


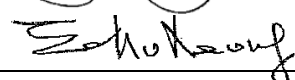
# China Harbour Engineering Company Limited

Contract No. HY/2010/02

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

Quarterly EM&A Report for  
March 2015- May 2015

[01/2016]

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

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<p><b>Disclaimer</b></p> <p>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.</p>		

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20 January 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 March 2015 to May 2015**

Reference is made to the Environmental Team's submission of the Quarterly Environmental Monitoring & Audit Report for March 2015 to May 2015 certified by the ET Leader (ET's ref.: "60249820/C/RMKY16012002" dated 20 January 2016) and provided to us via e-mail on 20 January 2016.

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

The ET Leader and the dolphin specialist of the ET are reminded that the EM&A report should never be regarded as a platform to express their own opinions towards a government topic, or to advocate his/her personal ideas, and also our verification to your report does not release any of your obligation 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)

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## EXECUTIVE SUMMARY

Contract No. HY/2010/02 – Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Work (here below, known as “the Project”) 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 Project, i.e. the amended Environmental Permits (EPs) issued on 19 January 2015 (EP-353/2009/H) 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 Project’s reclamation works (i.e. the Engineer for the Project).

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

Ramboll Environ Hong Kong Limited (formerly ENVIRON Hong Kong Limited) 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 Project for carrying out the environmental monitoring and audit (EM&A) works.

The construction phase of the Project 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 March 2015 and 31 May 2015. As informed by the Contractor, major activities in the reporting quarter were:-

### **Marine-base**

- Cellular structure installation and backfilling
- Capping Beams structures
- Conforming sloping seawalls
- Surcharge remove & laying
- Earthwork fill
- Deep Cement Mixing
- Jet grout columns works
- Geotechnical Instrumentation works
- Removal of Temporary Seawall
- Installations of Precast Culverts except sloping outfalls
- Maintenance of silt curtain & silt screen at sea water intake of HKIA

### **Land-base**

- 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	39 sessions
Impact dolphin monitoring	6 surveys
Joint Environmental site inspection	13 sessions

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

All 1-Hour TSP and 24-Hour TSP results were below the Action and Limit Level in the reporting month.

### **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**

For water quality, two (2) Action Level Exceedances of SS at IS10 and SR5 during Flood tide were recorded on 23 March 2015. No Action and Limit Level exceedances were recorded on other monitoring date in the reporting month. 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 on 09 March 2015, there is an air quality complaint received on 06 March 2015. The complainant Mr. Fung requested for follow-up actions to be taken by relevant departments in response to his Complaint about sand and dust emission from 4-5 uncovered sand barges parking near the coastline of Tuen Mun, the complainant concerns about the health problems to residents as the sand is blown to their apartments. After investigation, there is no adequate information to conclude the observed impact is related to this Contract.

Environmental Protection Department (EPD) referred a noise complaint to this project on 10 April 2015 and ENPO forwarded the noise complaint to Environmental Team on 15 April 2015. The complaint involves a complainant, who is resident of Caribbean Coast, Tung Chung and he was disturbed by noise from construction activities of the HZMB Project during weekends and holidays. After investigation, there is no adequate information to conclude the observed noise nuisance is related to this Contract.

A complainant contacted EPD through EPD's hotline on 21 May 2015 and complained that noise was generated from construction works when construction of artificial island at Lantau Island area was carried out overnight and dark smoke was emitted by construction plant. EPD's staff has contacted complainant and came to know that the dark smoke referring to could also be construction dust emitting from the filling work at the HKBCF. This complaint was subsequently referred by EPD to HZMB project team on 22 May 2015 to follow-up. With referred to the available information, it is unable to determine whether the night time noise and dark smoke complaint is related to this Contract.

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 Project”) mainly comprises seawall construction and 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 Project 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) and January 2015 (EP-353/2009/H). 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 19 January 2015 (EP-353/2009/H) and 13 March 2015 (EP-354/2009/D) (for TMCLKL Southern Landfall Reclamation only).
- 1.1.5 A Project Specific EM&A Manual, which included all project-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 Project’s reclamation works (i.e. the Engineer for the Project).
- 1.1.7 China Harbour Engineering Company Limited (CHEC) was awarded by HyD as the Contractor to undertake the construction work of the Project.
- 1.1.8 Ramboll Environ Hong Kong Limited (formerly ENVIRON Hong Kong Limited) 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 Project for carrying out the EM&A works.
- 1.1.10 The construction phase of the Project under the EPs was commenced on 12 March 2012 and will be tentatively completed by early Year 2016.
- 1.1.11 According to the Project 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 Project commenced on 12 March 2012.

### 1.2 Scope of Report

- 1.2.1 This is the thirteen 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



Contract No. HY/2010/02

Hong Kong-Zhuhai-Macao Bridge

Hong Kong Boundary Crossing Facilities – Reclamation Works

Quarterly EM&A Summary Report  
for March 2015 – May 2015

summary of the environmental monitoring and audit works, list of activities and mitigation measures proposed by the ET for the Project from 1 March 2015 to 31 May 2015.

**1.3 Project Organization**

1.3.1 The project 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	Roger Marechal	2528 3031	2668 3970
IEC / ENPO (Ramboll Environ Hong Kong Limited (formerly 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	Richard Ng	36932253	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 installation and backfilling
- Capping Beams structures
- Conforming sloping seawalls
- Surcharge remove & laying
- Earthwork fill
- Deep Cement Mixing
- Jet grout columns works
- Geotechnical Instrumentation works
- Removal of Temporary Seawall
- Installations of Precast Culverts except sloping outfalls
- Maintenance of silt curtain & silt screen at sea water intake of HKIA

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

- 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 Project is shown in Appendix B.
- 1.4.4 The general layout plan of the Project 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 Project 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 Project 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 Project 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 Project Specific EM&A Manual. However, for monitoring location NMS3 (Ho Yu College), as proposed in the Project 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 Project 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 Project/ 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 Project 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/H 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 Project 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 (AMS7A) 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 Project, 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.

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

Monitoring Parameter	Location	No. of monitoring events		
		March 15	April 15	May 15
1-hr TSP	AMS2	15	18	15
	AMS3B	15	18	15
	AMS7A	15	18	15
24-hr TSP	AMS2	5	6	5
	AMS3B	5	6	5
	AMS7A	5	6	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		
			March 15	April 15	May 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	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>

- 3.1.6 All 24-Hour TSP and 1-Hour TSP results were below the Action and Limit Level in the reporting month.

3.1.7 The event action plan is annexed in Appendix K.

3.1.8 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 March 2015, April 2015 and May 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 Project 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		
		March 15	April 15	May 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		
			March 15	April 15	May 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 A total of (2) two action level exceedances were recorded in this reporting quarter:

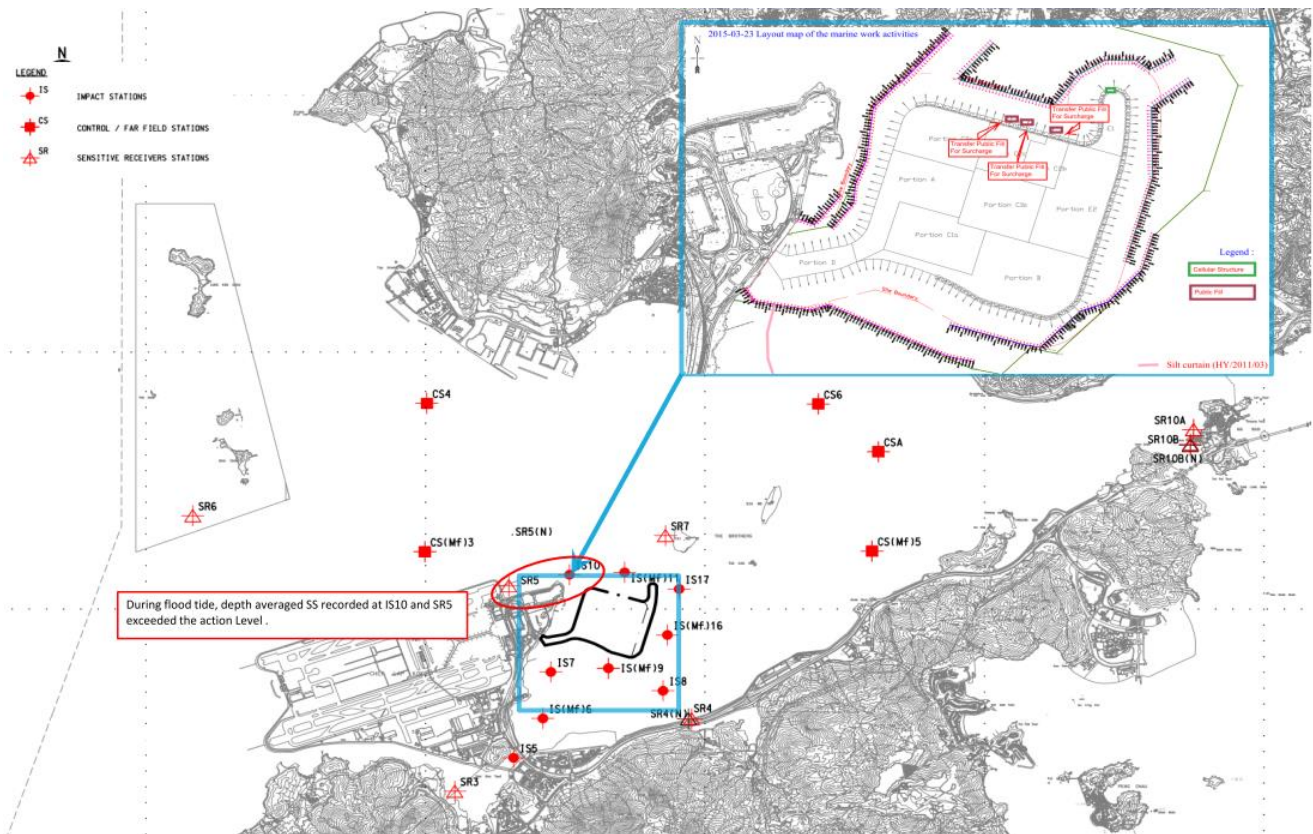
3.3.3 For water quality, two (2) Action Level Exceedances of SS at IS10 and SR5 were recorded on 23 March 2015 during Flood tide. No Action and Limit Level exceedances were recorded on other monitoring date in the reporting month. After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract.

**Table 3.5 Summary of Water Quality Exceedances in March 2015 – May 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	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)6	Action	0	0	0	0	0	0	0	0	0	0
	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	(1) 23 Mar15	0	1
	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	(1) 23 Mar15	0	1
	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
<b>Total</b>	<b>Action</b>	0	0	0	0	0	0	0	<b>2</b>	<b>2</b>	
	<b>Limit</b>	0	0	0	0	0	0	0	0	0	

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

- 3.3.4 For water quality, two (2) Action Level Exceedances of SS at IS10 and SR5 during Flood tide were recorded on 23 March 2015. No Action and Limit Level exceedances were recorded on other monitoring date in the reporting month.
  - 3.3.4.1 The exceedance was 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.
  - 3.3.4.2 Layout map below shows active works conducted on 23 March 2015. Transfer of public fill for surcharge was conducted at north part of HKBCF reclamation works and marine based construction works such cellular structure was conducted at northeast part of the HKBCF Reclamation Works.



3.3.4.3 Photo record which shows the sea condition near IS10 at northwest part of the HKBCF during flood tide on 23 March 2015



3.3.4.4 Exceedance recorded at IS10 and SR5 during mid-flood tide are unlikely due to marine based construction activities of the Project because:

- 3.3.4.5 With reference to the silt curtain checking record, defects such as disconnection of the silt curtain was not observed at northwest part of the perimeter silt curtain which are close to the IS10 and SR5.
- 3.3.4.6 The attached layout map shows transfer of public fill for surcharge was conducted at north part of HKBCF reclamation works, since it is not marine based work, therefore it was considered unlikely to cause the SS exceedances recorded at IS10 and SR5 during mid-flood tide.
- 3.3.4.7 The attached layout map shows that cellular structure was conducted at northeast part of the HKBCF Reclamation Works, however, the turbidity data retrieved from the IS17 and IS(Mf)11 which are in the vicinity of marine-based works (cellular structure) undertaken on 23 March 2015, did not exceed the action and limit level. As such, it was considered unlikely to cause the SS exceedances recorded at IS10 and SR5 during mid-flood tide.
- 3.3.4.8 Furthermore, no filling activities were observed in progress and no silt plume was observed to flow from the inside of the perimeter silt curtain to the outside of the perimeter silt curtain when monitoring was conducted at IS10 and SR5. (Also see attached for sea condition observed on 23 March 2015 during flood tide.)
- 3.3.4.9 Also, turbidity level recorded at SR5, IS10 and IS(Mf)11 were below the action and limit level. This indicates the turbidity level at area near SR5 and IS10 was not adversely affected.
- 3.3.4.10 The exceedances were likely due to local effects in the vicinity of SR5 and IS10.
- 3.3.4.11 After investigation, there is no adequate information to conclude the recorded exceedances are related to this Contract.
- 3.3.4.12 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 project related, as such, actions 5-7 under the EAP are not considered applicable.
- 3.3.4.13 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.
- 3.3.4.14 Maintenance work of the silt curtain was carried out by the Contractor on a daily basis as necessary.
- 3.3.5 The event action plan is annexed in Appendix K.

### 3.4 Dolphin Monitoring

- 3.4.1 In accordance with the Project 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 March 2015 – May 2015**

Number of Impact Surveys Completed^	6
Survey Distance Travelled under Favourable On- Effort Condition	658.2km
Number of Sightings	15 sightings (7 sightings are "on effort" (which are all under favourable condition), 3 "sightings are opportunistic")
Number of dolphin individual sighted	31 individuals (the best estimated group size)
Dolphin Encounter Rate#	NEL: 0 NWL: 1.6
Dolphin Group Size	Average of NEL: 0 Average of NWL: 3.1 Varied from 1-5 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 March 2015 - May 2015**

	NEL	NWL	Level Exceeded
STG*	0	1.6	Limit
ANI**	0	5.2	

\*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.
- 3.4.7 A review of survey conditions was conducted. The works at lines 1 and 2 are progressing and permanent in water structures are in place. Given that these lines are now truncated due to these structures, it is advised that the start/end points of these lines be revised to reflect the new navigation required. The proposal was under review and revision by the relevant parties in the reporting period.

### **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 Project. 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 Fugitive dust was observed generated when spoil was excavated at east side of the reclamation works, unloading of rocks and at Portion E1. The Contractor was reminded to sprayed dusty materials with water or a dust suppression chemical immediately prior to loading or unloading or transfer operation and the Contractor was advised to provide dust control measures when material during excavated of the spoil. The Contractor applied water on exposed soil during excavation of spoil. (Closed)
- 3.5.4 Cement was observed on surface of grout production facility; the Contractor was reminded that to ensure generation of fugitive dust is prevented and the entire grouting process and materials unloading, loading and transfer shall be performed within an enclosed system. (Reminder)
- 3.5.5 Haul road at Portion B was observed dry during site walk, however, watering was subsequently observed provided by the Contractor. The Contractor was reminded to provide sufficient watering to haul roads. (Reminder)
- 3.5.6 Road was observed moistened. The Contractor was reminded to continue to provide control measures to prevent generation of fugitive dust. (Reminder)
- 3.5.7 Fugitive dust was observed at Portion E1. The Contractor was reminded to provide effective dust control measures such as sufficient watering on road. Photo record shows that watering was provided on site to prevent generation of fugitive dust. The Contractor was reminded to provide sufficient measures to prevent generation of fugitive dust. (Reminder)
- 3.5.8 Dark smoke was observed from an excavator at Portion C2c. The Contractor was reminded to maintain to equipment in good condition. Photo record shows that dark smoke was no longer observed from the excavator and barge near Portion C2c. The Contractor was reminded to check the dark smoke of machineries and ensure proper implementation of air quality mitigation measures. (Reminder)

#### ***Noise***

- 3.5.9 The Contractor was reminded to provide the facilities with acoustic decoupling measures in accordance with the proposed mitigation measures for noise stated in the EP-353/2009/H. (Reminder)

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

- 3.5.10 Defects were observed on the secondary enclosure of grout delivery pipes. The Contractor was reminded to provide effective measure to contain any potential leakage of wastewater/grout and prevent them from releasing to the sea. The Contractor enhanced the measures to contain any potential leakage of wastewater/grout and prevent them from releasing to the sea. (Closed)
- 3.5.11 Soil was observed accumulated one side of the vessel, the Contractor was reminded to clear them regularly prevent runoff and keep the site clean and tidy. (Reminder)
- 3.5.12 Grout mixture was observed on land at the connection point of pipes. The Contractor was reminded to ensure no grout material is released to the sea. (Reminder)

- 3.5.13 Soil was observed at area near water outlet. The Contractor was reminded to provide measures such as sand bags to prevent silty water at water outlet. (Reminder)
- 3.5.14 Silt plume was observed at the northern part of the Portion C2b inside area enclosed by perimeter silt curtain. The Contractor was reminded to properly implement water quality mitigation measures. The Contractor provided measures such as rock bund the edge of Portion C2b. The contractor was reminded to ensure silt plume is prevented (Reminder)
- 3.5.15 Oil was observed in water adjacent to Portion C2c. The Contractor was reminded to clear the oil and take actions in accordance with the Spill Response Plan. The oil was cleared by the Contractor using oil spill kit and the used spill kit was disposed of by the Contractor as chemical waste. (Closed)
- 3.5.16 Turbid water was observed to flow from land area to seawall. The Contractor was advised to provide measures to prevent turbid water from going to the sea area. The Contractor provided measure to prevent the turbid water from going into the sea area from the land area. (Closed)

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

- 3.5.17 Defective drip tray was observed on barge, the Contractor was advised to provide drip tray without defects on barges. The Contractor rectified the defect of the drip tray. (Closed)
- 3.5.18 Waste water generated from the grout mixing process was stored within soil bund; the Contractor was advised to provide sufficient enclosure and ensure the wastewater from the work process is not released to the sea. The Contractor provided sufficient enclosure to the waste water observed. (Closed)
- 3.5.19 General refuse was observed stored on site without proper covers and at portion at portion C2c and on site. The Contractor was reminded to provide rubbish bin with over to general refuse. General refuse was cleared by the Contractor. (Closed)
- 3.5.20 General refuse was observed on site and at area near the pier of southern part and south eastern part of the site; the Contractor was reminded to provide sufficient rubbish bin on site and regular properly collect and dispose of general refuse. General refuse was removed by the Contractor. (Closed)
- 3.5.21 Oil drums without drip trays were observed on deck surface of barge DL4. The Contractor was reminded to provide mitigation measures such as drip tray to oil drums. The Contractor removed the oil drum. (Closed)
- 3.5.22 Oil drums without drip trays were observed barge 利航 8, on deck surface of barge Evershine18 and barge 振明 and material supplying vessel and on deck surface of barge DL4; generator was observed without drip tray. The Contractor was reminded to provide mitigation measures such as drip tray to oil drums. The Contractor removed the oil drums on deck surface of barge Evershine18 and barge 振明. The contractor removed the generator or provided drip tray to the oil drum on ground. The material supplying vessel where the oil drums were observed left the site. (Closed)
- 3.5.23 Generator was observed without drip tray. The Contractor was reminded to provide mitigation measures such as drip tray to all generators. Contractor removed the generator from the area. (Closed)
- 3.5.24 It was observed that the pipes used for transferring grout between barge DL4 and 天駿 3 were not fully enclosed, the Contractor was advised to provide measures to ensure potential leakage of grout from the grouting production process to the sea can be effectively prevented. The Contractor provided measures to prevent potential leakage of grout from the grouting production process to the sea. (Closed)
- 3.5.25 Solidified grout was observed on deck of barge DL4. The Contractor was reminded to keep the deck surface clean and tidy. The solidified grouts were cleared by the Contractor. (Closed)



- 3.5.26 Oil drums without drip trays were observed at portion C2a. The Contractor was reminded to provide mitigation measures such as drip tray to oil drums. The oil drums were removed by the Contractor. (Closed)
- 3.5.27 Stagnant water was observed accumulated inside a drip tray on Barge Luen Hing 368; Oil and water mixture was observed on barge 振明 18, s informed by the Contractor, the barge 振明 18 had left construction site of HKBCF reclamation works. The Contractor was reminded to clear the water/oil water mixture regularly to prevent potential runoff. (Reminder)
- 3.5.28 Hole was observed within bunding placed on Barge SHB 209, the Contractor was advised to provide effective mitigation measures by sealing the hole to prevent leakage and potential runoff. The Contractor rectified the deficiency by sealing the hole within the bunding on barge SHB 209. (Closed)
- 3.5.29 It was observed that waste water was generated from the jet grout process; the Contractor was advised to provide sufficient enclosure and ensure the wastewater from the work process is not released to the sea. Contractor enhanced the soil bund and ensures the wastewater from the work process is not released to the sea. (Closed)
- 3.5.30 Solidified grout was observed stored on deck of barge 天駿 3. The Contractor was reminded to sort and dispose them of properly (Reminder).

***Landscape and Visual Impact***

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

***Others***

- 3.5.32 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**

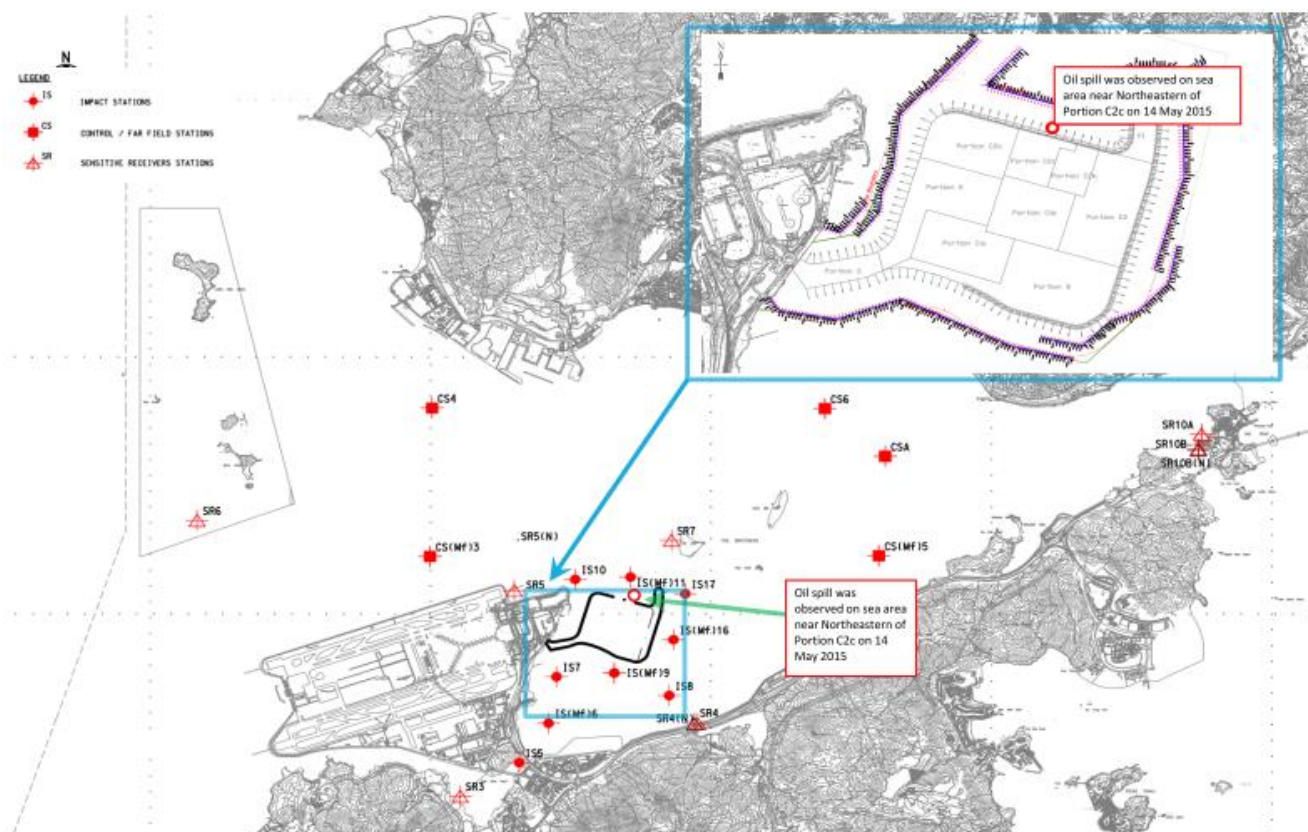
### **4.1 Summary of Solid and Liquid Waste Management**

- 4.1.1 The Contractor registered as a chemical waste producer for this project. Sufficient numbers of receptacles were available for general refuse collection and sorting.
- 4.1.2 As advised by the Contractor, 1,421,176m<sup>3</sup> of fill were imported for the Project use in the reporting period. 4kg of metal, 670kg of paper/cardboard packaging, 2kg plastics and 104m<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.
- 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 Oil spillage was observed on 14 May 2015 on sea area near Northeastern of Portion C2c (also refer to layout map below). There oil spillage incident including size, location, time of the spillage and Contractor's actions taken in response to the spill incident have been reviewed and summarised as follow.



5.1.6.1 Investigation actions includes review of Contractor’s actions taken in response to the spill incident and review of impact water quality monitoring records of 15 May 2015. Contractor’s actions taken in response to the spill incident:

- The oil on sea was observed during inspection jointly conducted by Contractor, ET, ESS and the RSS on 14 March 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.

5.1.6.2 Investigation observations and results:

- Oil was observed on sea next to Northeastern of Portion C2c within silt curtain at 10:45 a.m. on 14 May 2015 during joint inspection conducted by Contractor, ET, ESS and the RSS. The following actions was taken by the Contractor:
- The Contractor organised manpower to identify the spill source, the vessel (Evershin no.8) located close to the oil spill was inspected but the source of oil spill was not identified.
- The oil spill was identified during join site inspection conducted by the Contractor, ET, ESS and RSS on 14 May 2015 as discrete, non-continuous source with approximately 10m<sup>2</sup> spread. Also refer to photo below:



- The Contractor deployed absorption booms to remove the floating oil from water and 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).





- The oil stain observed was limited at nearby Northeastern sea area within the silt curtain.
- Photo record shows that oil on sea was no longer observed at sea area near Northeastern of Portion C2c. (Also refer to photo record below)



- Monitoring stations IS10, IS(Mf)11 and IS17 are the monitoring stations close to location of observed oil spill (also refer to above layout map). Impact water quality monitoring data record of IS10, IS(Mf)11 and IS17 have been reviewed. There is no water quality exceedance recorded at IS10, IS(Mf)11 and IS17 on 15 May 2015.

- 5.1.6.3 The contractor was reminded to continue to follow the spill response plan when oil is observed on sea.
- 5.1.6.4 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 mal-function 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

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

### **6.1 Summary of Exceedances of the Environmental Quality Performance Limit**

- 6.1.1 All 1-Hour TSP and 24-Hour TSP results were below the Action and Limit Level in the reporting month.
- 6.1.2 For construction noise, no exceedance was recorded at all monitoring stations in the reporting month.
- 6.1.3 For water quality, two (2) Action Level Exceedances of SS at IS10 and SR5 during Flood tide were recorded on 23 March 2015. No Action and Limit Level exceedances were recorded on other monitoring date in the reporting month. 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 on 09 March 2015, there is an air quality complaint received on 06 March 2015. The complainant Mr. Fung requested for follow-up actions to be taken by relevant departments in response to his Complaint about sand and dust emission from 4-5 uncovered sand barges parking near the coastline of Tuen Mun, the complainant concerns about the health problems to residents as the sand is blown to their apartments. After investigation, there is no adequate information to conclude the observed impact is related to this Contract.
- 7.1.3 EPD referred a noise complaint to this project on 10 April 2015 and ENPO forwarded the noise complaint to Environmental Team on 15 April 2015. The complaint involves a complainant, who is resident of Caribbean Coast, Tung Chung and he was disturbed by noise from construction activities of the HZMB Project during weekends and holidays. After investigation, there is no adequate information to conclude the observed noise nuisance is related to this Contract.
- 7.1.4 A complainant contacted EPD through EPD's hotline on 21 May 2015 and complained that noise was generated from construction works when construction of artificial island at Lantau Island area was carried out overnight and dark smoke was emitted by construction plant. EPD's staff has contacted complainant and came to know that the dark smoke referring to could also be construction dust emitting from the filling work at the HKBCF. This complaint was subsequently referred by EPD to HZMB project team on 22 May 2015 to follow-up. With referred to the available information, it is unable to determine whether the night time noise and dark smoke complaint is related to this Contract.
- 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 Project. With implementation of recommended effective environmental mitigation measures, the Project'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 Project. 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.
- 8.2.3 There is a report of silt plume observed near the silt curtain for HZMB HKBCF Project maintained by Contract No. HY/2010/02 during site visit conducted by HyD on 15 April 2015. Silt plume was observed Near the eastern part of HKBCF reclamation works (portion B and E), near the silt curtain for HZMB HKBCF Project maintained by Contract No. HY/2010/02.

8.2.3.1 Photo record taken on 15 April 2015 shows that silt plume was observed near the silt curtain for HZMB HKBCF Project maintained by Contract No. HY/2010/02 during a site visit conducted by HyD on 15 April 2015:



8.2.3.2 Investigation actions:

- Site inspection was conducted jointly with the Contractor, RSS and ESS on 16 April 2015.
- Construction activities and implementation of mitigation measures were reviewed.
- Review of available impact water quality monitoring data of monitoring station IS17, IS(Mf)16 and IS(Mf)9 recorded on 15 April 2015.

8.2.3.3 Investigation results:

- No silt plume around the Portion B and Portion E2 of HKBCF reclamation works were observed during the joint site inspection conducted jointly with the Contractor, RSS and ESS on 16 April 2015. Photos were taken and please see attached photo record for reference

8.2.3.4 Photo record taken on 16 April 2015 shows that no silt plume around the Portion B and Portion E2 of HKBCF reclamation works were observed during the joint site inspection conducted jointly with the Contractor, RSS and ESS on 16 April 2015.



- No disconnection of silt curtain was observed during the joint site inspection conducted jointly with the Contractor, RSS and ESS on 16 April 2015.
- Works activity such as deep cement mixing on land was observed at the Portion B and Portion E2 of HKBCF reclamation works and relocating rock material of cellular structure was observed at the Portion B of HKBCF reclamation works during the joint site inspection conducted jointly with the Contractor, RSS and ESS on 16 April 2015, however, silt plume or discharge of silt plume was not observed.
- In addition, available impact water quality monitoring data of monitoring station IS17, IS(Mf)16 and IS(Mf)9 obtained on 15 April 2015 was reviewed and the turbidity and suspended solids levels of all monitoring stations were well below the action and limit level. Also refer to the attached water quality monitoring data of 15 April 2015 for reference.

8.2.3.5 Nevertheless, the Contractor was reminded to continue to properly and implement all water quality mitigation measures.

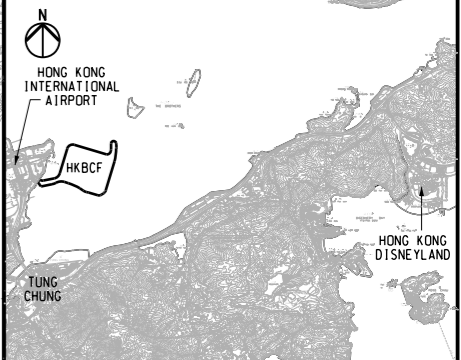
### 8.3 Conclusions

- 8.3.1 The construction phase and EM&A programme of the Project commenced on 12 March 2012.
- 8.3.2 All 1-Hour TSP and 24-Hour TSP results were below the Action and Limit Level in the reporting month.
- 8.3.3 For construction noise, no exceedance was recorded at all monitoring stations in the reporting period.
- 8.3.4 For water quality, two (2) Action Level Exceedances of SS at IS10 and SR5 during Flood tide were recorded on 23 March 2015. No Action and Limit Level exceedances were recorded on other monitoring date in the reporting month. 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 Environmental site inspection was carried out 13 times in the reporting quarter. Recommendations on remedial actions were given to the Contractors for the deficiencies identified during the site audits.
- 8.3.7 As informed by the Contractor on 09 March 2015, there is an air quality complaint received on 06 March 2015. The complainant Mr. Fung requested for follow-up actions to be taken by relevant departments in response to his Complaint about sand and dust emission from 4-5 uncovered sand barges parking near the coastline of Tuen Mun, the complainant concerns about the health problems to residents as the sand is blown to their apartments. After investigation, there is no adequate information to conclude the observed impact is related to this Contract.
- 8.3.8 EPD referred a noise complaint to this project on 10 April 2015 and ENPO forwarded the noise complaint to Environmental Team on 15 April 2015. The complaint involves a complainant, who is resident of Caribbean Coast, Tung Chung and he was disturbed by noise from construction activities of the HZMB Project during weekends and holidays. After investigation, there is no adequate information to conclude the observed noise nuisance is related to this Contract.
- 8.3.9 A complainant contacted EPD through EPD's hotline on 21 May 2015 and complained that noise was generated from construction works when construction of artificial island at Lantau Island area was carried out overnight and dark smoke was emitted by construction plant. EPD's staff has contacted complainant and came to know that the dark smoke referring to could also be construction dust emitting from the filling work at the HKBCF. This complaint was subsequently referred by EPD to HZMB project team on 22 May 2015 to follow-up. With referred to the available information, it is unable to determine whether the night time noise and dark smoke complaint is related to this Contract.
- 8.3.10 No notification of summons or prosecution was received in the reporting quarter.
- 8.3.11 As informed by the Contractor, oil spillage was observed on 14 May 2015 on sea area near Northeastern of Portion C2c. Following the spill response plan ET, IEC and the RSS were informed of the incident by the Contractor.
- 8.3.12 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.
- 8.3.13 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.

- 8.3.14 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.

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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**

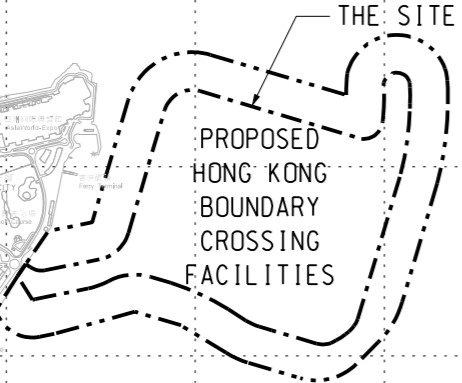
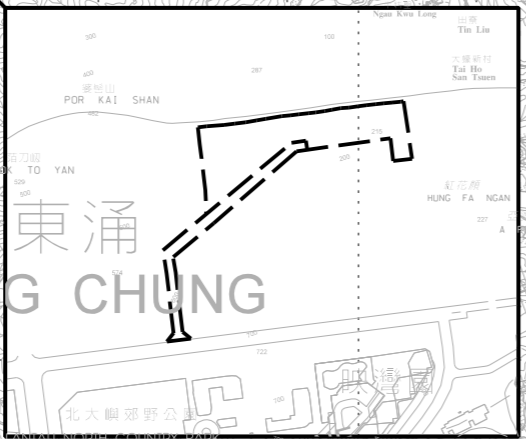
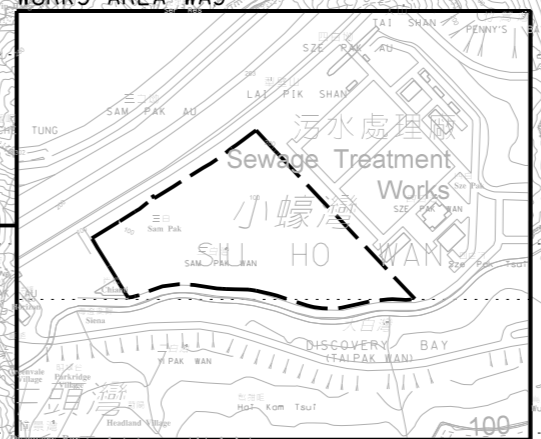
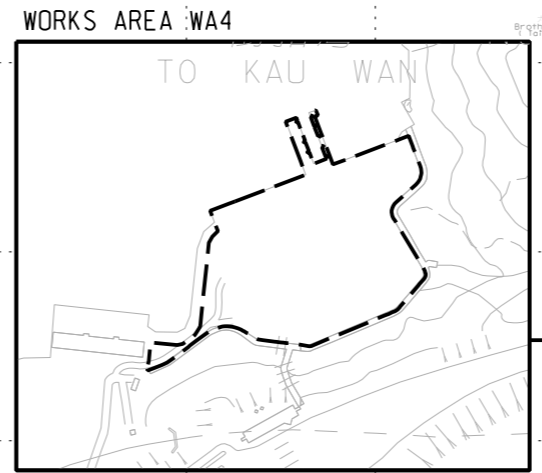
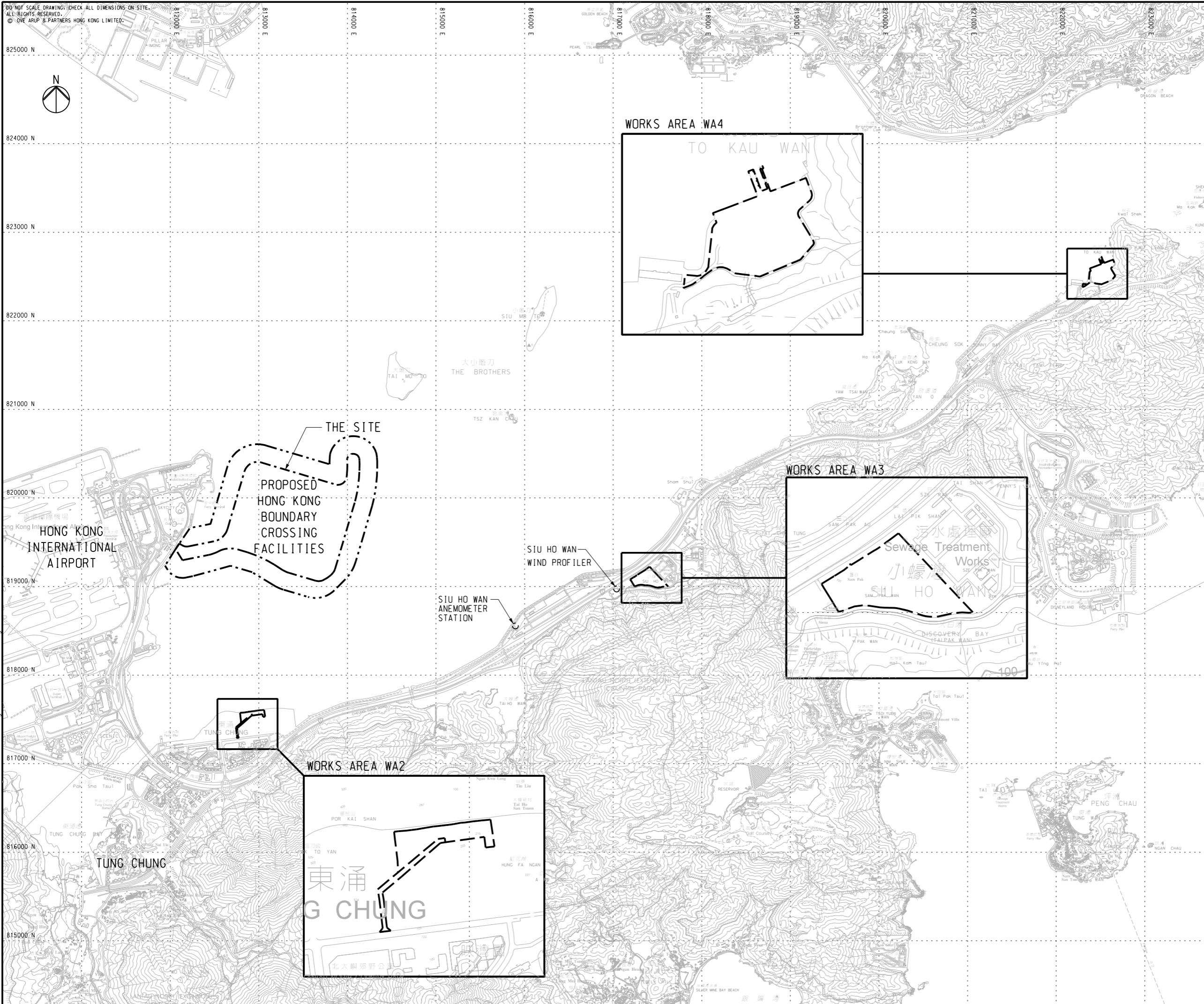
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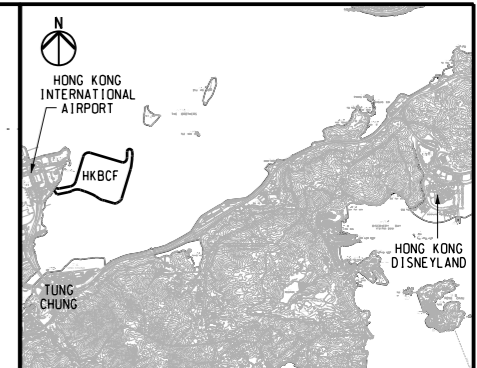
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**KEY PLAN**

- 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

<b>ARUP</b>	奧雅納工程顧問	•
Ove Arup & Partners Hong Kong Limited		
Supported By :	Ecosystems Ltd.	○
	EDA Marine Ltd.	○
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	Hong Kong Cetacean Research Project	○
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	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)**

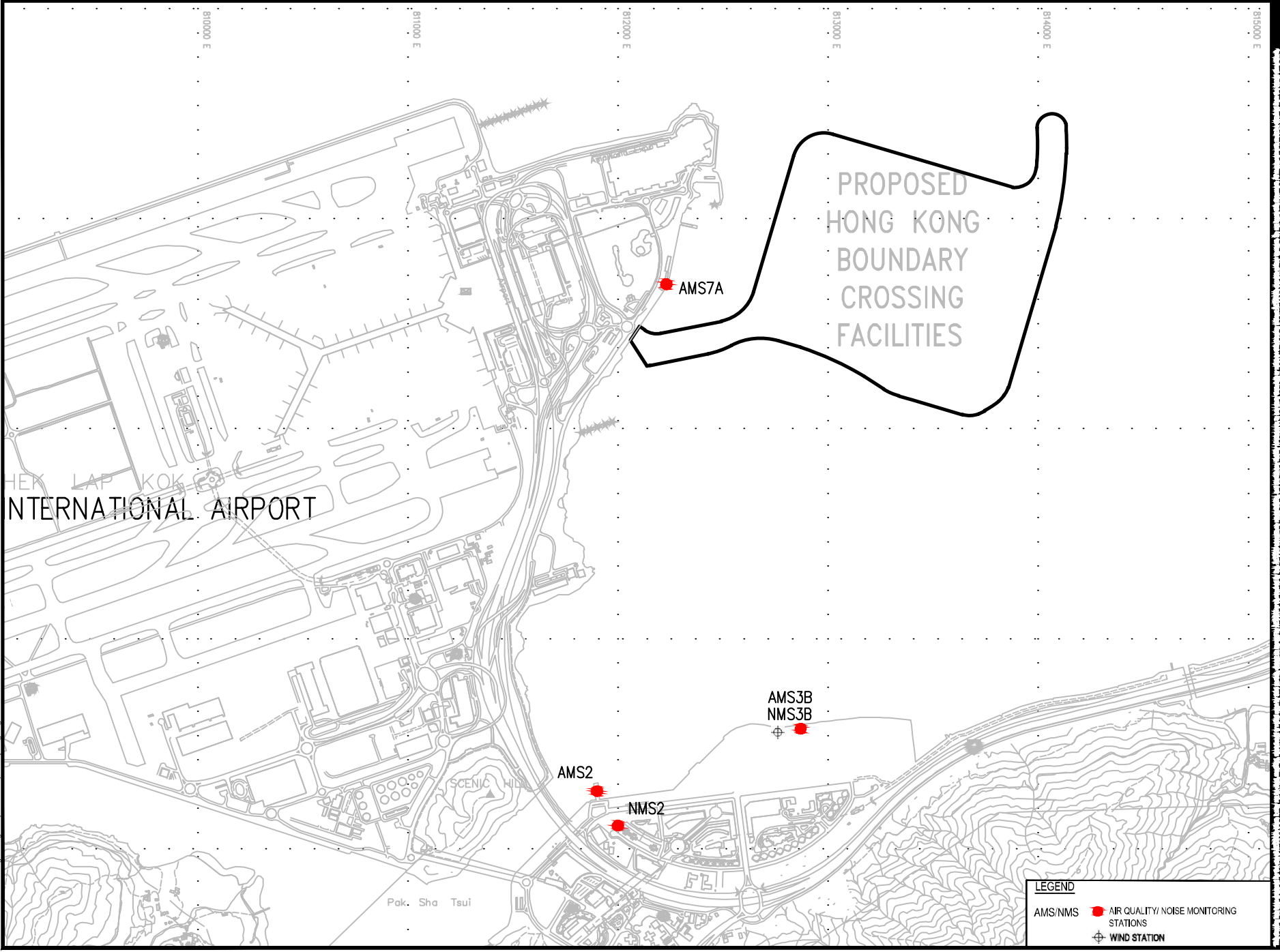
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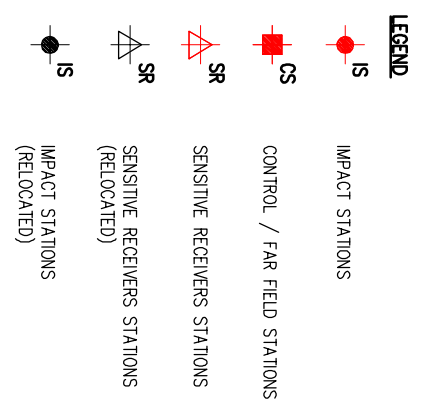
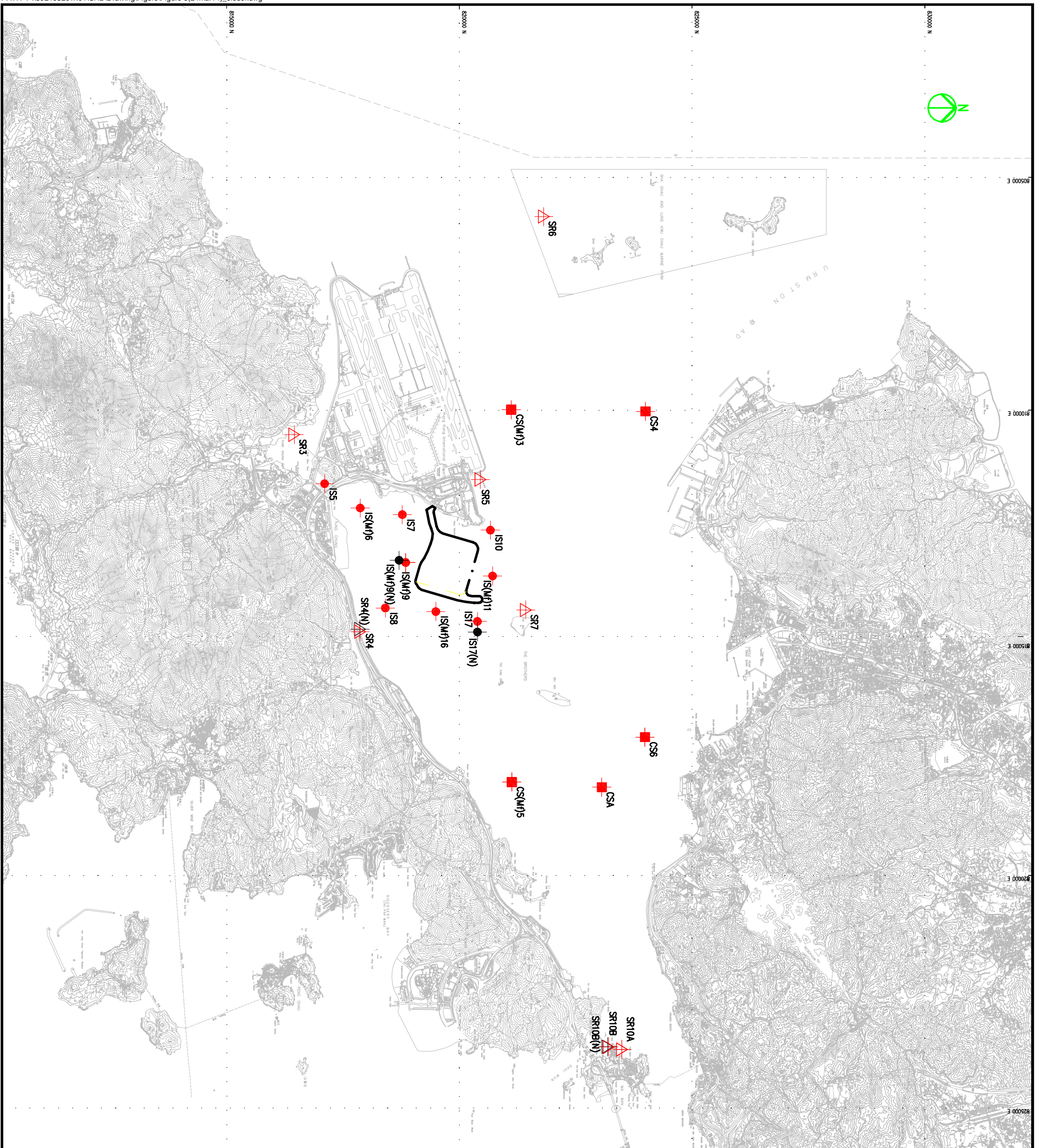
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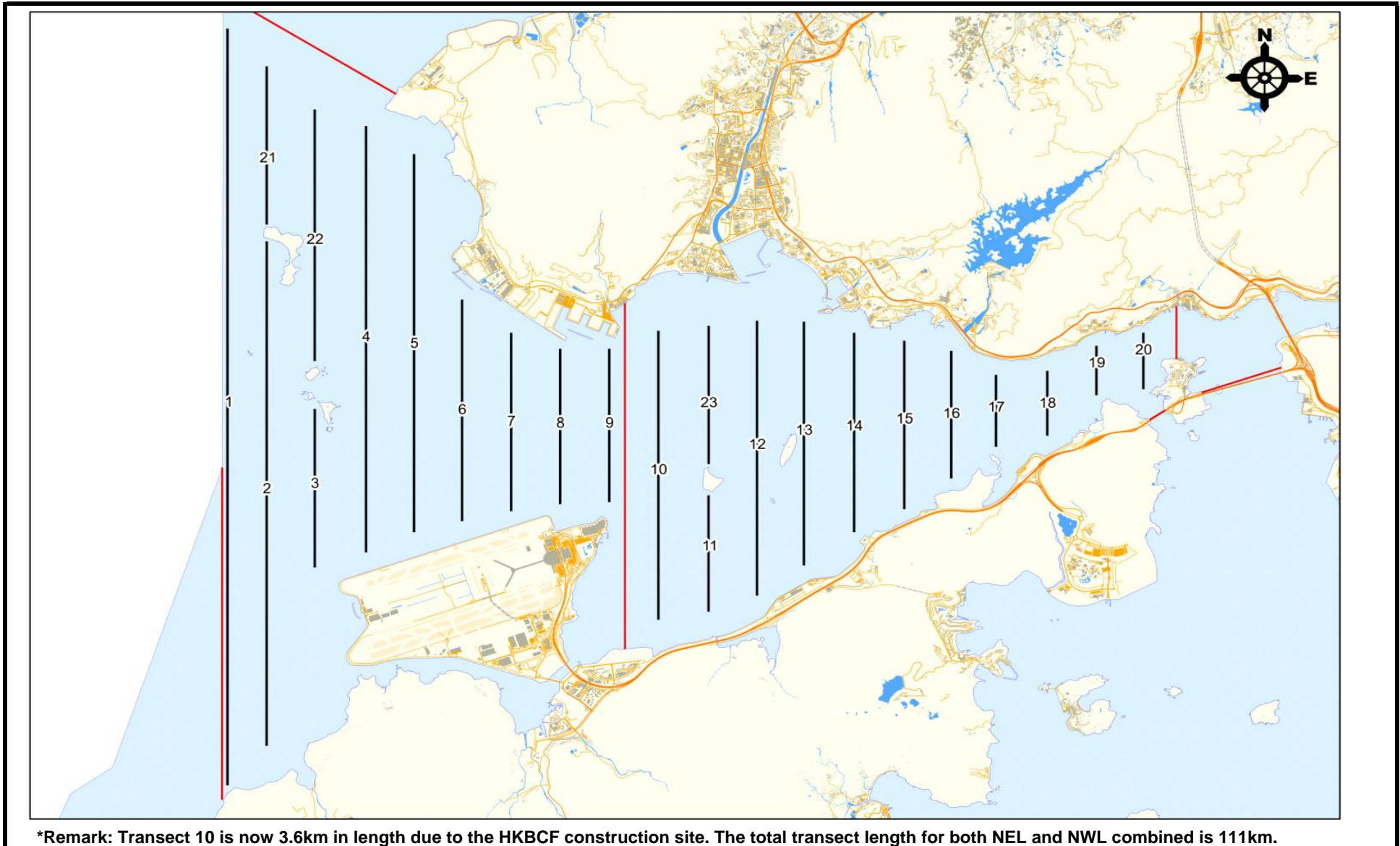




