
HZMB 082		2014/10/20	1024	NWL
		2013/02/21	587	NWL
		2013/02/15	579	NWL
		2013/01/28	563	NWL
HZMB 081		2013/01/28	559	NWL
		2013/01/28	557	NWL
HZMB 080		2013/01/28	556	NWL
HZMB 079		2013/01/28	556	NWL
HZMB 078		2013/02/15	579	NWL
		2013/01/08	552	NWL
HZMB 077		2013/12/26	878	NWL
		2013/07/08	706	NWL
		2012/12/11	541	NWL
HZMB 076		2013/07/08	706	NWL
		2012/12/11	541	NWL
HZMB 075		2012/12/06	525	NEL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 074		2013/05/09	647	NWL
		2013/04/01	623	NWL
		2013/04/01	621	NWL
		2013/02/21	594	NEL
		2012/12/10	529	NEL
		2012/12/06	525	NEL
HZMB 073		2013/05/09	647	NWL
		2013/04/01	623	NWL
		2013/04/01	621	NWL
		2013/02/21	594	NEL
		2012/12/10	529	NEL
		2012/12/06	525	NEL
HZMB 072		2012/10/24	476	NWL
HZMB 071		2012/10/24	475	NWL
		2012/10/12	466	NWL
HZMB 070		2012/10/24	476	NWL
HZMB 069		2015/06/04	1116	NWL
		2013/08/21	774	NWL
		2013/07/08	711	NWL
		2012/10/24	476	NWL
HZMB 068		2014/10/20	1025	NWL
		2013/11/01	839	NWL
		2012/10/24	476	NWL
HZMB 067		2012/10/24	475	NWL
HZMB 066	NL93	2013/01/28	559	NWL
		2012/12/11	537	NWL
		2012/10/24	475	NWL
		2012/10/12	466	NWL
		2011/11/07	Baseline	NWL
		2011/11/05	Baseline	NWL
HZMB 064		2015/03/19	1086	NWL
		2014/06/17	964	NWL
		2013/05/09	647	NWL
		2013/01/28	561	NWL
		2012/10/24	475	NWL
		2012/10/12	466	NWL
HZMB 063		2013/05/09	647	NWL
		2012/10/12	466	NWL
HZMB 062		2012/12/06	525	NEL
		2012/10/11	457	NWL
HZMB 060		2012/09/18	447	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 059		2013/02/21	591	NWL
		2012/09/18	445	NWL
HZMB 057		2012/09/18	440	NWL
HZMB 056		2012/09/18	442	NWL
		2012/09/05	433	NEL
HZMB 055		2012/09/04	425	NWL
HZMB 054	CH34	2015/04/20	1097	NWL
		2015/01/15	1062	NWL
		2014/05/31	953	NWL
		2014/01/06	888	NWL
		2013/11/07	854	NWL
		2013/11/02	845	NWL
		2013/10/24	831	NWL
		2013/08/30	780	NEL
		2013/07/08	711	NWL
		2013/09/18	448	NWL
		2012/09/05	432	NEL
		2011/11/07	Baseline	NWL
		2011/11/05	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/11/01	Baseline	NEL
		2011/11/01	Baseline	NEL
2011/10/28	Baseline	NWL		
2011/10/06	Baseline	NWL		
HZMB 053		2012/09/04	425	NWL
HZMB 052		2012/09/04	423	NWL
HZMB 051	NL213	2015/05/11	1104	NWL
		2014/08/04	989	NWL
		2013/05/09	644	NWL
		2013/04/01	622	NWL
		2013/02/15	582	NWL
		2013/02/15	581	NWL
		2013/01/28	559	NWL
		2013/01/28	556	NWL
		2012/09/04	422	NWL
HZMB 050		2014/07/14	971	NWL
		2014/01/10	900	NWL
		2014/01/06	888	NWL
		2013/02/15	579	NWL
		2012/09/04	421	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 049		2014/07/29	982	NWL
		2012/09/03	419	NWL
HZMB 048		2012/09/03	419	NWL
HZMB 047		2015/04/28	1100	NWL
		2012/09/03	412	NWL
HZMB 046		2012/09/03	412	NWL
HZMB 045		2014/02/17	910	NWL
		2013/06/13	682	NWL
		2013/02/15	579	NWL
		2012/11/01	495	NWL
HZMB 044	NL98	2014/10/13	1019	NWL
		2014/02/17	910	NWL
		2013/12/19	864	NWL
		2013/11/02	845	NWL
		2013/11/01	842	NWL
		2013/10/15	819	NWL
		2013/05/09	648	NWL
		2013/05/09	647	NWL
		2013/04/01	623	NWL
		2013/04/01	621	NWL
		2013/02/15	579	NWL
		2012/11/01	495	NWL
		2011/11/07	Baseline	NWL
		2011/11/06	Baseline	NEL
2011/11/01	Baseline	NEL		
2011/10/06	Baseline	NEL		
HZMB 043		2012/09/03	407	NWL
HZMB 042	NL260	2013/12/19	863	NWL
		2012/11/01	495	NWL
		2011/11/07	Baseline	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 041	NL24	2014/06/05	960	NEL
		2014/02/17	910	NWL
		2013/11/02	845	NWL
		2013/05/09	648	NWL
		2013/05/09	647	NWL
		2013/04/01	623	NWL
		2013/04/01	621	NWL
		2013/02/15	579	NWL
		2012/11/01	495	NWL
		2011/11/06	Baseline	NEL
		2011/11/05	Baseline	NWL
		2011/11/05	Baseline	NWL
		2011/10/10	Baseline	NWL
HZMB 040		2014/02/17	910	NWL
		2014/01/06	893	NWL
		2013/10/15	821	NWL
		2013/07/08	714	NWL
		2013/07/08	711	NWL
		2013/02/21	589	NWL
		2012/11/01	493	NWL
HZMB 038		2012/11/01	490	NWL
HZMB 037		2012/11/01	490	NWL
HZMB 036		2012/09/03	407	NWL
		2012/11/01	490	NWL
HZMB 035		2013/02/15	579	NWL
		2012/11/01	490	NWL
HZMB 034		2012/11/01	493	NWL
HZMB 028		2014/11/17	1035	NWL
		2013/04/01	625	NWL
		2012/08/06	373	NWL
HZMB 027		2013/12/19	863	NWL
		2013/02/15	579	NWL
		2013/01/28	568	NWL
		2013/01/28	564	NWL
		2012/06/14	299	NWL
HZMB 026		2014/10/13	1018	NWL
		2013/06/25	697	NWL
		2013/05/09	642	NWL
		2013/01/28	561	NWL
		2012/06/13	295	NEL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 025		2013/02/22	596	NEL
		2013/02/21	591	NWL
		2012/12/06	525	NEL
		2012/10/11	457	NWL
		2012/06/13	295	NEL
HZMB 024		2013/03/18	601	NWL
		2012/06/13	295	NEL
HZMB 023		2015/04/20	1097	NWL
		2014/12/18	1044	NWL
		2014/11/17	1035	NWL
		2014/01/06	888	NWL
		2013/07/08	715	NWL
		2013/07/08	711	NWL
		2013/04/01	619	NWL
		2013/02/21	589	NWL
		2013/02/15	579	NWL
HZMB 022		2012/07/10	330	NWL
		2013/02/15	579	NWL
		2013/02/21	589	NWL
		2013/04/01	619	NWL
		2013/07/08	711	NWL
		2013/07/08	715	NWL
		2013/10/24	827	NWL
		2014/01/06	888	NWL
		2014/08/04	991	NWL
		2014/11/17	1035	NWL
		2014/12/18	1044	NWL
		2015/04/20	1097	NWL
HZMB 021	NL37	2012/07/10	330	NWL
		2011/09/16	Baseline	NWL
HZMB 020		2012/07/10	330	NWL
HZMB 019		2012/07/10	330	NWL
HZMB 018		2012/07/10	330	NWL
		2012/12/10	529	NEL
		2013/02/21	594	NEL
		2013/05/09	647	NWL
HZMB 017		2014/02/17	910	NWL
		2012/07/10	330	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 016		2013/07/08	706	NWL
		2012/12/11	539	NWL
		2012/09/18	446	NWL
		2012/09/04	421	NWL
		2012/07/10	330	NWL
HZMB 015		2012/07/10	330	NEL
HZMB 014	NL176	2015/08/25	1139	NWL
		2013/12/26	880	NWL
		2012/08/06	373	NWL
		2012/06/13	295	NEL
		2011/11/06	Baseline	NEL
		2011/11/01	Baseline	NEL
		2011/11/01	Baseline	NEL
HZMB 013		2012/05/28	281	NWL
HZMB 012		2012/05/28	281	NWL
HZMB 011	EL01	2013/02/22	597	NEL
		2013/02/21	592	NEL
		2013/02/14	572	NEL
		2012/11/06	517	NEL
		2012/09/19	452	NWL
		2012/03/31	261	NEL
		2011/11/02	Baseline	NWL
		2011/11/01	Baseline	NEL
HZMB 009		2015/03/19	1084	NWL
		2012/05/28	281	NWL
HZMB 008		2015/07/06	1122	NWL
		2012/05/28	281	NWL
HZMB 007	NL246	2012/12/10	529	NEL
		2011/11/06	Baseline	NEL
		2011/09/16	Baseline	NWL
HZMB 006		2013/02/21	594	NEL
		2012/12/11	539	NWL
		2012/11/01	495	NWL
		2012/03/29	250	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 005		2015/02/09	1070	NWL
		2015/02/09	1069	NWL
		2013/11/09	860	NWL
		2013/11/07	858	NWL
		2013/10/15	813	NWL
		2012/12/10	532	NWL
		2012/08/06	374	NWL
		2012/05/28	287	NWL
HZMB 004		2015/07/28	1126	NWL
		2012/09/04	421	NWL
		2012/03/31	262	NWL
HZMB 003	NL179	2013/10/15	812	NWL
		2013/06/25	697	NWL
		2012/12/10	529	NEL
		2012/03/31	261	NWL
		2011/11/06	Baseline	NEL
		2011/09/16	Baseline	NWL
HZMB 002	WL111	2014/05/31	951	NWL
		2013/12/26	878	NWL
		2013/12/19	863	NWL
		2013/11/01	839	NWL
		2013/10/15	819	NWL
		2013/09/24	798	NWL
		2013/02/14	573	NWL
		2012/12/11	536	NWL
		2012/12/11	535	NWL
		2012/10/12	466	NWL
		2012/10/24	475	NWL
		2012/05/28	281	NWL
		2012/03/29	250	NWL
		2011/11/02	Baseline	NWL
HZMB 001	WL46	2014/08/25	997	NWL
		2013/08/21	771	NWL
		2013/06/13	681	NWL
		2013/04/01	617	NWL
		2013/02/14	573	NWL
		2012/03/29	250	NWL



Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
	CH98	2011/11/02	Baseline	NWL
	NL11	2011/11/02	Baseline	NWL
		2011/11/07	Baseline	NWL
	NL12	2011/11/02	Baseline	NWL
	NL33	2011/09/23	Baseline	NWL
		2011/11/01	Baseline	NEL
		2011/11/05	Baseline	NWL
		2011/11/07	Baseline	NWL
	NL46	2011/10/28	Baseline	NWL
	CH153	2011/10/11	Baseline	NWL
	NL48	2011/11/07	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/09/16	Baseline	NWL
	NL75	2011/09/16	Baseline	NWL
		2011/09/16	Baseline	NWL
		2011/11/01	Baseline	NEL
	NL80	2011/11/02	Baseline	NWL
	NL118	2011/09/06	Baseline	NWL
	NL120	2011/11/06	Baseline	NEL
		2011/10/10	Baseline	NWL
	NL123	2011/11/06	Baseline	NEL
		2011/10/10	Baseline	NWL
		2011/10/06	Baseline	NWL
	NL139	2011/11/01	Baseline	NEL
		2011/10/10	Baseline	NEL
		2011/09/16	Baseline	NWL
	NL165	2011/11/05	Baseline	NWL
		2011/11/02	Baseline	NWL
	NL170	2011/10/06	Baseline	NEL
	NL188	2011/11/07	Baseline	NWL
		2011/11/01	Baseline	NWL
		2011/10/28	Baseline	NWL
	NL191	2011/09/07	Baseline	NWL
	NL202	2011/11/07	Baseline	NWL
		2011/10/28	Baseline	NWL
	NL210	2011/11/07	Baseline	NWL
		2011/11/05	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/09/07	Baseline	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
	NL214	2011/11/05	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/10/28	Baseline	NWL
	NL220	2011/10/10	Baseline	NEL
	NL224	2011/10/28	Baseline	NWL
	NL226	2011/11/05	Baseline	NWL
		2011/10/17	Baseline	WL
	NL230	2011/11/02	Baseline	NWL
		2011/10/17	Baseline	WL
	NL233	2011/10/28	Baseline	NWL
		2011/10/06	Baseline	NWL
		2011/09/16	Baseline	NWL
	NL241	2011/11/07	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/09/16	Baseline	NWL
	NL244	2011/11/01	Baseline	NEL
		2011/11/01	Baseline	NWL
		2011/09/05	Baseline	WL
	NL256	2011/11/02	Baseline	NWL
	NL258	2011/09/16	Baseline	NWL
		2011/09/05	Baseline	WL
	NL259	2011/11/07	Baseline	NWL
	NL261	2011/11/01	Baseline	NEL
	NL264	2011/11/06	Baseline	NEL
		2011/10/06	Baseline	NEL
		2011/09/23	Baseline	NWL
	NL269	2011/11/02	Baseline	NWL
	NL272	2011/11/05	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/10/28	Baseline	NWL
		2011/09/16	Baseline	NWL
	NL278	2011/11/02	Baseline	NWL
	NL279	2011/11/02	Baseline	NWL
	SL42	2011/11/02	Baseline	NWL
	SL43	2011/10/28	Baseline	NWL
	WL04	2011/11/05	Baseline	NWL
		2011/11/02	Baseline	NWL
		2011/10/17	Baseline	WL
		2011/10/10	Baseline	NWL
		2011/09/16	Baseline	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
	WL05	2011/11/01	Baseline	NEL
		2011/11/01	Baseline	NEL
	WL11	2011/11/07	Baseline	NWL
	WL25	2011/10/17	Baseline	WL
		2011/09/23	Baseline	WL
		2011/09/16	Baseline	NWL
	WL88	2011/11/02	Baseline	WL
		2011/09/16	Baseline	NWL
	WL116	2011/09/16	Baseline	NWL
	WL124	2011/11/02	Baseline	NWL
	WL156	2011/10/28	Baseline	NWL
		2011/09/23	Baseline	WL
	WL162	2011/09/16	Baseline	NWL
	NL275	2011/09/23	Baseline	WL
	SL48	2011/11/02	Baseline	WL
		2011/10/17	Baseline	WL
		2011/09/23	Baseline	WL
	CH108	2011/11/02	Baseline	WL
		2011/11/02	Baseline	WL
	CH157	2011/11/02	Baseline	WL
	NL206	2011/10/07	Baseline	WL
	WL28	2011/09/23	Baseline	WL
	WL42	2011/11/02	Baseline	WL
		2011/09/05	Baseline	WL
	WL47	2011/10/17	Baseline	WL
	WL61	2011/10/17	Baseline	WL
		2011/09/23	Baseline	WL
	WL66	2011/11/07	Baseline	WL
	WL68	2011/09/05	Baseline	WL
		2011/09/05	Baseline	WL
	WL72	2011/11/02	Baseline	WL
		2011/11/02	Baseline	WL
		2011/09/23	Baseline	WL
	WL87	2011/09/23	Baseline	WL
	WL88	2011/11/02	Baseline	WL
		2011/09/16	Baseline	WL
	WL116	2011/09/16	Baseline	WL
	WL118	2011/11/02	Baseline	WL
		2011/11/02	Baseline	WL
	WL123	2011/11/02	Baseline	WL