**SETTING OUT SCHEDULE**

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

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**\*Remark: Transect 10 is now 3.6km in length due to the HKBCF construction site. The total transect length for both NEL and NWL combined is 111km.**

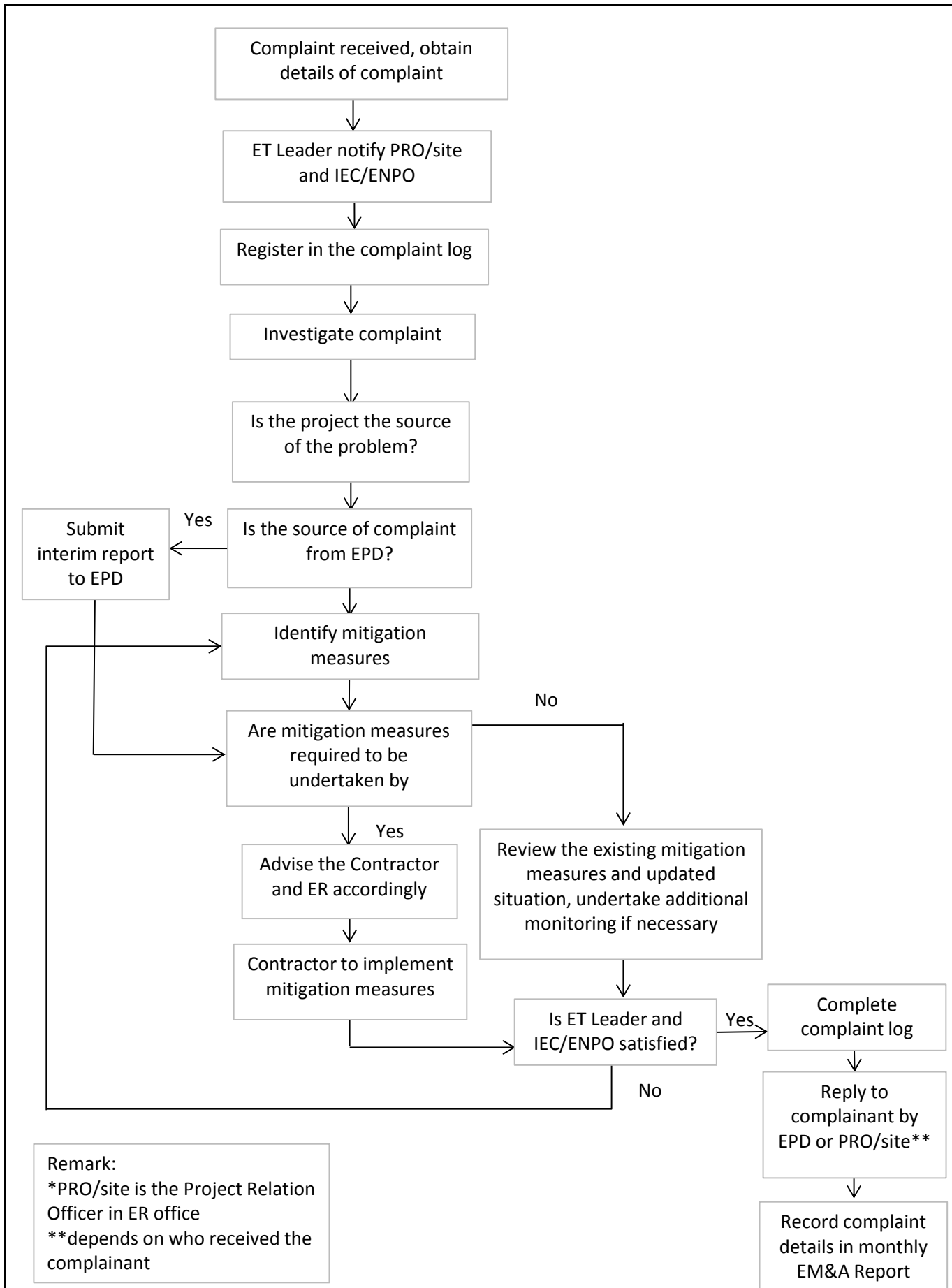
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**HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS  
 Project No.: 60249820 Date: January 13**

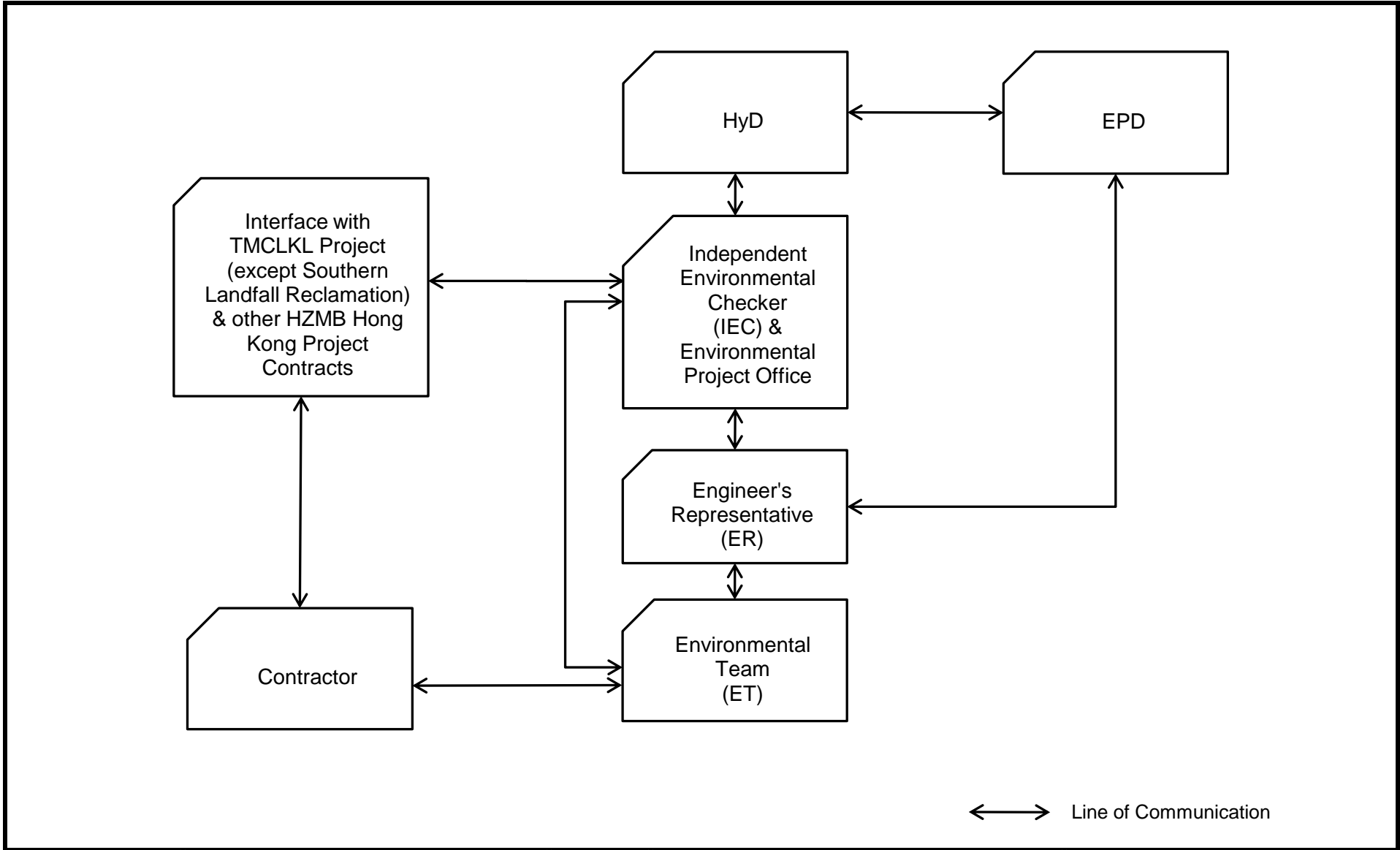
**Impact Dolphin Monitoring  
 Line Transect Layout Map**



**Figure 4**



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Activity ID	Activity Name	Start	Finish	2015			
				Mar	Apr	May	Jun
<b>43rd Monthly Progress Report Status as on 21Jun2015</b>							
<b>Contract Key Dates</b>							
<b>Key Dates for achievement of Stages and completion of Sections</b>							
G1085	KD-06C4TM, Completion of Section BC4TM Edge Area K040 - K046 12Sep2014 w DCM SA4		02-May-15 A				
<b>Work Zone, as defined in PS Clause 1.03(6)</b>							
<b>Portion A, B, C &amp; E</b>							
<b>Portion A, B, C &amp; E</b>							
<b>Seawall</b>							
<b>Cellular Structures</b>							
<b>Cellular Main Cells 85cells</b>							
<b>Full Guide Frames Method 85cells</b>							
<b>Portion E1 C078 &amp; C079 &amp; Portion E2 C065 &amp; C066 4cells</b>							
CSE1-040-0050	PE1 C078 Sheetpiles Collection	26-Jan-15 A	12-Mar-15 A				
CSE1-040-0060	PE1 C078 Sheetpiles Driving	13-Mar-15 A	19-Mar-15 A				
CSE1-040-0065	PE1 C078 Crane Plant removal	20-Mar-15 A	23-Mar-15 A				
CSE1-040-0070	PE1 C078 Backfill inside cell stg1 3,200m3	24-Mar-15 A	27-Mar-15 A				
CSE1-040-0075	PE1 C078 Extension Sheetpiles 2m removal	28-Mar-15 A	01-Apr-15 A				
CSE1-040-0080	PE1 C078 Removal of Crane and Temp Guide Frame	03-Apr-15 A	04-Apr-15 A				
CSE1-040-0090	PE1 C078 Removal of underwater guard ring	05-Apr-15 A	06-Apr-15 A				
CSE1-040-0100	PE1 C078 Removal of Temp Piles	08-Apr-15 A	08-Apr-15 A				
CSE1-040-0110	PE1 C078 Backfill inside cell stg2 5,752m3	09-Apr-15 A	13-Apr-15 A				
CSE1-040-1050	PE1 C079 Sheetpiles Collection	02-Feb-15 A	14-Mar-15 A				
CSE1-040-1060	PE1 C079 Sheetpiles Driving	15-Mar-15 A	21-Mar-15 A				
CSE1-040-1065	PE1 C079 Crane Plant removal	22-Mar-15 A	23-Mar-15 A				
CSE1-040-1070	PE1 C079 Backfill inside cell stg1 3,200m3	24-Mar-15 A	26-Mar-15 A				
CSE1-040-1075	PE1 C079 Extension Sheetpiles 2m removal	20-Mar-15 A	01-Apr-15 A				
CSE1-040-1080	PE1 C079 Removal of Crane & Temp Guide Frame	04-Apr-15 A	04-Apr-15 A				
CSE1-040-1090	PE1 C079 Removal of underwater guard ring	15-Apr-15 A	17-Apr-15 A				
CSE1-040-1100	PE1 C079 Removal of Temp Piles	18-Apr-15 A	18-Apr-15 A				
CSE1-040-1110	PE1 C079 Backfill inside cell stg2 6,134m3	19-Apr-15 A	24-Apr-15 A				
<b>Connecting Arcs</b>							
<b>Portion E1 between C077/078 to C079/080 3nrs</b>							
<b>C077/078</b>							
CAE1-2010	PE1 C077/078 - Temp Piles Drivening	09-Apr-15 A	13-Apr-15 A				
CAE1-2020	PE1 C077/078 - Temp Guide Frame Installation	14-Apr-15 A	14-Apr-15 A				
CAE1-2030	PE1 C077/078 - ICE Certificate & Form 5	15-Apr-15 A	15-Apr-15 A				
CAE1-2040	PE1 C077/078 - Sea Side Arc Sheetpile Assemby	17-Apr-15 A	25-Apr-15 A				
CAE1-2050	PE1 C077/078 - Sea Side Arc Sheetpile Drivening	26-Apr-15 A	27-Apr-15 A				
CAE1-2060	PE1 C077/078 - Land Side Arc Sheetpile Assemby	29-Apr-15 A	06-May-15 A				
CAE1-2070	PE1 C077/078 - Land Side Arc Sheetpile Drivening	07-May-15 A	10-May-15 A				
CAE1-2080	PE1 C077/078 - Removal of Guide Frame	12-May-15 A	12-May-15 A				
CAE1-2090	PE1 C077/078 - Removal of Temp Piles	13-May-15 A	15-May-15 A				
CAE1-2100	PE1 C077/078 - Backfill	10-May-15 A	18-May-15 A				
<b>C078/079</b>							
CAE1-4010	PE1 C078/079 - Temp Piles Drivening	13-May-15 A	15-May-15 A				
CAE1-4020	PE1 C078/079 - Temp Guide Frame Installation	17-May-15 A	18-May-15 A				
CAE1-4030	PE1 C078/079 - ICE Certificate & Form 5	19-May-15 A	20-May-15 A				
CAE1-4040	PE1 C078/079 - Sea Side Arc Sheetpile Assemby	22-May-15 A	29-May-15 A				

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

Activity ID	Activity Name	Start	Finish	2015			
				Mar	Apr	May	Jun
CAE1-4050	PE1 C078/079 - Sea Side Arc Sheetpile Drivening	30-May-15 A	01-Jun-15 A				
<b>C079/080</b>		17-Apr-15 A	29-May-15 A				
CAE1-3010	PE1 C079/080 - Temp Piles Drivening	17-Apr-15 A	19-Apr-15 A				
CAE1-3020	PE1 C079/080 - Temp Guide Frame Installation	24-Apr-15 A	24-Apr-15 A				
CAE1-3030	PE1 C079/080 - ICE Certificate & Form 5	27-Apr-15 A	27-Apr-15 A				
CAE1-3040	PE1 C079/080 - Sea Side Arc Sheetpile Assembly	29-Apr-15 A	06-May-15 A				
CAE1-3050	PE1 C079/080 - Sea Side Arc Sheetpile Drivening	07-May-15 A	08-May-15 A				
CAE1-3060	PE1 C079/080 - Land Side Arc Sheetpile Assembly	18-May-15 A	26-May-15 A				
CAE1-3070	PE1 C079/080 - Land Side Arc Sheetpile Drivening	27-May-15 A	29-May-15 A				
<b>Capping Beams</b>		21-Mar-15 A	20-Apr-15 A				
<b>Portion E1 between C090 to C074 Capping Beams</b>		21-Mar-15 A	20-Apr-15 A				
CBE1-030	PE1 Capping Beams structure C068 to C076 9cells 4days/cell	21-Mar-15 A	20-Apr-15 A				
<b>Conforming Sloping Seawalls</b>		01-Nov-14 A	28-Mar-15 A				
<b>Rockfill</b>		01-Nov-14 A	28-Mar-15 A				
<b>Seawall Portion E1 at C068 - C090 23cells</b>		01-Nov-14 A	28-Mar-15 A				
RFE1-010	PE1 Rockfill at C090 - C081 10cells	01-Nov-14 A	20-Mar-15 A				
RFE1-030	PE1 Rockfill at C076 - C068 9cells	01-Nov-14 A	28-Mar-15 A				
RFE1-099	PE1 Completion of Type V1 seawall		28-Mar-15 A				
<b>Reclamation</b>		31-Dec-14 A	30-Jun-15				
<b>Earthwork Fill</b>		31-Dec-14 A	30-Jun-15				
<b>Land Portion C2a</b>		23-Mar-15 A	15-Jun-15 A				
EFC2a-051	PC2a Edge Area C108-C112 Remedial works by additional band drains (outstanding 1,659nrs from 18May2015)	23-Mar-15 A	15-Jun-15 A				
<b>Land Portion E2</b>		01-Mar-15 A	02-May-15 A				
EFE2-024	PE2 North(N) -Edge 100m Type D Earthwork Sand Fill upto +5.5mPD 43,745m3 10,000m3/day	01-Mar-15 A	31-Mar-15 A				
EFE2-026	PE2 North(N) -Edge 100m Type D Earthwork Sand Fill upto +5.5mPD 11,255m3 14,000m3/day by TSHD	01-May-15 A	02-May-15 A				
<b>Land Portion C2b</b>		31-Dec-14 A	30-Jun-15				
EFC2b-010	PC2b Earthwork Fill Type B public w compaction upto +5.5mPD 168,546m3 5,000m3/day	31-Dec-14 A	30-Jun-15				
<b>Land Portion C2c</b>		31-Dec-14 A	30-Jun-15				
EFC2c-010	PC2c Earthwork Fill Type B public w compaction upto +5.5mPD 276,853m3 5,000m3/day	31-Dec-14 A	30-Jun-15				
<b>Surcharge</b>		05-Sep-14 A	15-Nov-15				
<b>Portion A Surcharge</b>		05-Sep-14 A	10-Aug-15				
<b>Main Reclamation Areas</b>		05-Sep-14 A	04-May-15 A				
SURA0-040	Completion of Section A at Main Reclamation Area		20-Mar-15 A				
<b>A2 East</b>		05-Sep-14 A	20-Mar-15 A				
SURA0-420	PA A2 East Surcharge Period as +11.5mPD 6mths (8-2=6mths)	05-Sep-14 A	04-Mar-15 A				
SURA0-425	PA A2 East Issue of Removal Surcharge	09-Mar-15 A					
SURA0-430	PA A2 East Surcharge Removal 75,757m3 10,000m3/day	09-Mar-15 A	20-Mar-15 A				
SURA0-440	Completion of PA Main Areas		20-Mar-15 A				
<b>Area of CLP substation</b>		05-Sep-14 A	04-May-15 A				
SUEA2-0070	PA CLP Substation Sand Surcharge Period as +11.5mPD 8mths	05-Sep-14 A	04-May-15 A				
<b>Edge Area From SOL offset within 180m to 50m</b>		19-Oct-14 A	10-Aug-15				
<b>CH5+110 to 5+440 Portion A North</b>		19-Oct-14 A	27-May-15 A				
<b>Area of 50m to 120 from Offset</b>		28-Dec-14 A	27-May-15 A				
SUEA1-2090	PA North 120m-50m from Offset Surcharge Period +11.5mPD 5mths	28-Dec-14 A	27-May-15 A				
<b>Area of 0 to 50m from Offset</b>		19-Oct-14 A	27-May-15 A				
SUEA1-2150	PA North 50m-40m Surcharge Sand Laying upto +11.5mPD 87520m3 8,000m3/day	14-Mar-15 A	20-Apr-15 A				
SUEA1-2180	PA North 50m-10m Surcharge Period +7.0mPD 5mths	19-Oct-14 A	27-May-15 A				
<b>CH5+440 to 5+650 Portion A South</b>		15-Nov-14 A	10-Aug-15				
<b>Area of 40m - 120m from Offset (other CLP area)</b>		06-Mar-15 A	10-Aug-15				
<b>Upto +11.5mPD Area</b>		06-Mar-15 A	10-Aug-15				
SUEA3-0060	PA South 120m-40m from SOL Surcharge Sand Laying upto +11.5mPD 60,480m3 8,000m3/day	06-Mar-15 A	13-Mar-15 A				
SUEA3-0070	PA South Surcharge Period +11.5mPD 5mths	14-Mar-15 A	10-Aug-15				
<b>Area of 10m - 40m from Offset (other CLP area)</b>		15-Nov-14 A	10-Aug-15				

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

Activity ID	Activity Name	Start	Finish	2015			
				Mar	Apr	May	Jun
SUEA4-0040	PA South 40m-10m from SOL Surcharge Sand Laying upto +9.5mPD 34,020m3 1,000m3/day by TSHD	15-Nov-14 A	30-May-15 A	[Gantt bar: Mar to Jun]			
SUEA4-0070	PA South 40m-10m Surcharge Period 5mths	15-Nov-14 A	10-Aug-15	[Gantt bar: Mar to Jun]			
<b>Land Portion B</b>		13-Oct-14 A	28-Sep-15	[Gantt bar: Mar to Jun]			
<b>Edge Areas</b>		21-Jan-15 A	28-Sep-15	[Gantt bar: Mar to Jun]			
<b>Deep Cement Mixing at K040 - K046</b>		21-Jan-15 A	02-May-15 A	[Gantt bar: Mar to Jun]			
DCM-1050	PB Edge Area K040-K046 Deep Cement Mixing 73m width - 1st 3plants Installation 98,000m3	21-Jan-15 A	28-Apr-15 A	[Gantt bar: Mar to Jun]			
DCM-1060	PB Edge Area K040-K046 Deep Cement Mixing 73m width - 2nd 3plants Installation 83,500m3	04-Feb-15 A	28-Apr-15 A	[Gantt bar: Mar to Jun]			
DCM-1080	PB Edge Area K040-K046 Filling up to +5.5mPD 41,000m3 10,000m3/day at DCM by TSHD	29-Apr-15 A	02-May-15 A	[Gantt bar: Mar to Jun]			
DCM-1090	PB Edge Area K040-K046 Completion (Target Date = 31Dec2014)		02-May-15 A	[Gantt bar: Mar to Jun]			
<b>Deep Cement Mixing at K047 - K052</b>		26-Feb-15 A	30-Jun-15	[Gantt bar: Mar to Jun]			
DCM-2010	PB Edge Area K047-K052 Mobilization ( 5 Plants)	26-Feb-15 A	10-Mar-15 A	[Gantt bar: Mar to Jun]			
DCM-2020	PB Edge Area K047-K052 Deep Cement Mixing 30m width - Installation 123,470m3	11-Mar-15 A	30-Jun-15	[Gantt bar: Mar to Jun]			
<b>at K028 - K039</b>		01-Apr-15 A	28-Sep-15	[Gantt bar: Mar to Jun]			
SUEB0-060	PB Edge Area K028-K039 Sand Surcharge upto 8.5mPD 45,272m3 5,000m3/day upto 20Apr2015	01-Apr-15 A	20-Apr-15 A	[Gantt bar: Mar to Jun]			
SUEB0-062	PB Edge Area K028-K039 Sand Surcharge upto 8.5mPD 45,448m3 10,000m3/day stg2 by TSHD	11-May-15 A	16-May-15 A	[Gantt bar: Mar to Jun]			
SUEB0-070	PB Edge Area K028-K039 Surcharge Period +8.5mPD 4.5mths	17-May-15 A	28-Sep-15	[Gantt bar: Mar to Jun]			
<b>at K013 - K027</b>		26-Jan-15 A	29-Jun-15	[Gantt bar: Mar to Jun]			
SUEB0-007	PB Edge Area K013-K027 Additional Works by Additional Band Drains 8,480hrs	26-Jan-15 A	19-Apr-15 A	[Gantt bar: Mar to Jun]			
SUEB0-010	PB Edge Area K013-K027 Sand Surcharge upto 6.5mPD 61,766m3 10,000m3/day by TSHD	27-May-15 A	29-Jun-15	[Gantt bar: Mar to Jun]			
<b>Reclamation Areas</b>		13-Oct-14 A	10-Jun-15 A	[Gantt bar: Mar to Jun]			
<b>at East of Main Area</b>		13-Oct-14 A	12-May-15 A	[Gantt bar: Mar to Jun]			
SURB0-040	PB Main Area East Sand Surcharge Period +11.5mPD (12May2015 after 7mths surcharge)	13-Oct-14 A	12-May-15 A	[Gantt bar: Mar to Jun]			
<b>at West of Main Area stg1</b>		20-Oct-14 A	19-May-15 A	[Gantt bar: Mar to Jun]			
SURB1-030	PB Main Area West-S Sand Surcharge Period +11.5mPD (19May2015 after 7mths surcharge)	20-Oct-14 A	19-May-15 A	[Gantt bar: Mar to Jun]			
<b>at West of Main Area stg2</b>		11-Nov-14 A	10-Jun-15 A	[Gantt bar: Mar to Jun]			
SURB2-030	PB Main Area West-N Sand Surcharge Period +11.5mPD (10Jun2015 after 7mths)	11-Nov-14 A	10-Jun-15 A	[Gantt bar: Mar to Jun]			
<b>Land Portion C2a</b>		01-Mar-15 A	31-Jul-15	[Gantt bar: Mar to Jun]			
<b>Edge Areas</b>		01-Mar-15 A	31-Jul-15	[Gantt bar: Mar to Jun]			
<b>Deep Cement Mixing Works at C101 - C103</b>		30-Apr-15 A	31-Jul-15	[Gantt bar: Mar to Jun]			
DCM-3010	PC2a Edge Area C101-C103 Mobilization from K040-K046 3plants	30-Apr-15 A	29-May-15 A	[Gantt bar: Mar to Jun]			
DCM-3020	PC2a Edge Area C101-C103 30m width x 128.5m Length Installation 56,700m3	30-May-15 A	31-Jul-15	[Gantt bar: Mar to Jun]			
<b>CH4+710 - CH5+110 Rubble Mound Seawall</b>		01-Mar-15 A	16-May-15 A	[Gantt bar: Mar to Jun]			
<b>40-120m</b>		01-Mar-15 A	16-May-15 A	[Gantt bar: Mar to Jun]			
SUEC2a-1010	PC2a 70m from SOL Check Point for Undrained shear strength Area at +5.5mPD 1mths	01-Mar-15 A	10-May-15 A	[Gantt bar: Mar to Jun]			
SUEC2a-1020	PC2a rubble mound seawall 120m-40m from SOL Surcharge Sand upto 7.5mPD stg1 24,000m3 4,000m3/day by T	11-May-15 A	16-May-15 A	[Gantt bar: Mar to Jun]			
<b>Reclamation Areas</b>		01-Apr-15 A	09-May-15 A	[Gantt bar: Mar to Jun]			
<b>South</b>		01-Apr-15 A	20-Apr-15 A	[Gantt bar: Mar to Jun]			
SURC2a-010	PC2a Main East Sand Surcharge Laying upto 8.5mPD 184,068m3 7,500m3/day by TSHD	01-Apr-15 A	20-Apr-15 A	[Gantt bar: Mar to Jun]			
SURC2a-014	PC2a Main South Sand Surcharge Laying upto 11.5mPD 138,901m3 by TSHD upto 20Apr2015	16-Apr-15 A	20-Apr-15 A	[Gantt bar: Mar to Jun]			
<b>North</b>		09-Apr-15 A	09-May-15 A	[Gantt bar: Mar to Jun]			
SURC2a-060	PC2a Main North Sand Surcharge Laying upto 8.5mPD 100,961m3 by TSHD upto 20Apr2015	09-Apr-15 A	20-Apr-15 A	[Gantt bar: Mar to Jun]			
SURC2a-062	PC2a Main North Sand Surcharge Laying upto 8.5mPD 83,107m3 14,000m3/day by TSHD from 28Apr2015	04-May-15 A	09-May-15 A	[Gantt bar: Mar to Jun]			
<b>Land Portion C1a</b>		01-Jan-15 A	28-Aug-15	[Gantt bar: Mar to Jun]			
<b>Reclamation Areas</b>		01-Jan-15 A	28-Aug-15	[Gantt bar: Mar to Jun]			
SURC1a-020	PC1a Main Area East Sand Surcharge Period as +11.5mPD 7mths	01-Jan-15 A	29-Jul-15	[Gantt bar: Mar to Jun]			
SURC1a-022	PC1a Main Area West Sand Surcharge Period as +11.5mPD 8mths	01-Jan-15 A	28-Aug-15	[Gantt bar: Mar to Jun]			
<b>Land Portion C1b</b>		22-Jan-15 A	31-Aug-15	[Gantt bar: Mar to Jun]			
<b>Reclamation Areas</b>		22-Jan-15 A	31-Aug-15	[Gantt bar: Mar to Jun]			
<b>West (1/4 Areas) (Include C1b C8NW)</b>		22-Jan-15 A	18-Aug-15	[Gantt bar: Mar to Jun]			
SURC1b-020	PC1b West Sand Surcharge Period 7mths	22-Jan-15 A	18-Aug-15	[Gantt bar: Mar to Jun]			
<b>East (3/4 Areas) (Include C1b C8SE)</b>		01-Feb-15 A	31-Aug-15	[Gantt bar: Mar to Jun]			
SURC1b-050	PC1b East Sand Surcharge Period +11.5mPD 7mths	01-Feb-15 A	31-Aug-15	[Gantt bar: Mar to Jun]			
<b>Land Portion E2</b>		09-Feb-15 A	15-Nov-15	[Gantt bar: Mar to Jun]			

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



Activity ID	Activity Name	Start	Finish	2015			
				Mar	Apr	May	Jun
<b>North Part</b>							
<b>Edge Areas - North, Land Area C066-C067 &amp; Edge Area C064-C067</b>							
SUEE2-110	PE2 North & East Edge C064-C067 Sand Surcharge Period as +5.5mPD 30days and Testing	03-May-15 A	03-Sep-15				
<b>Land Areas - East (TM) C057 - C065</b>							
SURE2-040-1	PE2 North Main Sand Surcharge tunnel area Laying upto 8.5mPD 64,632m3 20,000m3/day	07-Apr-15 A	15-Nov-15				
SURE2-042-1	PE2 North Main Sand Surcharge tunnel area Laying upto 11.5mPD at tunnel area 64,631m3 20,000m3/day	11-Apr-15 A	15-Apr-15 A				
SURE2-050	PE2 Land C057-C065 Tunnel Sand Surcharge Period as +11.5mPD at tunnel area 7mths	16-Apr-15 A	15-Nov-15				
<b>South Part</b>							
<b>Edge Areas East C056 to C063</b>							
SUEE2-009	PE2 North-E Edge Sand Period as +5.5mPD 1mths	01-Mar-15 A	12-Oct-15				
SUEE2-010	PE2 Edge C057-C063 Sand Surcharge Laying up to 8.5mPD 73,756m3 7,000m3/day by TSHD	14-May-15 A	30-May-15 A				
SUEE2-020	PE2 Edge C057-C063 Sand Surcharge Period as +8.5mPD 4.5mths	31-May-15 A	12-Oct-15				
<b>Edge Areas East C052 to C055</b>							
SUEE2-005	PE2 East Edge Sand Period as +5.5mPD 1mth	12-Feb-15 A	11-Mar-15 A				
<b>Land Areas</b>							
<b>Out of K052 300m</b>							
SURE2-012	PE2 Land C052-C060 Non-Tunnel Sand Surcharge Laying upto 8.5mPD 117,620m3 7,000m3/day by TSHD	04-May-15 A	01-Jul-15				
SURE2-015	PE2 South Main Sand Surcharge Laying upto 11.5mPD 56,012m3 10,000m3/day by TSHD	09-Feb-15 A	20-Apr-15 A				
<b>Geotechnical Instrumentation Works</b>							
<b>Geotechnical Instrumentation Works for Seawalls</b>							
<b>Cluster Type SD 26nrs Instrumentation and CPT Cluster behind cells</b>							
<b>Portion C2b &amp; C2c</b>							
<b>SD-18 C094</b>							
CTSD-180	Installation of SD-18 (C094) PC2c	16-Dec-14 A	30-Apr-15 A				
<b>SD-19 C099</b>							
CTSD-190	Installation of SD-19 (C099) PC2c	16-Dec-14 A	30-Apr-15 A				
<b>Cluster Type SE 26nrs Surface movement marker cluster at top of cell and sloping seawall</b>							
CTSE-120	Installation of SE-12 (C069) PE2	16-Mar-15 A	20-May-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	21-May-15 A	21-May-15 A				
<b>Precast Yard for Seawall Blocks &amp; Culverts</b>							
<b>Culverts</b>							
<b>Culverts C1</b>							
<b>C1-2</b>							
PY-C1-2050	PD C01-2 - Foundation Formwork Removal	04-Mar-15 A	22-Jun-15				
PY-C1-2060	PD C01-2 - Wall internal Formwork	04-Mar-15 A	20-Apr-15 A				
PY-C1-2070	PD C01-2 - Wall Rebar Fixing	22-Mar-15 A	06-Mar-15 A				
PY-C1-2080	PD C01-2 - Wall External Formwork	30-Mar-15 A	29-Mar-15 A				
PY-C1-2090	PD C01-2 - Wall Concrete	01-Apr-15 A	04-Apr-15 A				
PY-C1-2100	PD C01-2 - Wall External Formwork Removal	09-Apr-15 A	08-Apr-15 A				
PY-C1-2110	PD C01-2 - Wall Internal Formwork Removal	14-Apr-15 A	09-Apr-15 A				
PY-C1-2120	PD C01-2 - Top Slab Formwork Removal	09-Apr-15 A	20-Apr-15 A				
<b>C1-3</b>							
PY-C1-3010	PD C01-3 - Foundation Platform	14-Apr-15 A	18-Apr-15 A				
PY-C1-3020	PD C01-3 - Foundation Rebar Fixing	11-Mar-15 A	14-Mar-15 A				
PY-C1-3030	PD C01-3 - Foundation Formwork	15-Mar-15 A	21-Mar-15 A				
PY-C1-3040	PD C01-3 - Foundation Concrete	24-Mar-15 A	30-Mar-15 A				
PY-C1-3050	PD C01-3 - Foundation Formwork Removal	31-Mar-15 A	31-Mar-15 A				
PY-C1-3060	PD C01-3 - Wall internal Formwork	01-Apr-15 A	04-Apr-15 A				

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

Activity ID	Activity Name	Start	Finish	2015			
				Mar	Apr	May	Jun
PY-C1-3070	PD C01-3 - Wall Rebar Fixing	17-Apr-15 A	20-Apr-15 A				
PY-C1-3080	PD C01-3 - Wall External Formwork	22-Apr-15 A	24-Apr-15 A				
PY-C1-3090	PD C01-3 - Wall Concrete	25-Apr-15 A	25-Apr-15 A				
PY-C1-3100	PD C01-3 - Wall External Formwork Removal	28-Apr-15 A	28-Apr-15 A				
PY-C1-3110	PD C01-3 - Wall Internal Formwork Removal	01-May-15 A	09-May-15 A				
PY-C1-3120	PD C01-3 - Top Slab Formwork Removal	01-May-15 A	09-May-15 A				
<b>C1-4</b>		<b>09-Mar-15 A</b>	<b>08-Apr-15 A</b>	[Summary bar]			
PY-C1-4060	PD C01-4 - Wall internal Formwork	09-Mar-15 A	19-Mar-15 A				
PY-C1-4070	PD C01-4 - Wall Rebar Fixing	21-Mar-15 A	24-Mar-15 A				
PY-C1-4080	PD C01-4 - Wall External Formwork	24-Mar-15 A	01-Apr-15 A				
PY-C1-4090	PD C01-4 - Wall Concrete	02-Apr-15 A	02-Apr-15 A				
PY-C1-4100	PD C01-4 - Wall External Formwork Removal	06-Apr-15 A	08-Apr-15 A				
PY-C1-4110	PD C01-4 - Wall Internal Formwork Removal	06-Apr-15 A	08-Apr-15 A				
PY-C1-4120	PD C01-4 - Top Slab Formwork Removal	06-Apr-15 A	08-Apr-15 A				
<b>C1-5</b>		<b>04-Mar-15 A</b>	<b>08-Mar-15 A</b>	[Summary bar]			
PY-C1-5100	PD C01-5 - Wall External Formwork Removal	04-Mar-15 A	08-Mar-15 A				
PY-C1-5110	PD C01-5 - Wall Internal Formwork Removal	04-Mar-15 A	08-Mar-15 A				
PY-C1-5120	PD C01-5 - Top Slab Formwork Removal	04-Mar-15 A	08-Mar-15 A				
<b>C1-6</b>		<b>22-Mar-15 A</b>	<b>22-Jun-15</b>	[Summary bar]			
PY-C1-6010	PD C01-6 - Foundation Platform	22-Mar-15 A	26-Mar-15 A				
PY-C1-6020	PD C01-6 - Foundation Rebar Fixing	31-Mar-15 A	01-Apr-15 A				
PY-C1-6030	PD C01-6 - Foundation Formwork	03-Apr-15 A	09-Apr-15 A				
PY-C1-6040	PD C01-6 - Foundation Concrete	10-Apr-15 A	10-Apr-15 A				
PY-C1-6050	PD C01-6 - Foundation Formwork Removal	12-Apr-15 A	13-Apr-15 A				
PY-C1-6060	PD C01-6 - Wall internal Formwork	15-Apr-15 A	20-Apr-15 A				
PY-C1-6070	PD C01-6 - Wall Rebar Fixing	21-Apr-15 A	29-Apr-15 A				
PY-C1-6080	PD C01-6 - Wall External Formwork	24-Apr-15 A	29-Apr-15 A				
PY-C1-6090	PD C01-6 - Wall Concrete	30-Apr-15 A	30-Apr-15 A				
PY-C1-6100	PD C01-6 - Wall External Formwork Removal	08-May-15 A	08-May-15 A				
PY-C1-6110	PD C01-6 - Wall Internal Formwork Removal	20-May-15 A	22-Jun-15				
<b>Culverts C2</b>		<b>20-Jan-15 A</b>	<b>26-Jun-15</b>	[Summary bar]			
<b>C2-2</b>		<b>29-Mar-15 A</b>	<b>11-May-15 A</b>	[Summary bar]			
PY-C2-2010	PD C02-2 - Foundation Platform	29-Mar-15 A	05-Apr-15 A				
PY-C2-2020	PD C02-2 - Foundation Rebar Fixing	05-Apr-15 A	07-Apr-15 A				
PY-C2-2030	PD C02-2 - Foundation Formwork	11-Apr-15 A	14-Apr-15 A				
PY-C2-2040	PD C02-2 - Foundation Concrete	15-Apr-15 A	15-Apr-15 A				
PY-C2-2050	PD C02-2 - Foundation Formwork Removal	17-Apr-15 A	18-Apr-15 A				
PY-C2-2060	PD C02-2 - Wall internal Formwork	21-Apr-15 A	29-Apr-15 A				
PY-C2-2070	PD C02-2 - Wall Rebar Fixing	30-Apr-15 A	04-May-15 A				
PY-C2-2080	PD C02-2 - Wall External Formwork	01-May-15 A	04-May-15 A				
PY-C2-2090	PD C02-2 - Wall Concrete	05-May-15 A	05-May-15 A				
PY-C2-2100	PD C02-2 - Wall External Formwork Removal	11-May-15 A	11-May-15 A				
<b>C2-3</b>		<b>20-Jan-15 A</b>	<b>26-Jun-15</b>	[Summary bar]			
PY-C2-3010	PD C02-3 - Foundation Platform	20-Jan-15 A	04-Mar-15 A				
PY-C2-3020	PD C02-3 - Foundation Rebar Fixing	07-Mar-15 A	13-Mar-15 A				
PY-C2-3030	PD C02-3 - Foundation Formwork	14-Mar-15 A	18-Mar-15 A				
PY-C2-3040	PD C02-3 - Foundation Concrete	19-Mar-15 A	19-Mar-15 A				
PY-C2-3050	PD C02-3 - Foundation Formwork Removal	20-Mar-15 A	24-Mar-15 A				
PY-C2-3060	PD C02-3 - Wall internal Formwork	03-May-15 A	09-May-15 A				
PY-C2-3070	PD C02-3 - Wall Rebar Fixing	10-May-15 A	26-Jun-15				
PY-C2-3080	PD C02-3 - Wall External Formwork	14-May-15 A	26-Jun-15				

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

Activity ID	Activity Name	Start	Finish	2015			
				Mar	Apr	May	Jun
<b>C2-4</b>							
PY-C2-4010	PD C02-4 - Foundation Platform	06-Apr-15 A	19-May-15 A				
PY-C2-4020	PD C02-4 - Foundation Rebar Fixing	06-Apr-15 A	10-Apr-15 A				
PY-C2-4030	PD C02-4 - Foundation Formwork	12-Apr-15 A	16-Apr-15 A				
PY-C2-4040	PD C02-4 - Foundation Concrete	17-Apr-15 A	21-Apr-15 A				
PY-C2-4050	PD C02-4 - Foundation Formwork Removal	22-Apr-15 A	22-Apr-15 A				
PY-C2-4060	PD C02-4 - Wall internal Formwork	23-Apr-15 A	10-May-15 A				
<b>C2-5</b>							
PY-C2-5010	PD C02-5 - Foundation Platform	11-May-15 A	19-May-15 A				
PY-C2-5020	PD C02-5 - Foundation Rebar Fixing	26-Apr-15 A	16-May-15 A				
PY-C2-5030	PD C02-5 - Foundation Formwork	26-Apr-15 A	30-Apr-15 A				
PY-C2-5040	PD C02-5 - Foundation Concrete	01-May-15 A	09-May-15 A				
PY-C2-5050	PD C02-5 - Foundation Formwork Removal	10-May-15 A	13-May-15 A				
<b>Culverts C3</b>							
<b>C3-2</b>							
PY-C3-2100	PD C03-2 - Wall External Formwork Removal	14-Mar-15 A	22-Mar-15 A				
PY-C3-2110	PD C03-2 - Wall Internal Formwork Removal	14-Mar-15 A	18-Mar-15 A				
PY-C3-2120	PD C03-2 - Top Slab Formwork Removal	14-Mar-15 A	18-Mar-15 A				
<b>Culverts C4</b>							
<b>C4-2</b>							
PY-C4-2110	PD C04-2 - Wall Internal Formwork Removal	01-Mar-15 A	13-Mar-15 A				
PY-C4-2120	PD C04-2 - Top Slab Formwork Removal	01-Mar-15 A	08-Mar-15 A				
<b>C4-5</b>							
PY-C4-5100	PD C04-5 - Wall External Formwork Removal	01-Mar-15 A	08-Mar-15 A				
PY-C4-5110	PD C04-5 - Wall Internal Formwork Removal	08-Mar-15 A	13-Mar-15 A				
PY-C4-5120	PD C04-5 - Top Slab Formwork Removal	08-Mar-15 A	13-Mar-15 A				
<b>Site Construction</b>							
<b>Surcharge</b>							
<b>West1 Portion</b>							
A1660	PD West1 - Surcharge Period +11.5mPD 6mths	28-Oct-14 A	25-Jun-15				
A1670	PD West1 - Advanced 14days notice to remove surcharge issued by RE	30-Oct-14 A	03-Jun-15 A				
A1700	PD West1 - Preparation Works & Mobilization of plant	30-Oct-14 A	27-Apr-15 A				
A1930	PD West1 - Surcharge Removal 60,000m3 5,000m3/day	05-May-15 A	18-May-15 A				
<b>West2 Portion</b>							
A2220	PD West2 - Surcharge Period +11.5mPD 6mths	10-May-15 A	03-Jun-15 A				
A2224	PD West2 - Advanced 7days notice to remove surcharge issued by RE	28-Oct-14 A	11-May-15 A				
<b>East1 Portion</b>							
A1690	PD East1 - Surcharge Period +11.5mPD 6mths	28-Oct-14 A	25-Jun-15				
<b>East2 Portion</b>							
A2260	PD East2 - Surcharge Period +11.5mPD 6mths	26-Nov-14 A	24-May-15 A				
<b>Works Area WA2 (Tung Chung)</b>							
<b>Zone A</b>							
A1880	Maintenance of Engineer's Accommodation	21-May-12 A	28-Feb-17				
<b>Works Area TKO Fill Bank</b>							
WA-TKO-1040	Operate and Maintain Public Fill Sorting Facilities in Zone A, B1 & B2	25-Sep-12 A	30-Nov-16				

█ Remaining Level of Effort    ◆ Milestone  
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█ Remaining Work  
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**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^	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.

^ Action Level set out at AMS7 Hong Kong SkyCity Marriot 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	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.

^ Action Level set out at AMS7 Hong Kong SkyCity Marriot 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.



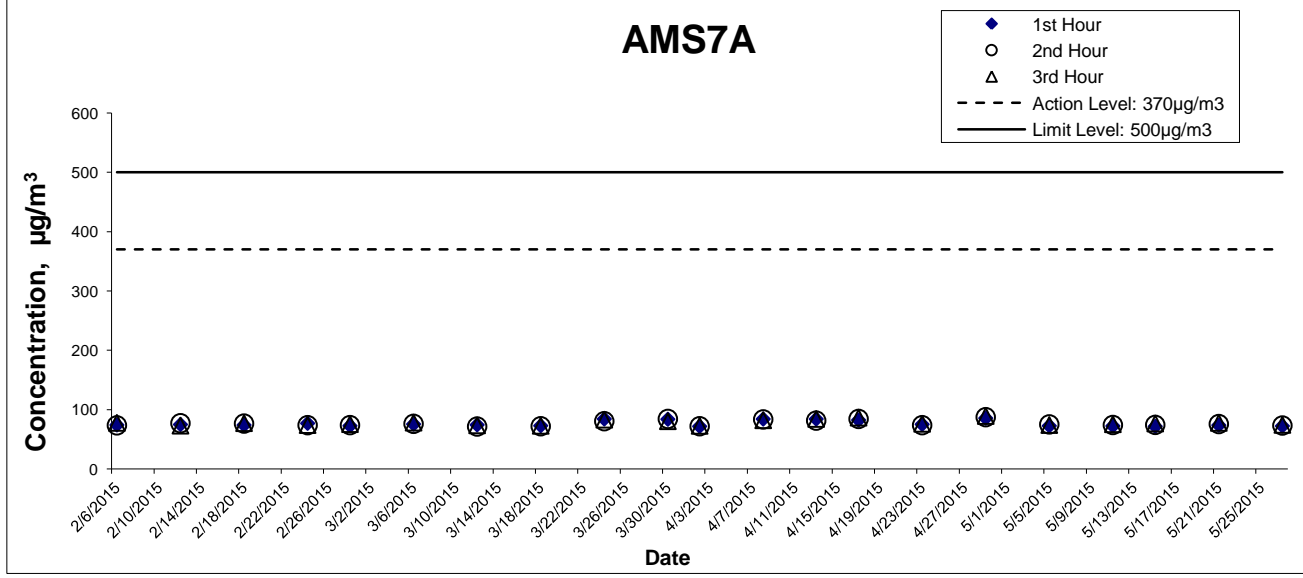
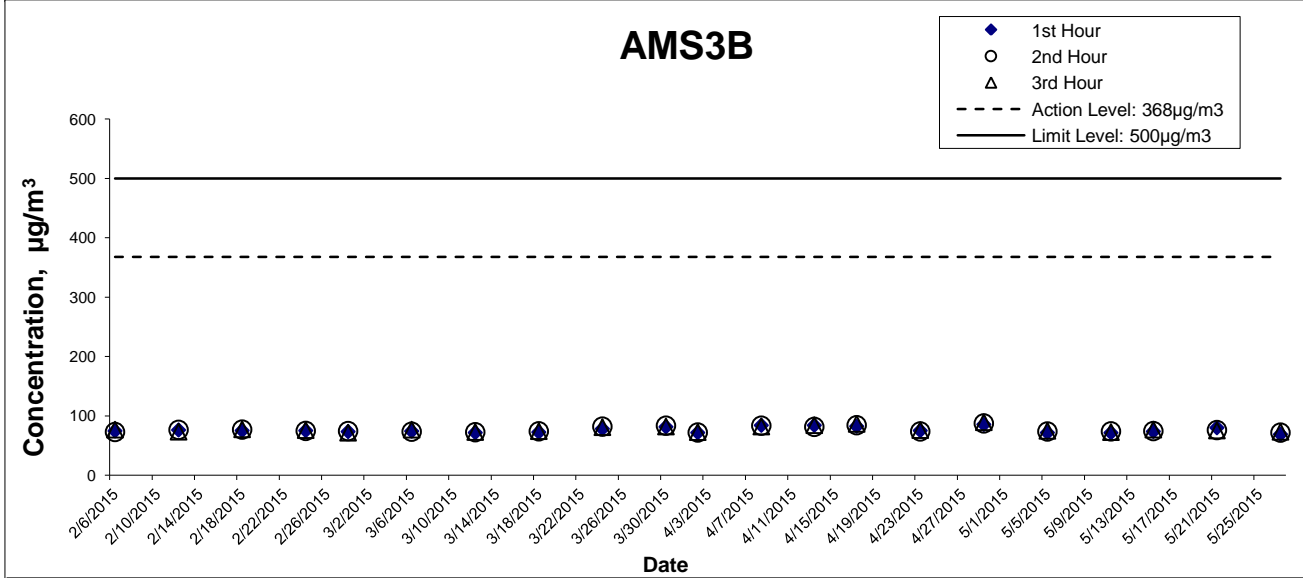
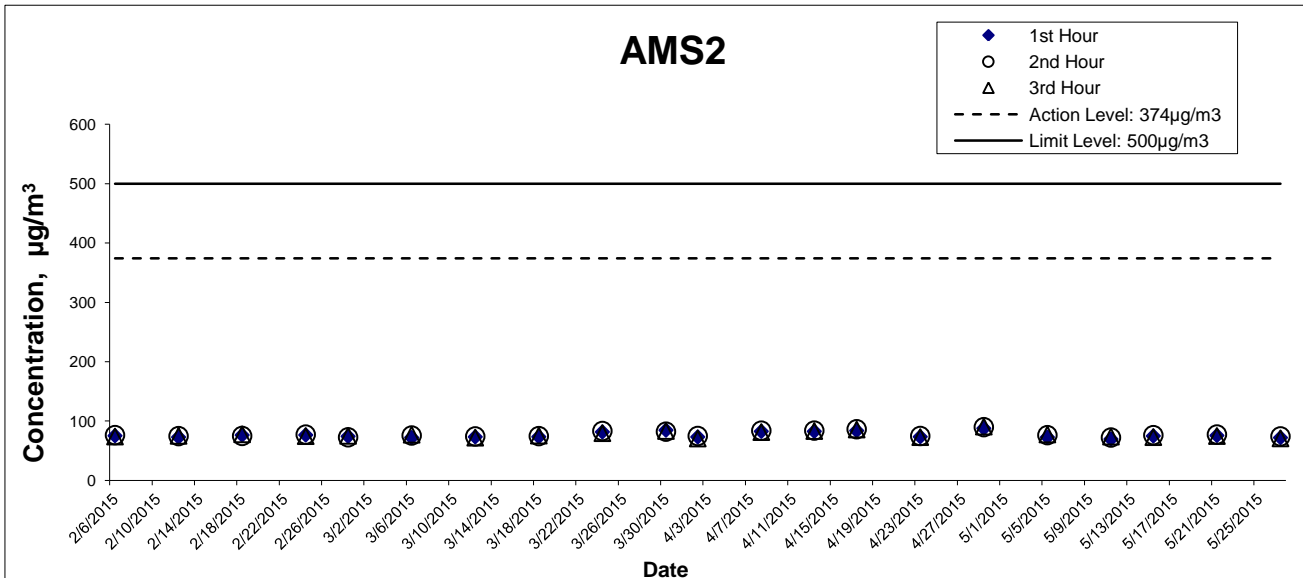
Table 5(a) Action and Limit Levels for Chinese White Dolphin Monitoring - Approach to Define Action Level (AL) and Limit Level (LL):

	<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)]	

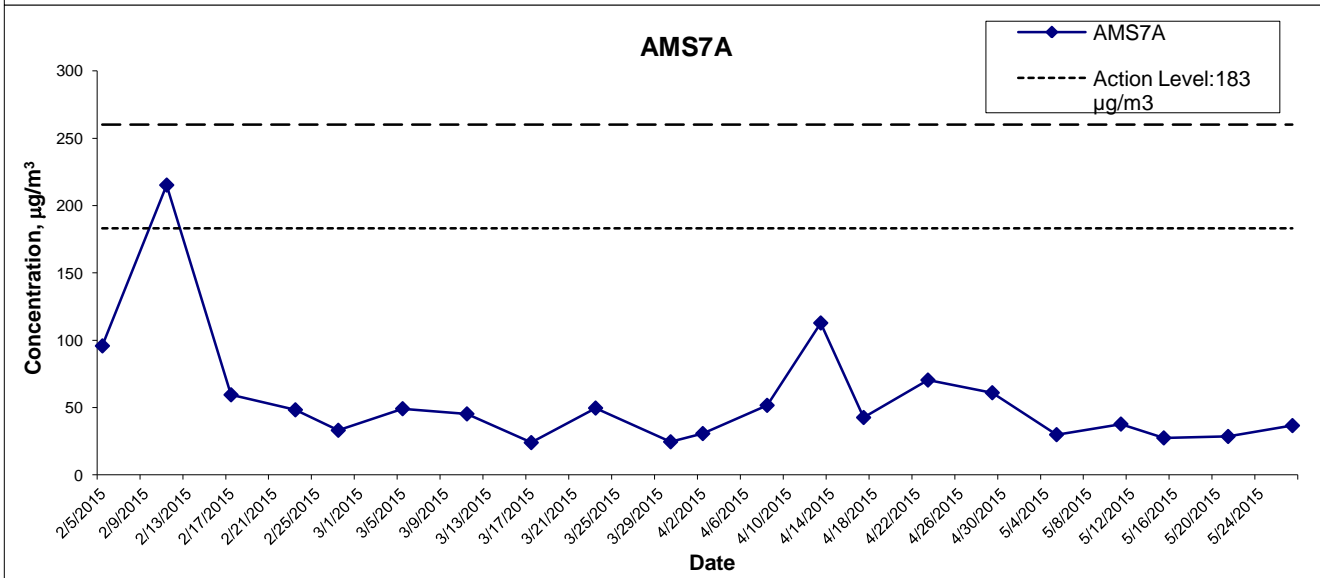
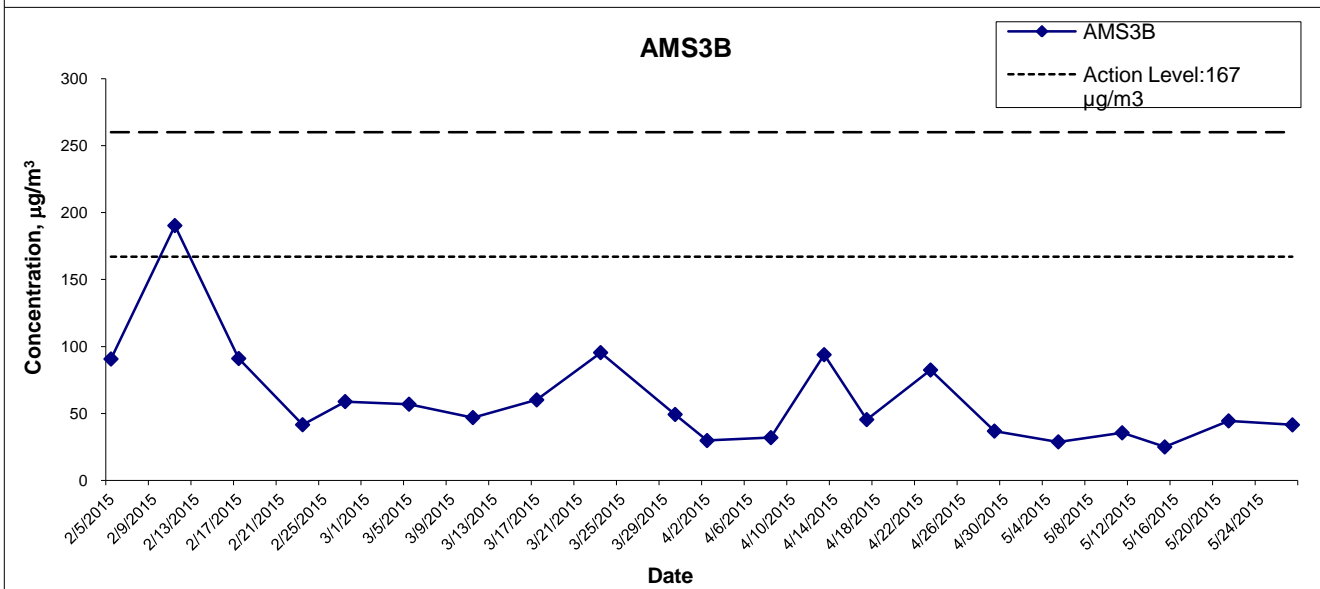
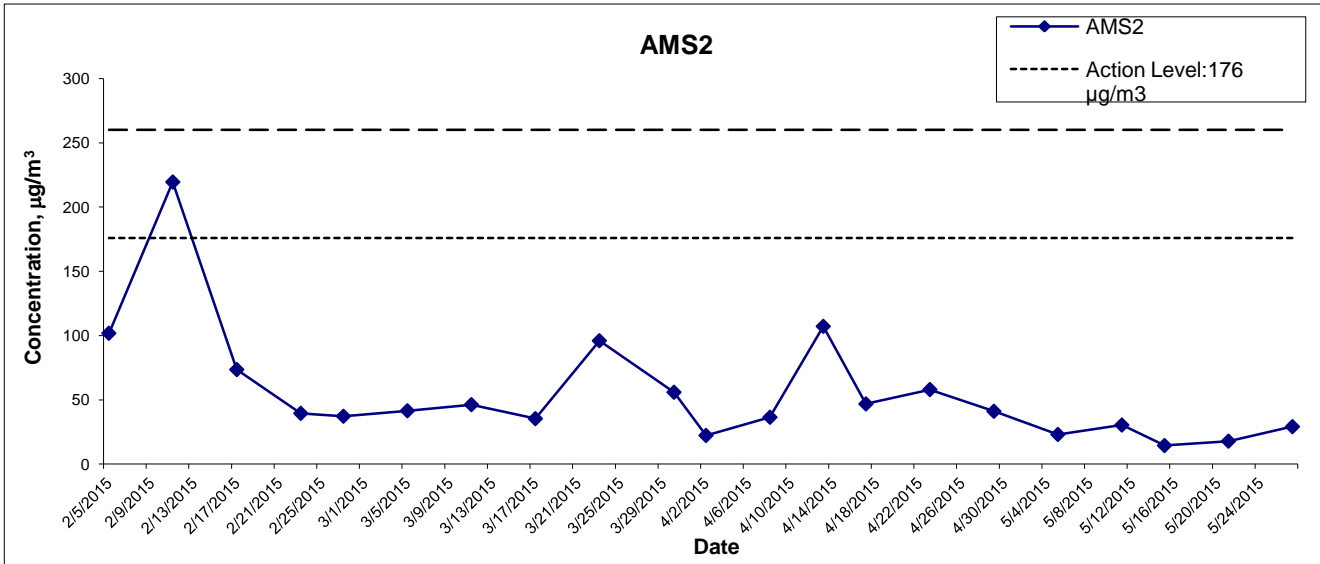
For North Lantau Social Cluster, action level will be trigger if either NEL **or** NWL fall below the criteria; limit level will be triggered if both NEL **and** NWL fall below the criteria.

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

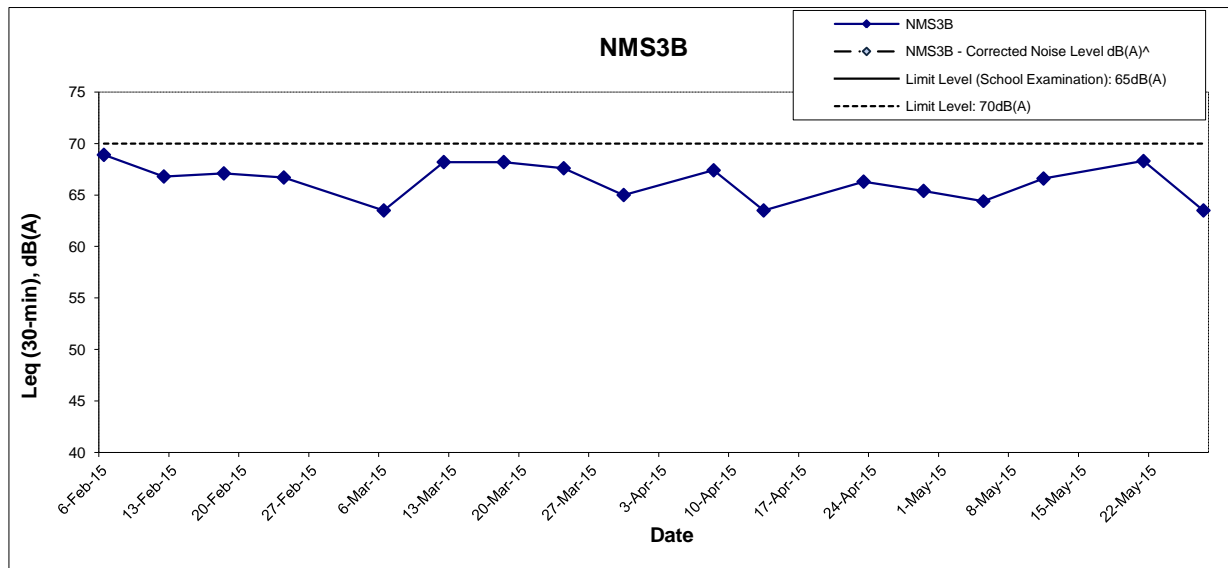
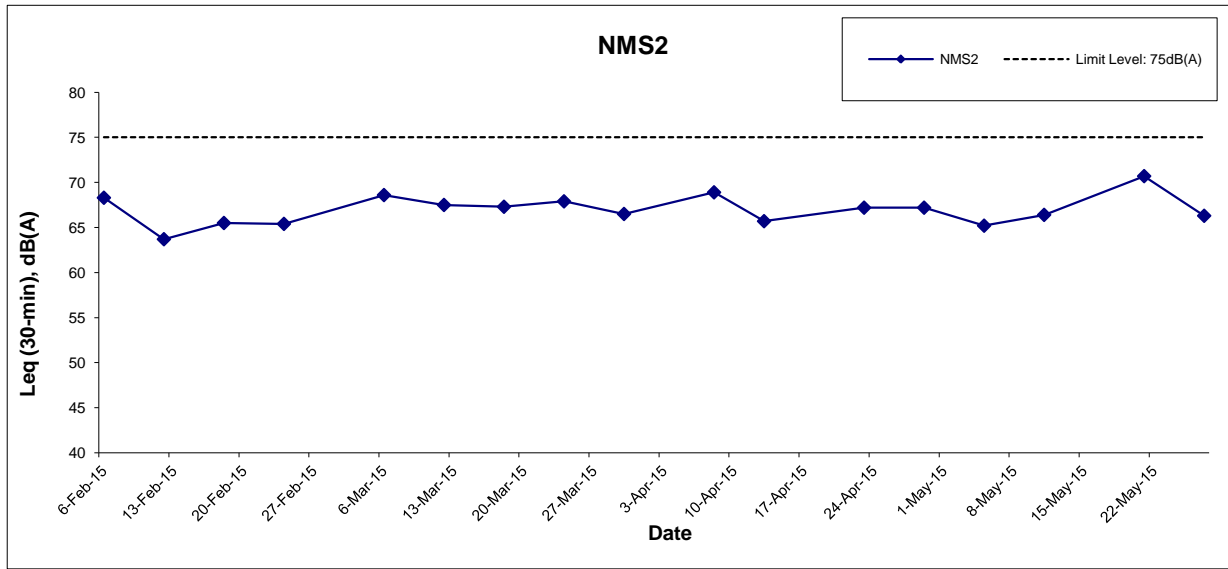
	<b>North Lantau Social Cluster</b>	
	<b>NEL</b>	<b>NWL</b>
Action Level	(STG < 4.2) & (ANI < 15.5 )	(STG < 6.9) & (ANI < 31.3)
Limit Level	[(STG < 2.4) & (ANI <8.9)] AND [ (STG < 3.9)& (ANI < 17.9)]	



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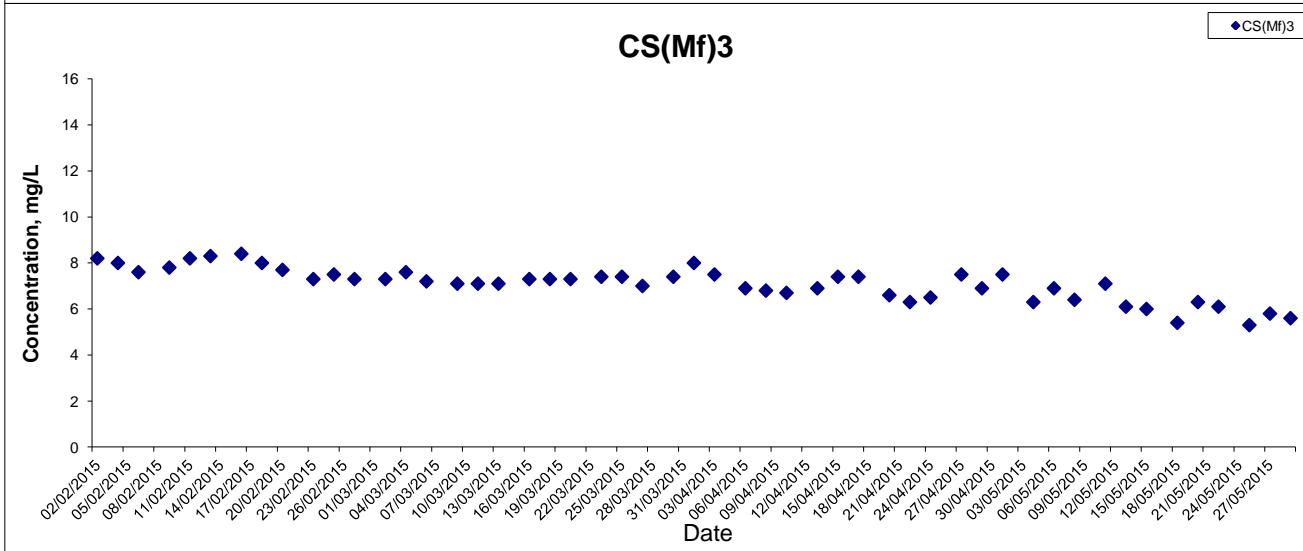
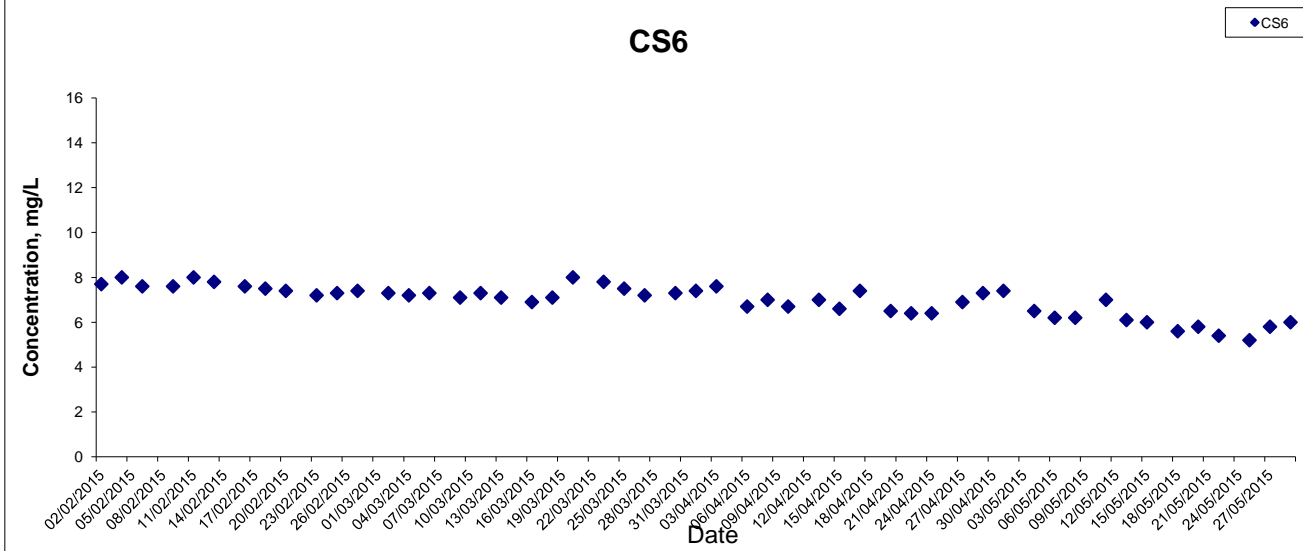
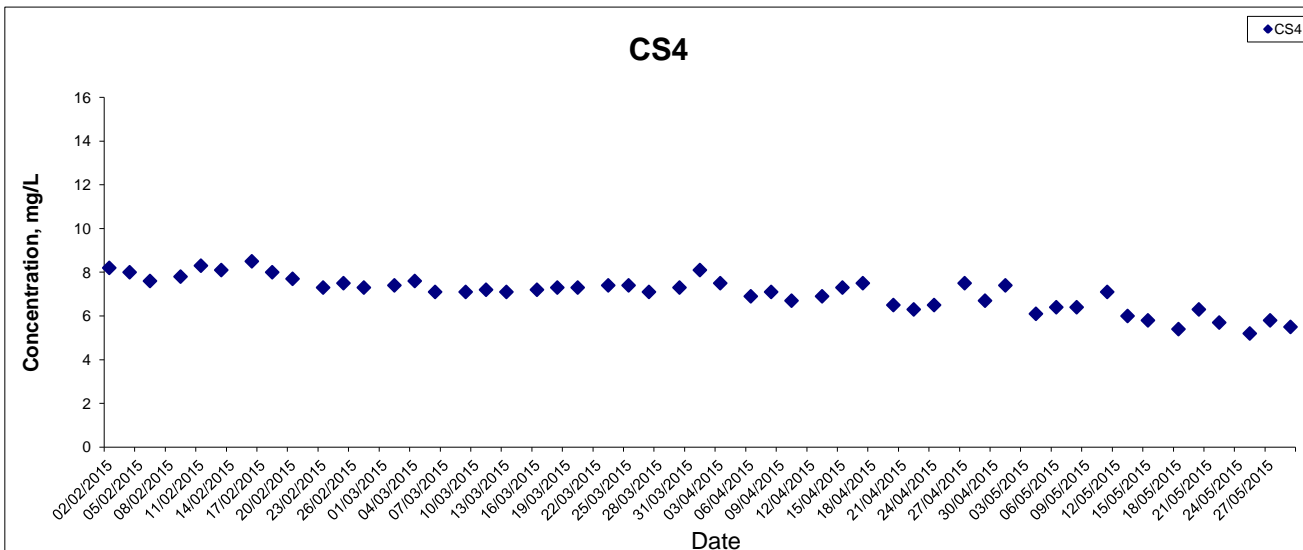
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Remarks: Effective from July 2012, the Limit Level at NMS3A was revised to 70dB(A). Daytime noise Limit Level of 70 dB(A) applies to education institutions, while 65dB(A) applies during school examination period.

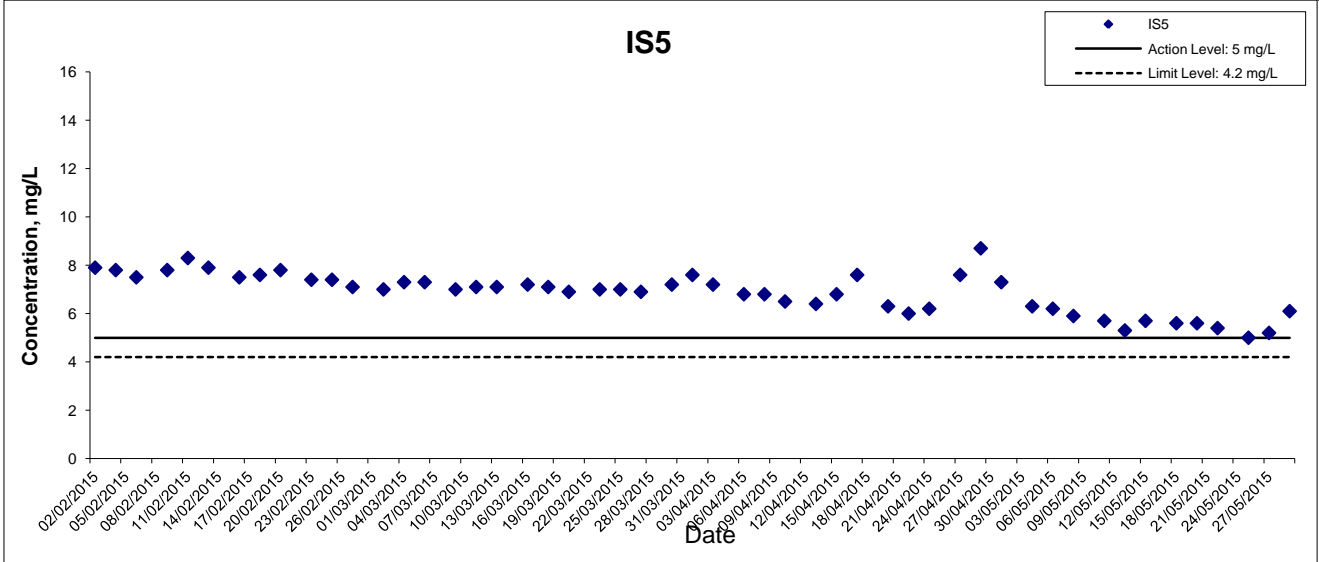
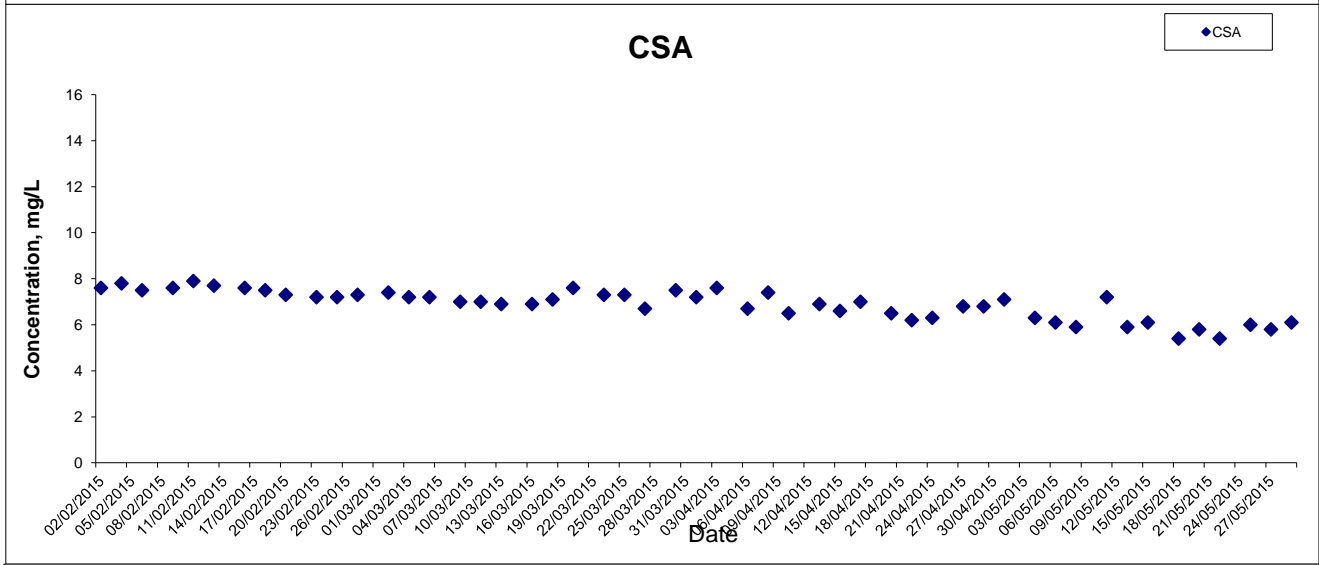
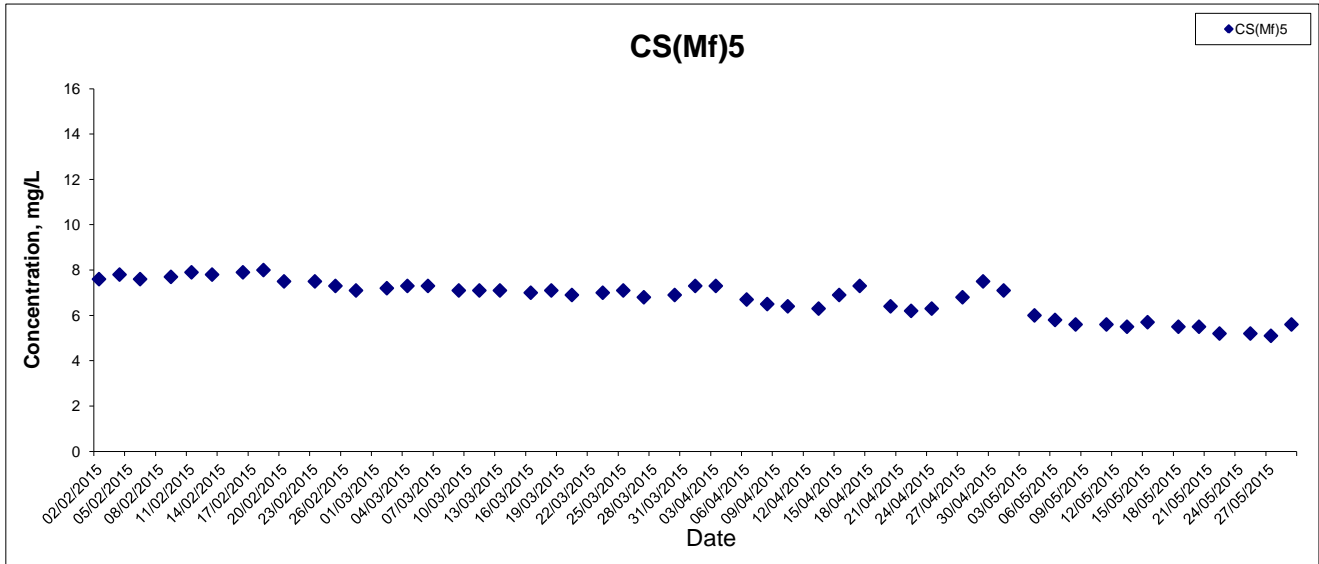
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## Dissolved Oxygen (Surface & Middle) at Mid-Ebb Tide



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



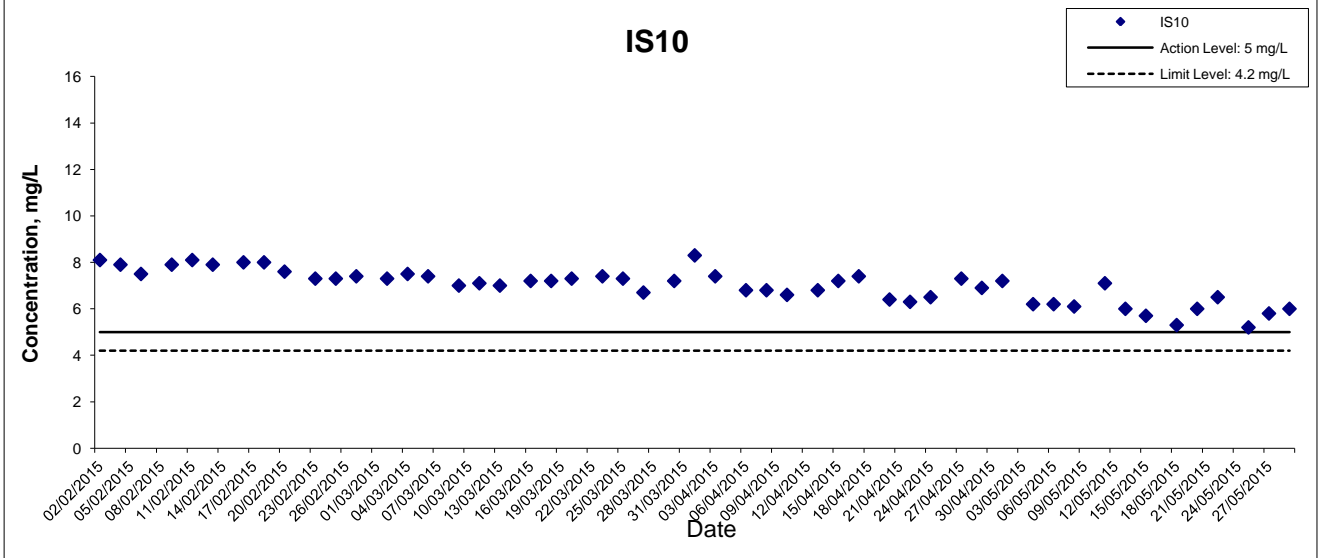
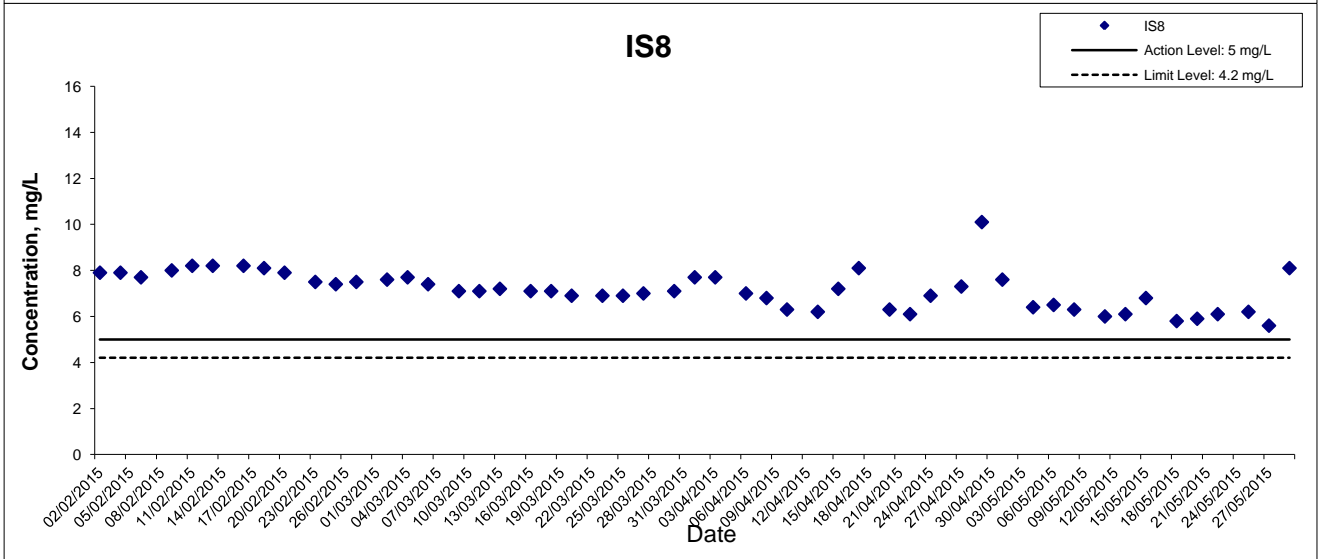
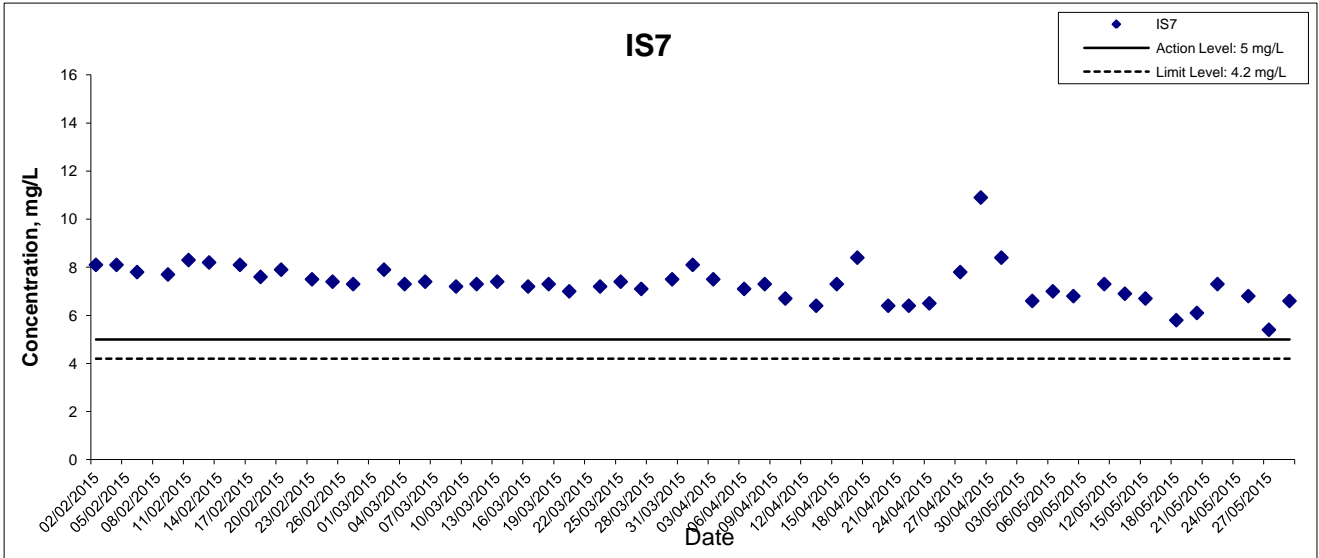
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 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results

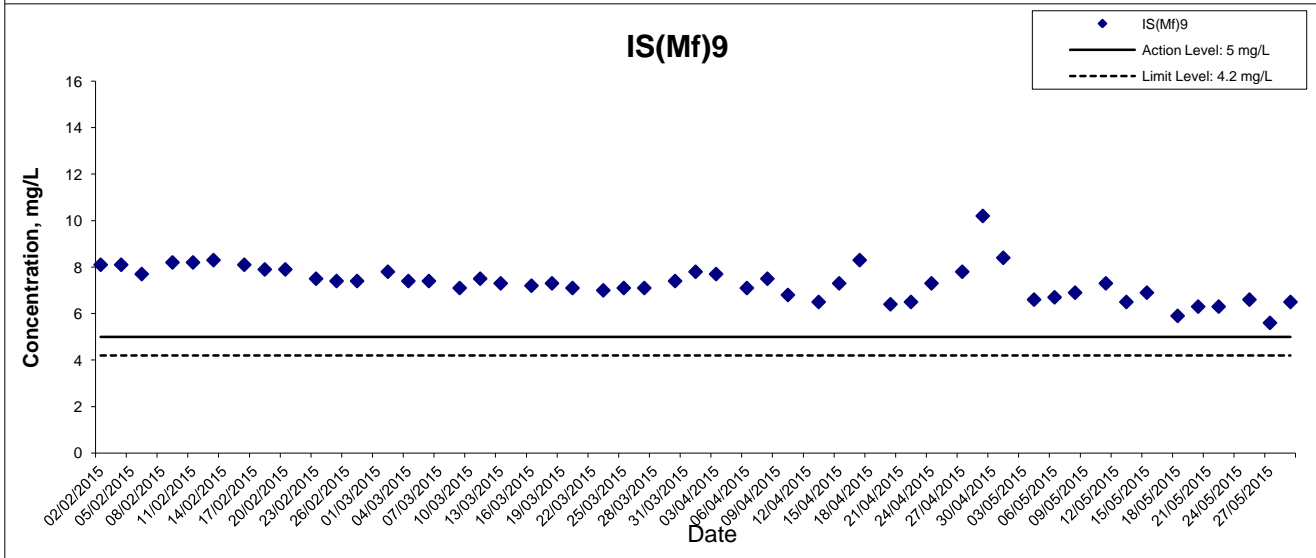
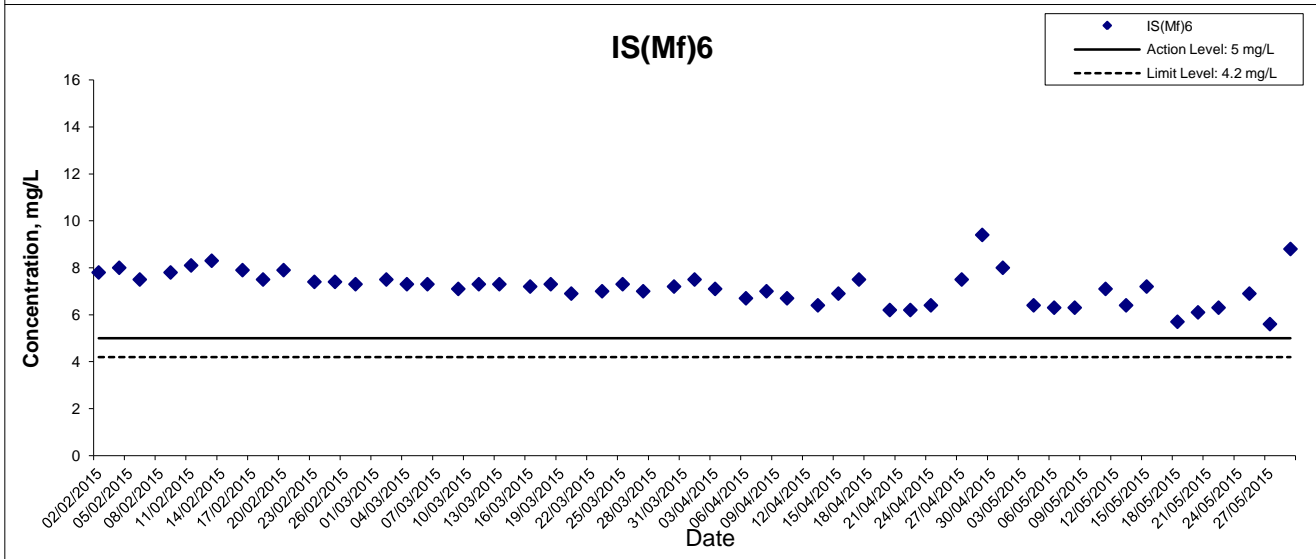
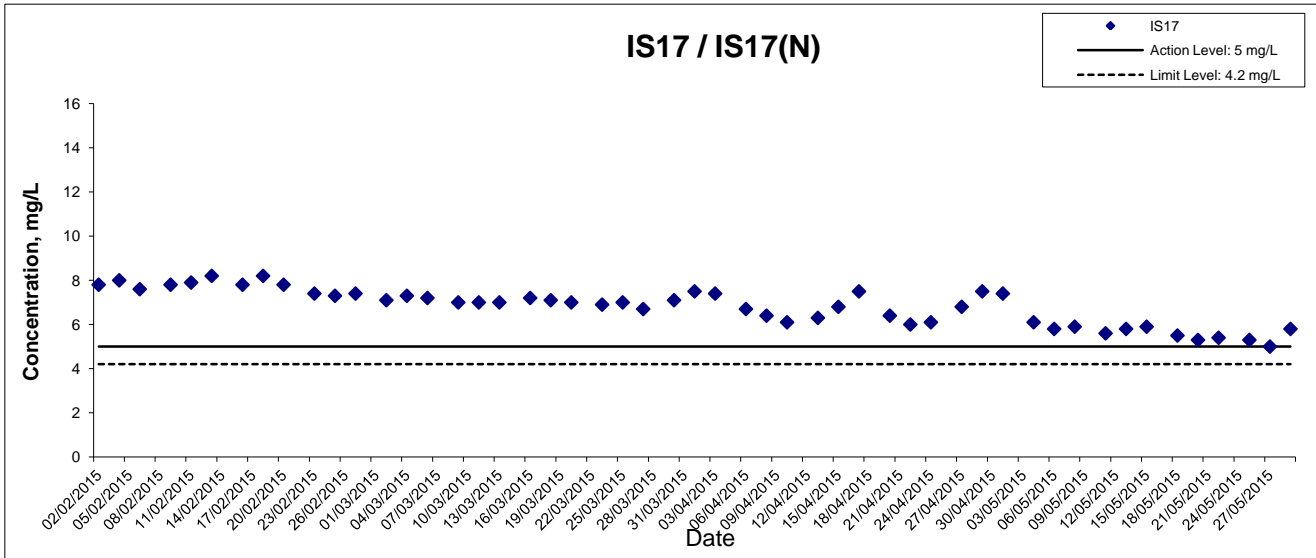