<b>Identification Number</b>	<b>Baseline Identification Number</b>	<b>Date (YYYY-MM-DD)</b>	<b>Sighting Number</b>	<b>Area Sighted</b>
	<i>WL124</i>	<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL128</i>	<i>2011/11/07</i>	<i>Baseline</i>	<i>WL</i>
		<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL131</i>	<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
		<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
		<i>2011/09/23</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL132</i>	<i>2011/09/23</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL137</i>	<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL138</i>	<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL144</i>	<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL145</i>	<i>2011/09/05</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL146</i>	<i>2011/10/17</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL153</i>	<i>2011/11/07</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL157</i>	<i>2011/09/23</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL158</i>	<i>2011/09/23</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL163</i>	<i>2011/11/07</i>	<i>Baseline</i>	<i>WL</i>
		<i>2011/11/02</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL165</i>	<i>2011/10/17</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL167</i>	<i>2011/10/17</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL170</i>	<i>2011/11/07</i>	<i>Baseline</i>	<i>WL</i>
	<i>WL171</i>	<i>2011/10/28</i>	<i>Baseline</i>	<i>WL</i>

HZMB 001 2012-03-18\_10-52-16



HZMB 001 2012-03-18\_11-07-00



HZMB 002 2012-03-18\_10-53-38



HZMB 002 2013-02-14\_15-41-58\_02



HZMB 003 2012-03-18\_10-54-02\_02



HZMB 003 2012-12-10\_11-20-34\_02



HZMB 004 2012-03-18\_10-54-28\_01



HZMB 004 2012-09-04\_09-24-54



HZMB 005 2012-03-18\_10-51-26\_01



HZMB 005 2012-12-10\_15-49-53\_04



HZMB 006 2012-03-18\_11-17-54



HZMB 006 2012-03-18\_11-21-16\_02



HZMB 007 2012-03-18\_11-06-40\_01



HZMB 007 2012-12-10\_11-21-27



HZMB 008 2012-05-28\_09-14-06



HZMB 009 2012-05-28\_09-15-02



HZMB 011 2012-03-10\_13-19-04\_01



HZMB 011 2012-03-10\_13-22-52



HZMB 012 2012-05-28\_09-15-44\_01



HZMB 013 2012-05-28\_09-11-04\_01



HZMB 013 2012-05-28\_09-19-30\_01



HZMB 014 2012-06-13\_12-57-56\_02 1C



HZMB 015 2012-07-10\_10-22-28\_02



HZMB 016 2012-07-10\_10-23-28\_02 9A



HZMB 016 2012-12-11\_12-26-46\_01



HZMB 017 2012-07-10\_10-31-34\_03



HZMB 018 2012-07-10\_10-34-36\_03



HZMB 018 2012-12-10\_11-14-55



HZMB 019 2012-07-10\_10-42-50\_01



HZMB 020 2012-07-10\_10-43-22\_02



HZMB 021 WL 2012-07-10\_10-23-30



HZMB 022 2013-02-16\_14-59-12\_01



HZMB 022 2013-04-01\_10-38-57\_03



HZMB 023 2012-07-10\_10-42-20\_02



HZMB 023 2013-04-01\_10-43-27



HZMB 024 2012-06-14\_13-09-40\_03





HZMB 024 2012-06-14\_13-12-02\_01



HZMB 025 2012-06-13\_12-51-58



HZMB 025 2013-02-21\_16-49-44



HZMB 026 2012-06-13\_12-59-46\_01 2C



HZMB 027 2012-06-14\_13-33-40



HZMB 028 2012-08-08\_13-53-56



HZMB 028 2012-08-08\_13-59-08\_05



HZMB 029 2012-08-25\_11-57-08\_01



HZMB 030 2012-08-25\_11-57-04\_03



HZMB 031 2012-08-25\_11-58-40\_01



HZMB 032 2012-10-24\_13-58-34\_02



HZMB 032 2012-12-11\_11-37-06\_01



HZMB 033 2012-08-15\_11-08-02\_03



HZMB 033 2012-10-12\_14-55-22\_06



HZMB 034 2012-11-01\_13-30-58\_02



HZMB 035 2012-11-01\_11-59-54



HZMB 036 2012-09-03\_08-53-14\_01



HZMB 036 2012-11-01\_11-37-20\_01



HZMB 037 2012-11-01\_11-47-18\_03



HZMB 038 2012-11-01\_11-40-32\_01



HZMB 040 2012-11-01\_13-22-54\_03



HZMB 040 2013-02-21\_13-27-55\_01



HZMB 041 2013-02-16\_14-41-58\_01



HZMB 041 2013-02-16\_14-45-08\_02



HZMB 042 2012-11-01\_17-01-20\_02



HZMB 043 2012-09-03\_08-54-50\_02



HZMB 044 2013-02-15\_14-41-06\_01



HZMB 044 2013-02-15\_14-46-22



HZMB 045 2013-02-15\_14-58-16\_01



HZMB 046 2012-09-03\_10-21-44\_03