## Dissolved Oxygen (Surface & Middle) at Mid-Ebb Tide



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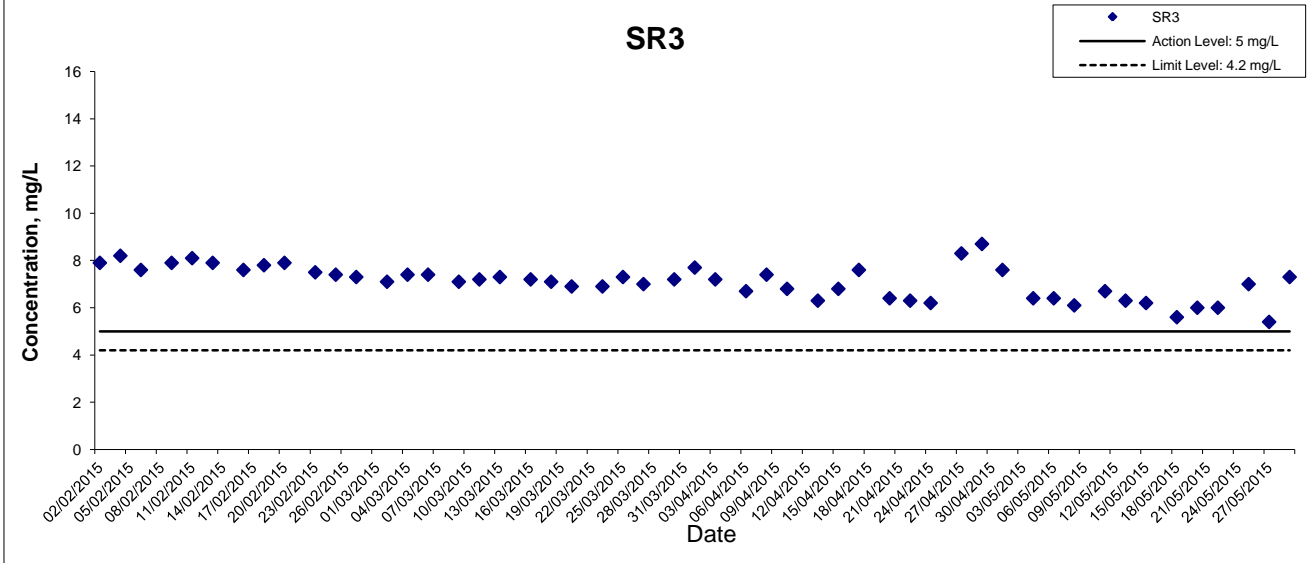
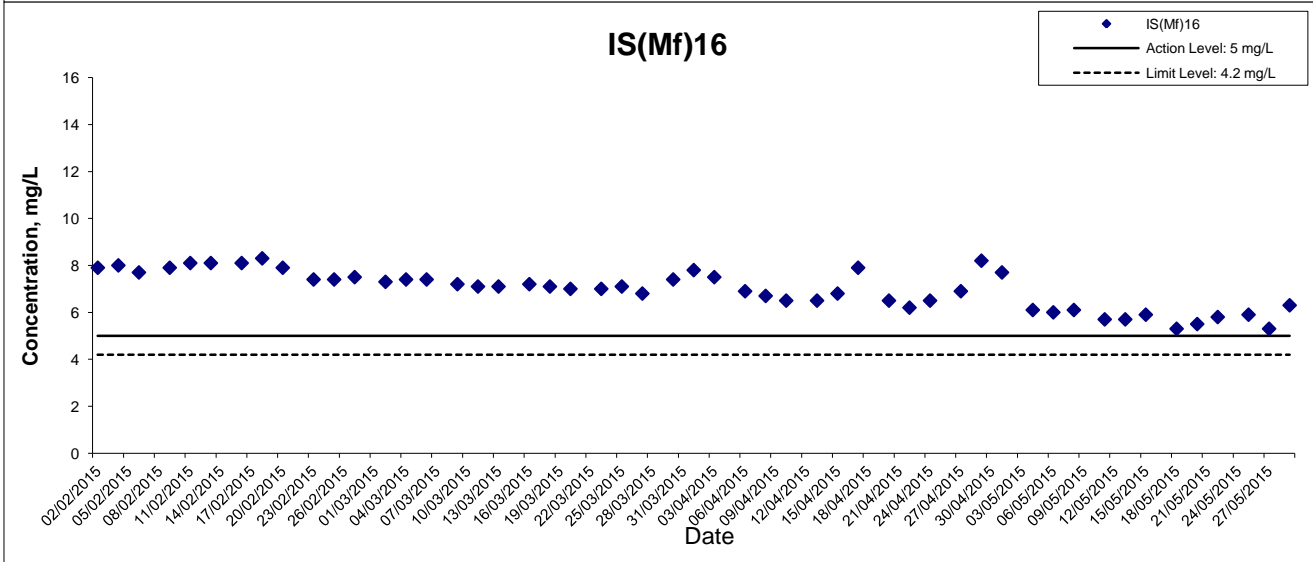
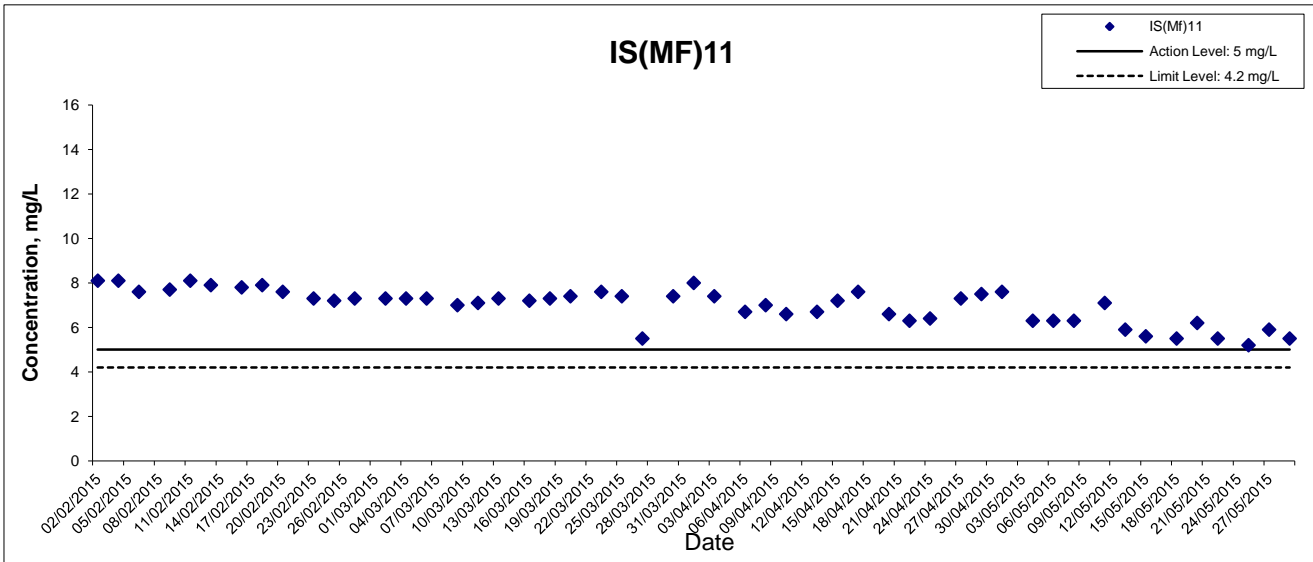
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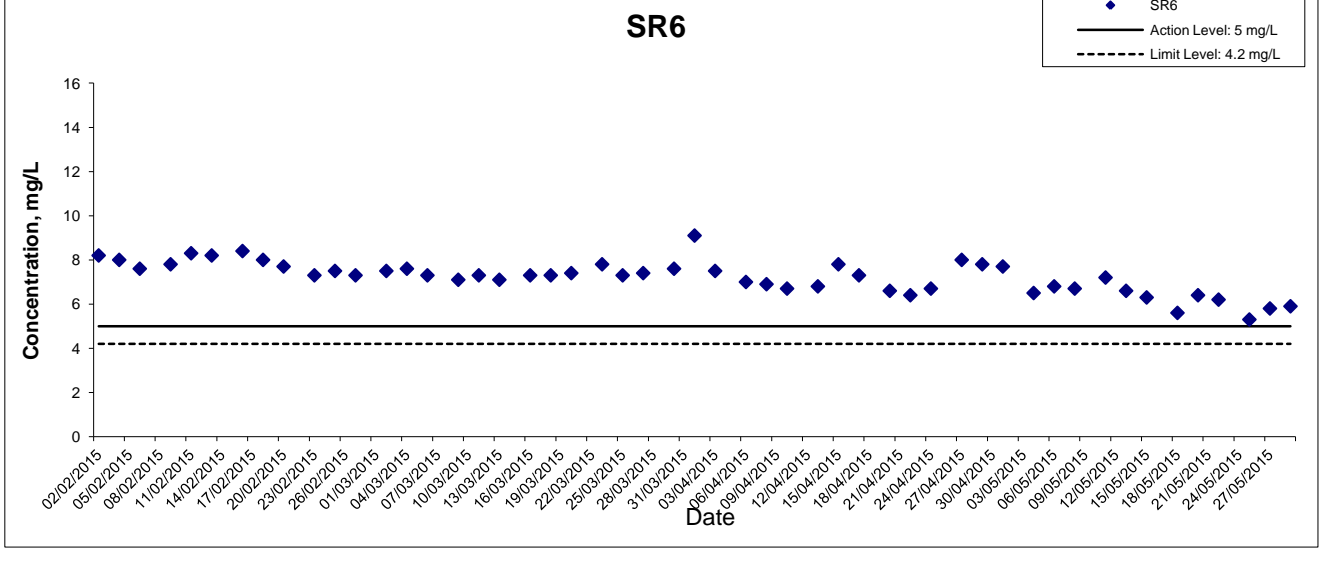
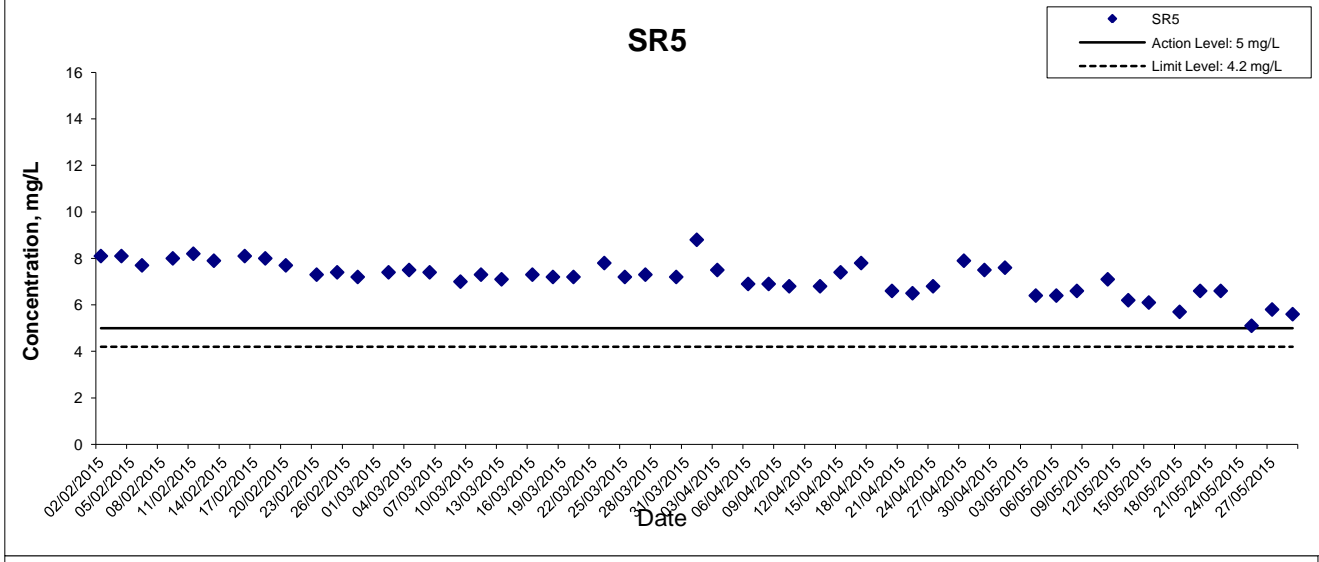
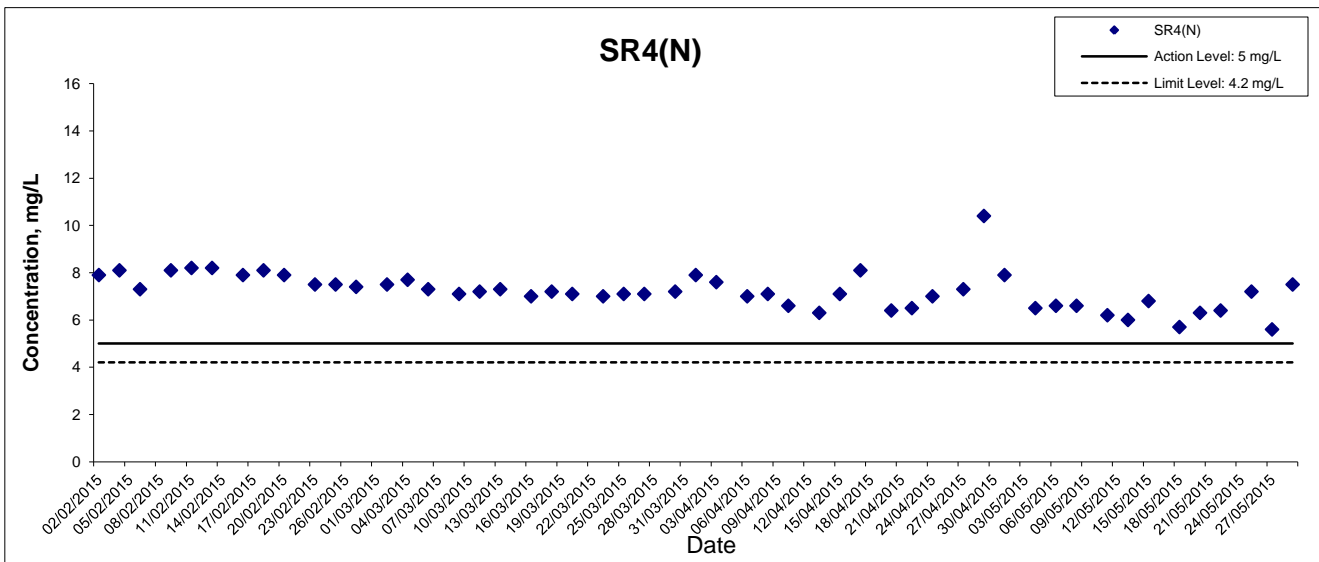






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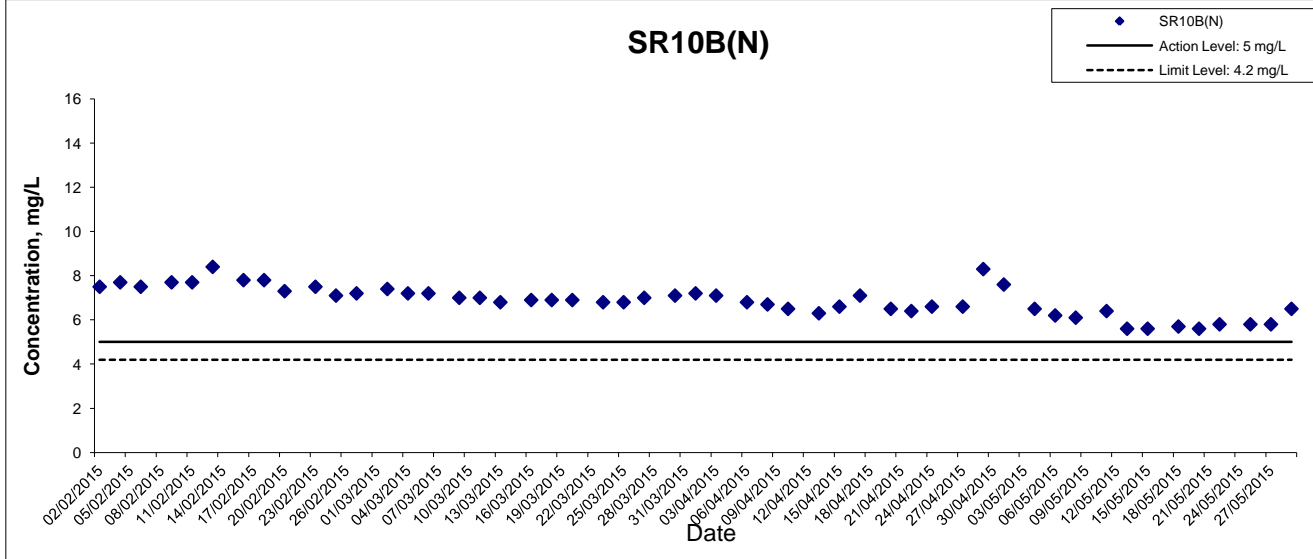
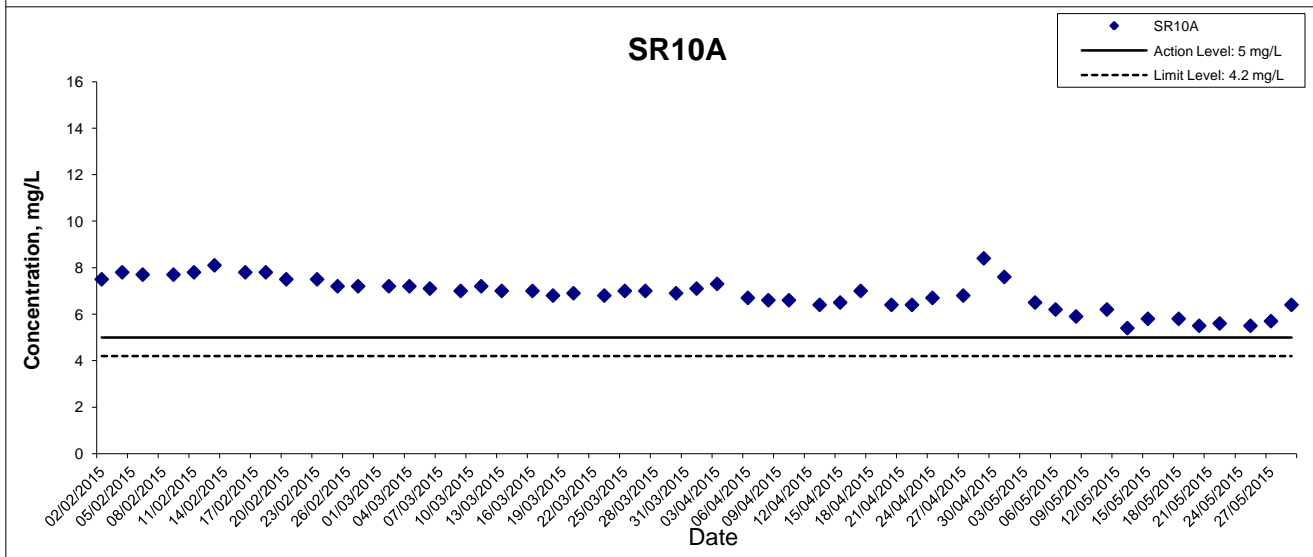
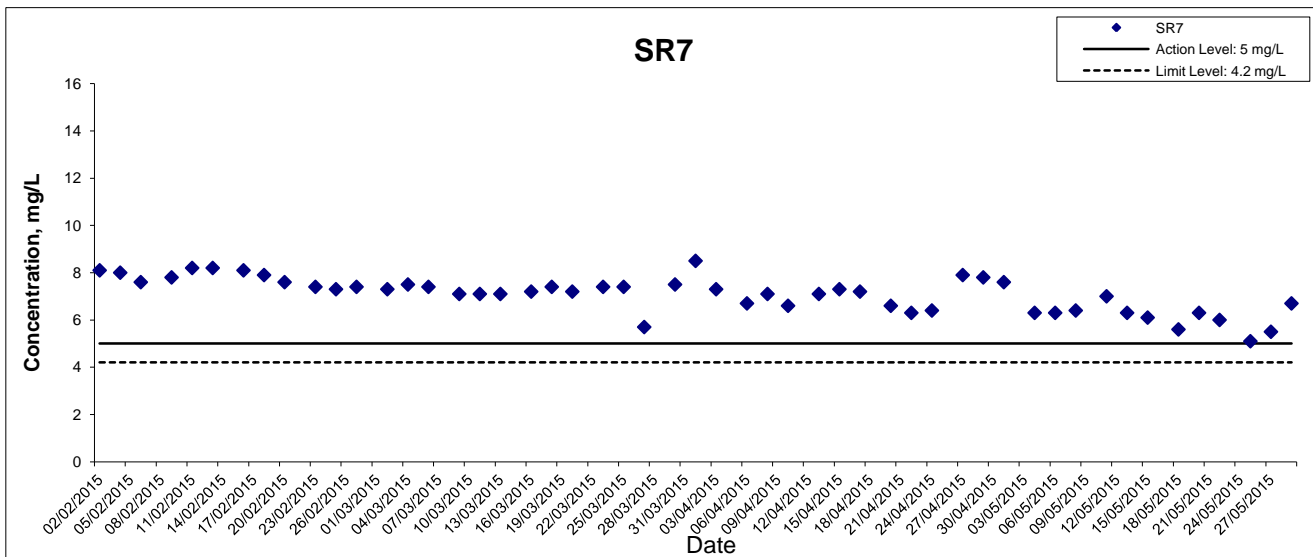


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 - RECLAMATION WORKS

Graphical Presentation of Impact Water Quality  
 Monitoring Results





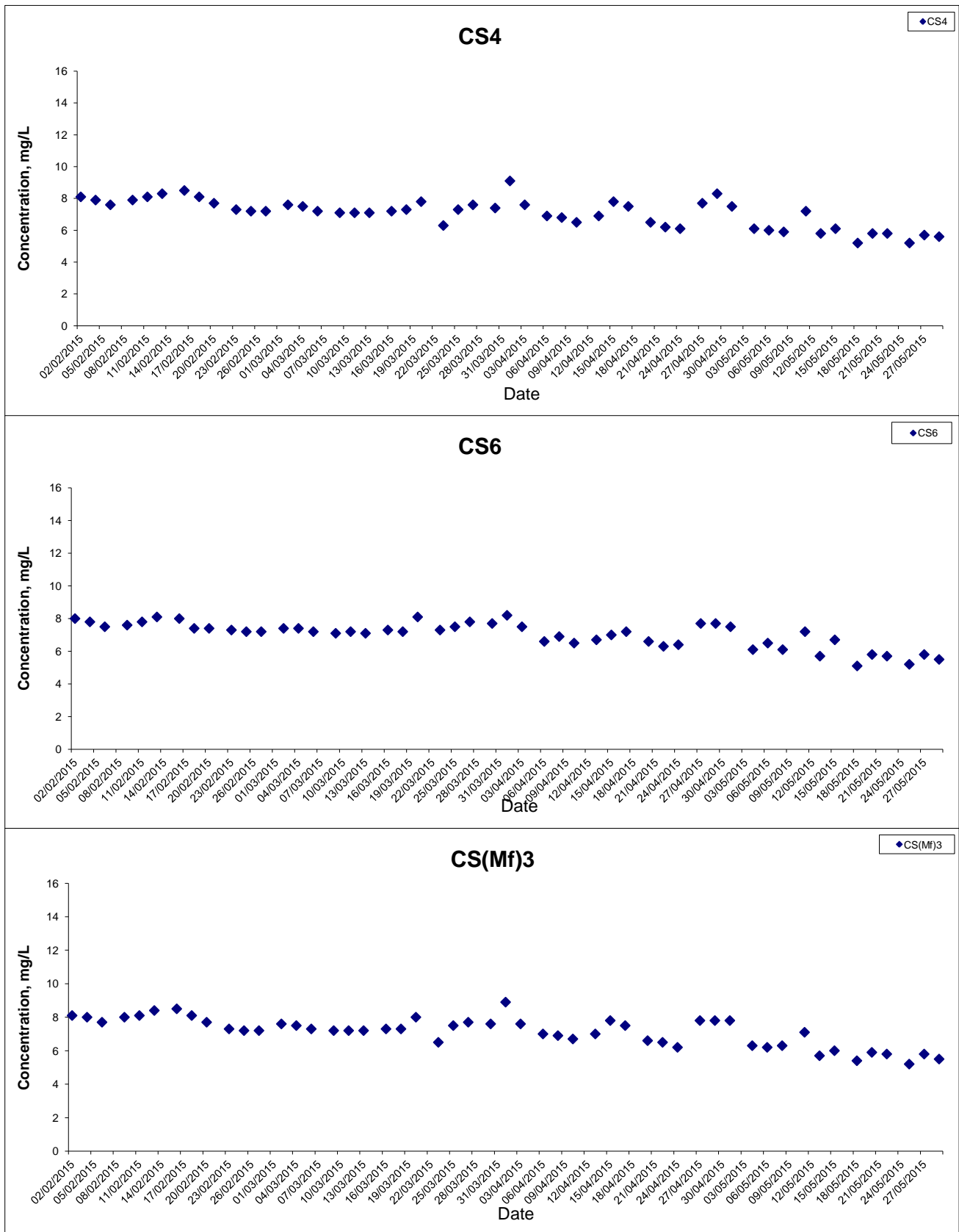
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## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



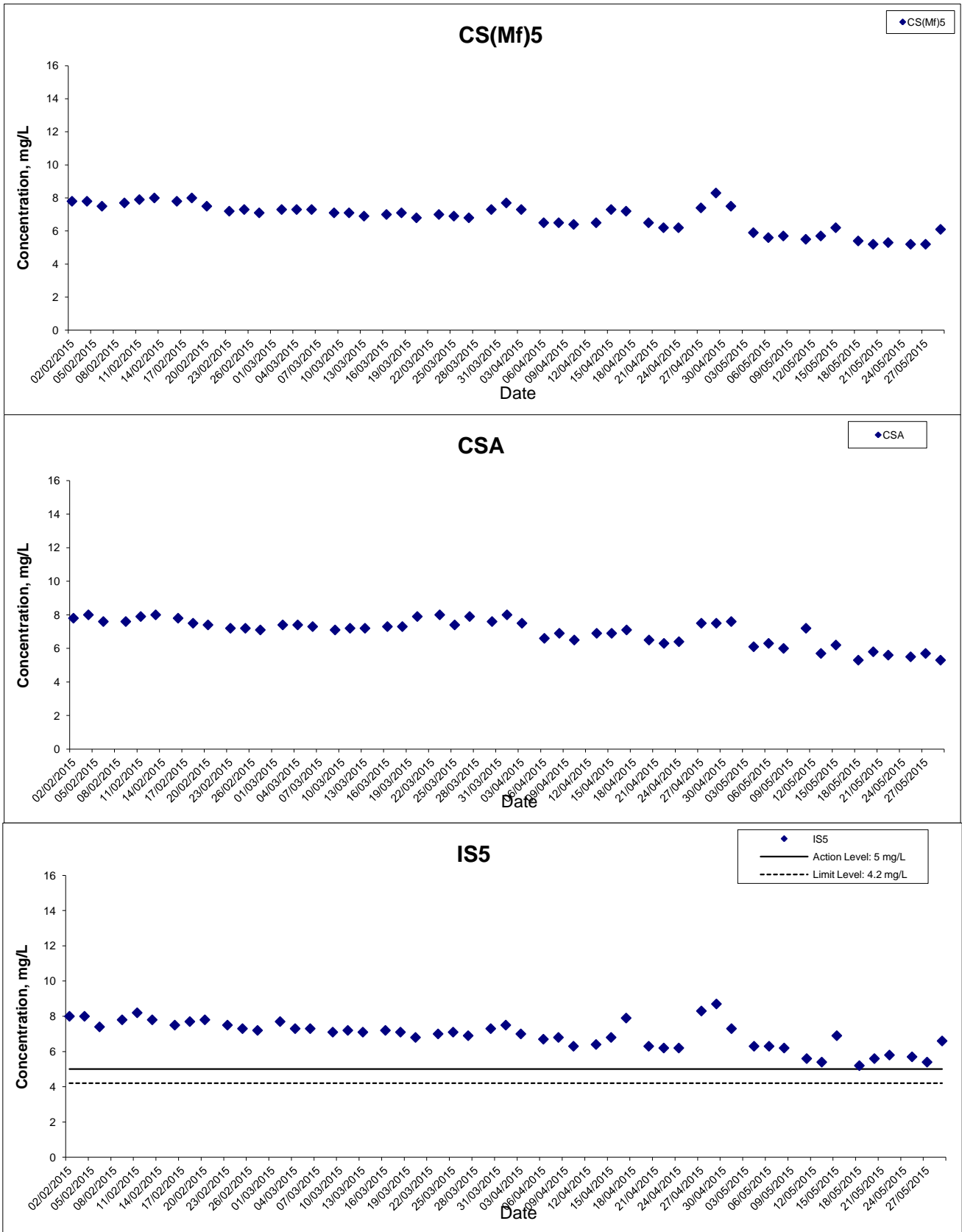
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Graphical Presentation of Impact Water Quality  
 Monitoring Results

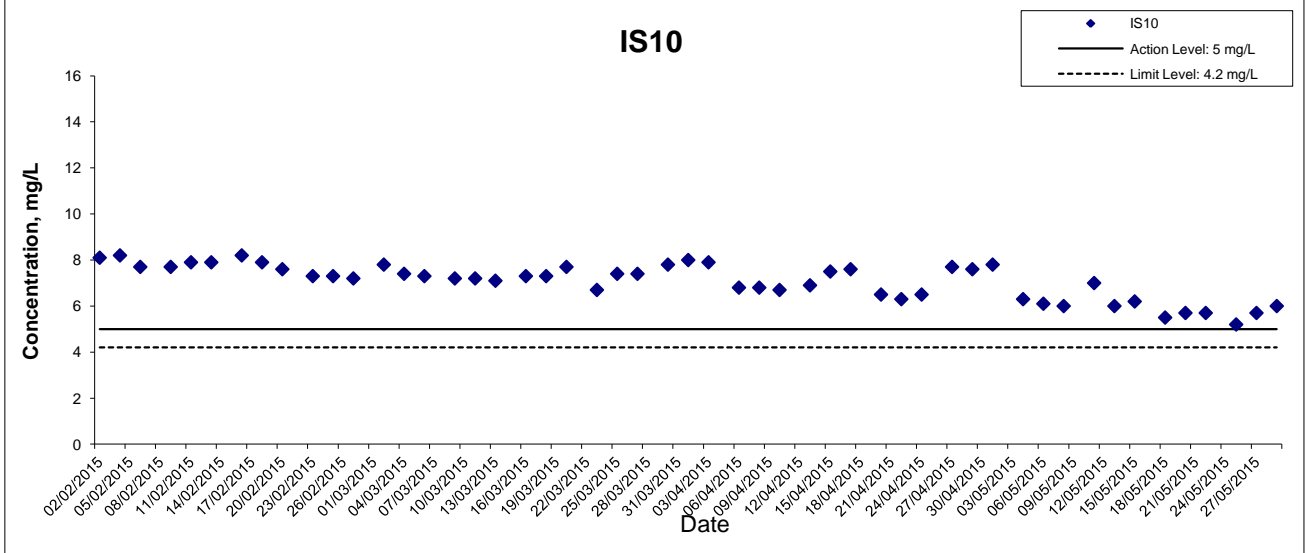
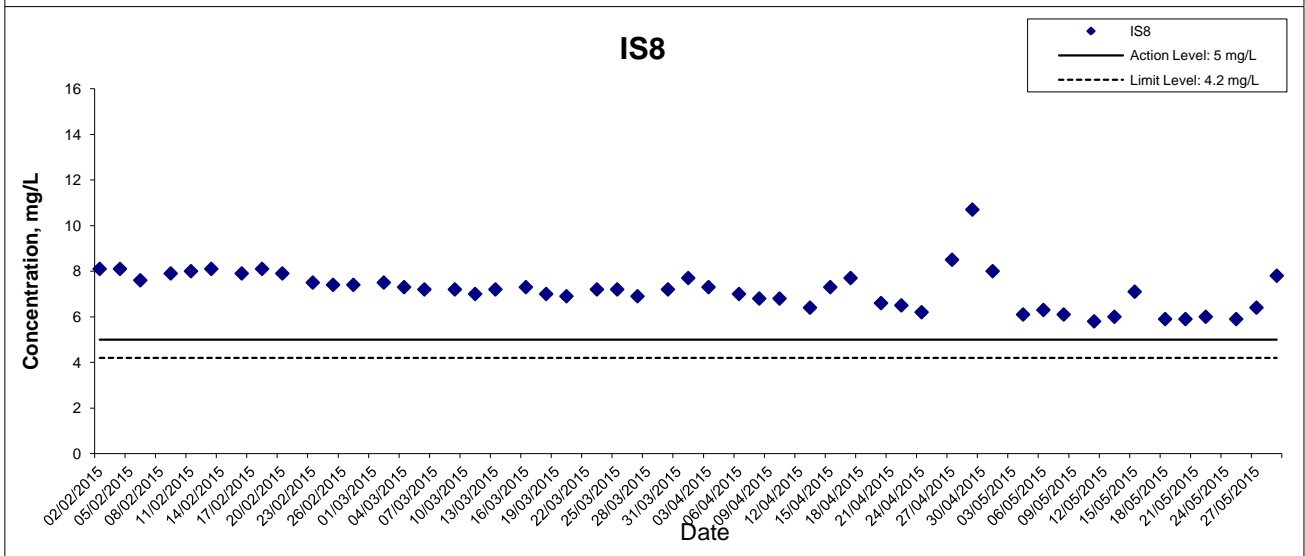
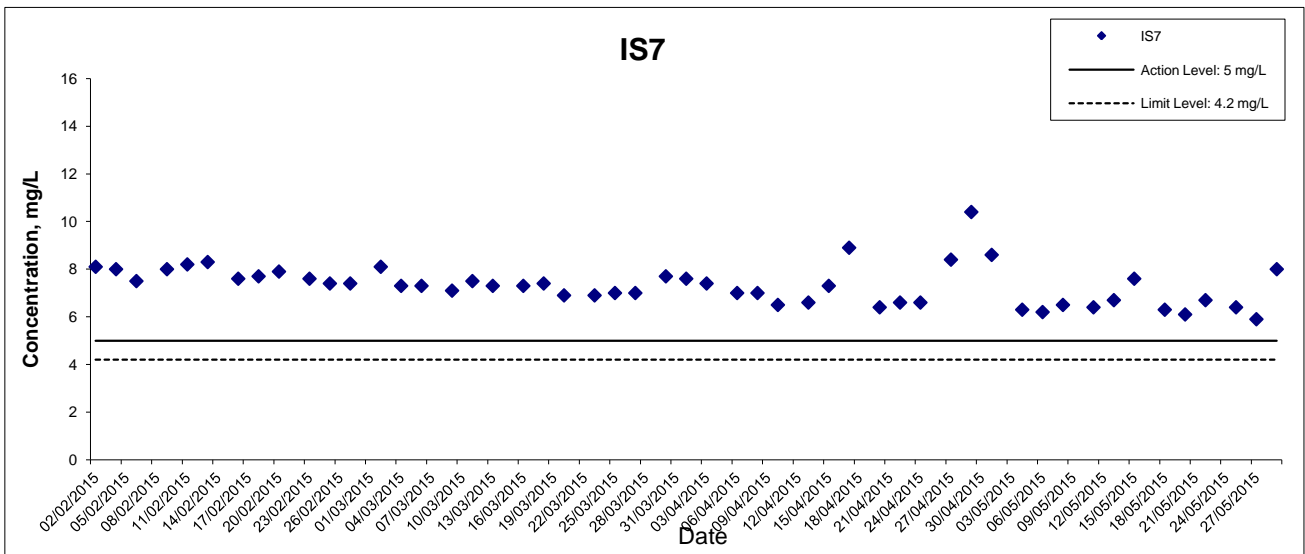


Project No.: 60249820

Date: June 2015

Appendix G

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



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



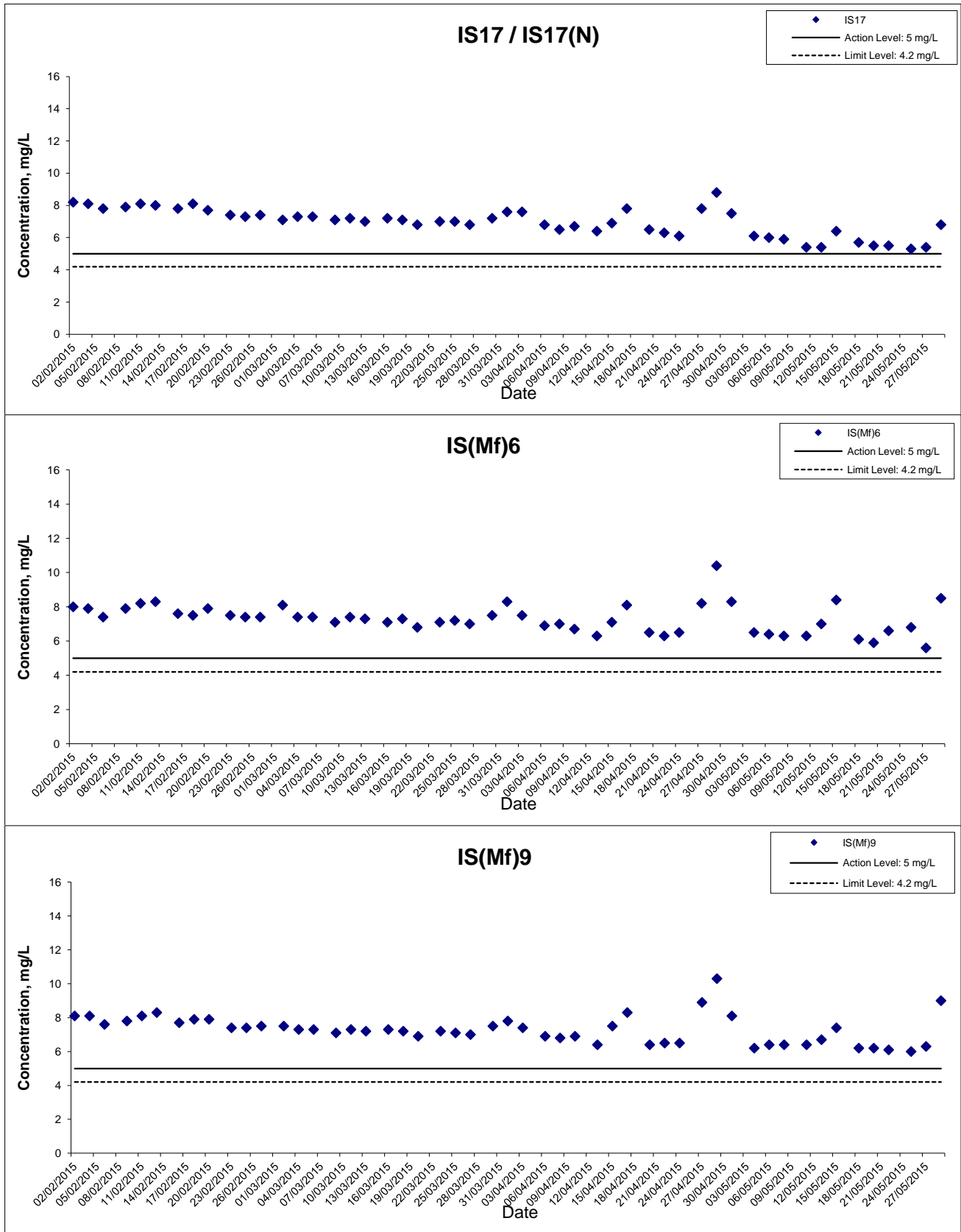
**Graphical Presentation of Impact Water Quality**  
**Monitoring Results**

**Project No.: 60249820**

**Date: June 2015**

**Appendix G**

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



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

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

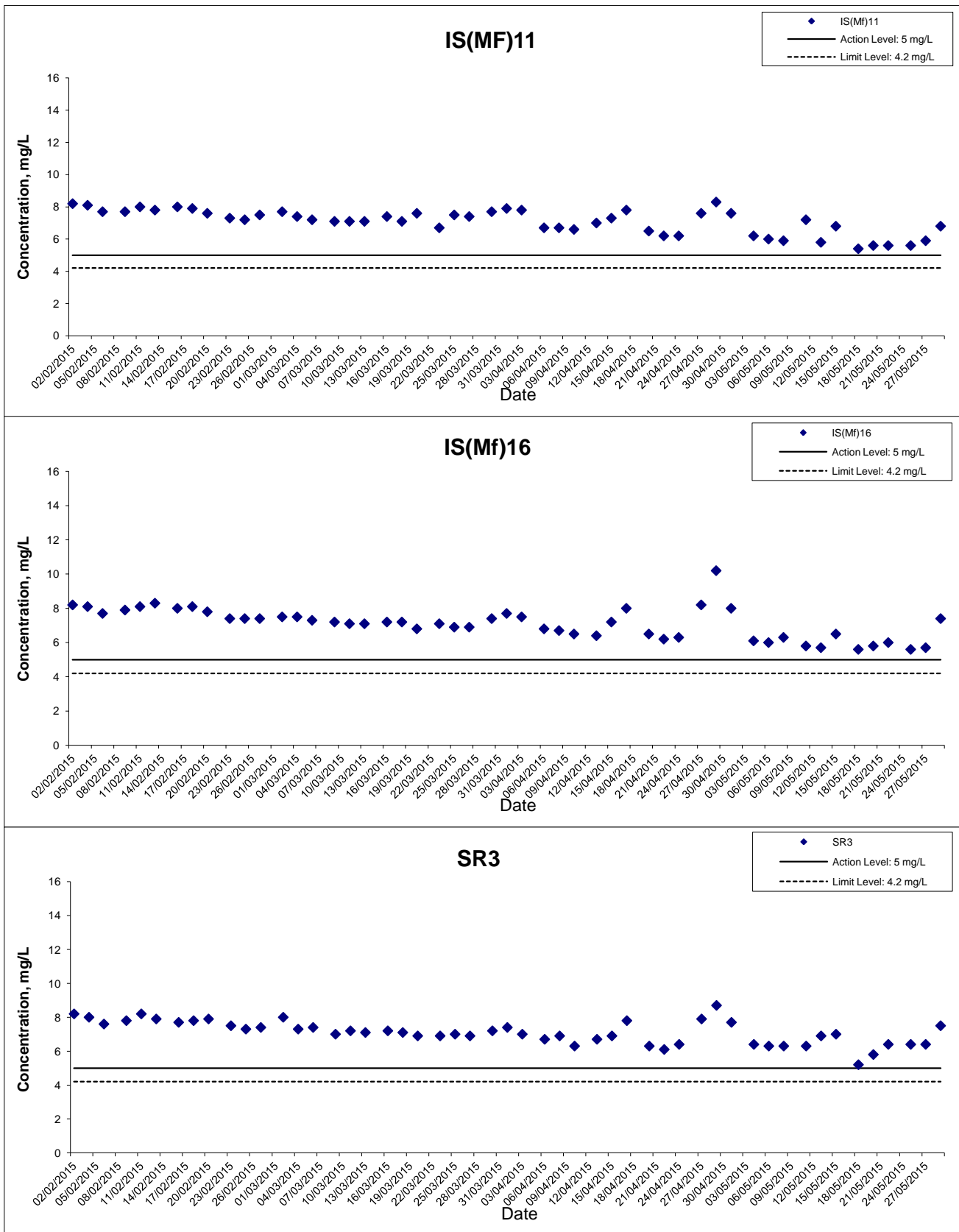


Project No.: 60249820

Date: June 2015

Appendix G

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

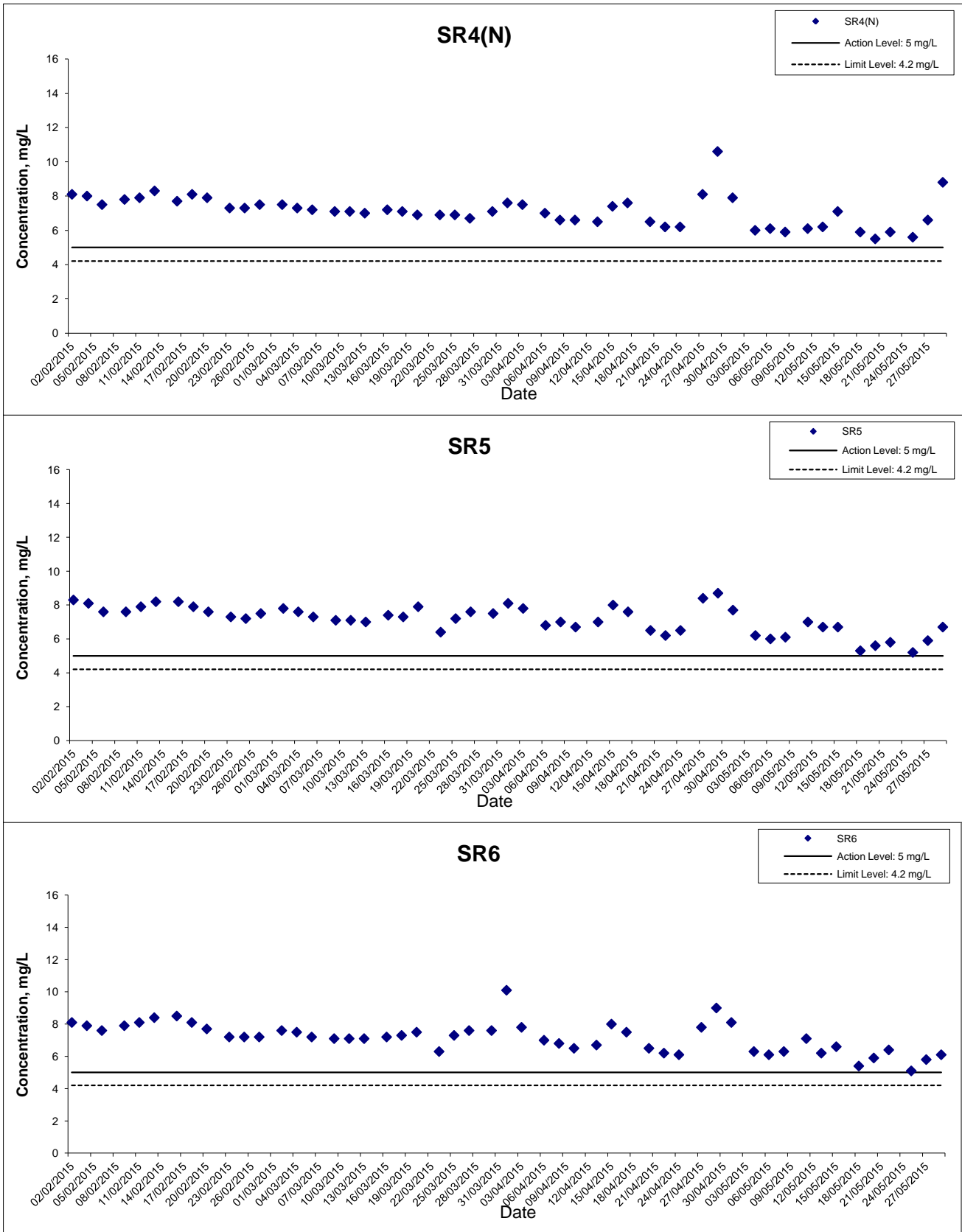


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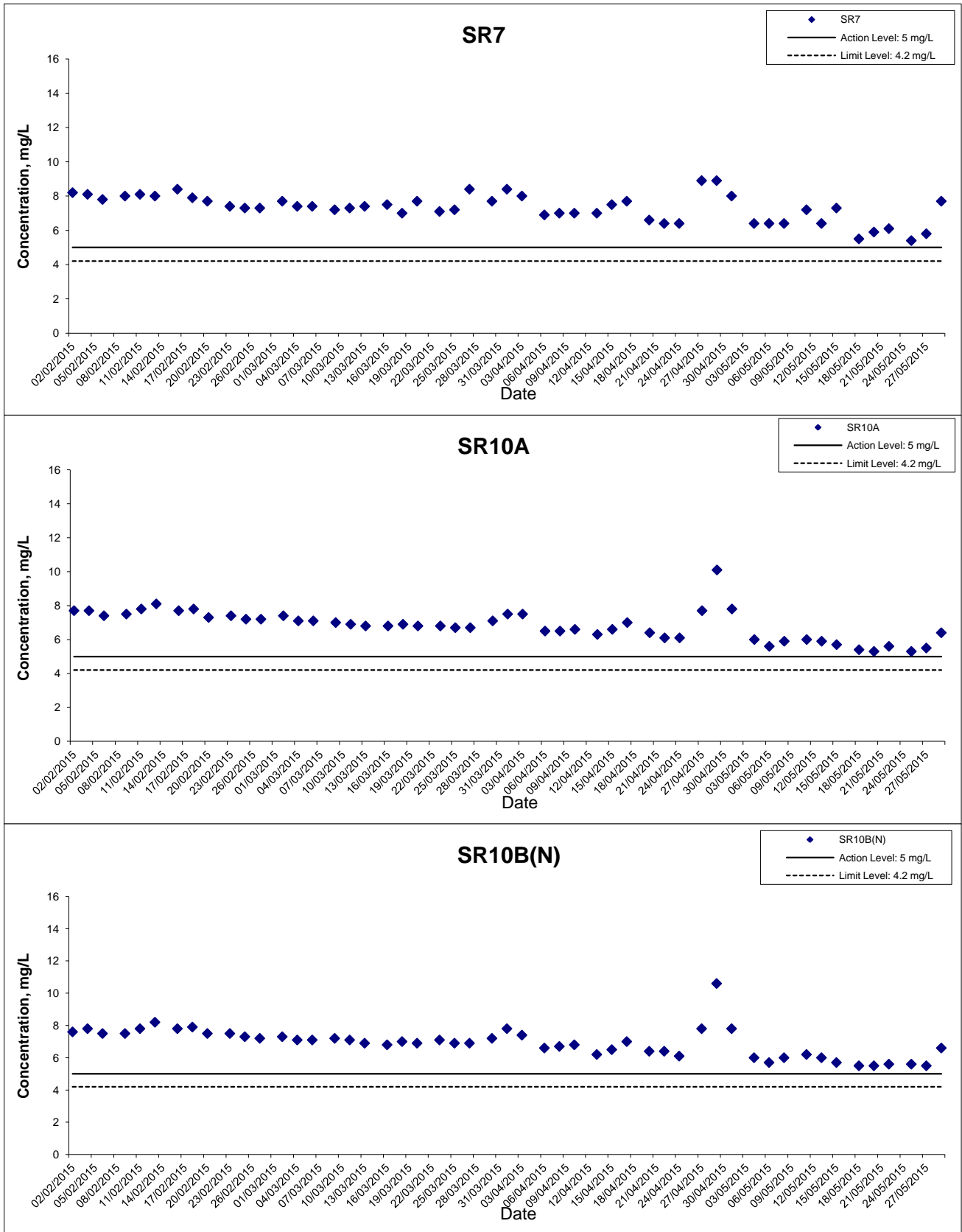


## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



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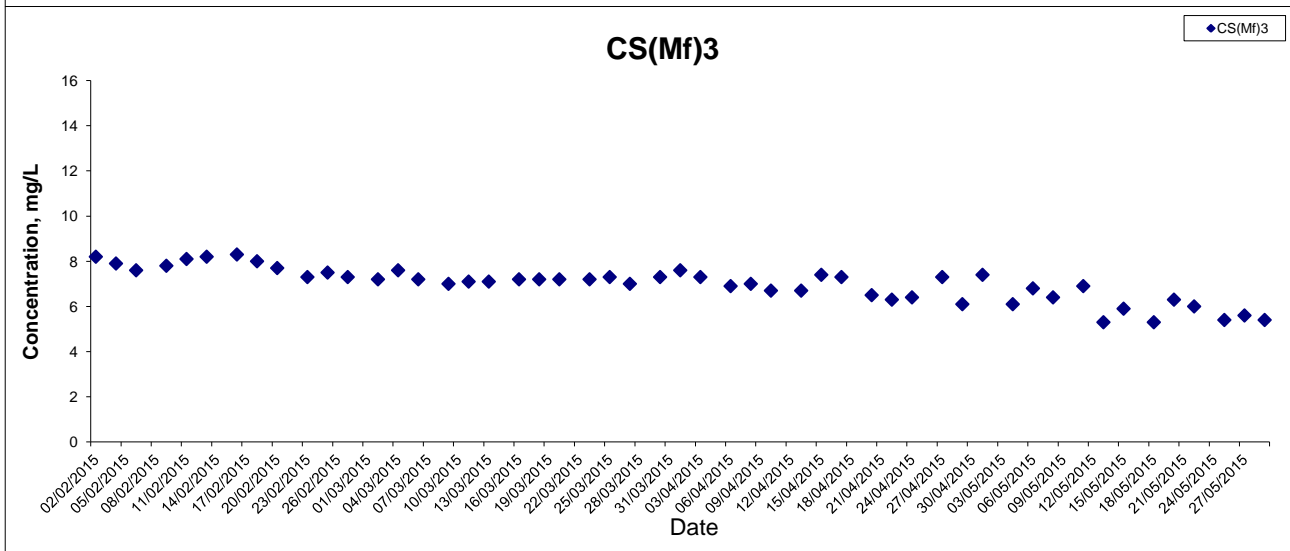
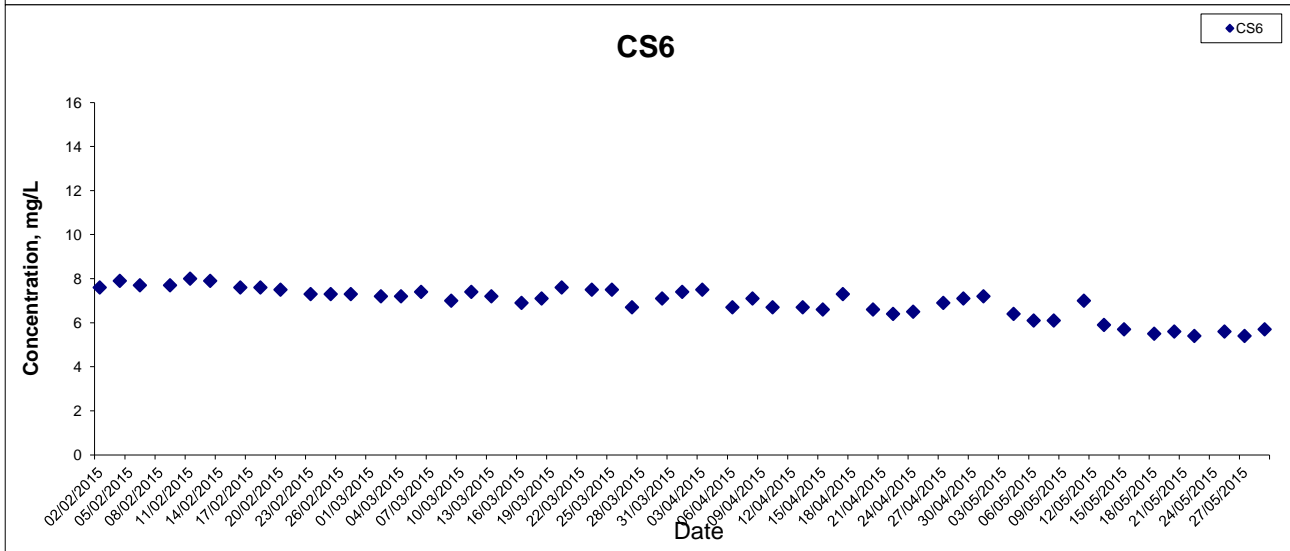
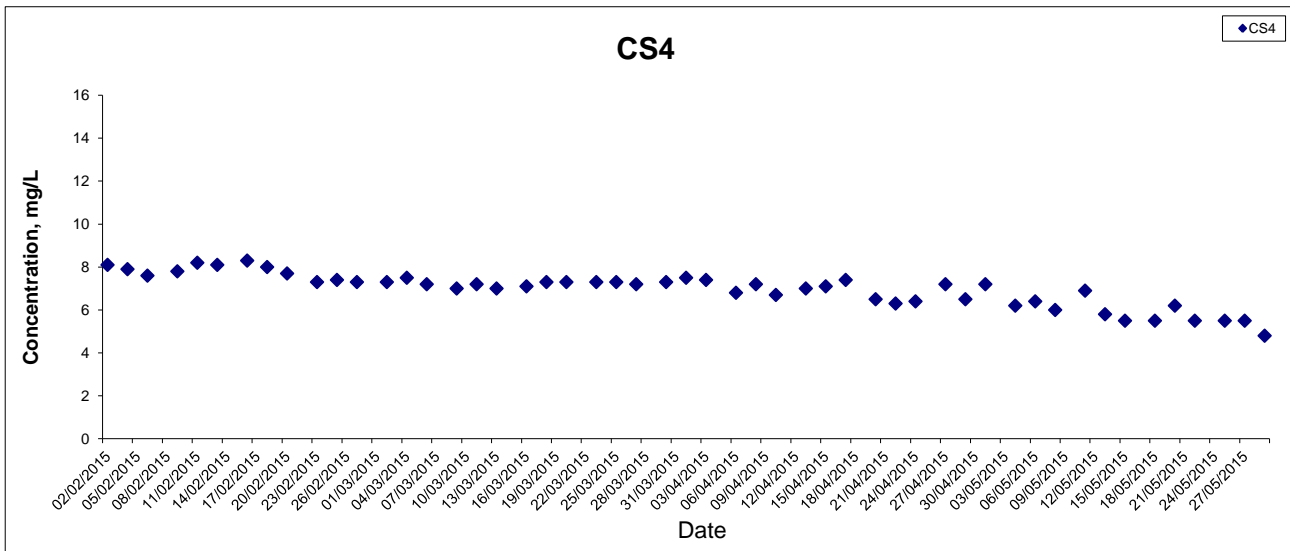
## Dissolved Oxygen (Surface & Middle) at Mid-Flood Tide



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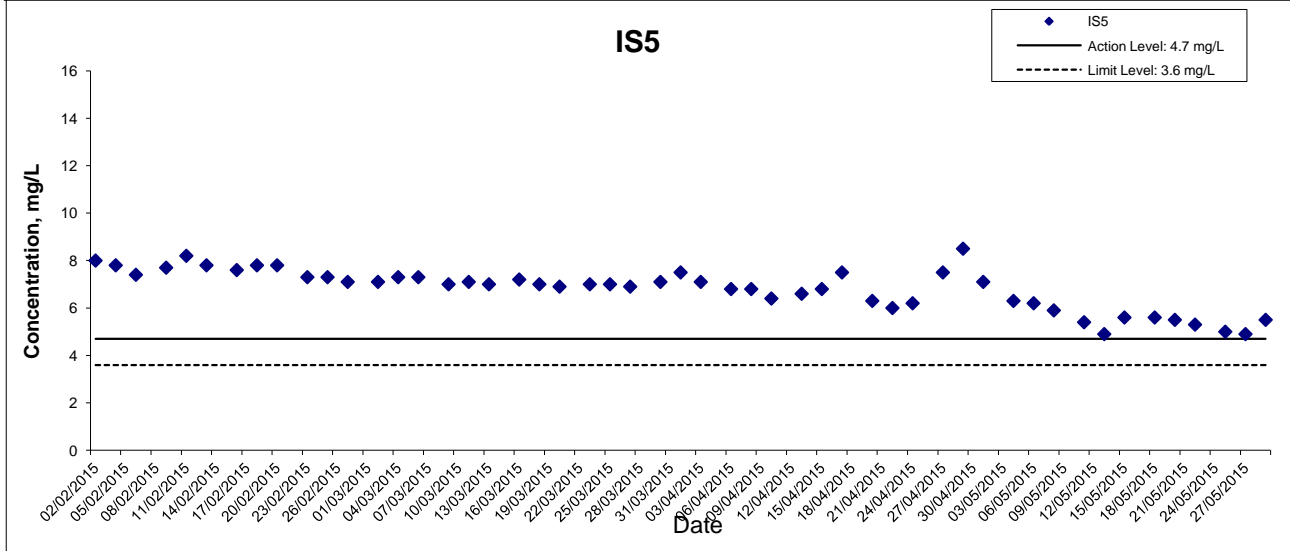
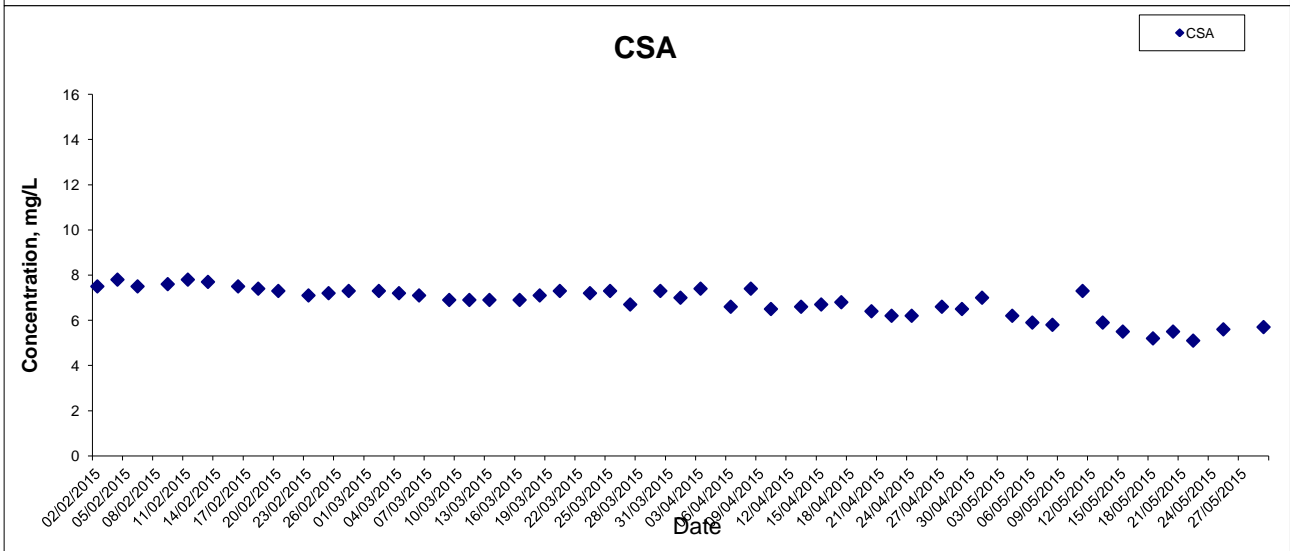
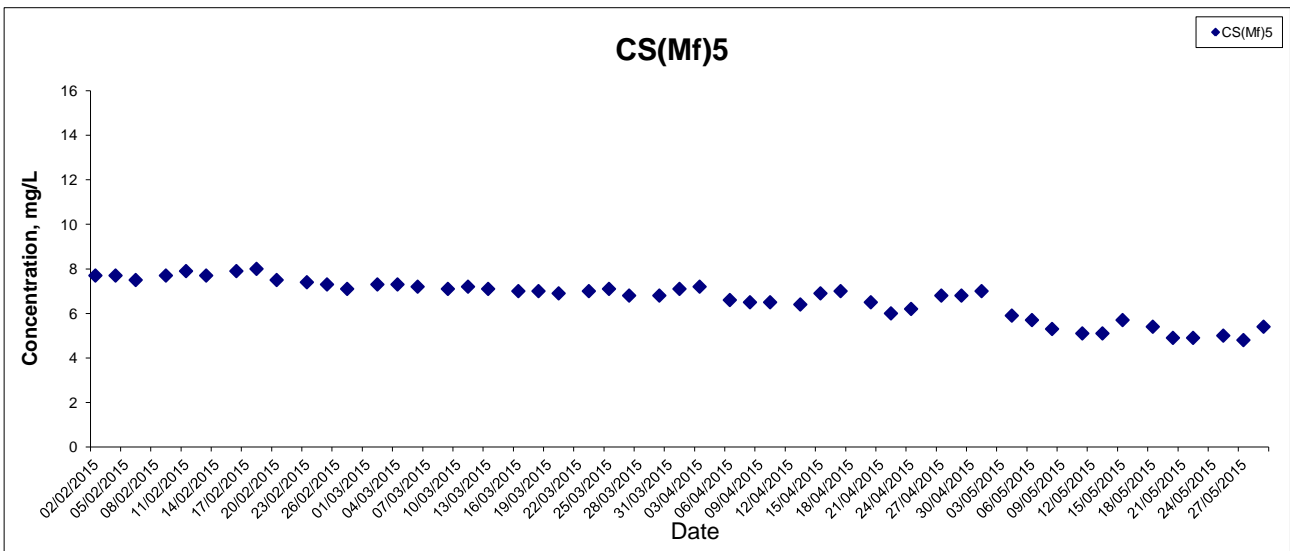


## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



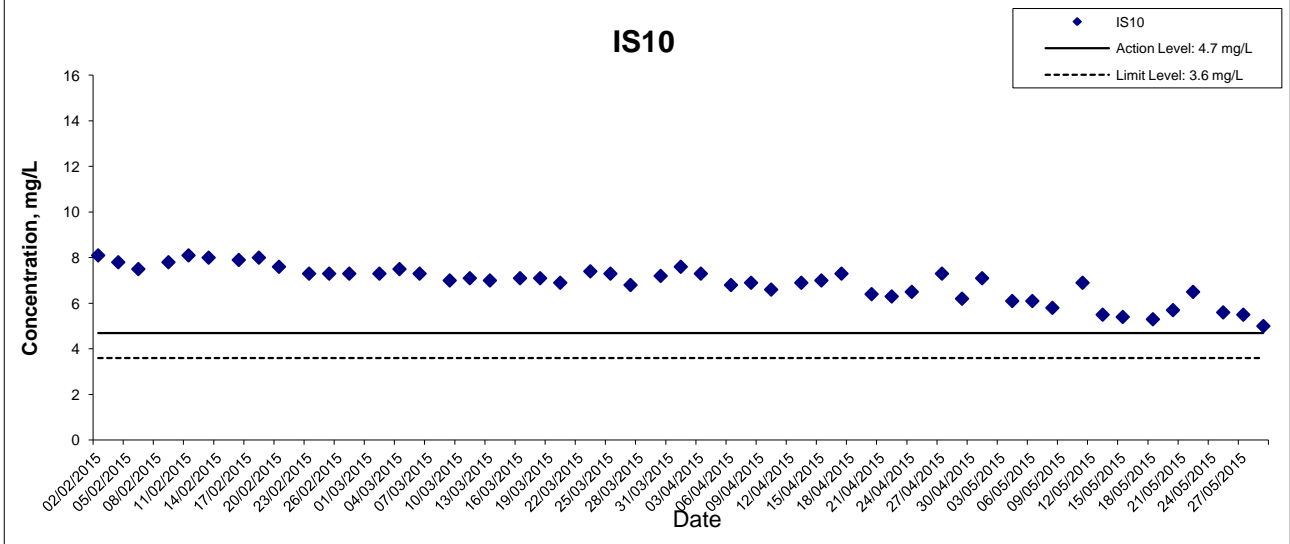
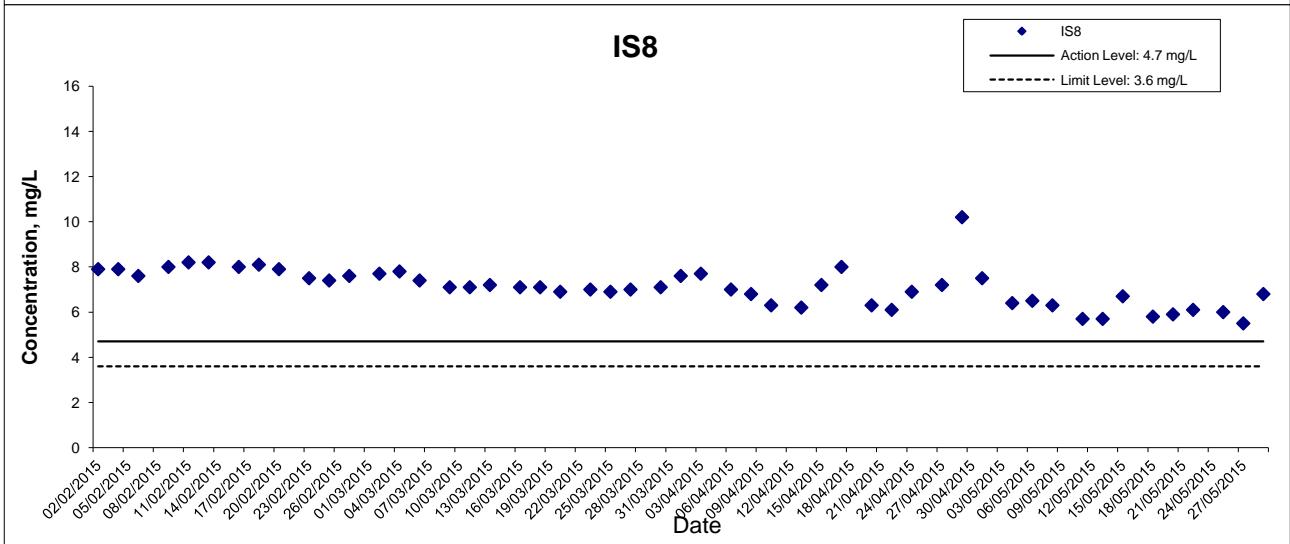
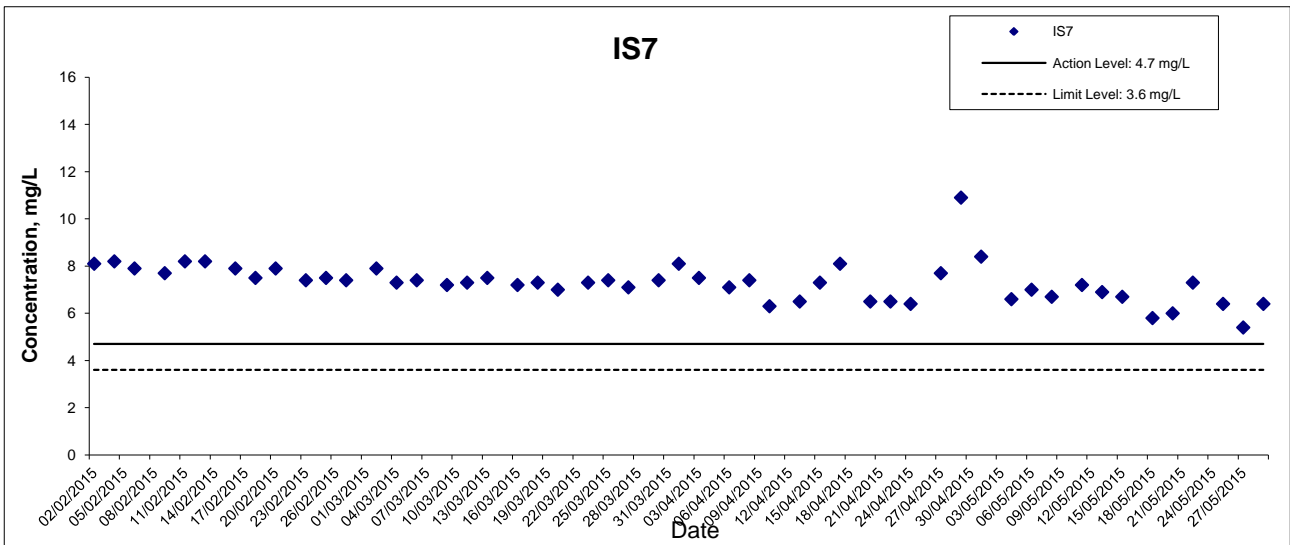
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## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



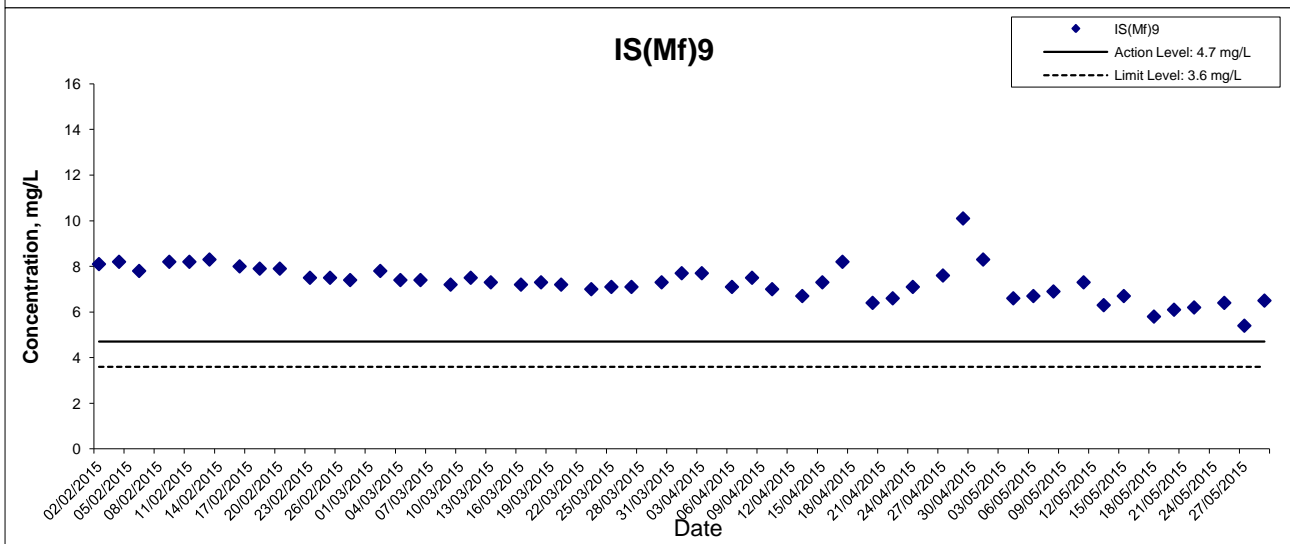
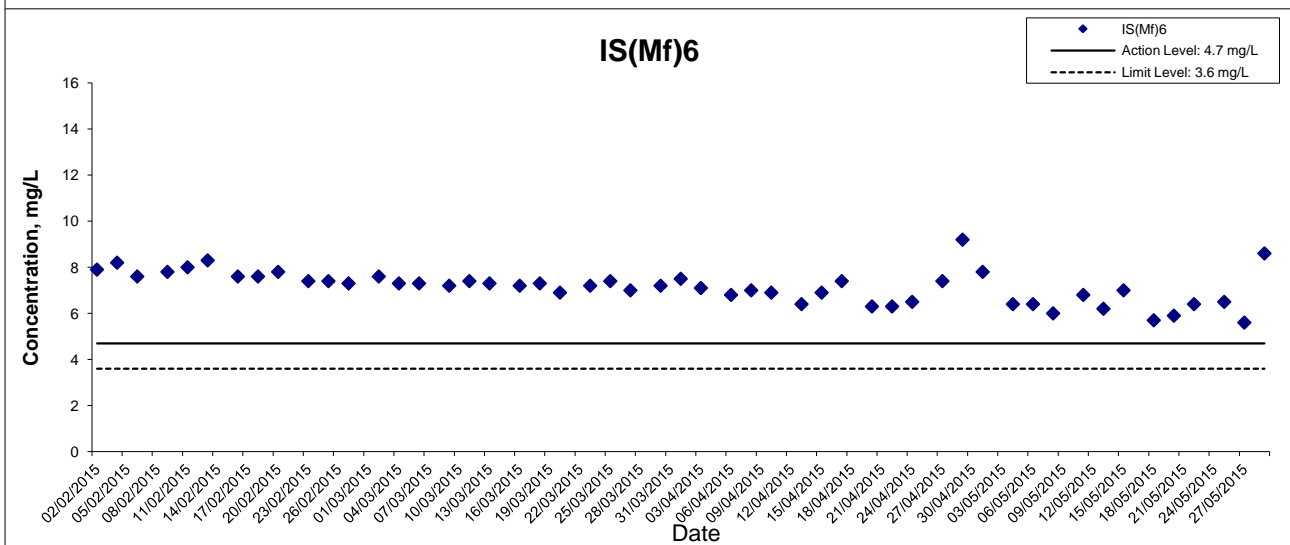
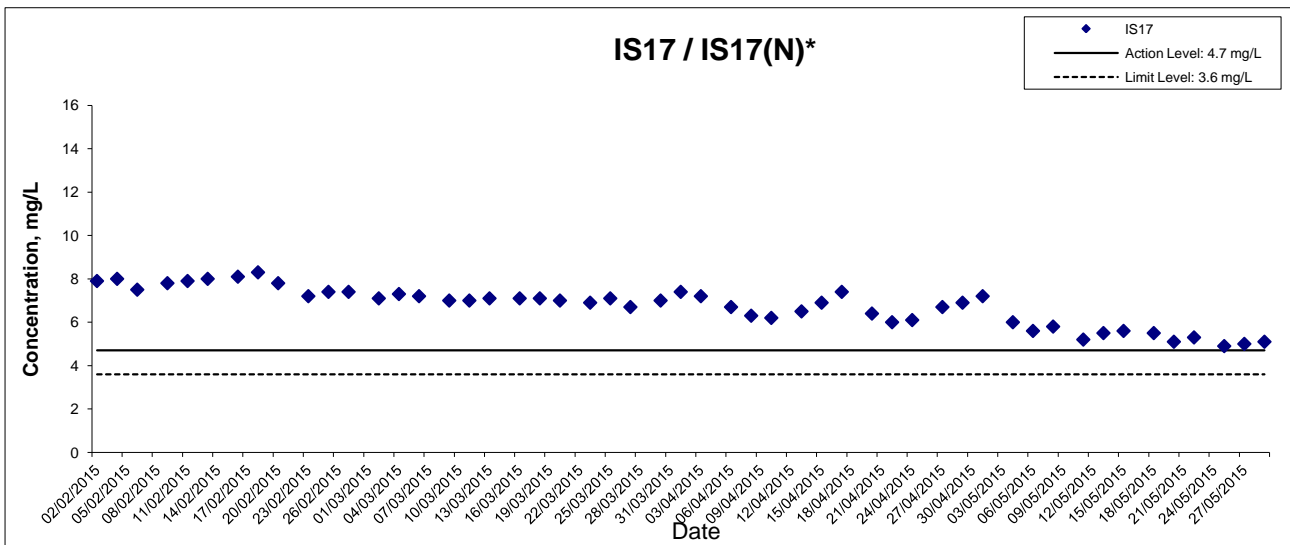
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### Dissolved Oxygen (Bottom) at Mid-Ebb Tide



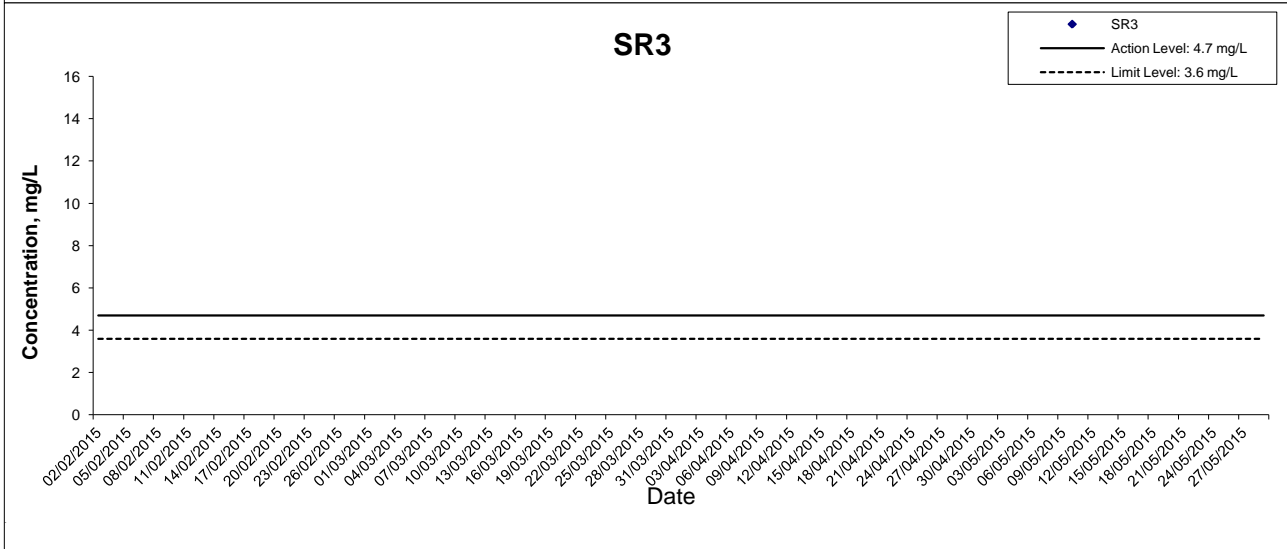
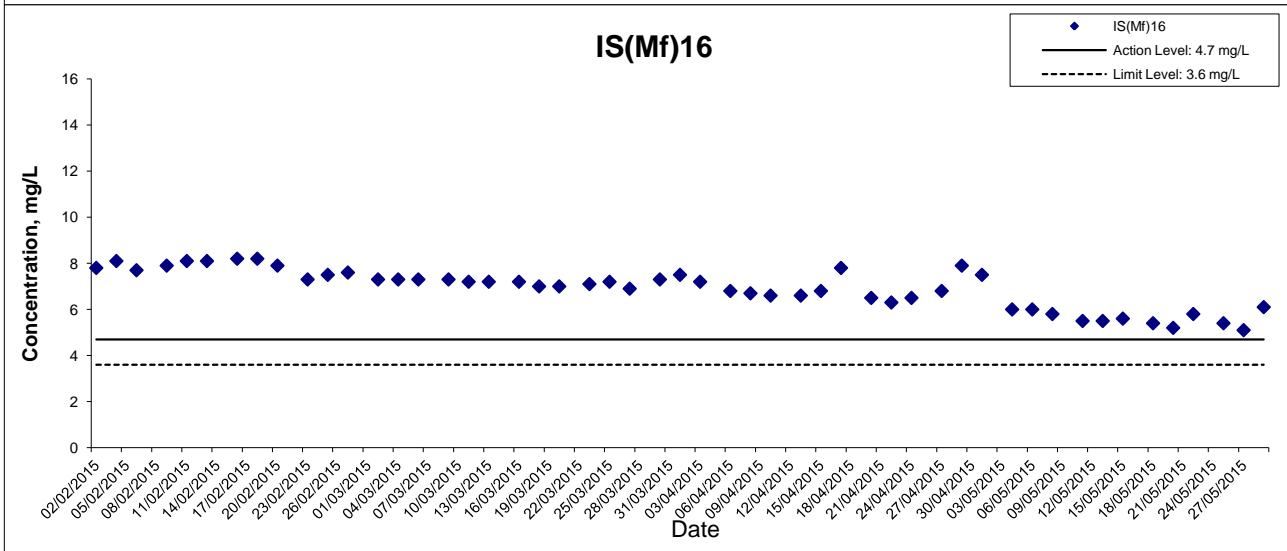
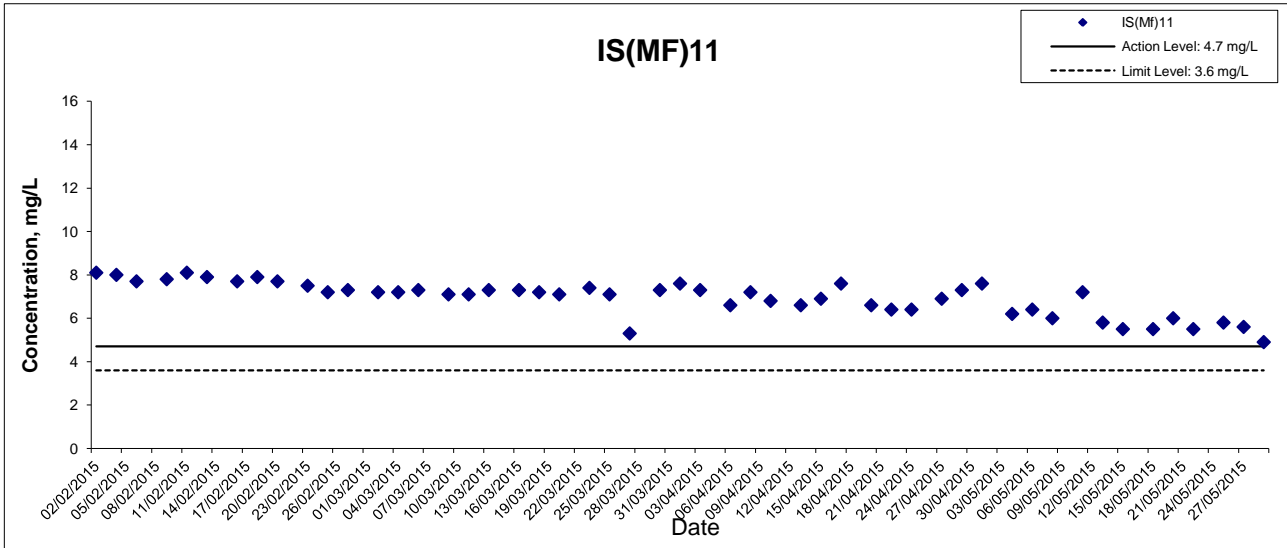
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## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



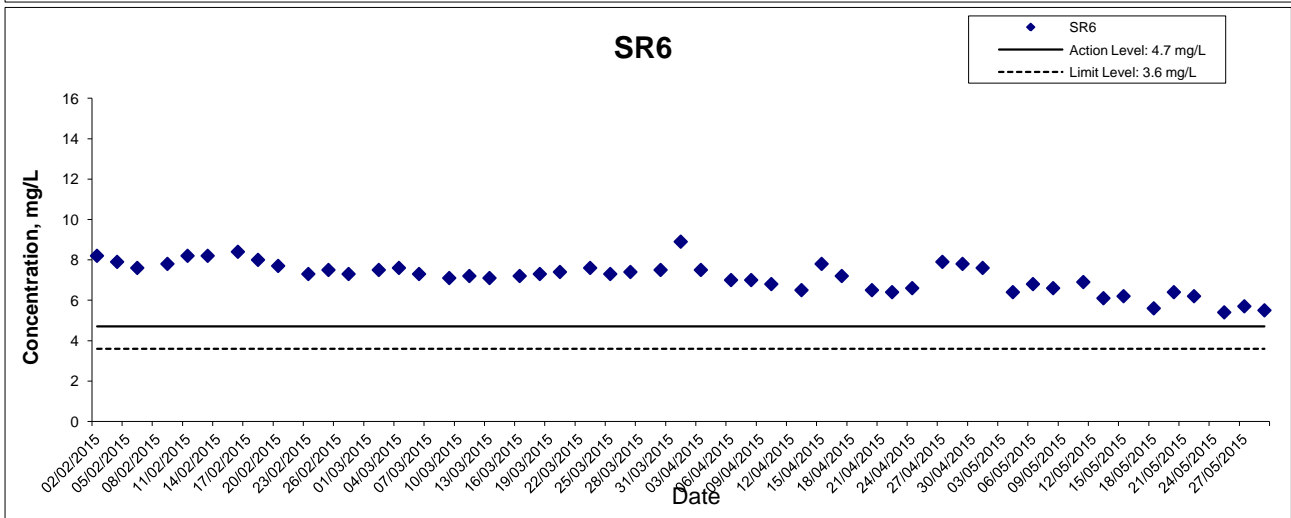
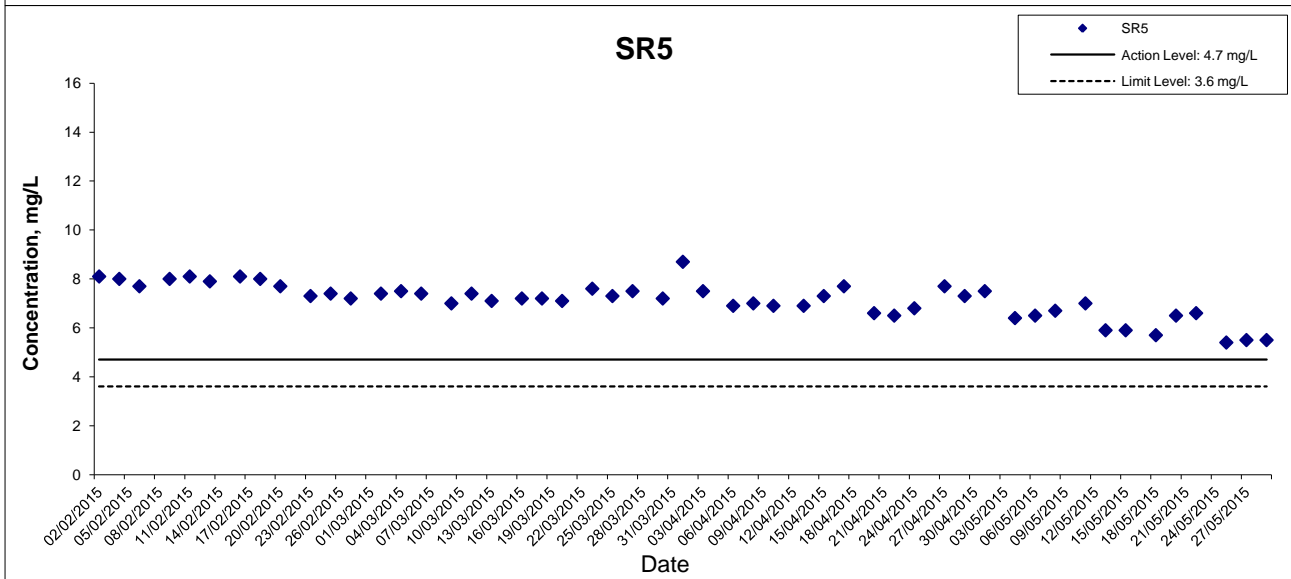
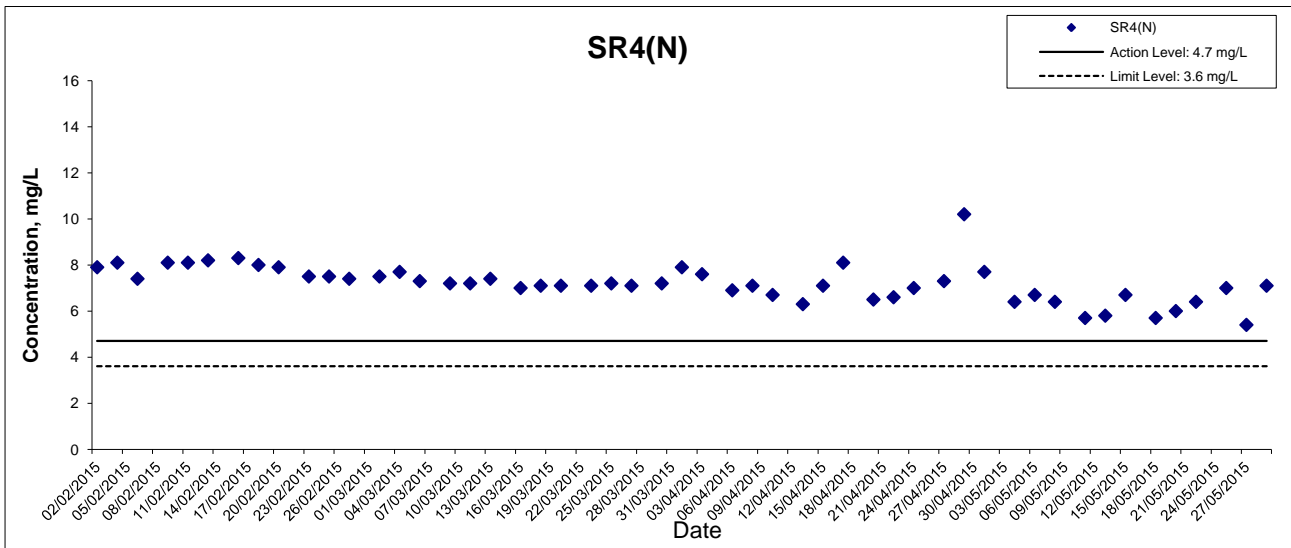
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## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



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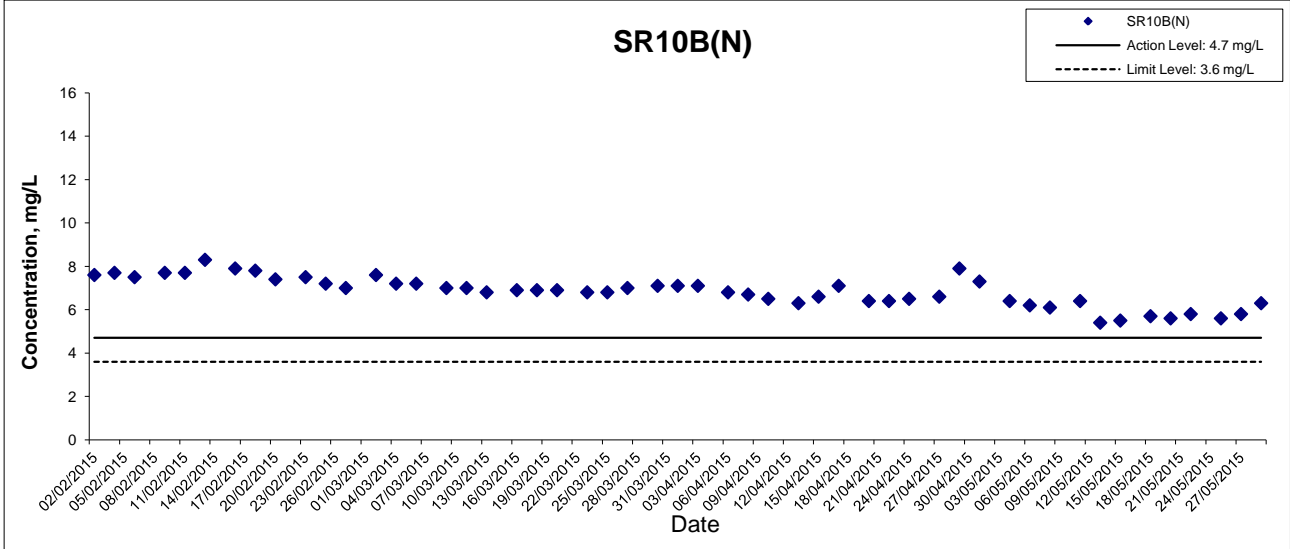
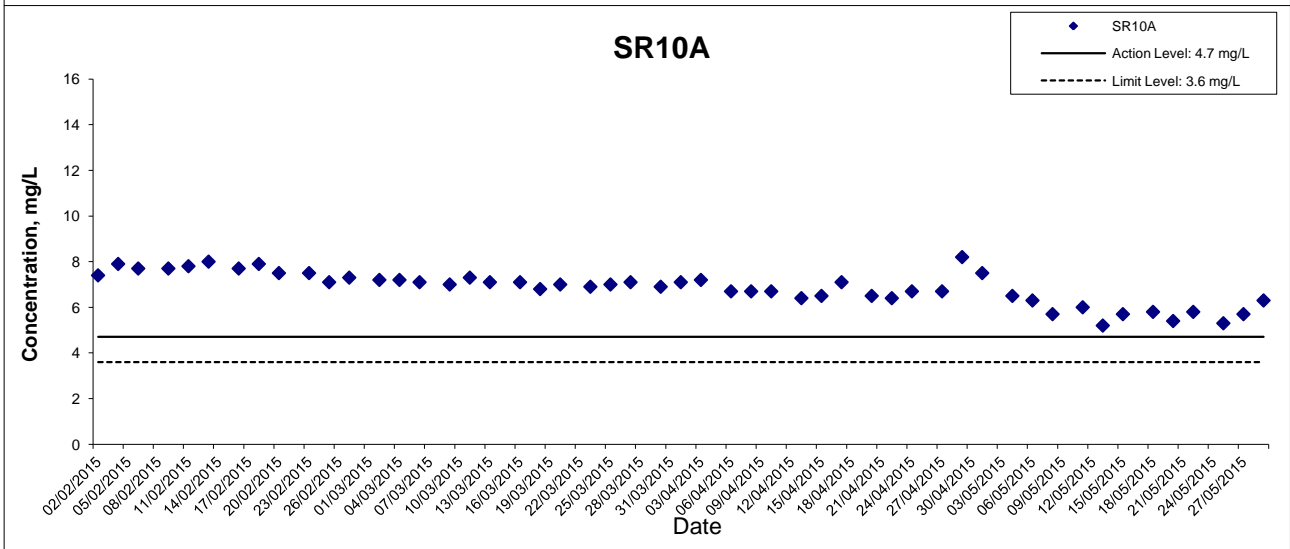
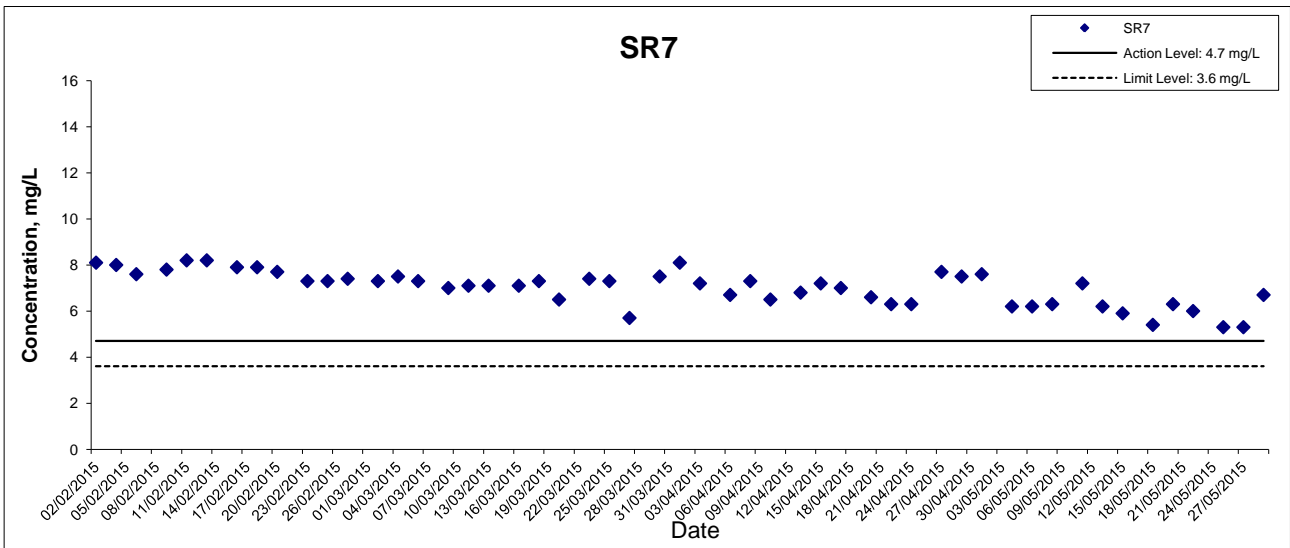
## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



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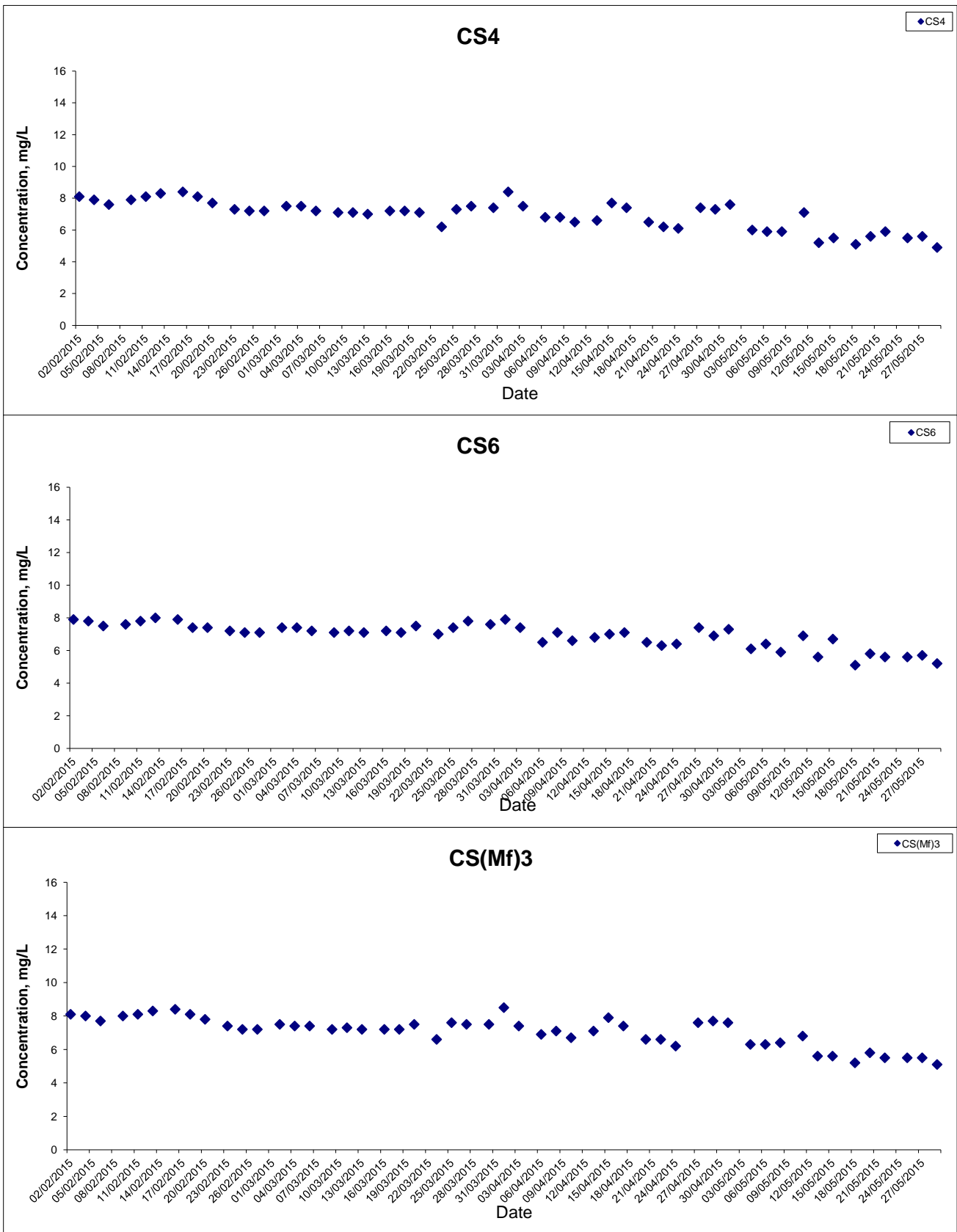


## Dissolved Oxygen (Bottom) at Mid-Ebb Tide



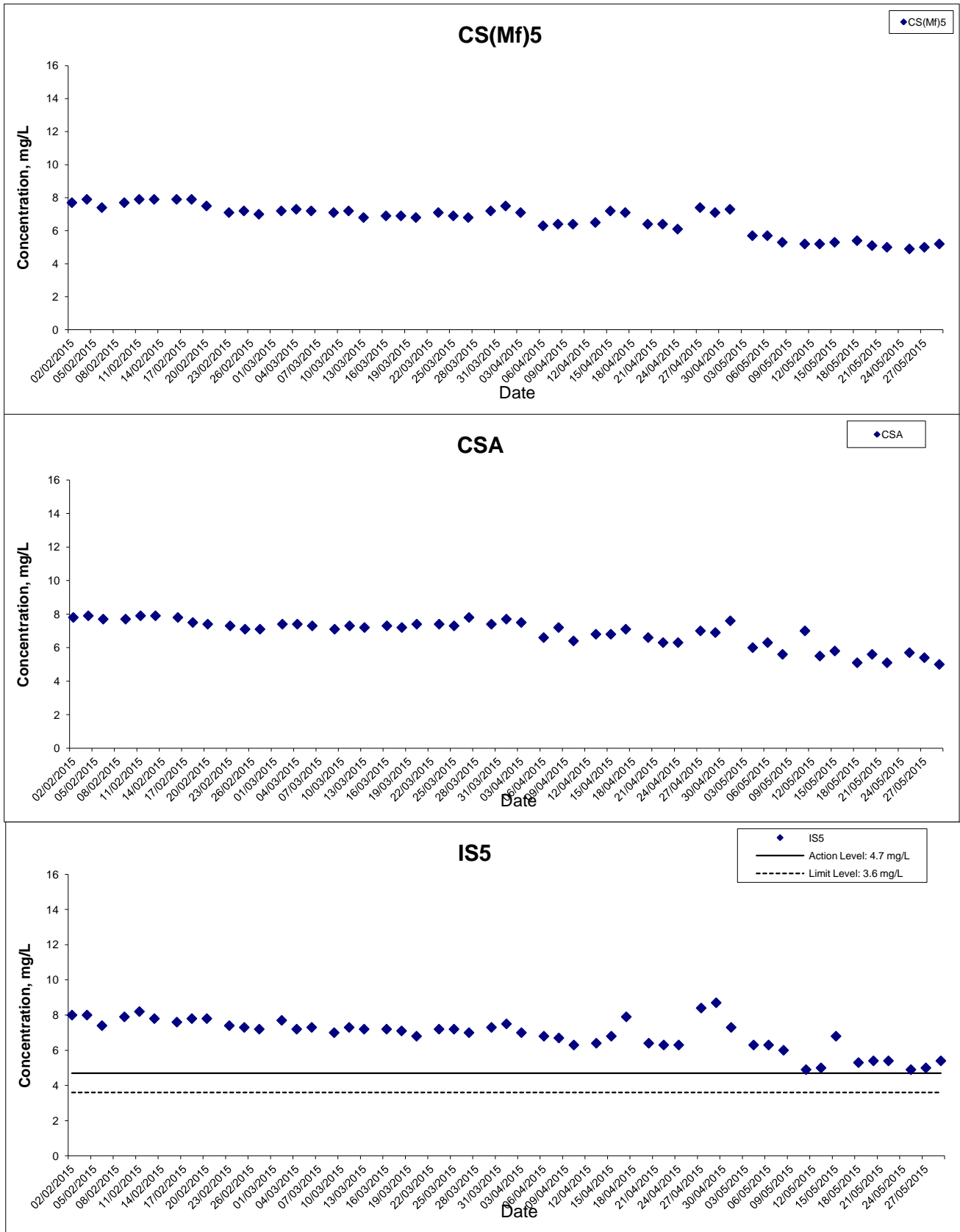
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## Dissolved Oxygen (Bottom) at Mid-Flood Tide