HZMB 047 2012-09-03\_10-11-52\_01



HZMB 048 2012-09-03\_15-33-04\_03



HZMB 049 2012-09-03\_15-39-04\_02



HZMB 050 2013-02-15\_14-59-04\_03



HZMB 050 2013-02-15\_15-00-34\_01



HZMB 051 2013-01-28\_10-57-38



HZMB 051 2013-02-15\_15-56-54\_04



HZMB 052 2012-09-04\_10-33-08



HZMB 053 2012-09-04\_11-08-56\_01



HZMB 054 2012-09-05\_11-06-42\_04



HZMB 055 2012-09-04\_11-21-04\_01



HZMB 056 2012-09-18\_09-56-52



HZMB 056 2012-09-18\_10-01-04



HZMB 057 2012-09-18\_08-44-30



HZMB 059 2013-02-21\_16-49-34\_02



HZMB 060 2012-09-18\_14-57-50\_01



HZMB 061 2012-09-18\_17-17-58\_01



HZMB 063 2012-10-12\_14-54-50\_03



HZMB 064 2012-10-12\_14-54-48\_01



HZMB 064 2012-10-24\_14-02-40\_05



HZMB 067 2012-10-24\_14-40-28\_01



HZMB 068 2012-10-24\_14-32-56\_02



HZMB 069 2012-10-24\_14-37-06



HZMB 070 2012-10-24\_14-38-06



HZMB 072 2012-10-24\_14-37-52\_03\_9A



HZMB 073 2012-12-10\_11-13-02



HZMB 073 2012-12-10\_11-20-33



HZMB 074 2013-02-21\_17-11-59\_03



HZMB 075 2012-12-06\_11-40-11\_01



HZMB 076 2012-12-11\_13-11-24\_01



HZMB 077 2012-12-11\_13-02-24



HZMB 078 2013-01-08\_13-44-00\_02



HZMB 078 2013-02-15\_15-03-16\_03



HZMB 079 WL\_2013-01-28\_09-38-49



HZMB 080 WL\_2013-01-28\_09-46-26\_01



HZMB 081 2013-01-28\_10-04-13\_01



HZMB 082 2013-01-28\_12-59-32\_01



HZMB 082 WL 2013-02-15\_14-57-44\_02



HZMB 083 2013-01-28\_13-22-47



HZMB 083 2013-02-15\_15-00-38\_03



HZMB 084 2013-02-14\_15-54-46



HZMB 085 2013-02-15\_14-45-40\_02





HZMB 085 2013-02-15\_14-46-42\_01



HZMB 086 2013-02-15\_14-46-14\_02



HZMB 087 2013-02-15\_14-58-54\_04



HZMB 087 2013-02-15\_15-00-34\_05



HZMB 088 2013-02-15\_14-57-08\_02



HZMB 089 2013-02-15\_15-00-46\_01



HZMB 090 2013-02-15\_14-58-22\_02



HZMB 091 2013-02-15\_15-02-52\_01



HZMB 092 2013-02-15\_15-41-04\_01



HZMB 098 2013-05-24\_13-17-20\_02



HZMB 098 2014-08-04\_13-41-32



HZMB 099 2013-06-13\_10-00-39\_01



HZMB 100 2013-07-08\_09-34-44\_03



HZMB 100 2013-07-08\_09-43-16\_03



HZMB 101 2013-07-08\_09-35-35\_01



HZMB 101 WL 2013-07-08\_09-42-35\_03



HZMB 102 2013-07-08\_09-43-13



HZMB 103 2013-07-08\_13-52-32\_02



HZMB 098 2013-04-29\_10-57-14\_03



HZMB 098 WL\_2013-07-12\_10-08-01\_01



HZMB 099 2013-06-13\_10-00-39\_01



HZMB 100 2013-07-08\_09-34-44\_03



HZMB 100 2013-07-08\_09-43-16\_03



HZMB 101 2013-07-08\_09-35-35\_01



HZMB 101 WL 2013-07-08\_09-42-35\_03



HZMB 102 2013-07-08\_09-43-13



HZMB 103 2013-07-08\_13-52-32\_02



HZMB 104 2013-07-08\_14-00-59\_01



HZMB 104 2013-07-08\_14-08-35\_02



HZMB 105 WL 2013-07-08\_14-17-45



HZMB 106 WL\_2013-08-21\_09-37-43



HZMB 107 2013-08-21\_11-54-23\_02



HZMB 107 2013-08-21\_12-01-31\_01



HZMB 108 2013-08-30\_16-04-04\_02



HZMB 110 2013-10-15\_09-39-45



HZMB 111 2013-10-15\_10-21-46\_01



HZMB 112 2013-10-15 10-20-30



HZMB 113 2013-10-24 11-04-54 01



HZMB 114 2013-10-24 11-06-19



HZMB 115 2013-12-26 13-54-54 01



HZMB 116 2013-12-26 13-59-59



HZMB 116 2014-07-14 12-40-48



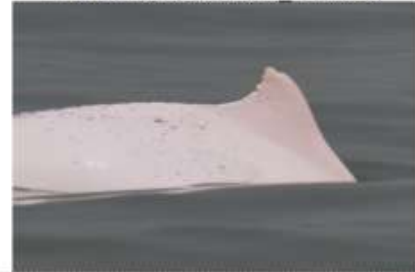
HZMB 117 2014-01-06 11-39-43 03



HZMB 118 2014-01-06 13-40-50 01



HZMB 119 2014-04-19 10-55-28



HZMB 120 2014-05-31 09-50-10\_02



HZMB 120 2014-05-31 09-50-27



HZMB 121 LL 2014-07-14 11-08-30 (4)



HZMB 122 2014-08-04 09-33-46 01



HZMB 122 2014-08-04 09-34-18 01



HZMB 123 2014-08-25#2



HZMB 124 LL 2014-09-22 09-33-30



HZMB 125 2014-10-13 13-58-29\_04 M



HZMB 126 2015-01-03-10-02-25 02 MED



HZMB 126 2015-01-03-10-05-18 01 MED



HZMB 127 2015-01-03-11-39-50 01 MED



HZMB 127 2015-01-03-11-42-25 02 MED



HZMB 128 2015-01-03-11-39-52 01 MED



HZMB 128 2015-01-03-11-42-22 03 MED



HZMB 129 2015-09-07-13-47-07 MED





# China Harbour Engineering Company Limited

## Monthly Summary Waste Flow Table for August / 2015 (year)

Project : Hong Kong – Zhuhai – Macao Bridge, Hong Kong Boundary Crossing Facilities – Reclamation Works