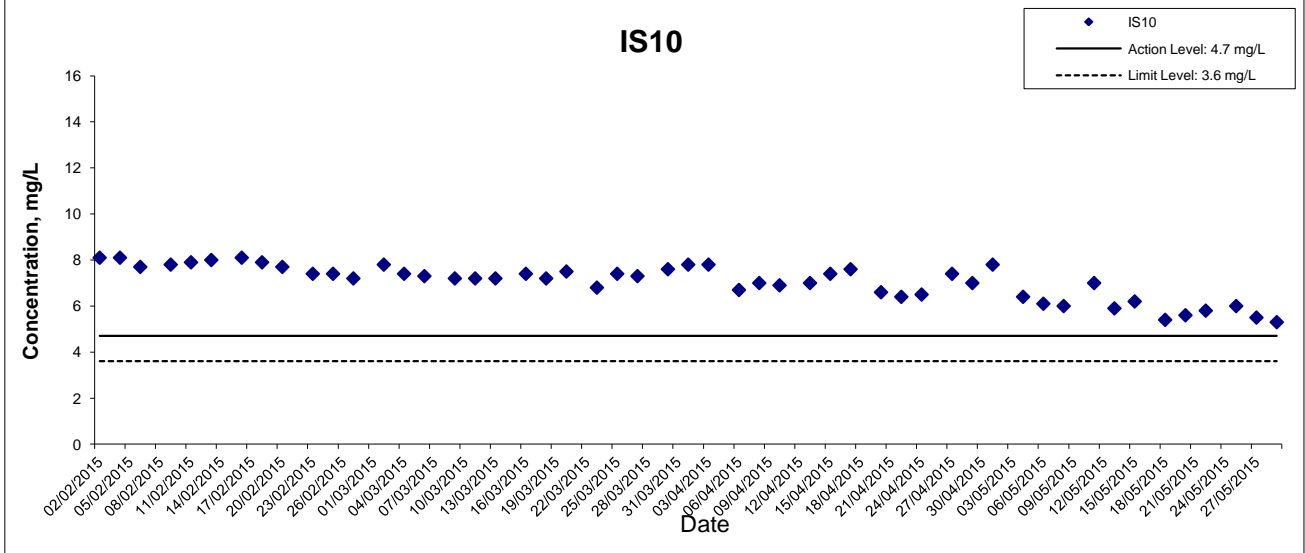
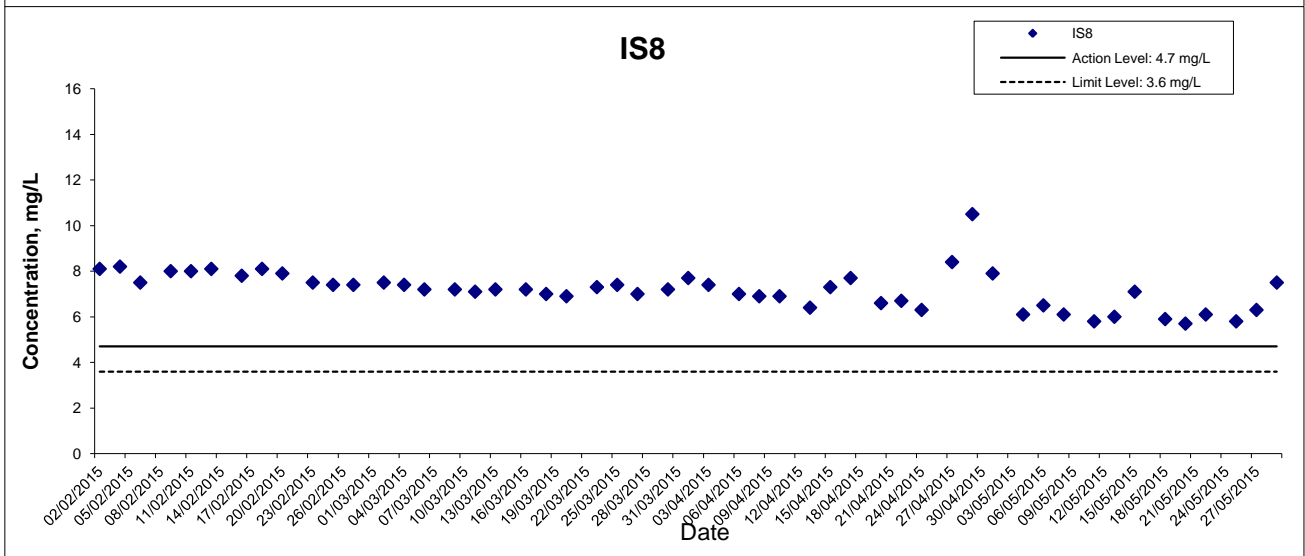
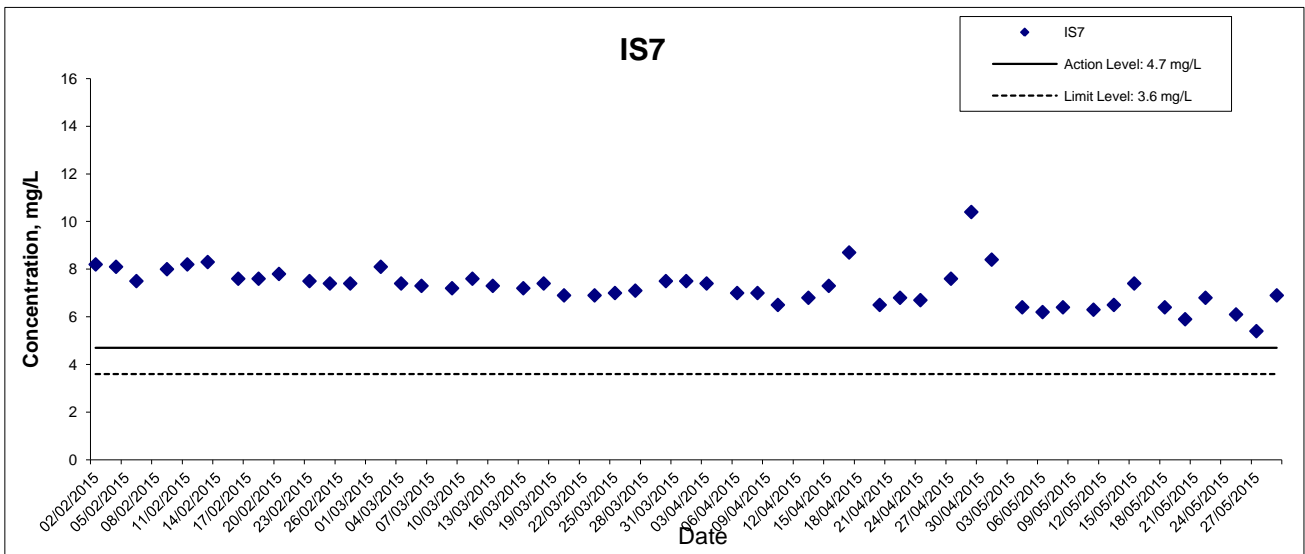
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## Dissolved Oxygen (Bottom) at Mid-Flood Tide



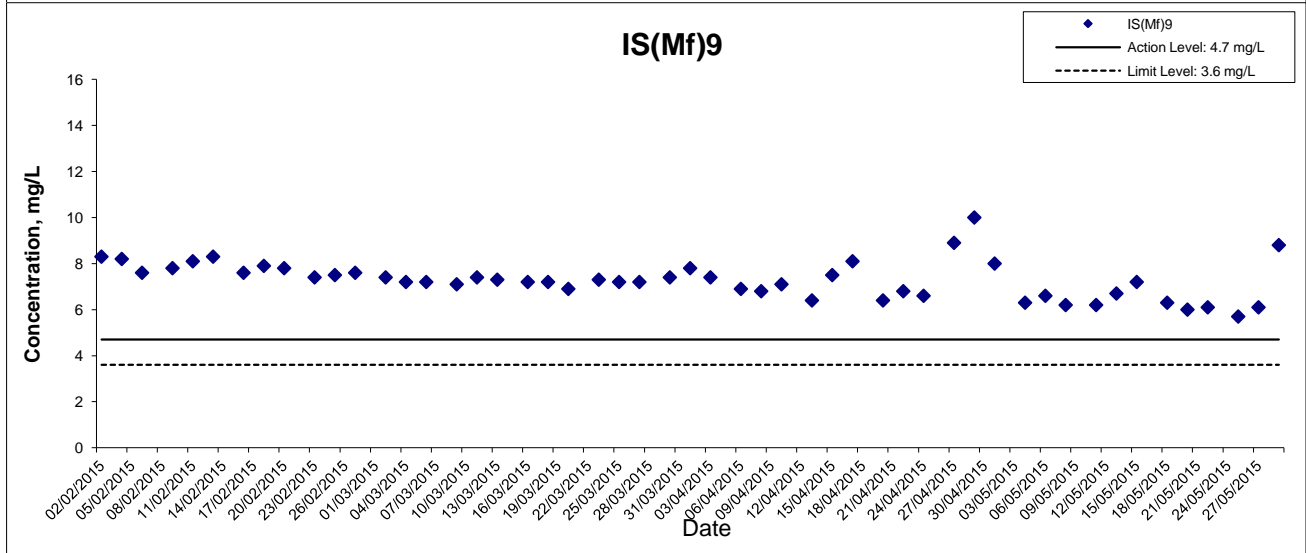
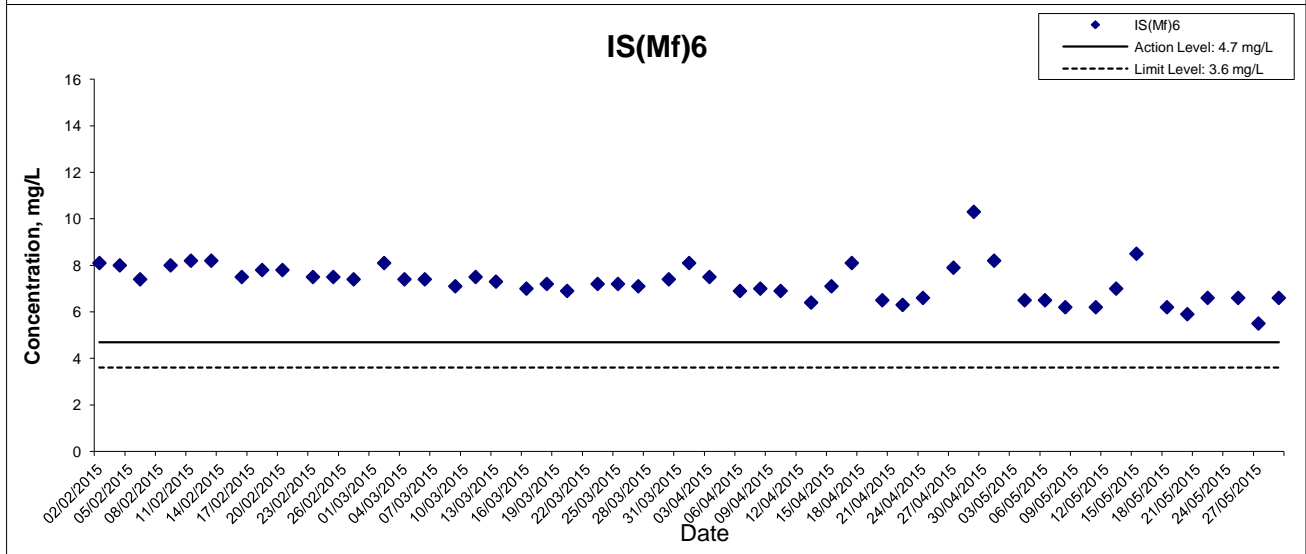
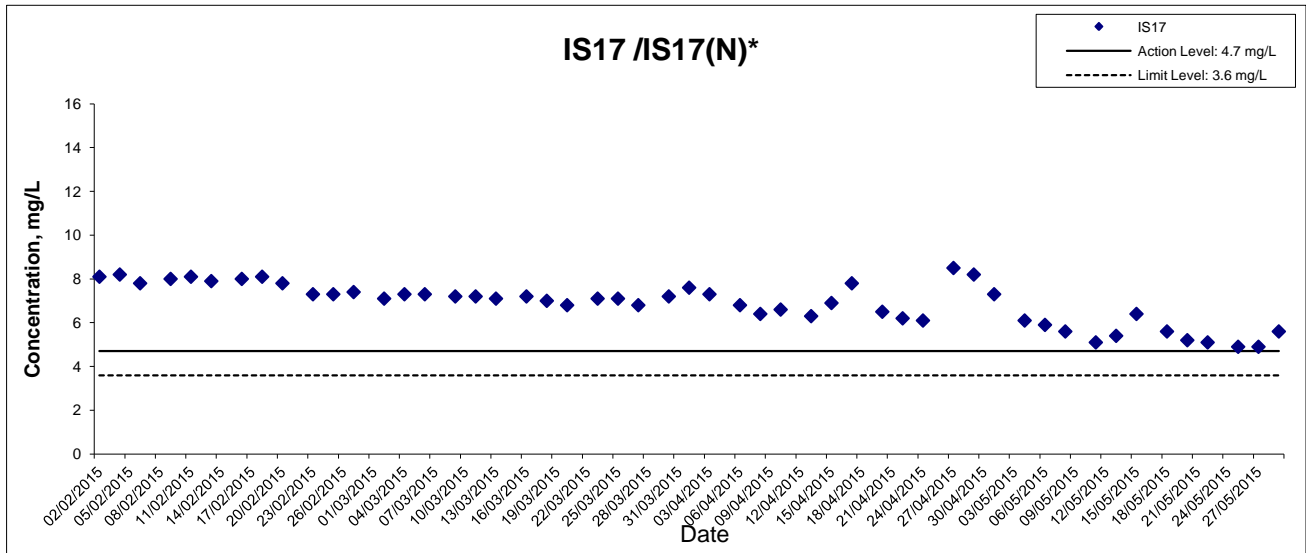
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## Dissolved Oxygen (Bottom) at Mid-Flood Tide



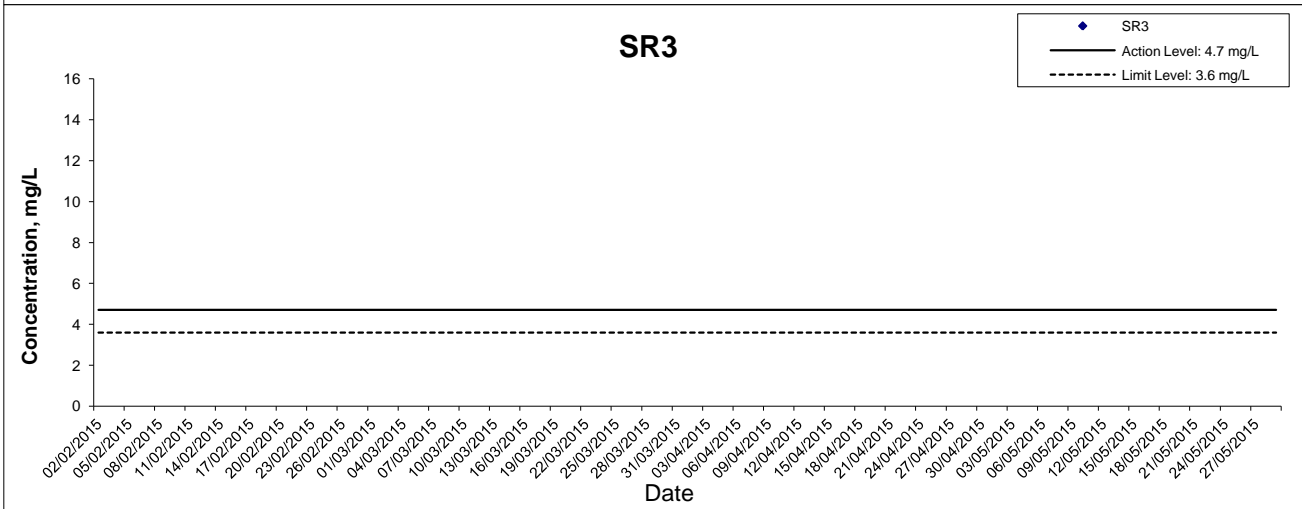
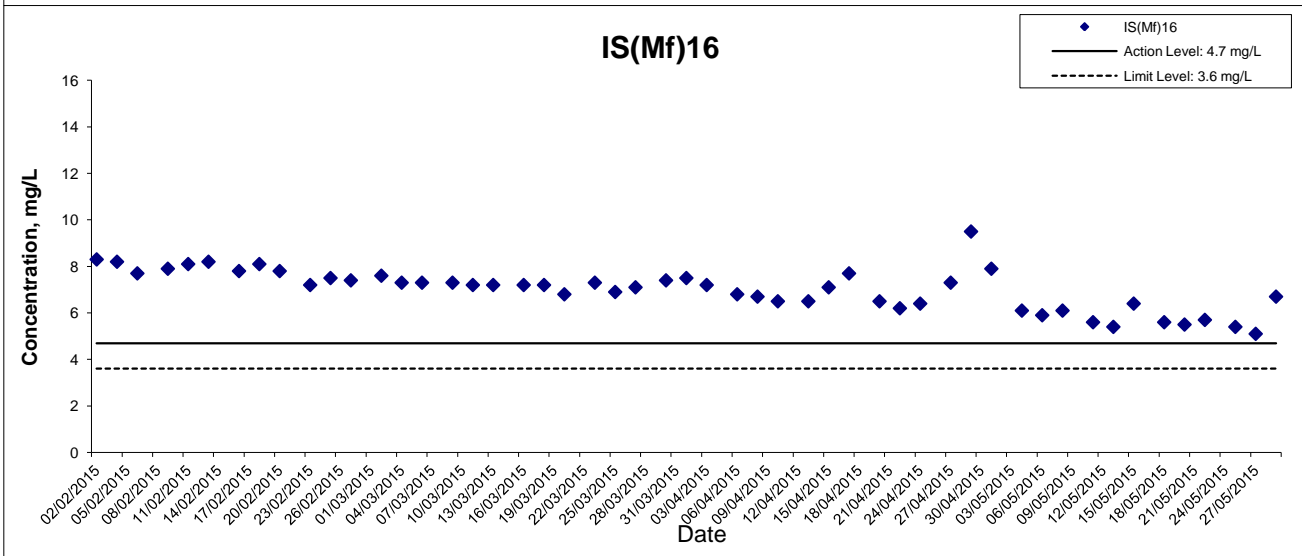
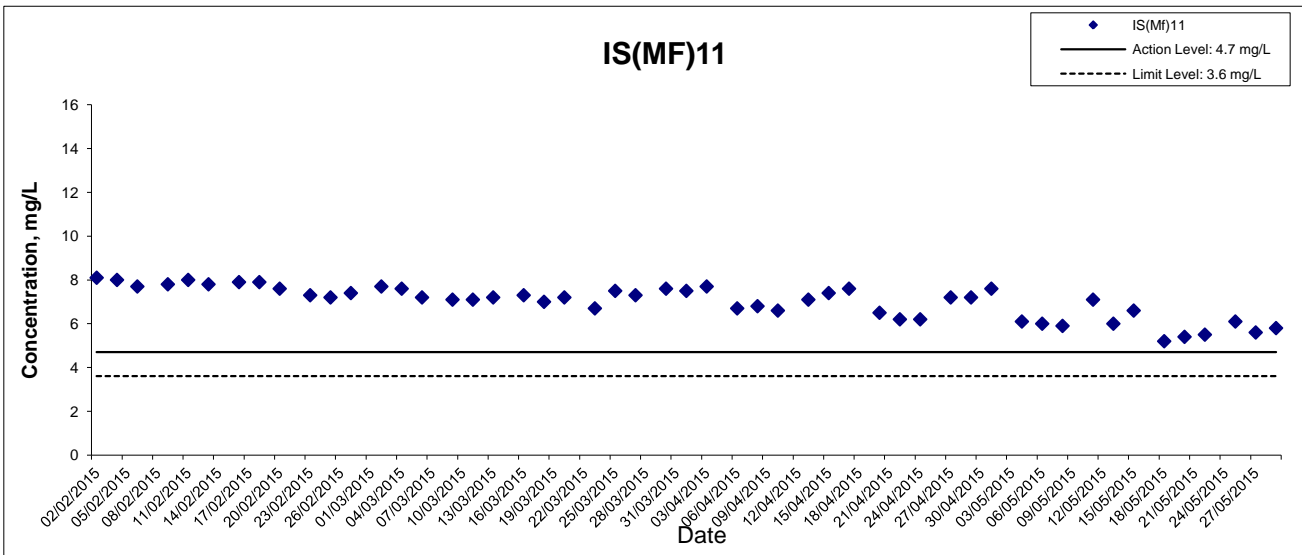
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## Dissolved Oxygen (Bottom) at Mid-Flood Tide



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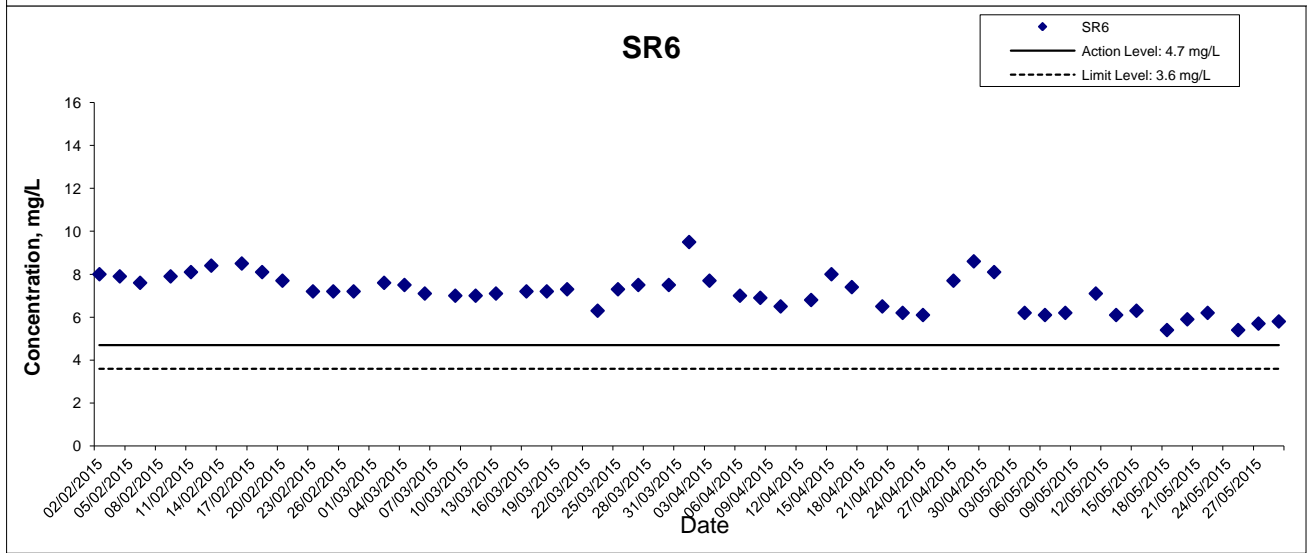
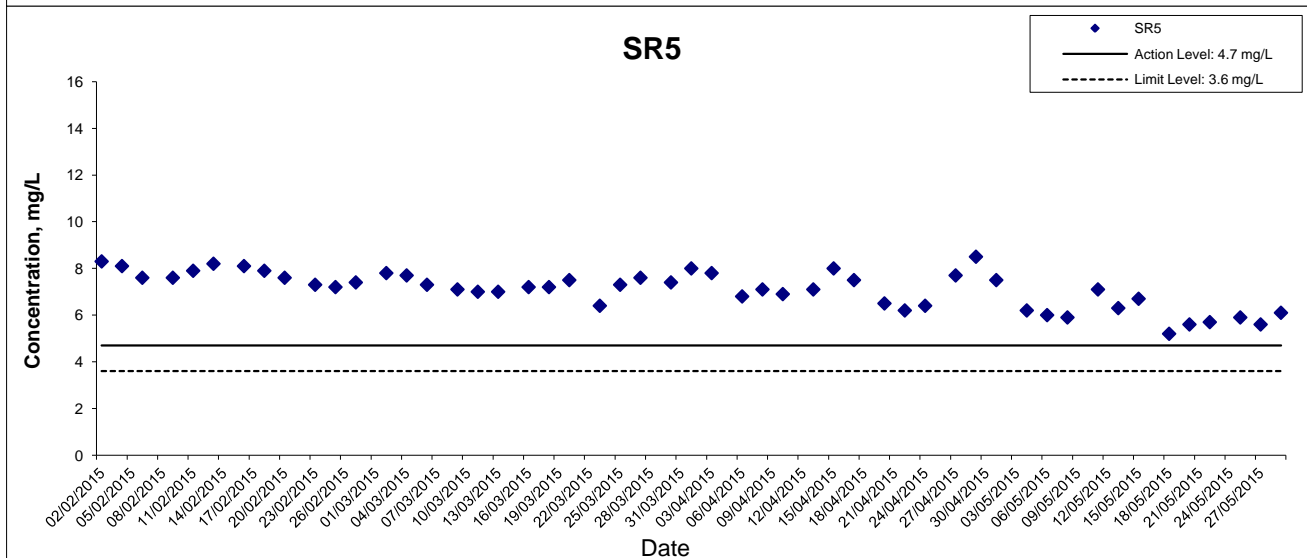
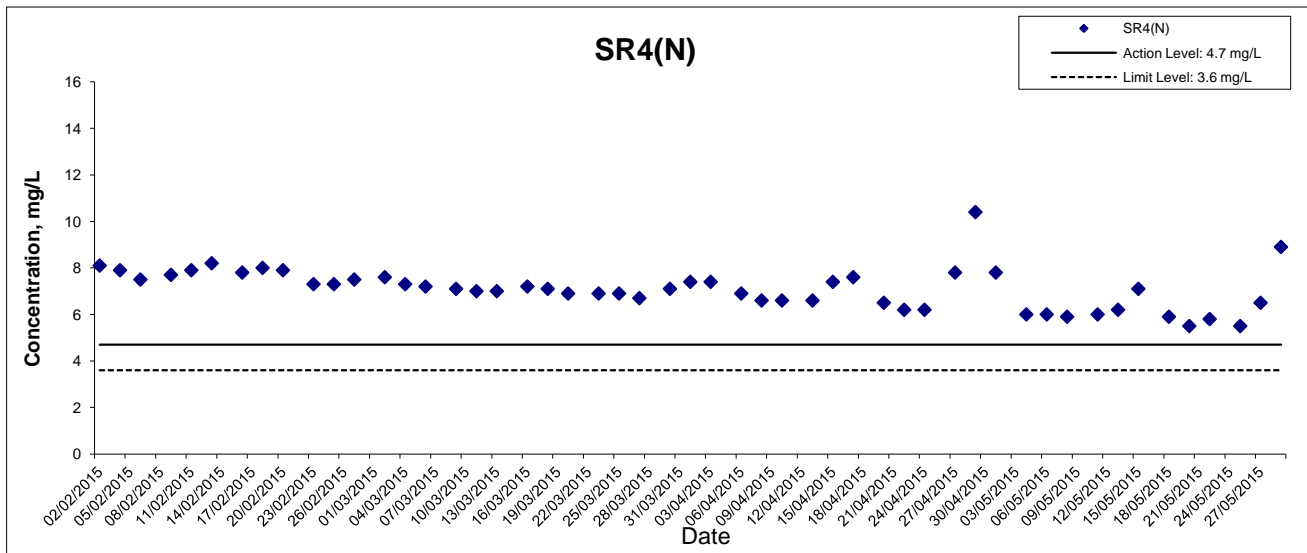
## Dissolved Oxygen (Bottom) at Mid-Flood Tide



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

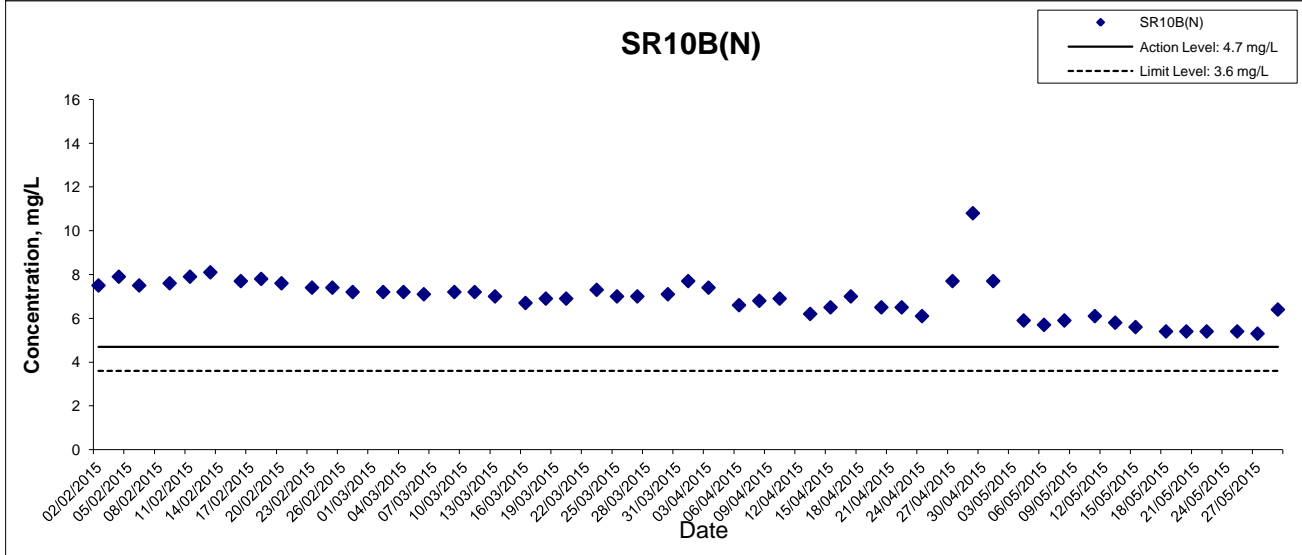
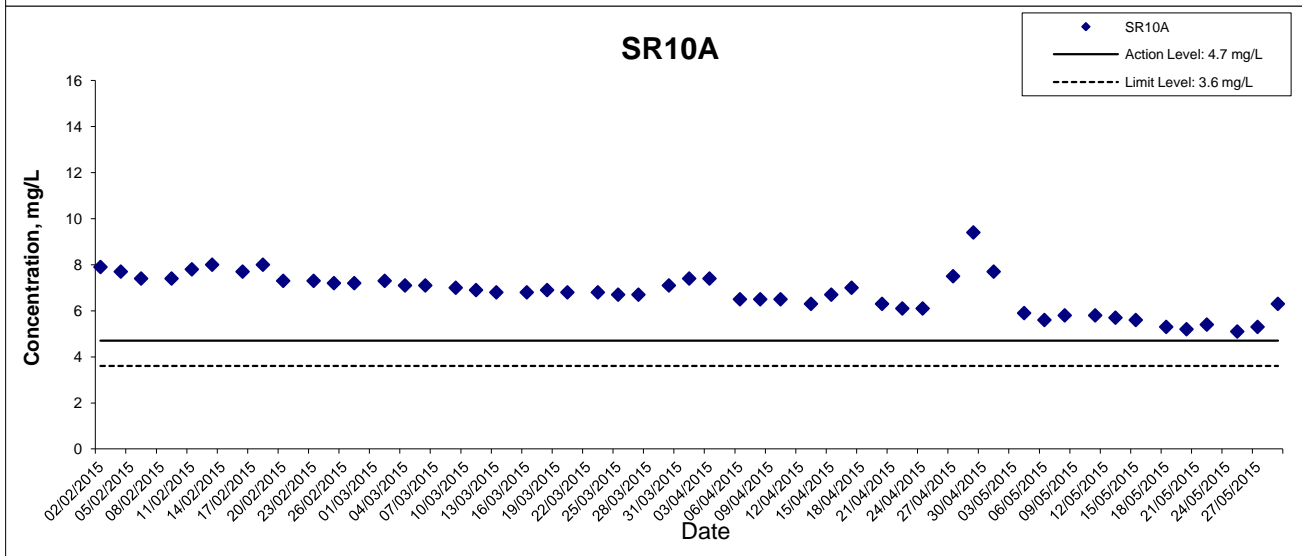
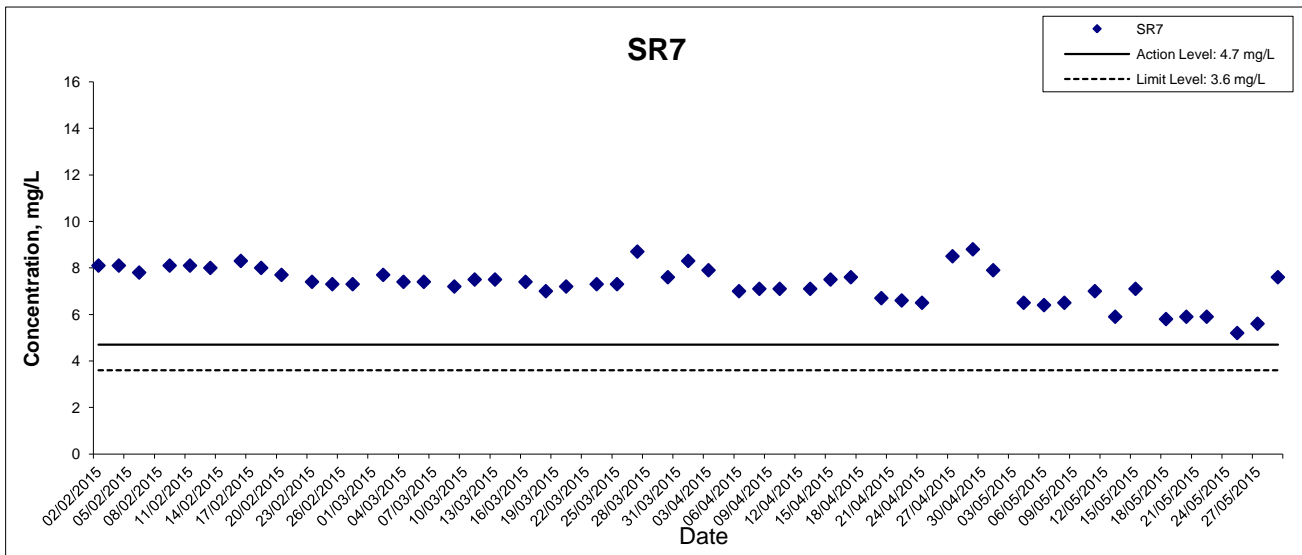
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## Dissolved Oxygen (Bottom) at Mid-Flood Tide



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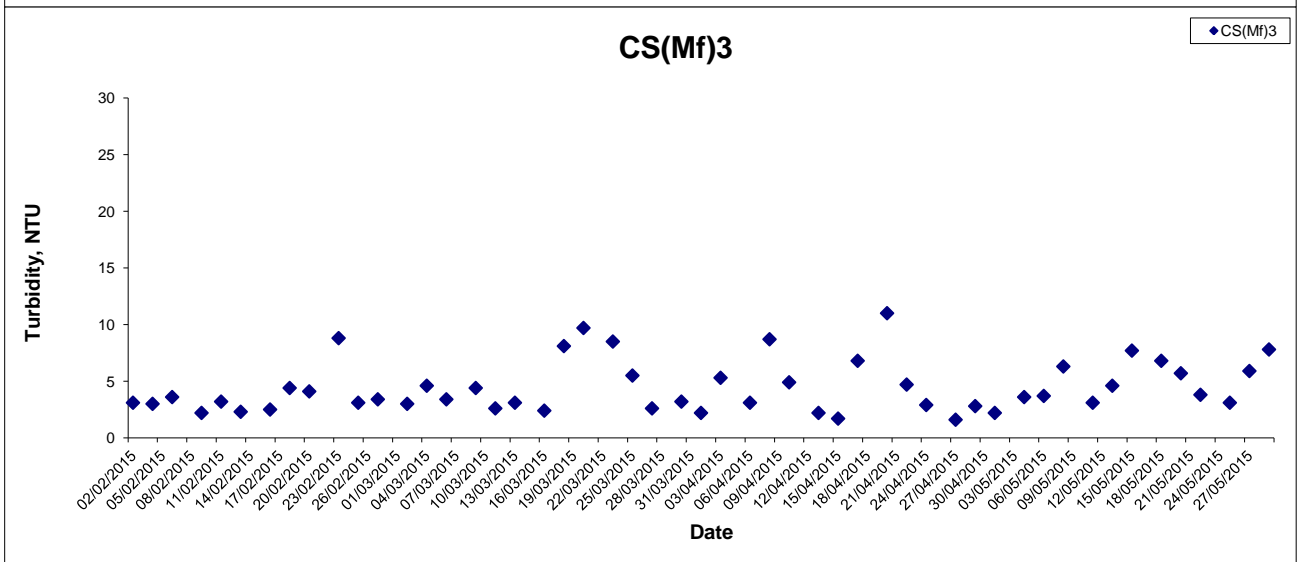
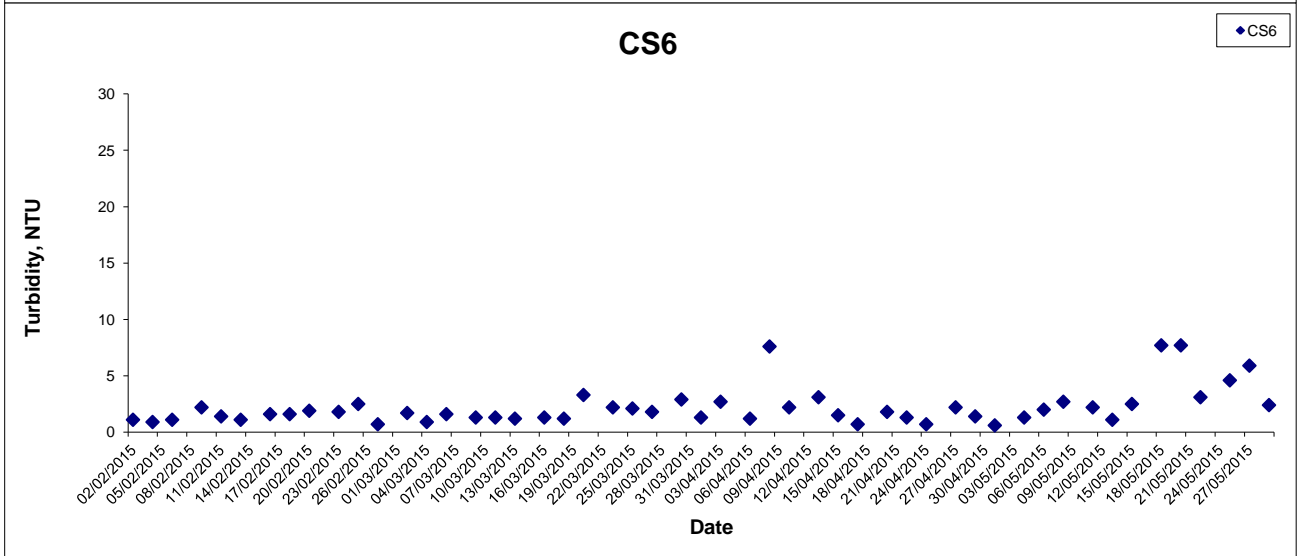
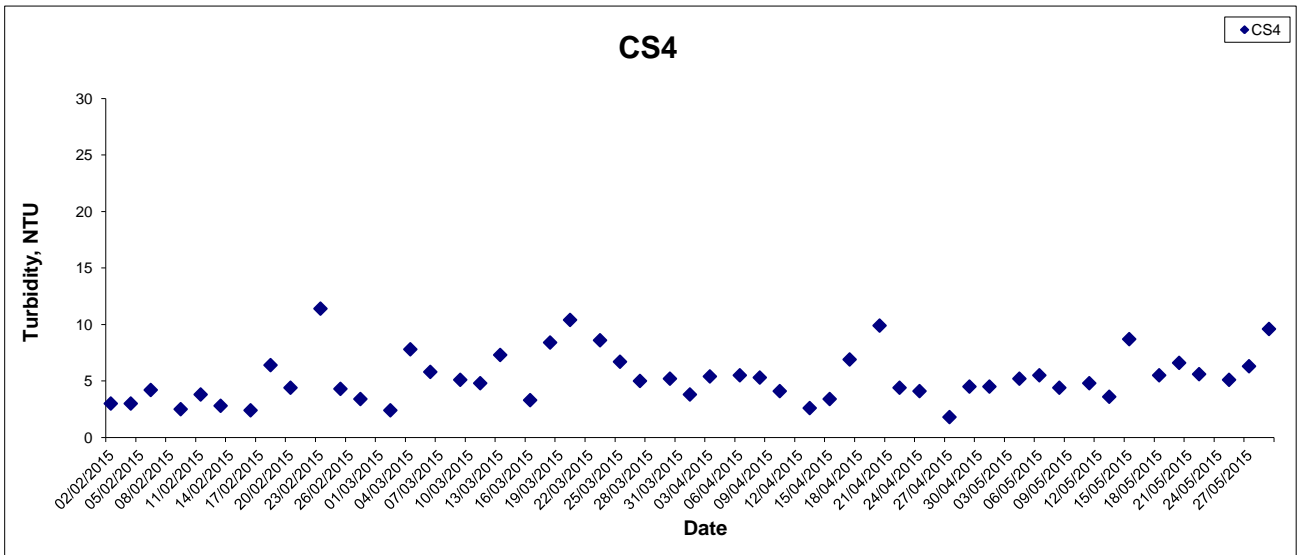
## Dissolved Oxygen (Bottom) at Mid-Flood Tide



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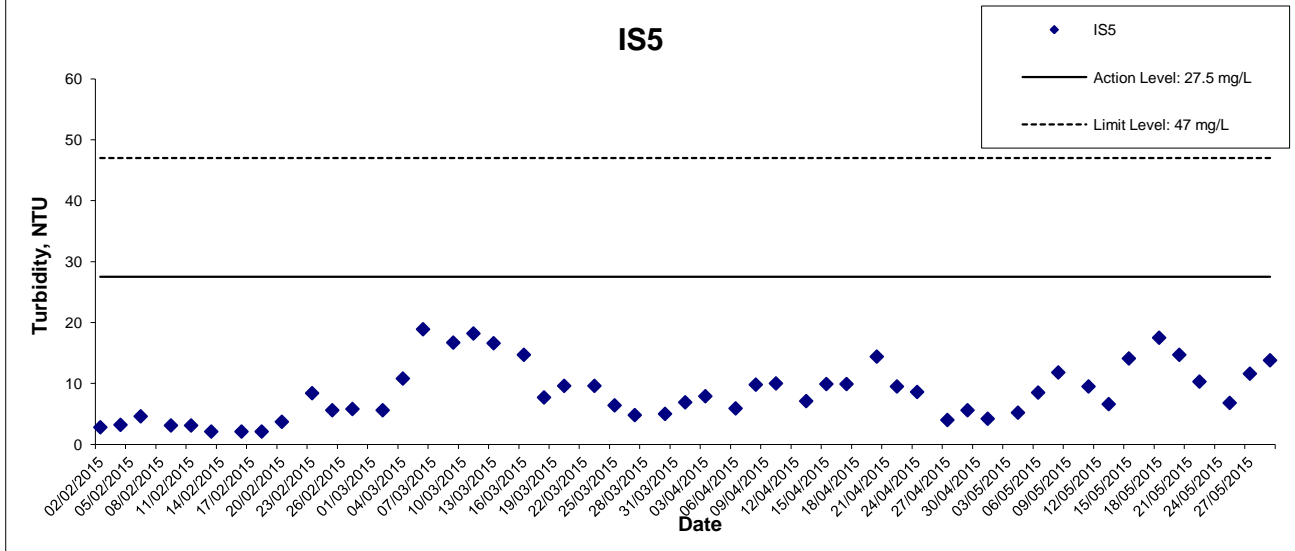
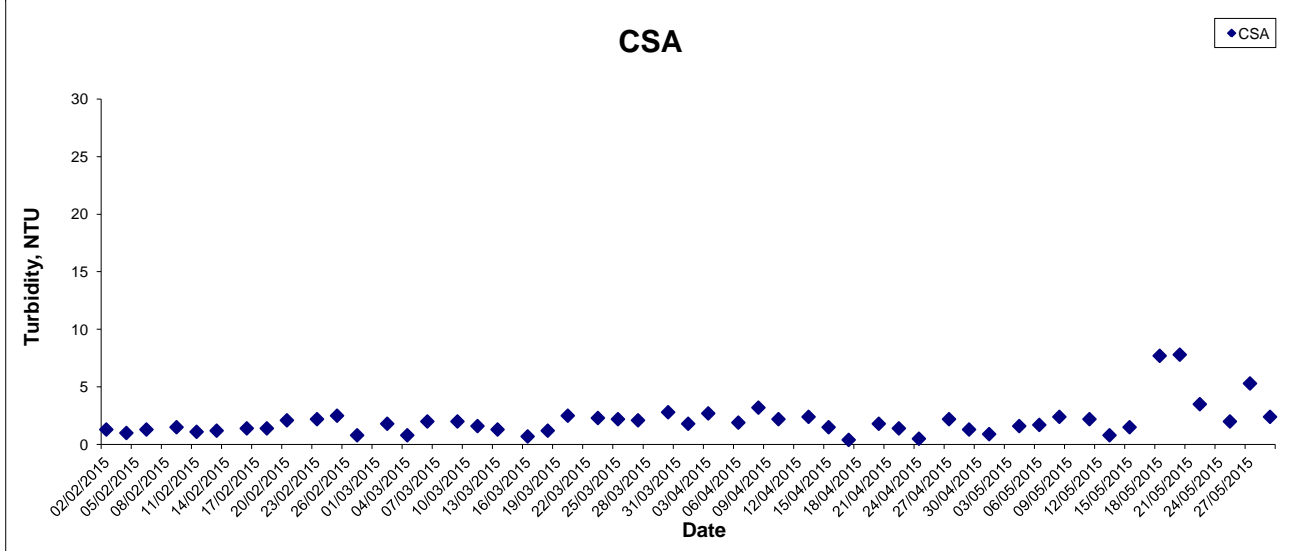
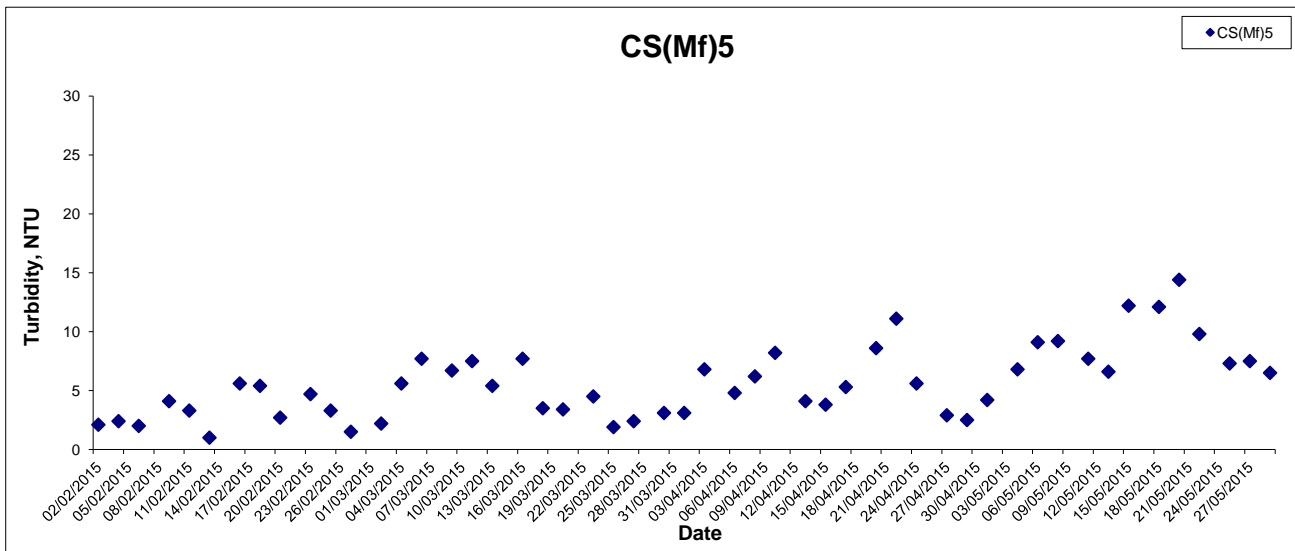


## Turbidity at Mid-Ebb Tide



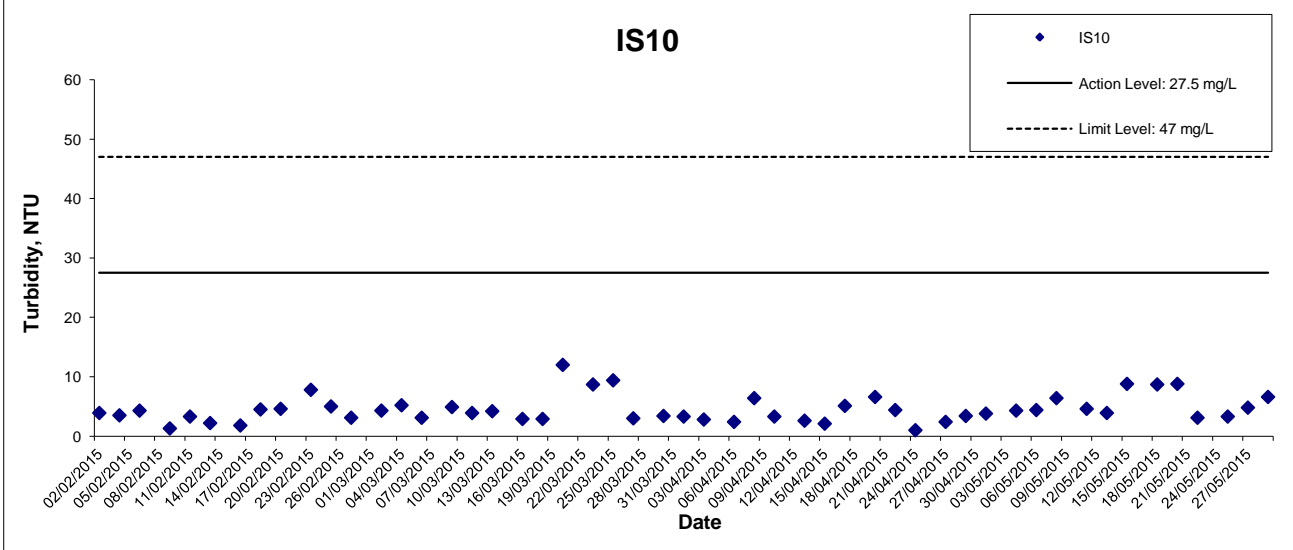
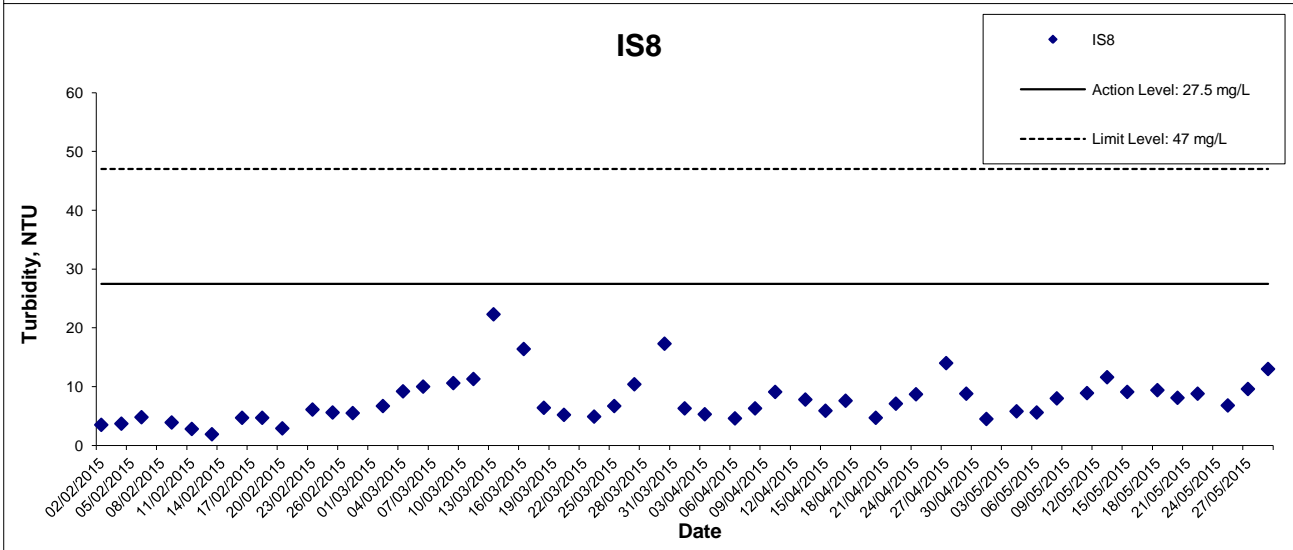
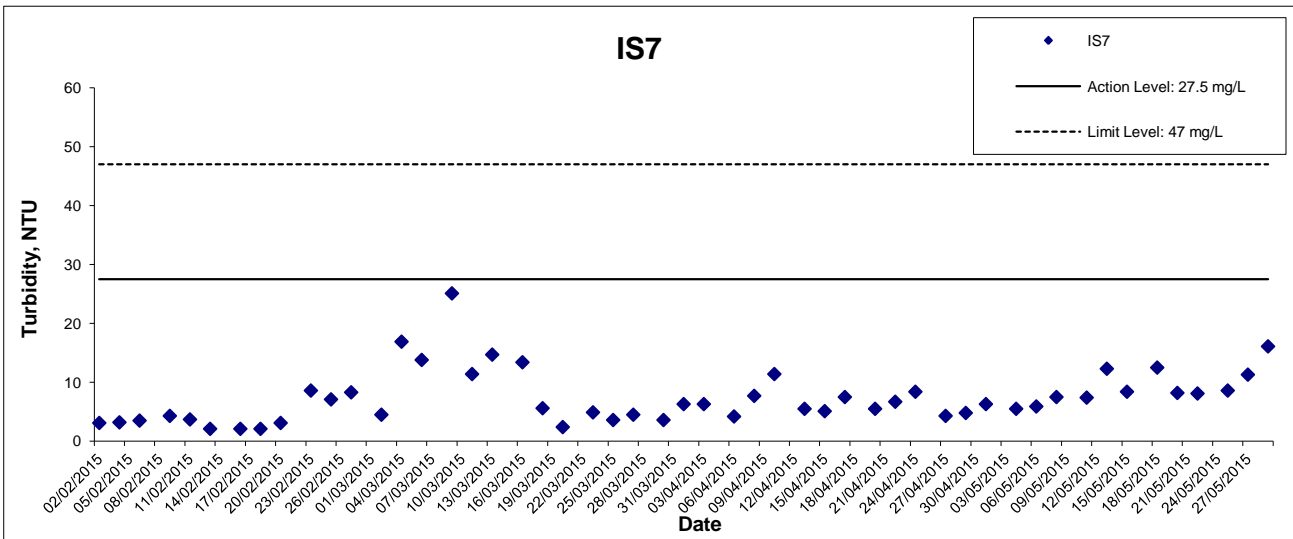
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### Turbidity at Mid-Ebb Tide



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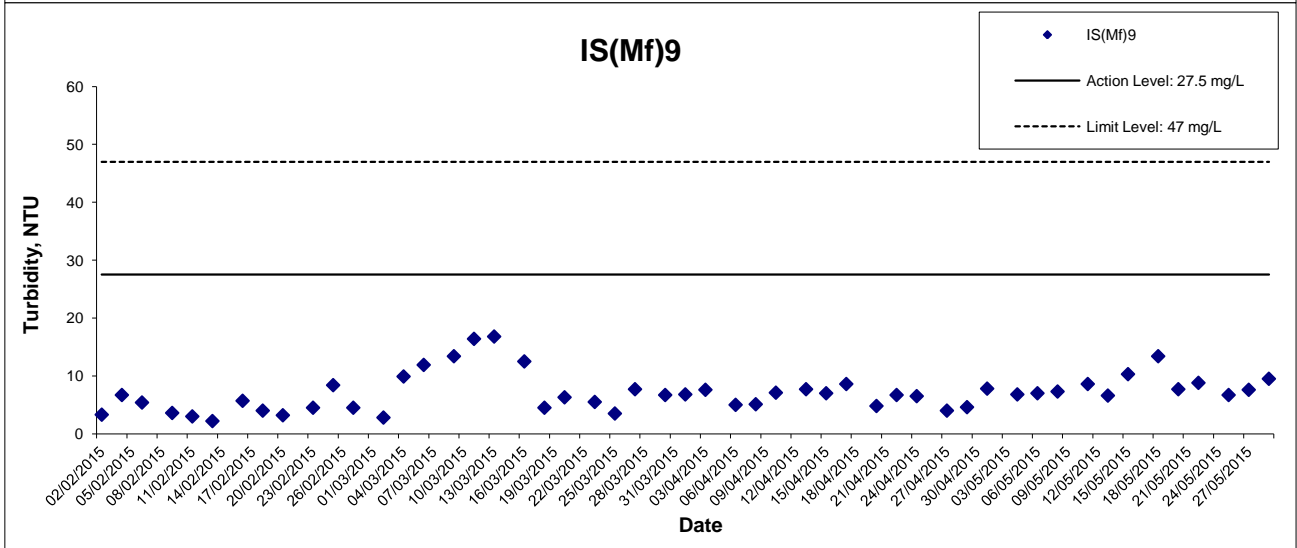
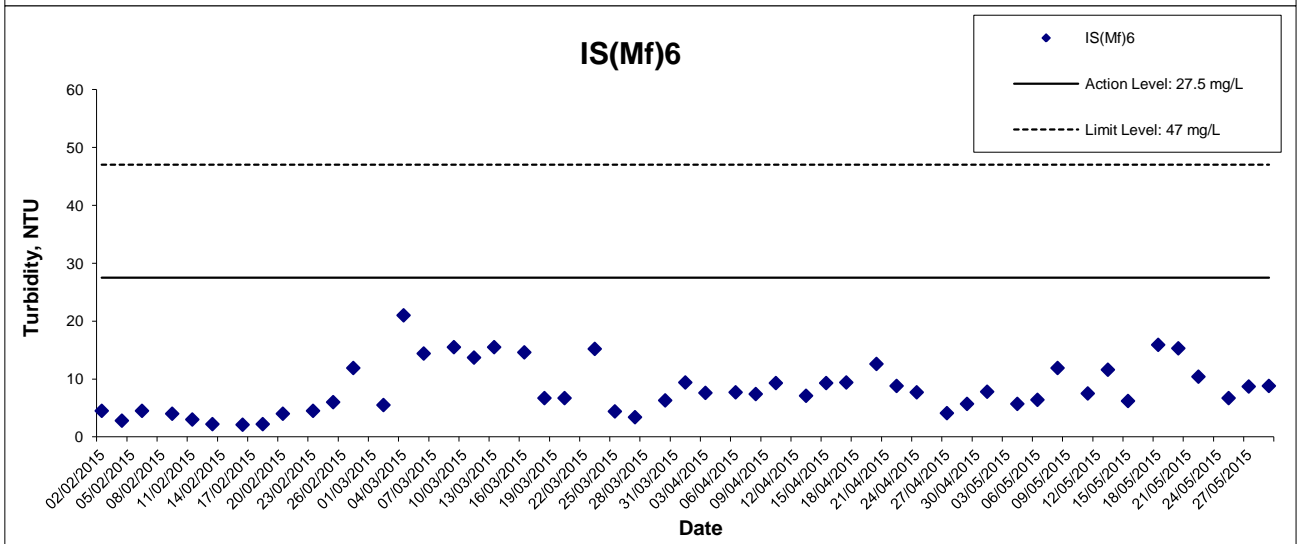
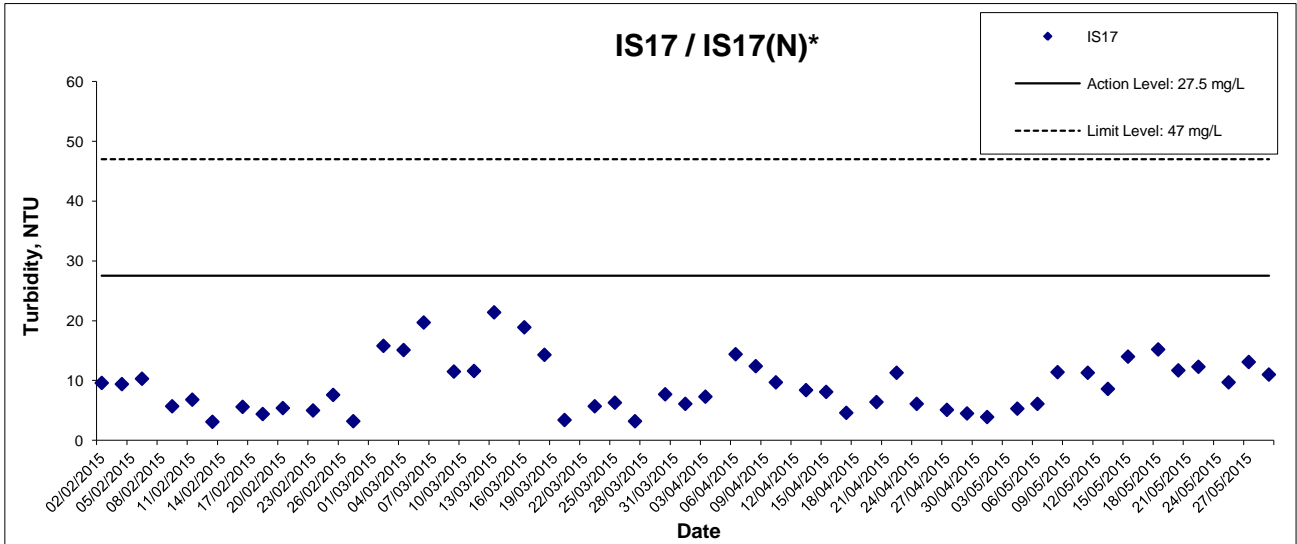
## Turbidity at Mid-Ebb Tide



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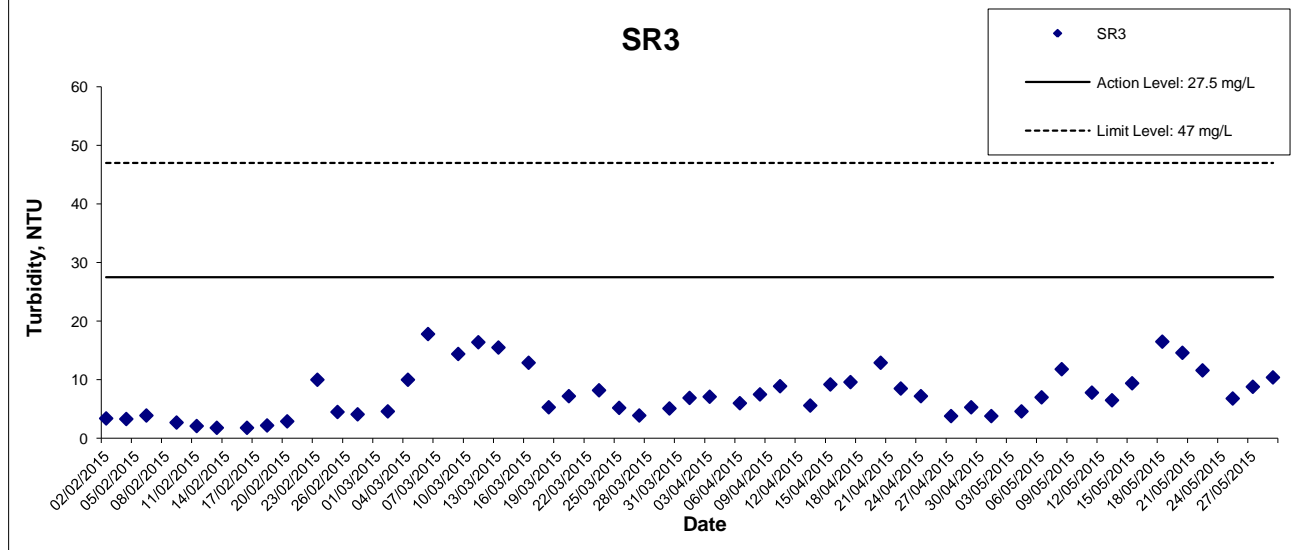
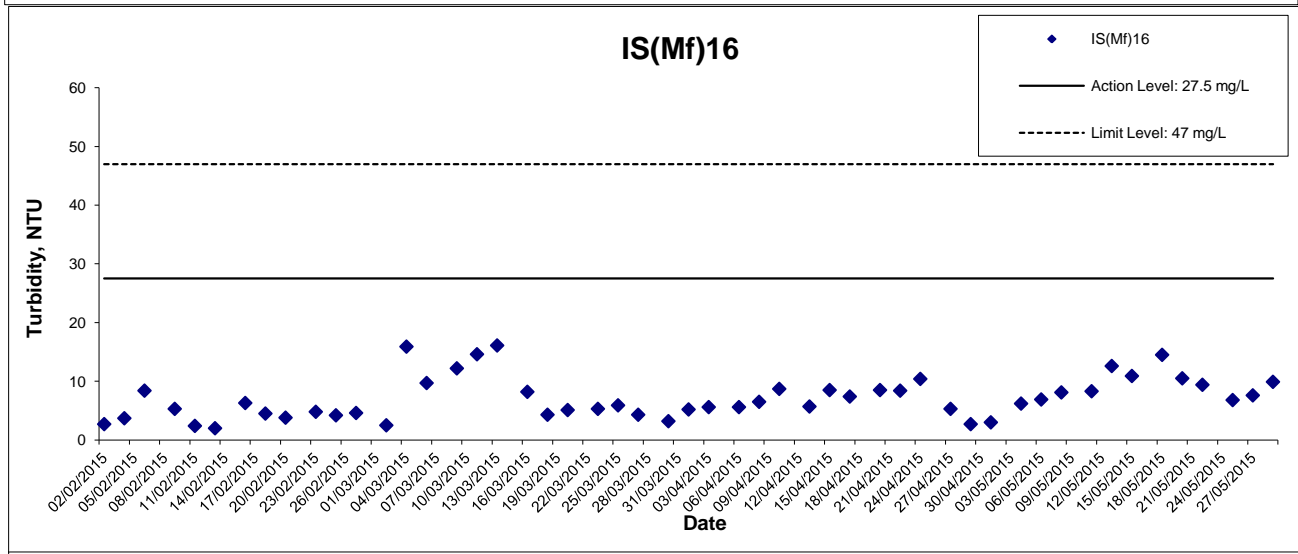
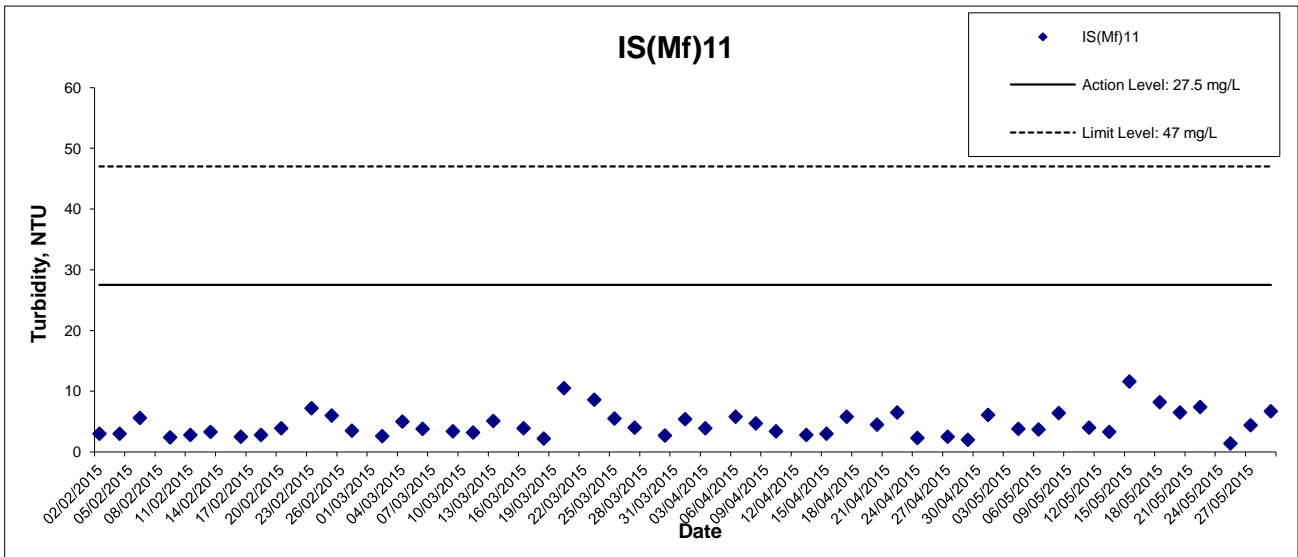


## Turbidity at Mid-Ebb Tide



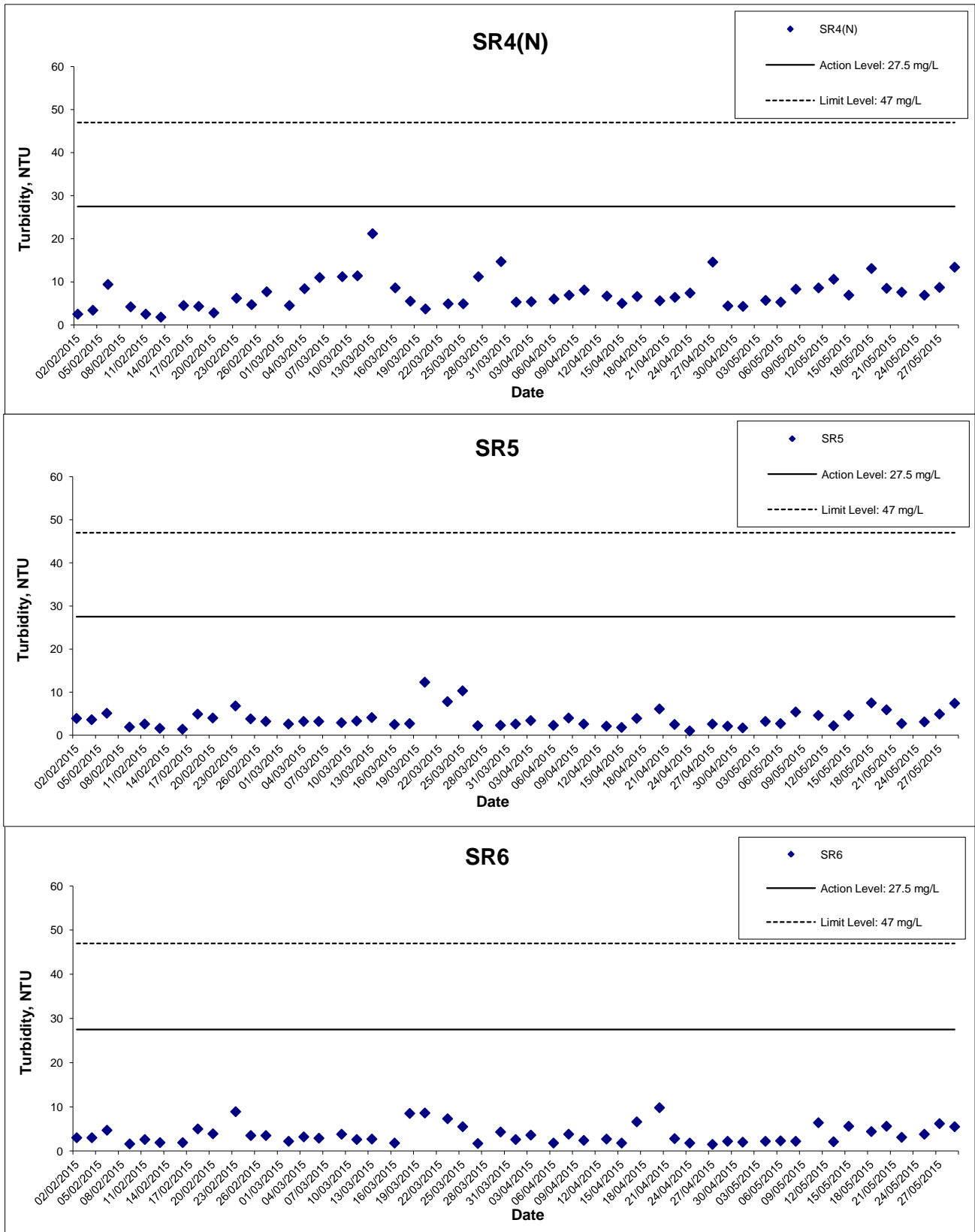
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## Turbidity at Mid-Ebb Tide



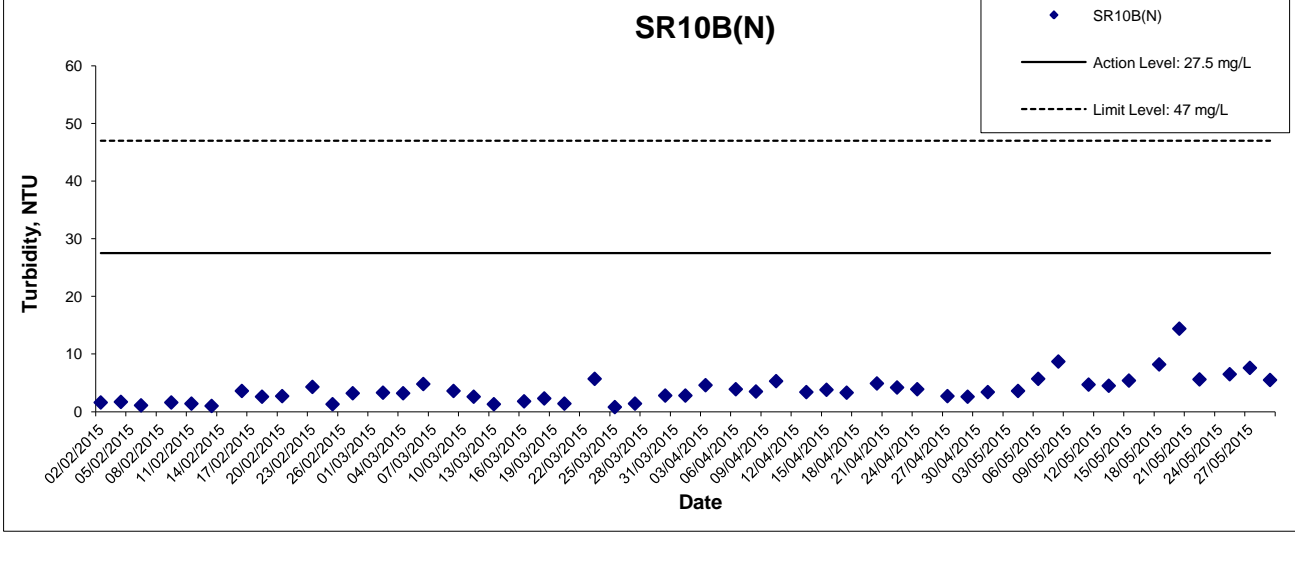
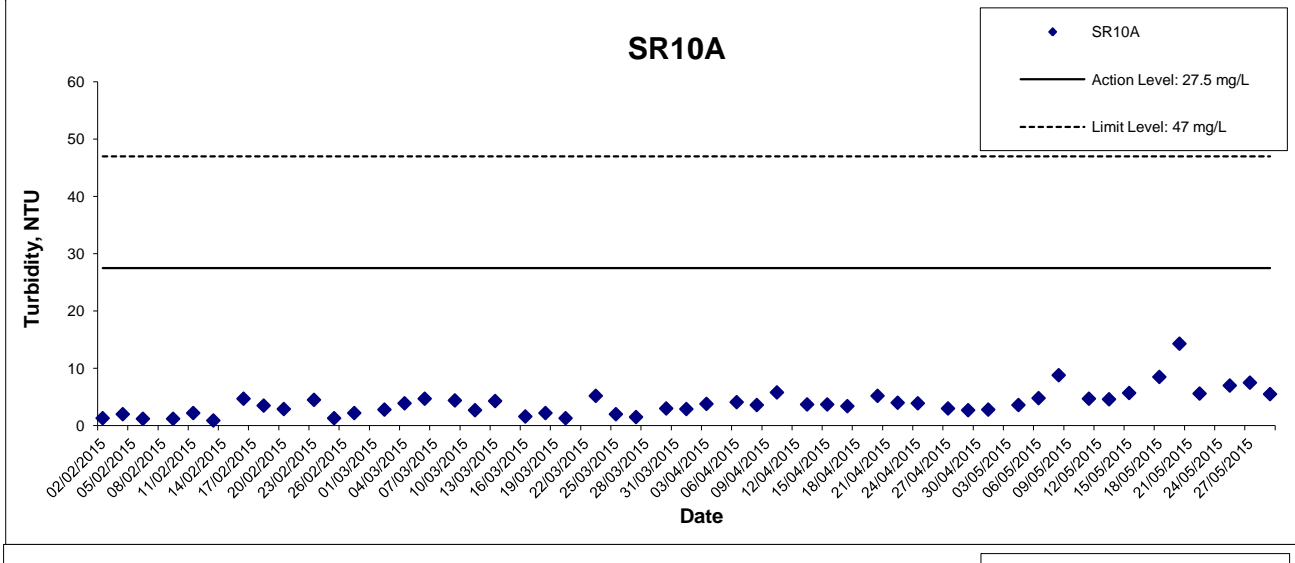
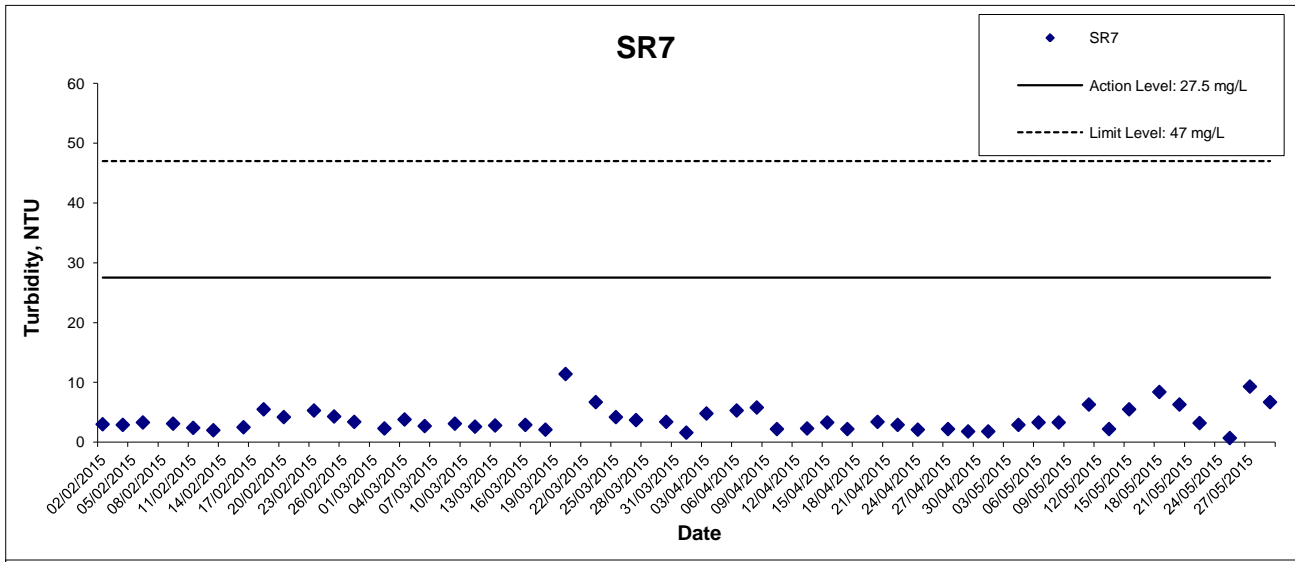
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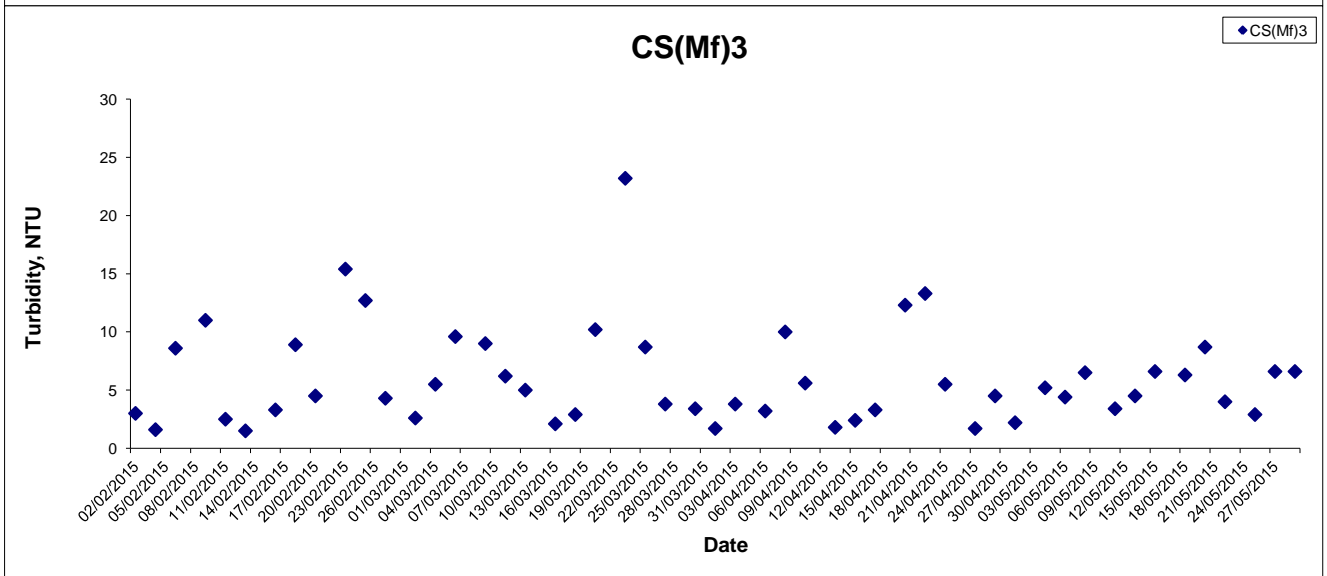
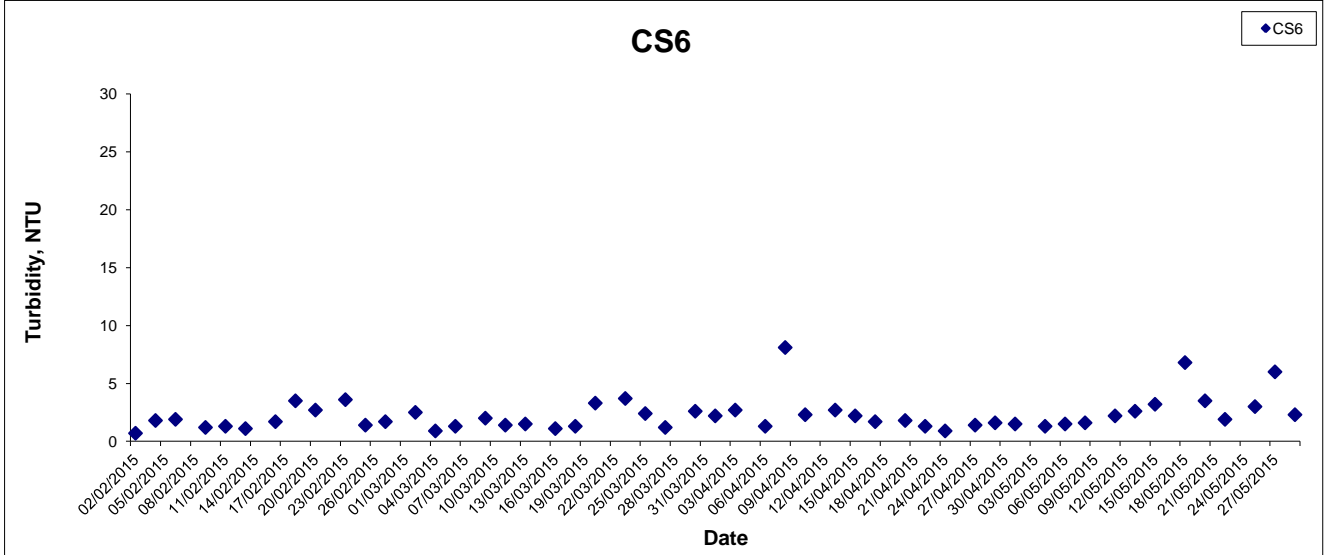
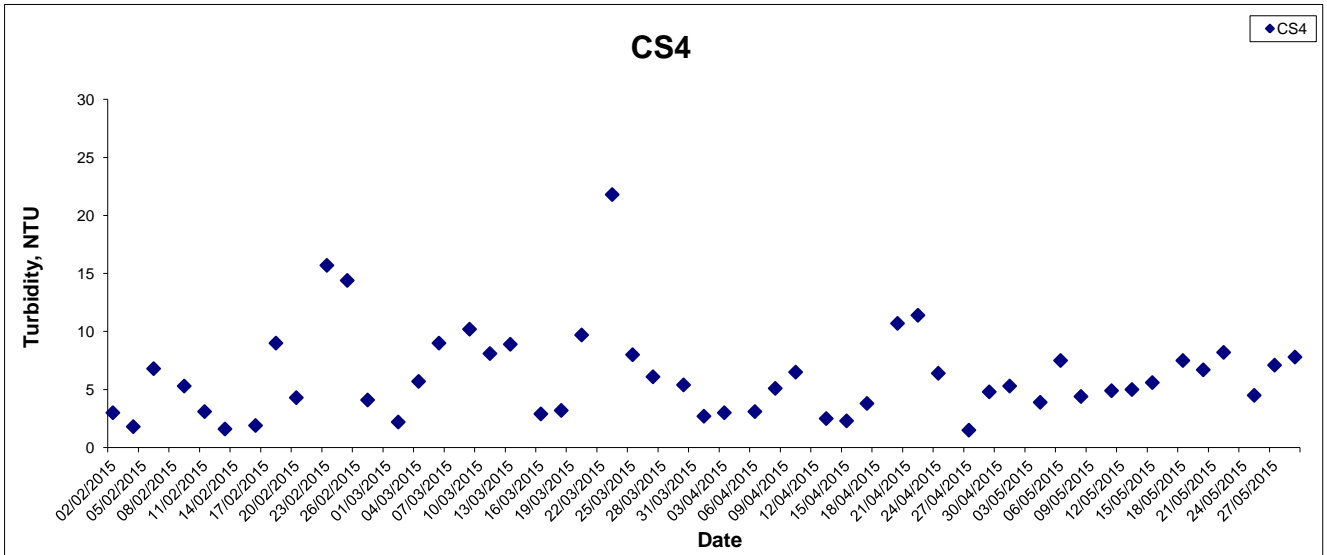
## Turbidity at Mid-Ebb Tide



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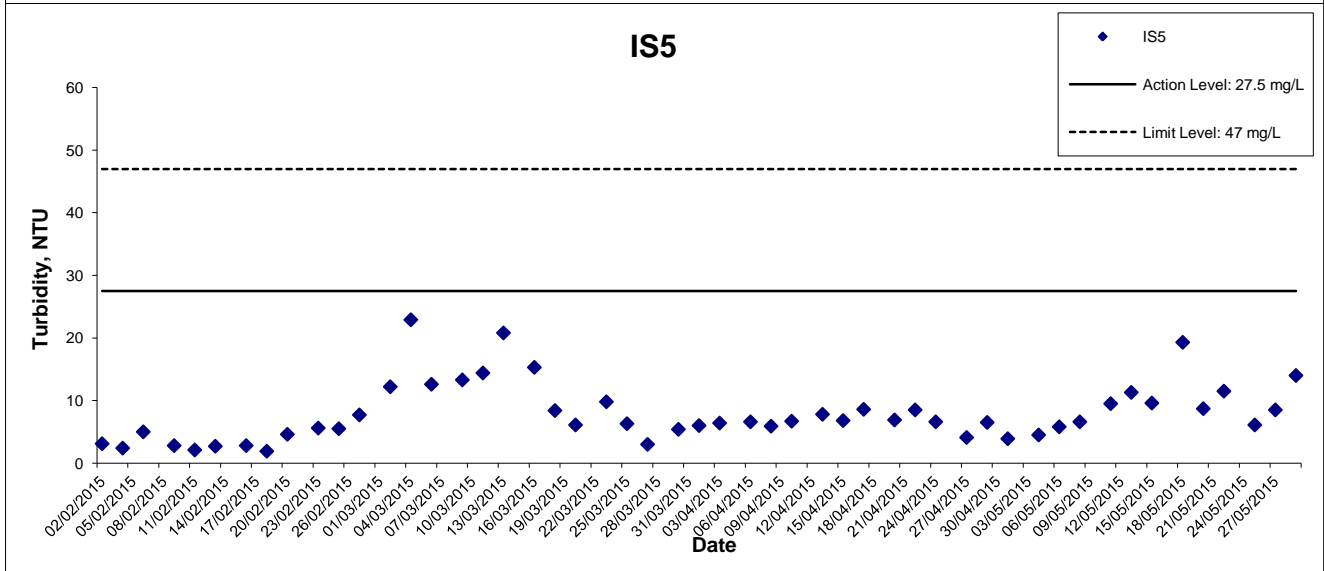
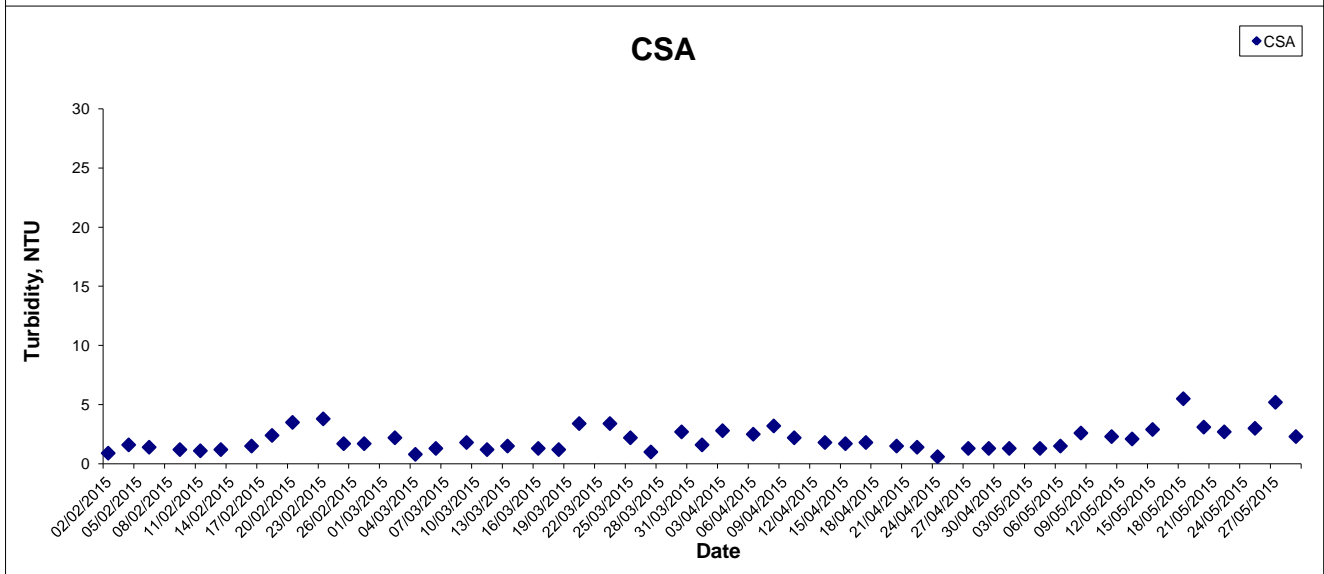
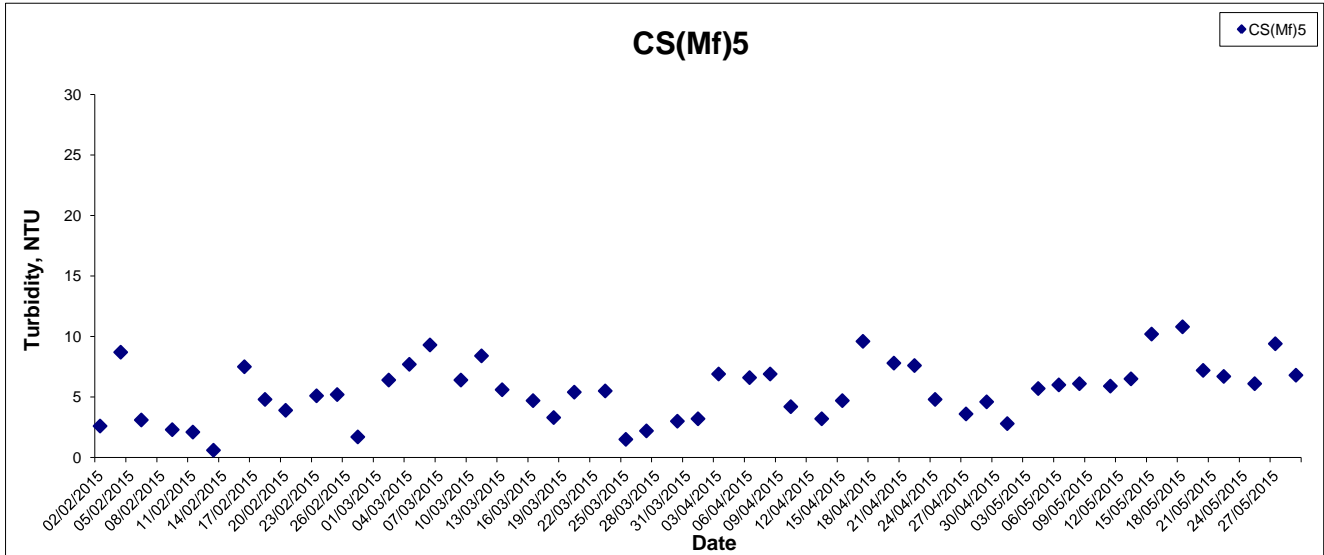
## Turbidity at Mid-Flood Tide



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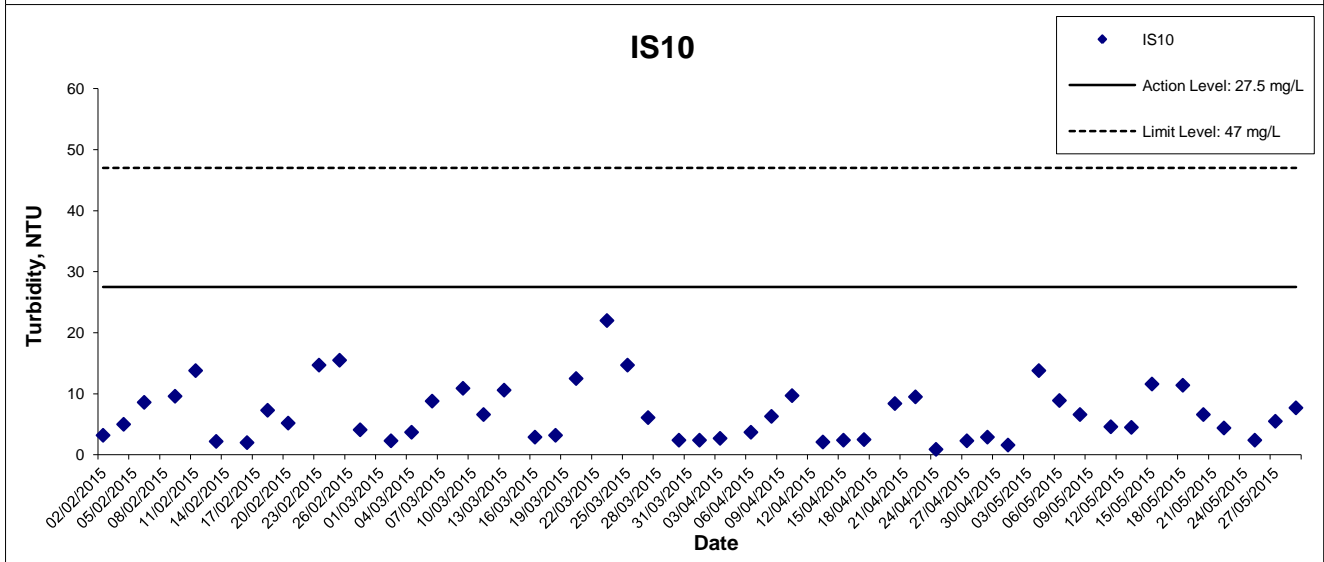
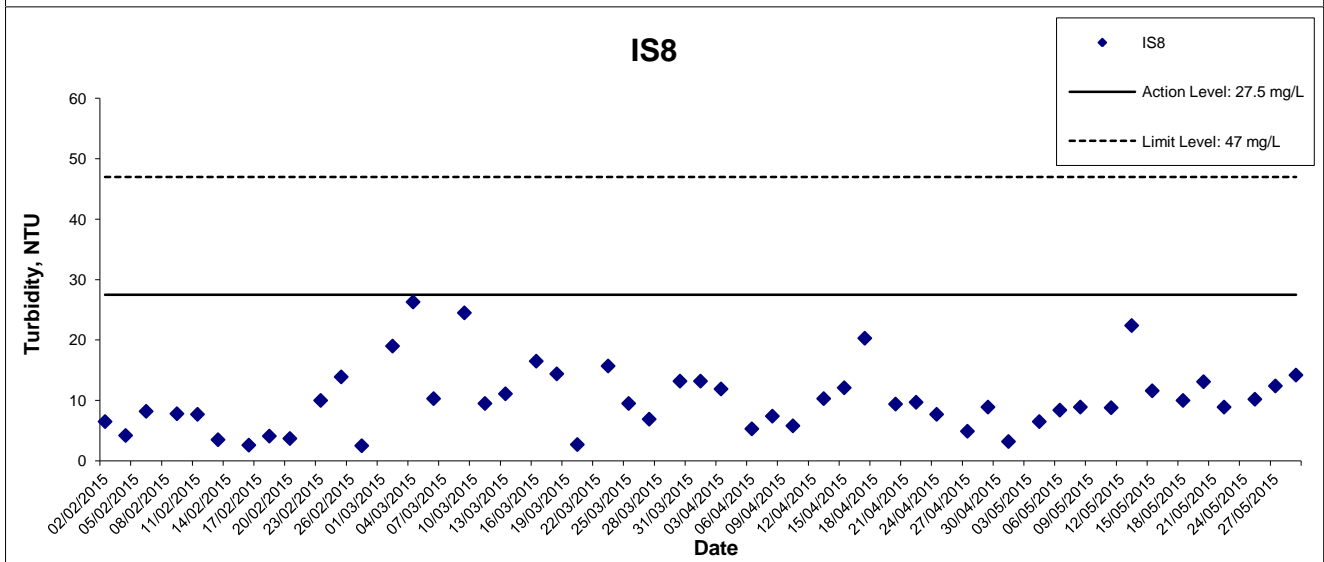
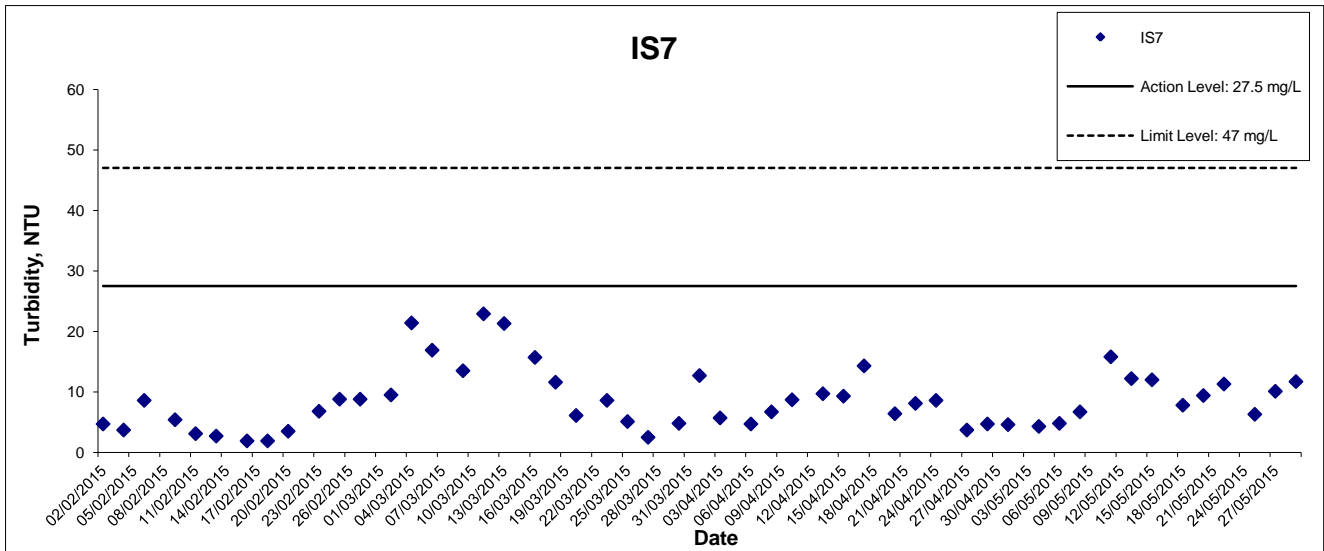