Contract No.: HY/2010/02

Month	Actual Quantities of Inert C&D Materials Generated Monthly						Actual Quantities of C&D Wastes Generated Monthly				
	Total Quantity Generated	Hard Rock and Large Broken Concrete (see Note 1)	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Imported Fill	Metals	Paper/ cardboard packaging	Plastics (see Note 2)	Chemical Waste (see Note 4)	Others, e.g. general refuse (see Note 3)
	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000 kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000 m <sup>3</sup> )
Jan-15	0.0000	0.0000	0.0000	0.0000	0.0000	1774.7845	0.0000	0.4200	4.0000	2.4000	0.0455
Feb-15	0.0000	0.0000	0.0000	0.0000	0.0000	1120.6675	0.0000	0.1400	0.0000	0.0000	0.0390
Mar-15	0.0000	0.0000	0.0000	0.0000	0.0000	390.8735	0.0040	0.3340	0.0020	0.0000	0.0390
Apr-15	0.0000	0.0000	0.0000	0.0000	0.0000	251.3183	0.0000	0.1400	0.0000	0.0000	0.0390
May-15	0.0000	0.0000	0.0000	0.0000	0.0000	778.9842	0.0000	0.1960	0.0000	0.0000	0.0260
Jun-15	0.0000	0.0000	0.0000	0.0000	0.0000	400.6428	0.0000	0.1680	0.0000	0.0000	0.0520
Sub-total	0.0000	0.0000	0.0000	0.0000	0.0000	4717.2709	0.0040	1.3980	4.0020	2.4000	0.2405
Jul-15	0.0000	0.0000	0.0000	0.0000	0.0000	60.7108	0.0150	0.4750	0.0020	0.0000	0.0585
Aug-15	0.0000	0.0000	0.0000	0.0000	0.0000	60.6718	0.0000	0.3360	5.1200	0.0000	0.0585
Sep-15											
Oct-15											
Nov-15											
Dec-15											
Total	0.0000	0.0000	0.0000	0.0000	0.0000	4838.6536	0.0190	2.2090	9.1240	2.4000	0.3575

- Notes:
- (1) Broken concrete for recycling into aggregates.
  - (2) Plastics refer to plastic bottles/ containers, plastic sheets/ foam from packaging materials.
  - (3) Use the conversion factor : 1 full load of dumping truck being equivalent to 6.5m<sup>3</sup> by volume.
  - (4) Chemical waste refer to spent “battery” and “oil with water”.



## Appendix J

### Cumulative Statistics on Exceedances, Complaints, Notifications of Summons and Successful Prosecutions

#### Cumulative statistics on Exceedances

		Total no. recorded in this month	Total no. recorded since project commencement
<b>1-Hour TSP</b>	Action	-	-
	Limit	-	-
<b>24-Hour TSP</b>	Action	-	-
	Limit	-	-
<b>Noise</b>	Action	-	-
	Limit	-	-
<b>Water Quality</b>	Action	-	2
	Limit	-	3
<b>Dolphin Monitoring</b>	Action	-	-
	Limit	-	-

Remarks: Exceedances which are not project-related are not presented in this table.

#### Cumulative statistics on Exceedances, Complaints, Notifications of Summons and Successful Prosecutions

	Date Received	Subject	Status	Total no. received in this month	Total no. received since project commencement
<b>Environmental complaints</b>	3 July 2015	As informed by the Contractor, 3 July 2015, an air quality complaint has been received on 11 June 2015 by HyD via complaint hotline 1823. The complainant complained that sand and dust pollution near Richland Garden, 138 Wu Chui Road, Tuen Mun, caused by sand delivery barges. After investigation, there is no adequate	Closed	1	31

		information to conclude the observed impact is related to this Contract.			
	13 July 2015	As informed by Engineer Representative of this Contract on 13 July 2015, EPD referred a noise related complaint to this Contract on 13 July 2015. The complainant complained noise came from BCF site near HK Skycity Marriott Hotel during nighttime period of the past 10 days which involves excavation with a grab dredger, transfer of excavated material using a derrick barge and a tug boat, and backfilling with a pelican barge. Based on EPD's record, the above activities are covered by CNP no. GW-RS0503-15. After investigation, the construction activities carried out during restricted hour between 1- 13 July 2015 were considered complied with CNP conditions (no. GW-RS0503-15).	Closed	2	32
	30 July 2015	As informed by the Contractor on 30 July, Home Affairs Department referred a complaint to project team of this Contract on 29 July 2015. The complaint involved Mr. Chan and Mr. Tang, Resident Representatives of Tong Fuk Village who complained significant sand loss of Tong Fuk Beach, particularly after typhoon when the beach was hit by strong	Closed	3	33

		waves; this exposed the rocks at the beach. The complainant enquired whether the sand loss is related to sand extraction for construction of airport and reclamation works of HZMB artificial island. After investigation, the complaint is considered as non-project related.			
<b>Notification of summons</b>	-	-	-	-	2
<b>Successful Prosecutions</b>	-	-	-	-	2

## Appendix K – Event Action Plan

### Event / Action Plan for Air Quality

Event	Action			
	ET Leader	IEC	ER	Contractor
<b>Action Level</b>				
Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform IEC and ER;</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency to daily.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Rectify any unacceptable practice;</li> <li>2. Amend working methods if appropriate.</li> </ol>
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC and ER;</li> <li>3. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>4. Repeat measurements to confirm findings;</li> <li>5. Increase monitoring frequency to daily;</li> <li>6. Discuss with IEC and Contractor on remedial actions required;</li> <li>7. If exceedance continues, arrange meeting with IEC and ER;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise Implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit proposals for remedial to ER within 3 working days of notification;</li> <li>2. Implement the agreed proposals;</li> <li>3. Amend proposal if appropriate.</li> </ol>

Event	Action			
	ET Leader	IEC	ER	Contractor
<b>Limit Level</b>				
Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform ER, Contractor and EPD;</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Amend proposal if appropriate.</li> </ol>

Event	Action			
	ET Leader	IEC	ER	Contractor
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, Contractor and EPD;</li> <li>2. Identify source;</li> <li>3. Repeat measurement to confirm findings;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

Event / Action Plan for Construction Noise

Event	Action			
	ET Leader	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> <li>1. Notify IEC and Contractor;</li> <li>2. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>3. Report the results of investigation to the IEC, ER and Contractor;</li> <li>4. Discuss with the Contractor and formulate remedial measures;</li> <li>5. Increase monitoring frequency to check mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analysed results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IEC;</li> <li>2. Implement noise mitigation proposals.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Inform IEC, ER, EPD and Contractor;</li> <li>2. Identify source;</li> <li>3. Repeat measurements to confirm findings;</li> <li>4. Increase monitoring frequency;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Inform IEC, ER and EPD the causes and actions taken for the exceedances;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

Event / Action Plan for Water Quality

Event	Action			
	ET Leader	IEC	ER	Contractor
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat <i>in situ</i> measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, contractor and ER;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Repeat measurement on next day of exceedance to confirm findings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working methods;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of non-compliance in writing;</li> <li>2. Discuss with IEC on the proposed mitigation measures;</li> <li>3. Make agreement on mitigation measures to be implemented;</li> <li>4. Ensure mitigation measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER;</li> <li>5. Implement the agreed mitigation measures.</li> <li>6. Amend working methods if appropriate.</li> </ol>



Event	Action			
	ET Leader	IEC	ER	Contractor
Action level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat <i>in situ</i> measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor and ER;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Action level;</li> <li>8. Repeat measurement on next day of exceedance to confirm findings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of non-compliance in writing;</li> <li>2. Discuss with IEC on the proposed mitigation measures;</li> <li>3. Make agreement on mitigation measures to be implemented;</li> <li>4. Ensure mitigation measures are properly implemented;</li> <li>5. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the Engineer and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER within 3 working days of notification;</li> <li>5. Implement the agreed mitigation measures;</li> <li>6. Amend working methods if appropriate.</li> </ol>

Event	Action			
	ET Leader	IEC	ER	Contractor
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat <i>in-situ</i> measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor, ER and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li> <li>3. Request Contractor to critically review the working methods;</li> <li>4. Ensure mitigation measures are properly implemented;</li> <li>5. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER;</li> <li>5. Implement the agreed mitigation measures;</li> <li>6. Amend working methods if appropriate.</li> </ol>

Event	Action			
	ET Leader	IEC	ER	Contractor
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat <i>in-situ</i> measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, contractor, ER and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li> <li>3. Request Contractor to critically review the working methods;</li> <li>4. Make agreement on the mitigation measures to be implemented;</li> <li>5. Ensure mitigation measures are properly implemented;</li> <li>6. Assess the effectiveness of the implemented mitigation measures;</li> <li>7. 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.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Take immediate action to avoid further exceedance;</li> <li>3. Rectify unacceptable practice;</li> <li>4. Check all plant and equipment and consider changes of working methods;</li> <li>5. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER;</li> <li>6. Implement the agreed mitigation measures;</li> <li>7. Resubmit proposals of mitigation measures if problem still not under control;</li> <li>8. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li> </ol>

Event / Action Plan for Dolphin Monitoring

<b>Event</b>	<b>ET Leader</b>	<b>IEC</b>	<b>ER / SOR</b>	<b>Contractor</b>
Action Level	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>3. Identify source(s) of impact;</li> <li>4. Inform the IEC, ER/SOR and Contractor;</li> <li>5. Check monitoring data.</li> <li>6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and finding with the ET and the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss monitoring with the IEC and any other measures proposed by the ET;</li> <li>2. If ER/SOR is satisfied with the proposal of any other measures, ER/SOR to signify the agreement in writing on the measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER/SOR and confirm notification of the non-compliance in writing;</li> <li>2. Discuss with the ET and the IEC and propose measures to the IEC and the ER/SOR;</li> <li>3. Implement the agreed measures.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>3. Identify source(s) of impact;</li> <li>4. Inform the IEC, ER/SOR and Contractor of findings;</li> <li>5. Check monitoring data;</li> <li>6. Repeat review to ensure all the</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and findings with the ET and the Contractor;</li> <li>3. Attend the meeting to discuss with ET, ER/SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>4. Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and</li> </ol>	<ol style="list-style-type: none"> <li>1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>2. If ER/SOR is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, ER/SOR to signify the agreement in writing on such proposals and any other mitigation measures.</li> <li>3. Supervise the implementation</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER/SOR and confirm notification of the non-compliance in writing;</li> <li>2. Attend the meeting to discuss with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary.</li> <li>4. Implement the agreed additional dolphin monitoring and/or any other mitigation</li> </ol>

	<p>dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</p> <p>7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, ER/SOR and Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to modify the perimeter silt curtain or consider to control/temporarily stop relevant construction activity etc.) and submit to IEC a proposal of additional dolphin monitoring and/or mitigation measures where necessary.</p>	<p>advise ER/SOR of the results and findings accordingly.</p> <p>5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise ER/SOR the results and findings accordingly.</p>	<p>of additional monitoring and/or any other mitigation measures.</p>	<p>measures.</p>
--	--	--	---	------------------

**Report No. D010**  
**Monitoring Period June 2015 - August 2015**

The Action and Limit Levels of Chinese White Dolphin (CWD) monitoring which was extracted from the enhanced Event and Action Plan<sup>#</sup> are reproduced below:

	North Lantau Social Cluster	
	NEL	NWL
<b>Action Level</b>	(STG<4.2) & (ANI<15.5)	(STG<6.9) & (ANI<31.3)
<b>Limit Level</b>	[(STG<2.4) & (ANI<8.9)] AND [(STG<3.9) & (ANI<17.9)]	

**Quarterly Encounter Rate**

	STG*	ANI**	Level Exceeded
<b>NEL</b>	0.0	0.0	Limit
<b>NWL</b>	1.6	5.2	

<sup>#</sup>Reference is made to the enhanced Event Action Plan for Chinese White Dolphin Monitoring accepted by EPD on 7 May 2013.

\*Quarterly Encounter Rate of Number of Dolphin Sightings (STG) presents averaged encounter rates of the three monitored months in terms of groups per 100km per survey event.

\*\*Quarterly Encounter Rate of Total Number of Dolphins (ANI) presents averaged encounter rates of the three monitored months in terms of individuals per 100km per survey event.

**Investigation Results:**

a) Causes of exceedance

- After review of all available and relevant data, including the raw data and analyses of other parameters included in the EM&A, no significant variation is detected in key environmental parameters.
- No direct relationship with Project construction activities can be found between either the increase or decrease of dolphin numbers in NEL but this project activities may contribute to disturbance.
- Current mitigation measures are being upheld. Both day and night MMO and PAM systems have been fully implemented from the start of works of the Project.
- There has been no failure or reduction of dolphin-specific mitigation measures.
- Meetings were held on 9 December 2014, 27 April 2015, 10 July 2015 and 6 October 2015 between ENPO, project ET for this and other HZMB projects and engineer representatives, to discuss dolphin encounter rates during the period September-November 2014, December 2014-February 2015, March 2015-May 2015 and June 2015-August 2015. It was concluded that the HZMB construction work is one of the contributing factors affecting the dolphins. It was also concluded the contribution of impacts due to individual HZMB contracts and processes cannot be separated from the other activities within the dolphins habitat.

b) Action required under the action plan

Please refer to corresponding Event and Action Plan.

c) Action taken under the action plan

1. Statistical data analysis has been repeated to confirm findings;
2. All available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A have been reviewed;
3. Identification of source of impact was carried out;
4. The IEC, ER and Contractor have been informed of findings;
5. Monitoring data have been checked;
6. Repeated review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary;
7. After investigation, there was no evidence that indicated that the reduced number of dolphins in NWL and NEL was related solely to Project works. It was also concluded the contribution of impacts due to the HZMB works as a whole (or individual contracts) cannot be quantified nor separate from the other stress factors. Please also refer to the attachment for full investigation result.

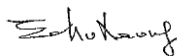
d) ET's conclusions and recommendations for mitigation

- Current mitigation measures for CWD are being implemented fully, and the Contractor has been reminded to consistently implement existing mitigation measures.
- It was considered that the current monitoring works under the EM&A programmes have already provided a high level of monitoring effort, and the joint meeting with ENPO, project ET for this and other HZMB projects and engineer representatives on 10 October 2015 concluded that additional monitoring in the three monitoring areas was not considered necessary as it may not generate additional information regarding dolphin distribution pattern in these three areas. Instead, it was considered that existing data can be reviewed and alternative analytical methods can be explored to see if it could provide new insight to the dolphin distribution pattern. On a meeting held on 27 April 2014, ENPO stated a pilot survey of the South-west Lantau was underway to better characterize the possible dolphin redistribution pattern since March 2015.
- On 9 December 2014, a joint meeting with ENPO, project ET for this and other HZMB projects and engineer representatives agreed to explore options for bringing forward measures (e.g., speed limit control) which have been proposed for the proposed Brothers Island Marine Park (BMP) so as to reduce boat related impacts. It was noted that under the Regular Marine Travel Route Plan, the contractors of HKBCF Reclamation Works have committed to reduce the vessel speed in BMP.

e) Contractor's actions to implement the mitigation

- The Contractor was reminded to ensure relevant mitigation measures were fully implemented.
- It was recommended that the marine works of HZMB projects should be accelerated and completed as soon as possible so as to reduce the overall duration of impacts and allow the dolphins population to recover as early as possible.
- It was also recommended that the marine works footprint to be reduced (e.g., reduce the size of peripheral silt curtain). It is noted that a phase plan proposal for perimeter silt curtain removal has been submitted to EPD on 27 October 2014, comments were issued by EPD on 9 December 2014 and it was under project team's review in the reporting quarter. Although no supplementary or further information will be provided for responding comments from the authorities in this stage. This Contract may resume the processing of the phase plan proposal for perimeter silt curtain removal to cater the needs of the Contract in the future.
- In addition to the phase plan proposal for perimeter silt curtain removal has been submitted to EPD on 27 October 2014, a notification of removal of Perimeter Silt Curtain in Stages was submitted to EPD via letter dated on 9 September 2015 for notification purposes for the removal of section of perimeter silt curtain near Portion B of HKBCF. EPD replied on 24 September 2015 reminded the Project Proponent that if grouting trial is undertaken, to adhere to the VEP requirement and undertake the necessary mitigation measures after the phase removal of the perimeter silt curtain.
- It was also recommended that vessels for the marine works should be reduced as much as possible, and vessels idling / mooring in other part of the North Lantau shall be avoided whenever possible. The Contractor was already using large capacity sand barge so as to reduce the number of vessel traffic .

ET Leader Signature & Date:



27-Jan-16

**Report No. D010**  
**Monitoring Period June 2015 - August 2015**

### ***Investigation Report Attachment***

- 1. Review all available and relevant data (construction activities), including raw data and analyses of other parameters (air, noise, water and underwater acoustic) covered in the EM&A, to ascertain if differences are a result of natural variation or previously observed seasonal differences.***

On 6 October 2015, a meeting was held between ENPO, ET for this contract and other HZMB contracts and engineer representatives following the limit level/action level exceedances for Chinese white dolphin encounter rate during the period June 2015 to August 2015. After review of the AFCD annual monitoring data, it was advised that dolphins in Hong Kong waters may have re-distributed throughout Hong Kong waters and that data from all three monitoring sections, as well as areas from outside these, should be reviewed to give a better, overall picture of current dolphin distribution patterns and to monitor individual dolphin movement. As AFCD data suggests that some dolphins have been distributed outside the range of the current monitoring for this Project, it was noted that ENPO had initiated a new study in areas adjacent to WL. This study is not part of this Projects reporting, however, details are available on the ENPO website.

In the last year, there has been a consistent decrease of dolphins in the NEL and NWL areas. As stated in previous investigation reports, the HZMB works is one of the contributing factors affecting the dolphins and it was reiterated at this latest meeting that there are also concurrent works ongoing in both NEL and NWL, some of which are not part of the HZMB Project. Further, it was noted that it is extremely difficult to attribute specific impacts from any single works or activity and also, it is not possible to separate the impact caused by one part of the HZMB project from another. It was noted that there has been consistently less dolphins adjacent to HZMB construction sites as all parts of the HZMB Project have been initiated. These are in addition to the existing pressures the dolphins faced in the Lantau habitat before the HZMB development started, e.g., boat traffic, habitat degradation, pollution, competition with fisheries. All ETs noted at the meeting that mitigation across individual HZMB sites has been fully implemented. Regular checking and auditing of all mitigation works at the HKBCF reclamation works record that all dolphin mitigation measures, in the form of vessel routes and speeds, etc., have been implemented and DEZ/DWP are in place. The meeting summarised that multiple factors, as listed above and including the HZMB project, have all contributed to dolphin distribution changes in Hong Kong.



Two (2) Action Level Exceedances of suspend solids were recorded at IS5 and IS(Mf)6 during flood tide on 17 July 2015. After investigation, the information available was not adequate to conclude that the recorded exceedances were related to this Contract. IWQM exceedances were at locations which dolphins have not been noted previously, i.e., close to Tung Ching Public pier and it is unlikely that short-lived and localised increased sedimentation would affect dolphins when it is not their usual habitat.

## **2. Identify source(s) of impacts.**

There is a documented significant population decline of the Hong Kong dolphin and, in 2008, an expert panel concluded that the anthropogenic activities which occur in the Hong Kong and adjacent habitat have the potential to affect the dolphin population through pollution, infection, lowered prey availability, intense and low noise levels, collisions, behavioural changes, disturbance, entanglement in fishing gear and habitat modification by activities such as construction, dredging, sewage disposal, industrial effluent discharge, shipping, reclamation, fishing. Since this review, pro-active management by AFCD has resulted in a reduction of the negative impacts caused by non-sustainable fishing, i.e., as the trawling ban progresses, more prey should be available to dolphins, and a general reduction in fishing activities will reduce the potential for entanglement in fishing gear. It is noted that other fishing activities are ongoing in Hong Kong waters which also pose a risk of entanglement, however, data from strandings programme often cannot discern which type of fishery is (and/or net) is responsible for an individual entanglement. In other areas where coastal fisheries have been monitored by independent observers, it was noted that of trawling, purse seine and gill netting have the highest bycatch incidence for bottlenose dolphins, with trawling noted as having the greatest impact (Allen *et al* 2014). Globally, trawling fisheries are of the greatest conservation concern due to their high impact on small cetaceans (Ross and Isaac 2004), and although there may still be other fisheries in operation in Hong Kong which pose an entanglement risk to dolphins, none are as intensive or as widespread as the trawl fishery was. Other identified impacts, however, are ongoing and it is noted that construction activities and the high speed ferry traffic in NEL and NWL have both increased since 2008 (AFCD Annual Monitoring Reports 2009;2010;2011;2012;2013;2014). A recent publication incorporating data from AFCD assessed impacts known from Hong Kong between 1996 and 2013 and concluded that high speed ferries have significantly contributed to the decline in dolphins from NEL. This paper also suggests that there has been an overall decline of dolphins in the northern waters of Lantau Island (Marcotte *et al* 2015). This paper also states that caution should be exercised when interpreting these preliminary findings and further analysis is encouraged. A recent publication (Li *et al* 2015) examined the acoustic disturbance of high speed boats<sup>1</sup> on Chinese white dolphins and observed that frequencies of over >100kHz dominated. This is within the dolphins communication range. The recorded boat noise raised the ambient underwater noise levels from ~5 to 47 decibels, with louder levels recorded at higher speeds and at closer distances. In Hong Kong, similar vessels include small fishing boats, commonly referred to as “P4s” and high speed ferries. This study notes the potential impact these elevated levels have on Chinese white dolphins in southern China and it can be assumed that similar acoustic

<sup>1</sup> Boats travelling at over 15kmph

disturbance may occur in Hong Kong waters. It is known from studies elsewhere that dredging and marine piling activities cause significant disturbance to marine mammals (David 2006; Jefferson et al. 2009; Bailey et al 2010). In particular, Wang *et al* (2014) note the vibratory piling which occurs as part of HZMB construction in waters adjacent to Hong Kong (cited as the worlds largest vibratory piling vessel) exceeded the cetacean safety exposure level on several occasions in 2013/14 (peak levels of 208.2 dB re. 1 $\mu$ Pa at 1m were recorded [Yang *et al* 2015]).

The underwater noise levels were affected up to 3.5km distant from this piling site and thus would have been audible in Hong Kong waters. The elevated underwater noise levels caused by this piling activity would have resulted in auditory masking of dolphin whistles which may disrupt social behavior. Activities which are stressful to dolphins are usually associated with increased underwater noise levels and this includes vessel traffic (from all construction works in the proximity of North Lantau). It is also noted that Hong Kong and adjacent ports are the world's busiest commercial shipping area with heavy shipping traffic.

The meetings held as part of assessing trends in the CWD population has led to useful discussion, initiation of new monitoring and actions aimed at reducing HZMB impacts. Meetings have been held on 9 December 2014, 27 April 2015, 10 July 2015 and 6 October 2015. Actions which have resulted from this have included the reduction of small sand barges (by HY/2010/02) to reduce overall project related shipping activities in the NEL area and a review of early implementation in the proposed marine park at the Brothers island. In addition, new monitoring on dolphins outside the three currently monitored areas has been initiated to investigate where dolphins may have re distributed. Also, some image data obtained from waters adjacent to Hong Kong was assessed by both dolphin specialists and dolphins which were previously commonly known to Hong Kong waters were identified. This indicates that dolphins identified as part of HZMB study still occur, however, they are outside the usual monitoring areas of HZMB. Thus, at least some, CWD have redistributed outside NEL, NW and WL areas and continued monitoring initiated by ENPO will continue to assess re distribution. Please note, the additional monitoring is outside the work of this Project. The most recent joint meeting discussed means of monitoring all shipping traffic associated with HZMB and all teams agreed to contribute project specific data where appropriate, including project team of this Contract.

**3. *Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise if additional measures are necessary.***

Site inspection of the implementation of vessel speed limit, acoustic decoupling measures, spillage and runoff prevention measures on barges, training records related to regular marine travel routes for Contract's vessels, record of implementation of dolphin watching plan and silt curtain integrity checking record were conducted during weekly site inspection. The appropriate mitigation monitoring was in place depending on site activities, i.e., Dolphin Exclusive Zone for silt curtain laying and Dolphin Watching Plan for all other Project activities.

#### **4. Investigate whether the exceedance was caused by any of the construction activity associated with the works contract.**

No single construction works associated with the HKBCF Project can be found to coincide with the observed reduction in dolphin encounter rates in NEL and NWL. As discussed at the series of meetings held, it was agreed that all HZMB works are a contributing factor affecting the dolphins. It was also concluded the contribution of impacts due to individual Projects cannot be quantified nor separate from the other stress factors. All mitigation measures as detailed in the EM&A are being upheld and additional measures to restrict traffic number and routing have been proposed and, in some cases, already implemented for the HKBCF Project.

These factors were reported in D005 - D009, and the conclusions therein are still valid, that is, there are ongoing construction works, both Project related and not, which are known to impact dolphins. Joint meetings have been conducted and actions taken to assess and evaluate HZMB activities. At this time, the long term impacts of these works cannot be assessed although it is hoped that the recent expansion of monitoring areas and data gathered in adjacent waters will provide additional information on those zones outside NEL and NWL.

#### References

AFCD Monitoring Report. From:

[http://www.afcd.gov.hk/english/conservation/con\\_mar/con\\_mar\\_chi/con\\_mar\\_chi\\_chi/con\\_mar\\_chi\\_chi.html](http://www.afcd.gov.hk/english/conservation/con_mar/con_mar_chi/con_mar_chi_chi/con_mar_chi_chi.html)

Allen, S., Tyne, J., Kobryn, H., Bejder, L., Pollock, K. and Loneragan, N. (2014). Patterns of Dolphin Bycatch in a North-Western Australian Trawl Fishery. *PLoS One*. 9(4)

Li, S., Wu, H., Xu, Y., Peng, C., Fang, L., Lin, M. & Zhang, P., (2015). Mid-to high-frequency noise from high-speed boats and its potential impacts on humpback dolphins. *The Journal of the Acoustical Society of America*, 138(2), 942-952.

Marcotte, D., Hung, S. K., & Caquard, S. (2015). Mapping cumulative impacts on Hong Kong's pink dolphin population. *Ocean & Coastal Management*, 109, 51-63.

Ross, A. and Isaac, S. 2004. The Net Effect. Greenpeace Environment Trust report. London: Greenpeace

Wang, Z., Wu, Y., Duan, G., Cao, H., Liu, J., Wang, K., & Wang, D. (2014). Assessing the Underwater Acoustics of the World's Largest Vibration Hammer (OCTA-KONG) and Its Potential Effects on the Indo-Pacific Humpbacked Dolphin (*Sousa chinensis*). *PLoS one*, 9(10), e110590.

Yang, L., Xu, X., Huang, Z., & Tu, X., (2015). Recording and Analyzing Underwater Noise During Pile Driving for Bridge Construction. *Acoustics Australia*, 1-9.