## Turbidity at Mid-Flood Tide



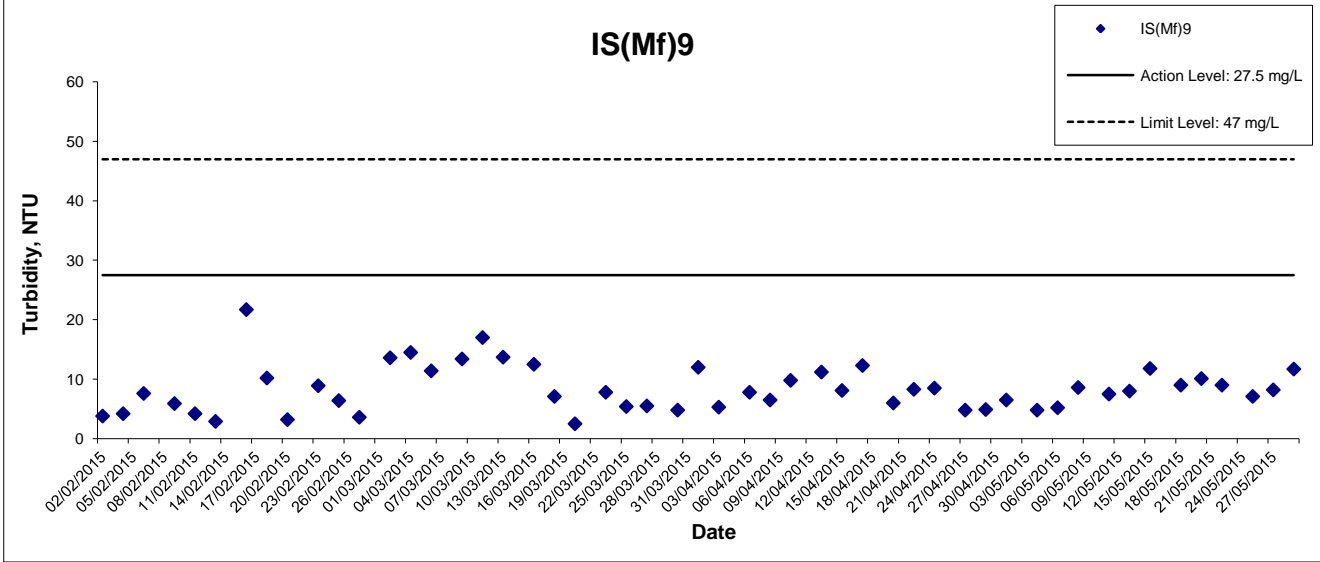
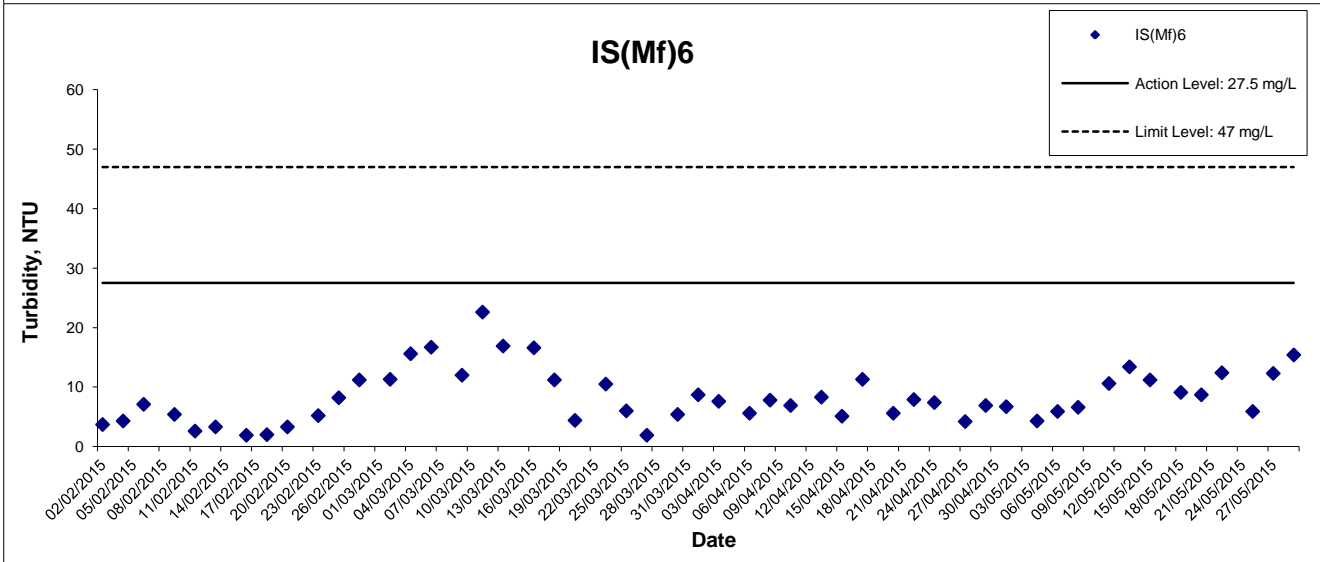
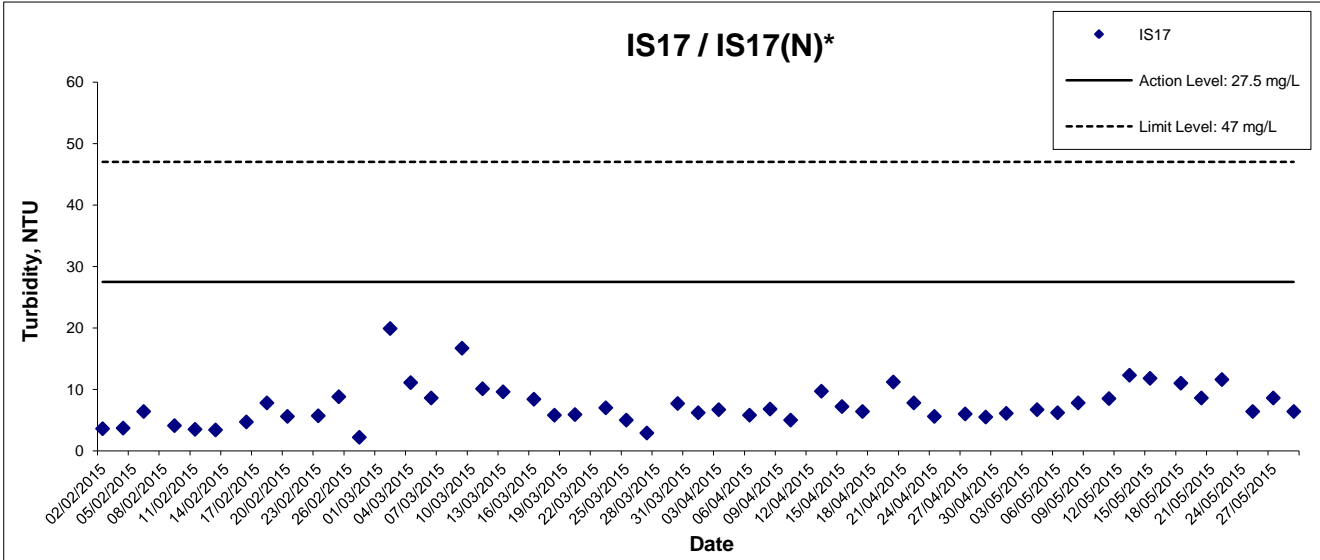
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## Turbidity at Mid-Flood Tide



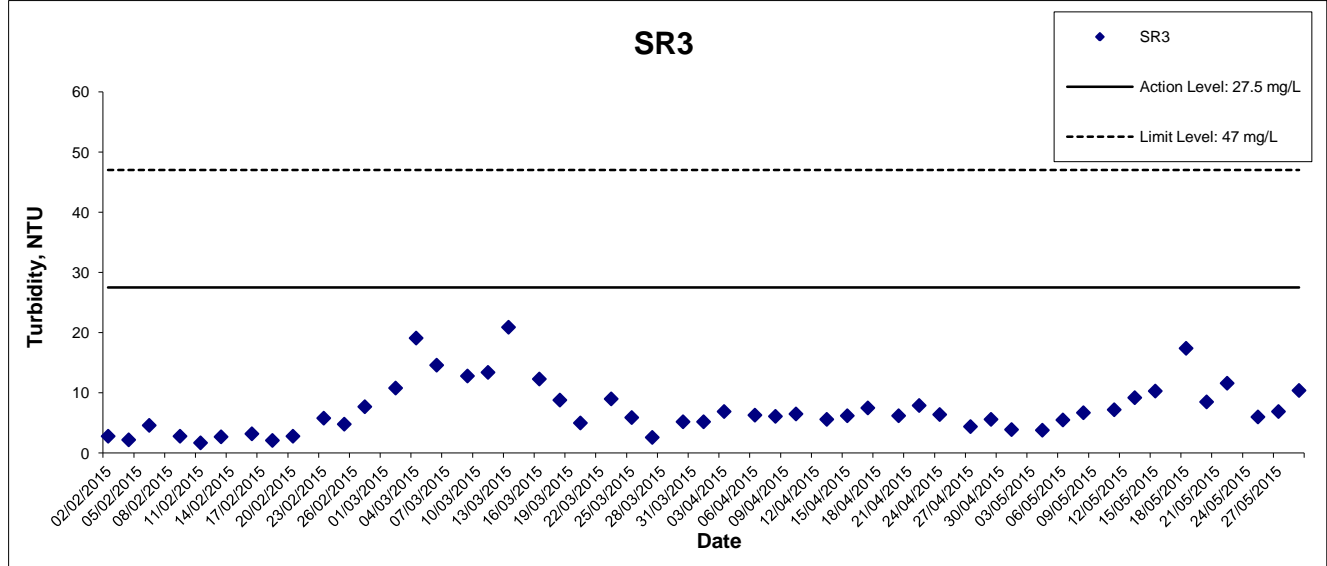
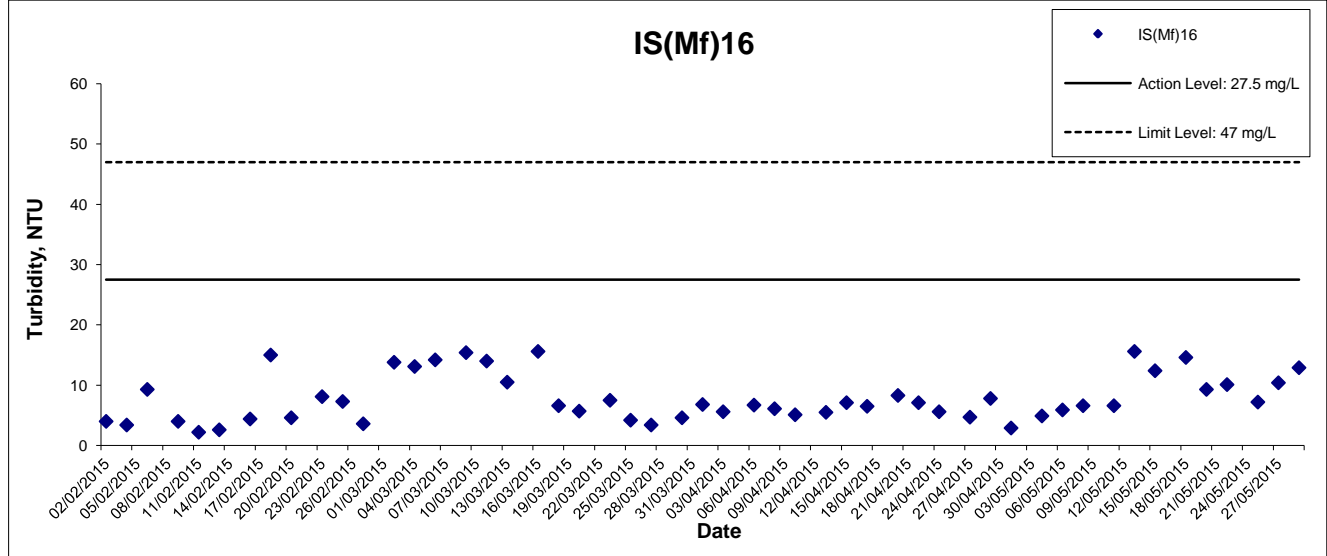
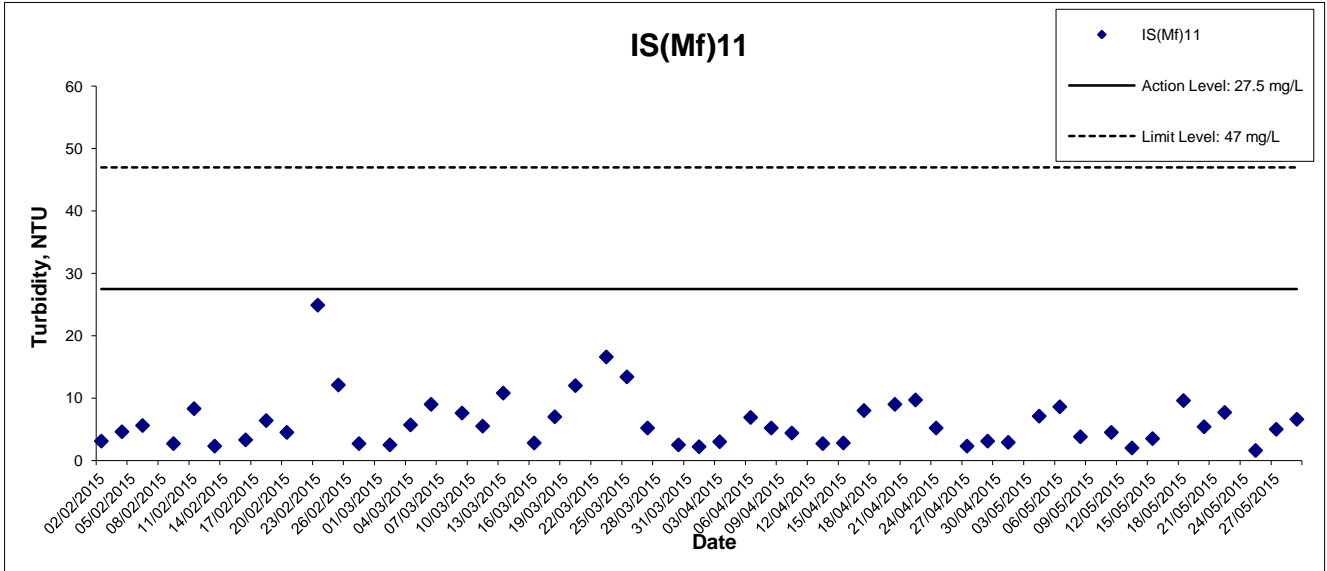
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## Turbidity at Mid-Flood Tide



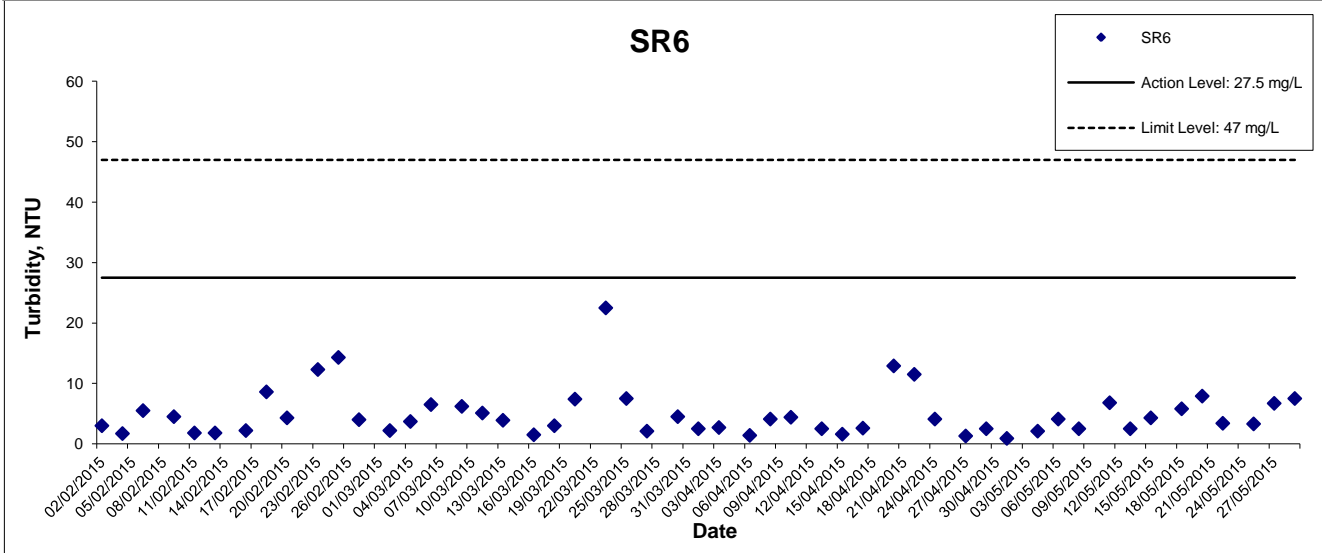
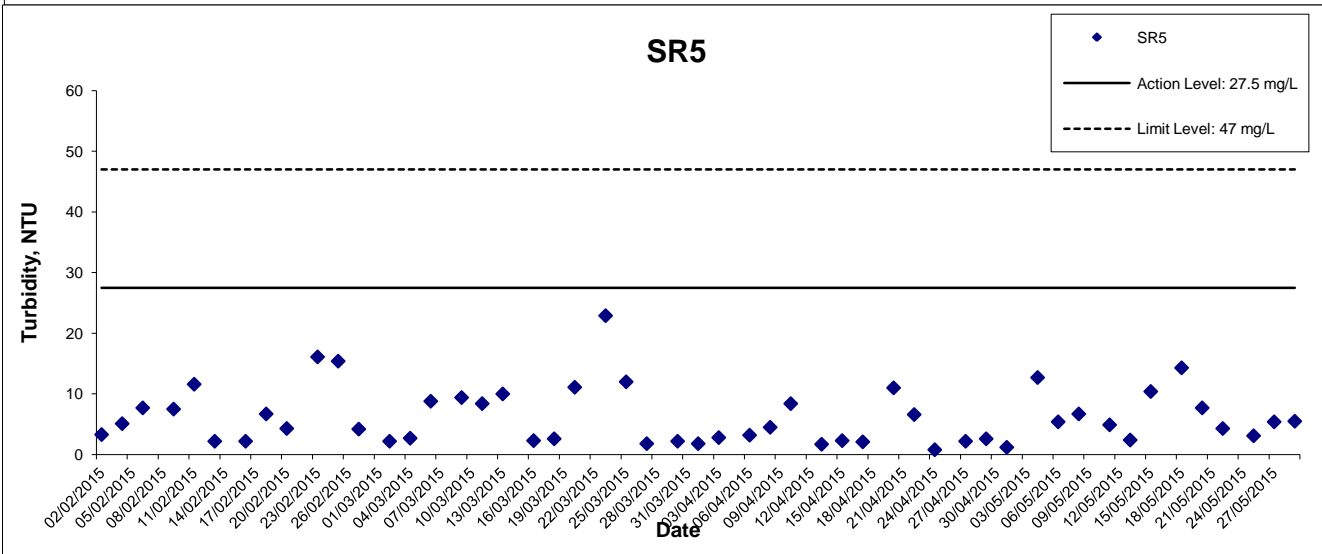
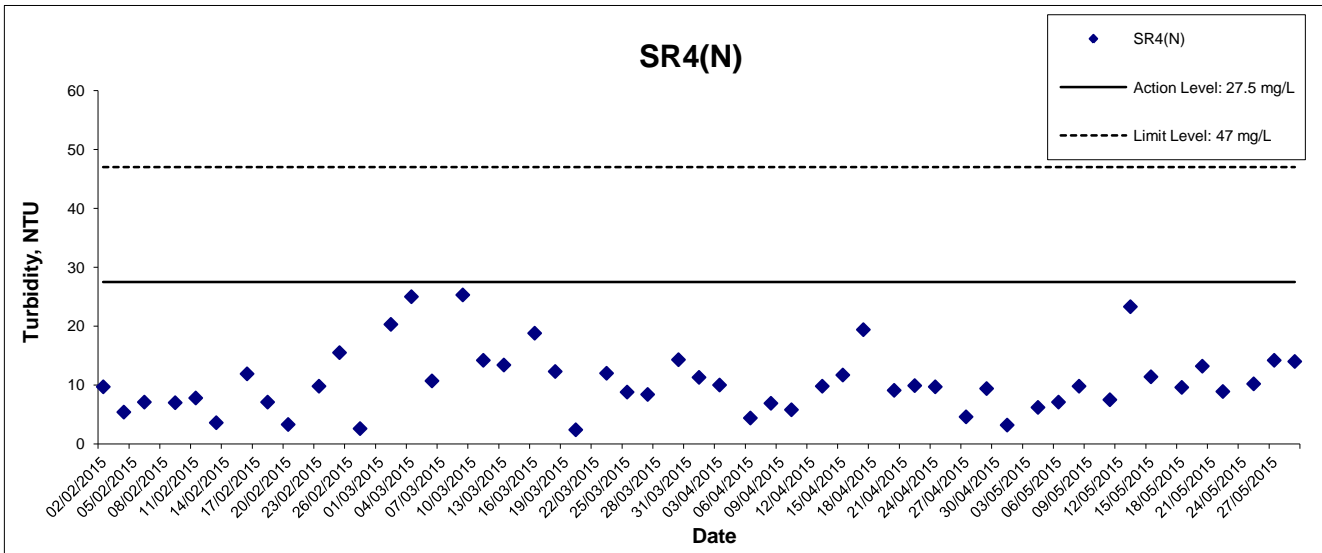
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## Turbidity at Mid-Flood Tide



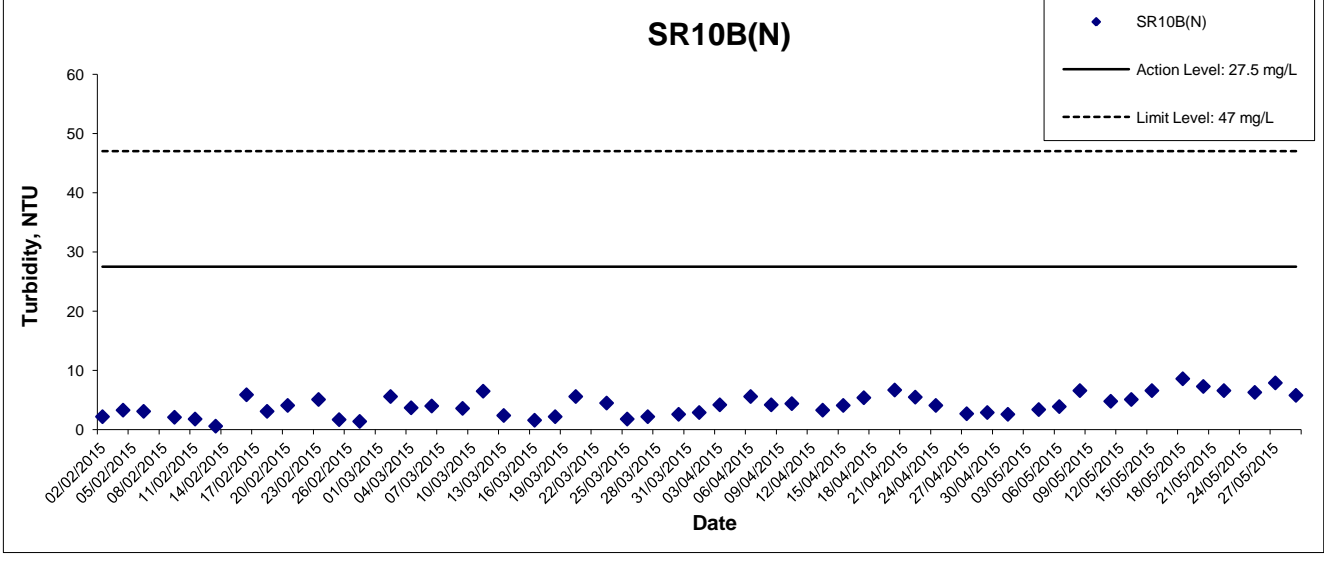
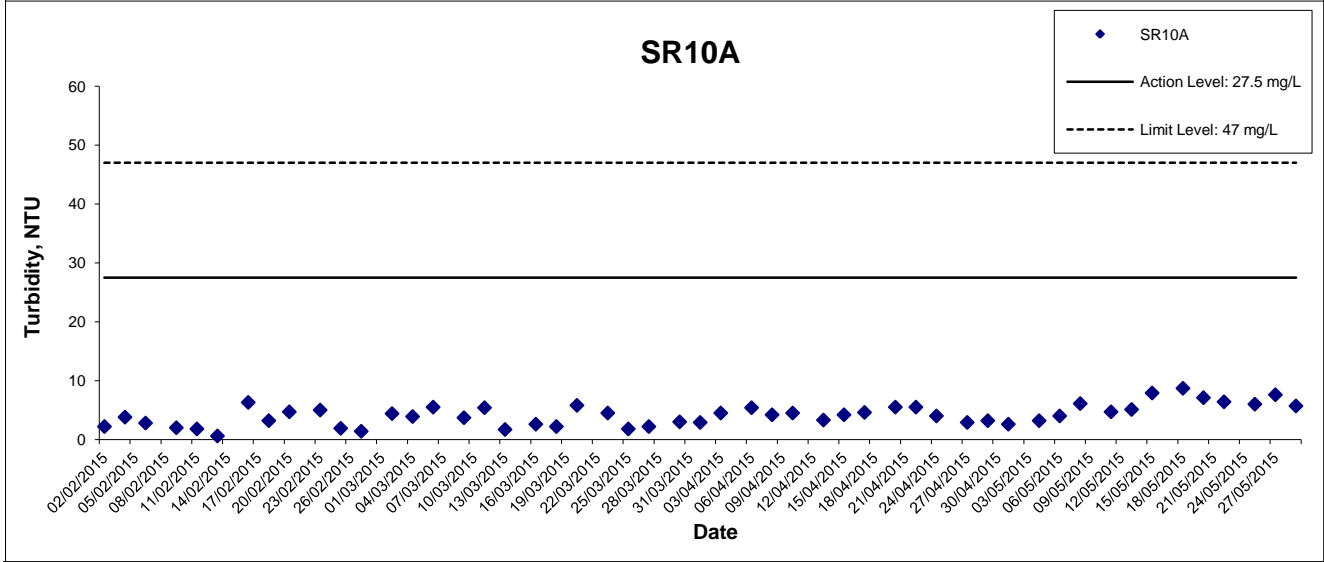
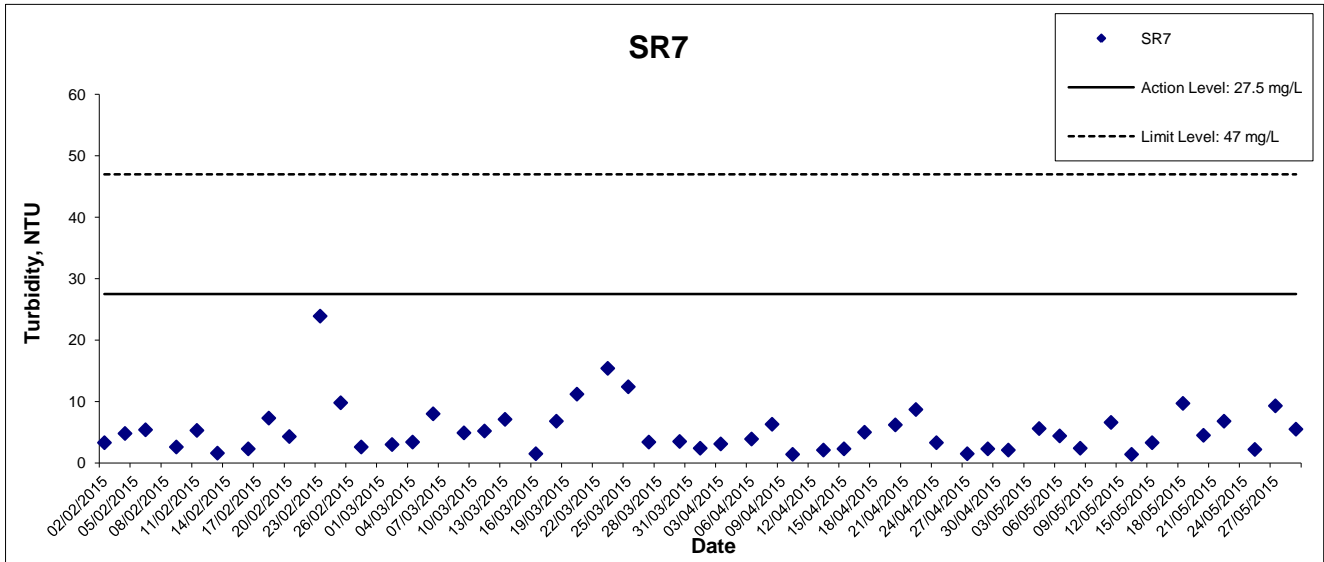
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## Turbidity at Mid-Flood Tide



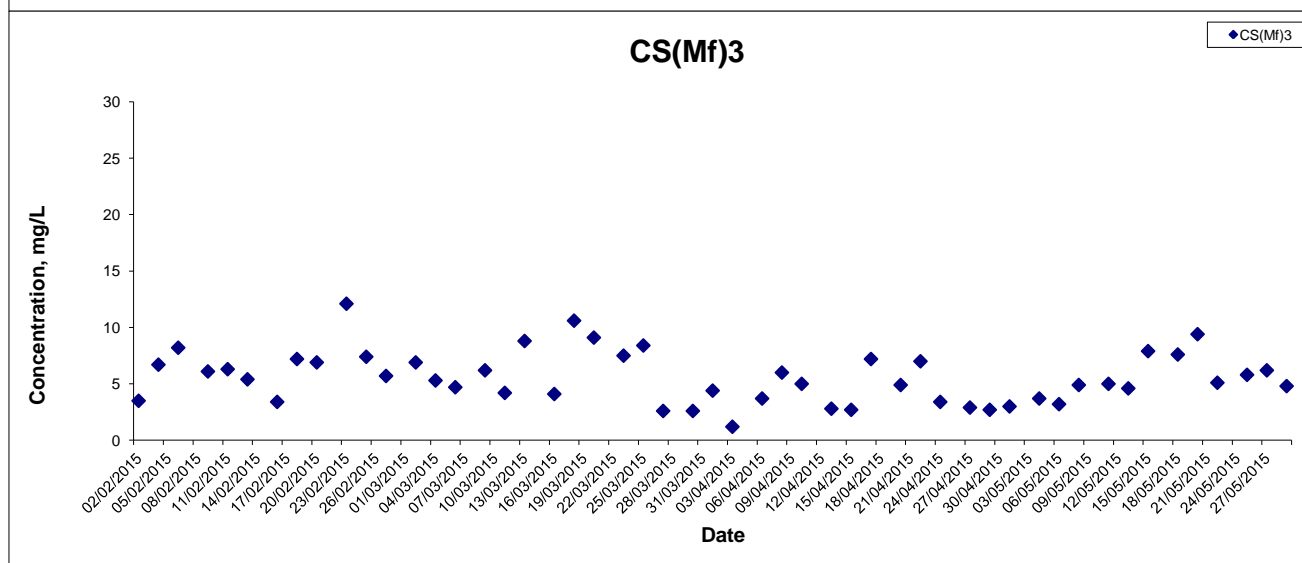
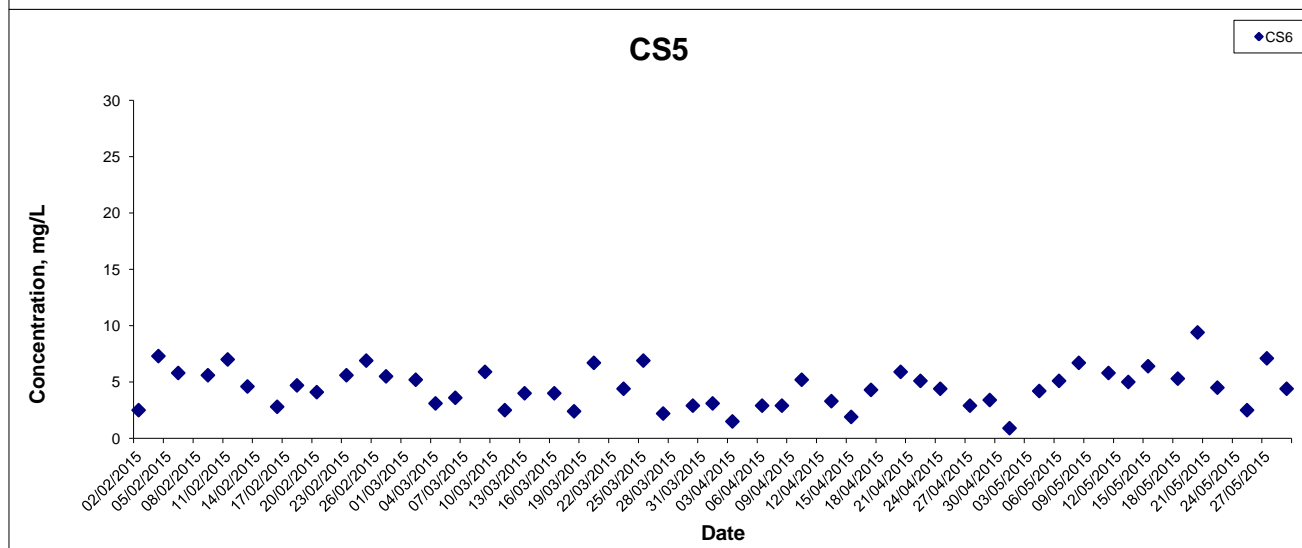
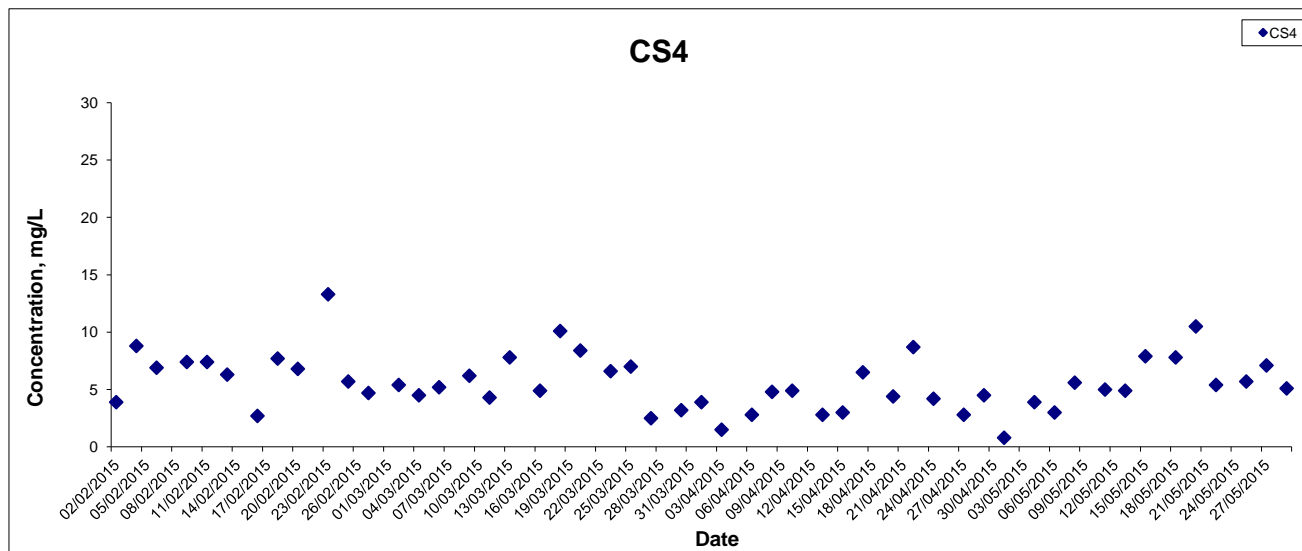
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## Turbidity at Mid-Flood Tide



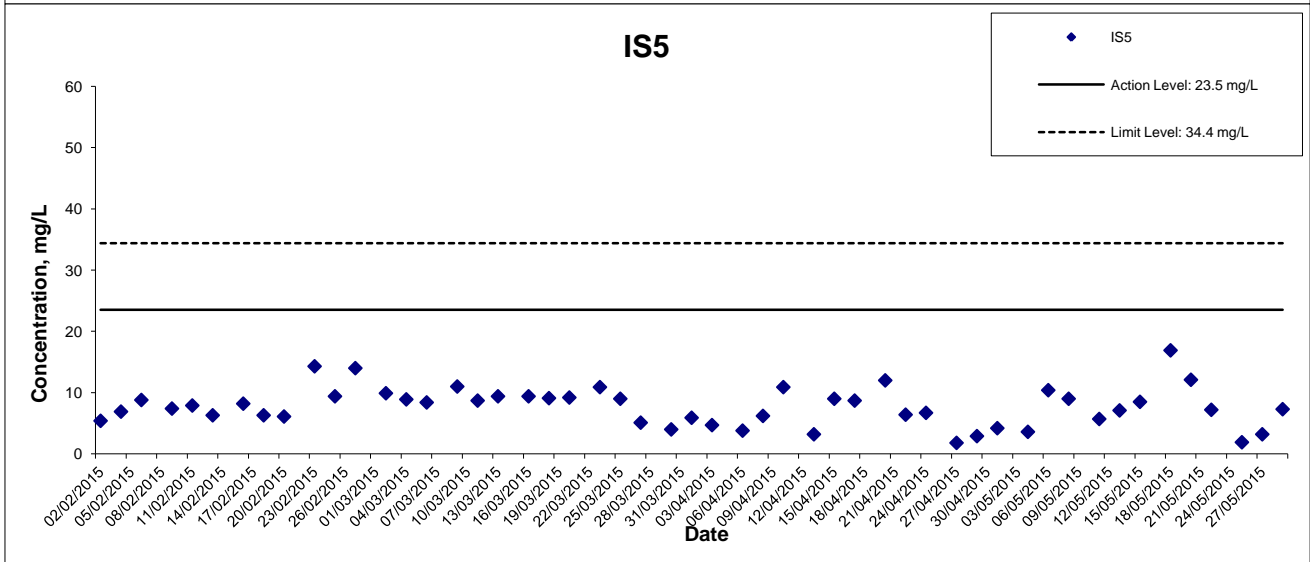
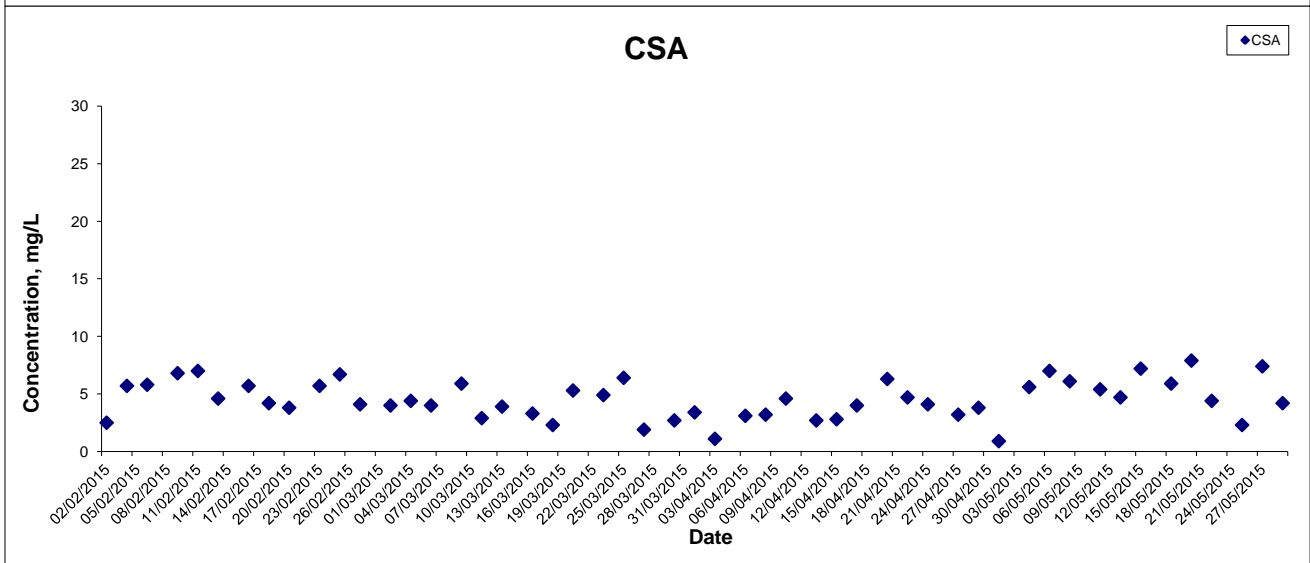
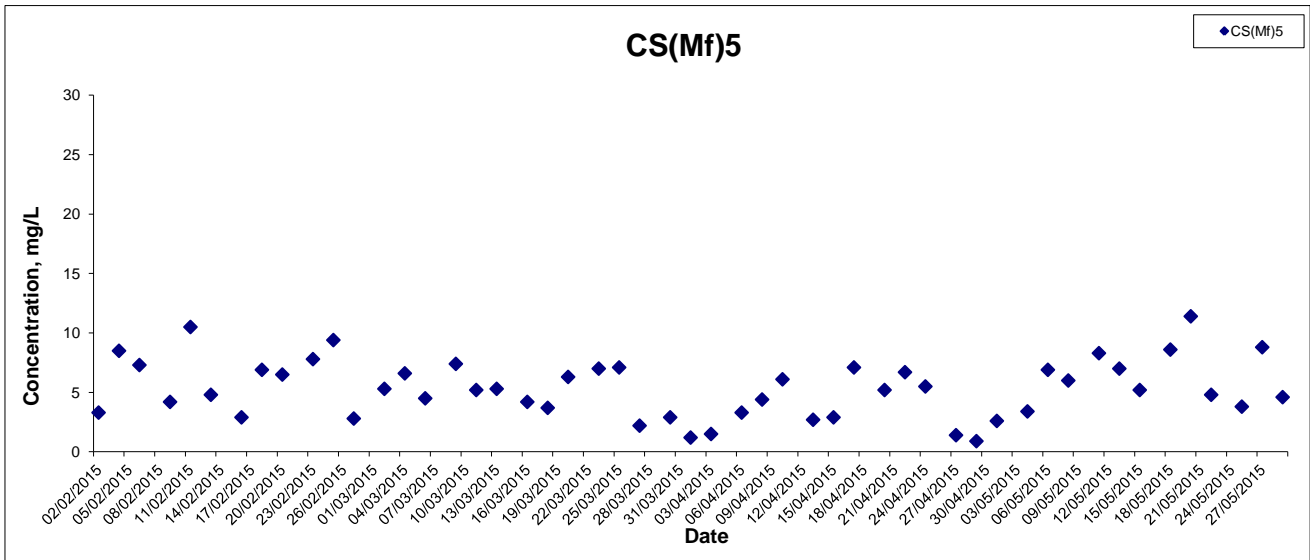
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## Suspended Solids at Mid-Ebb Tide



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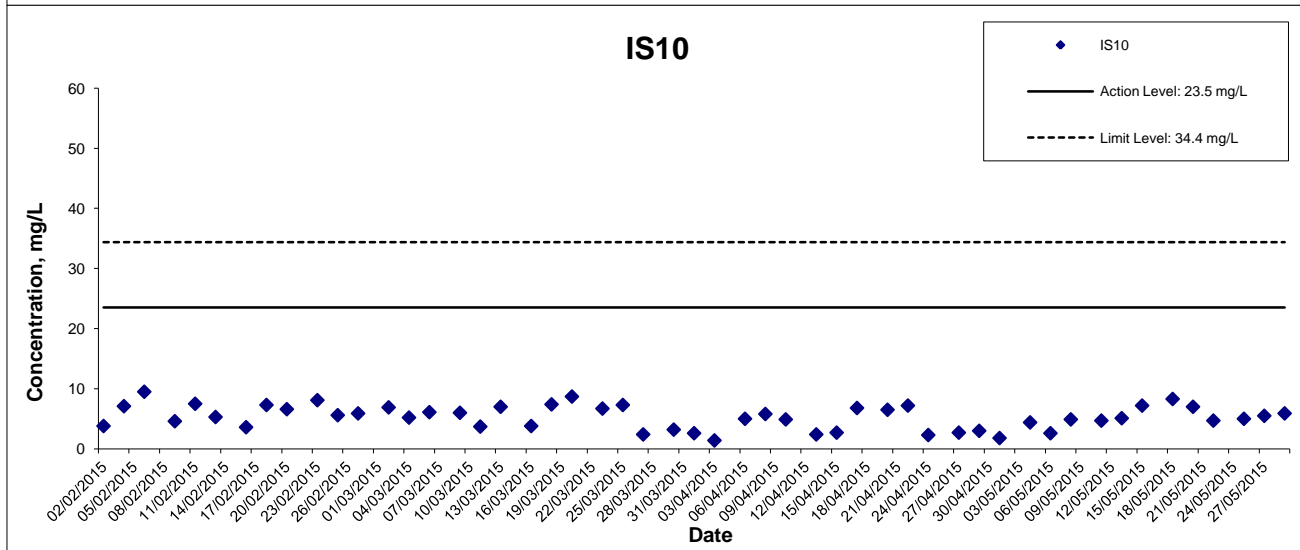
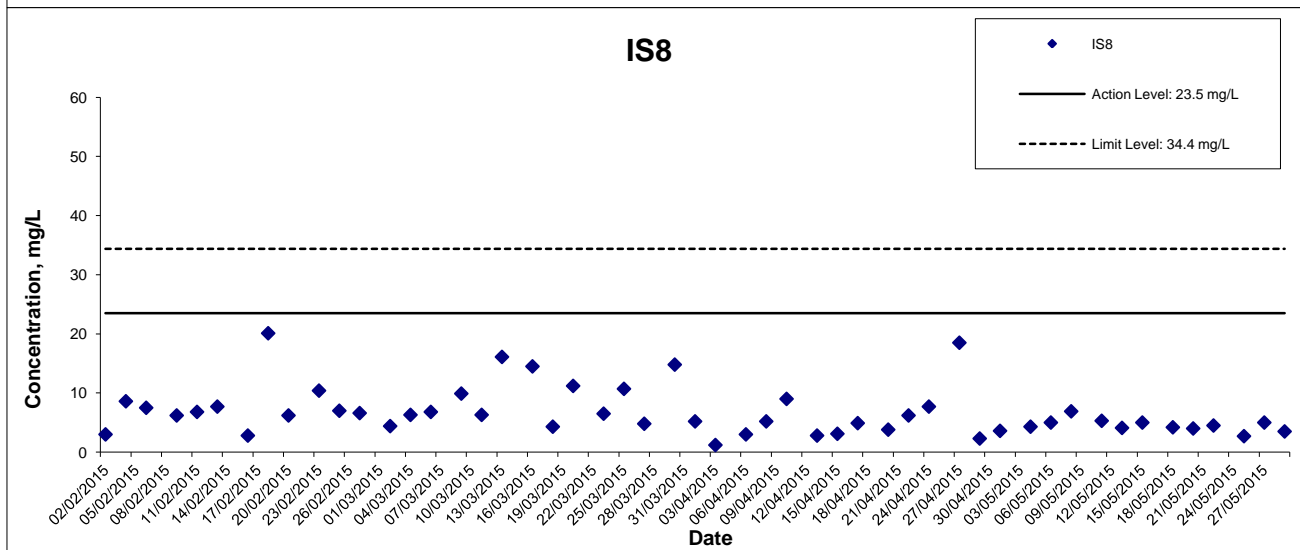
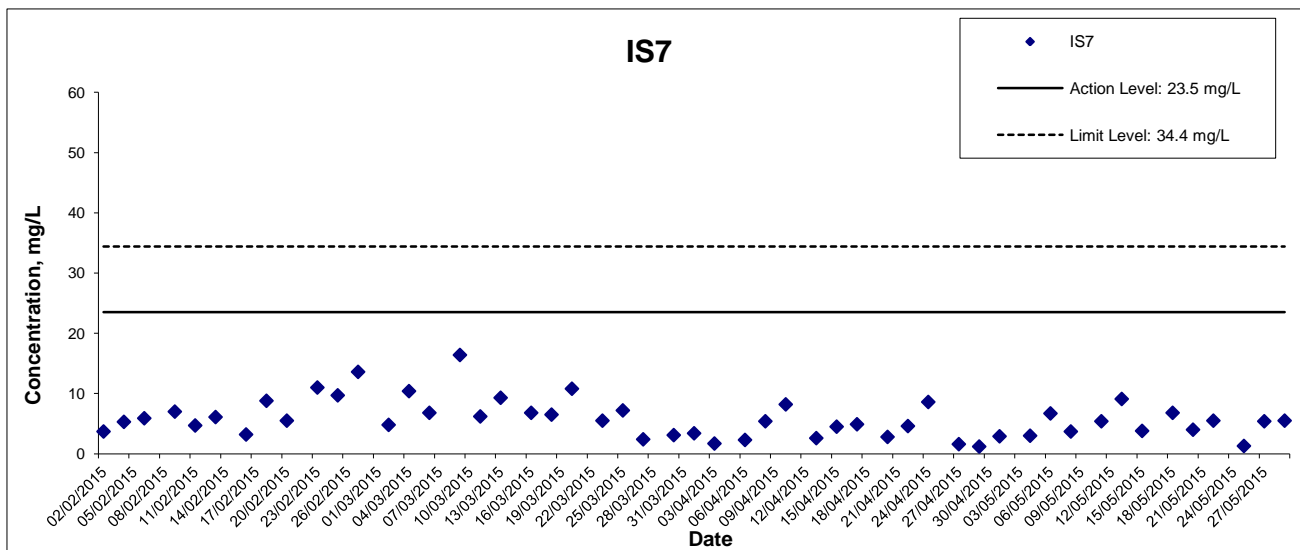
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## Suspended Solids at Mid-Ebb Tide



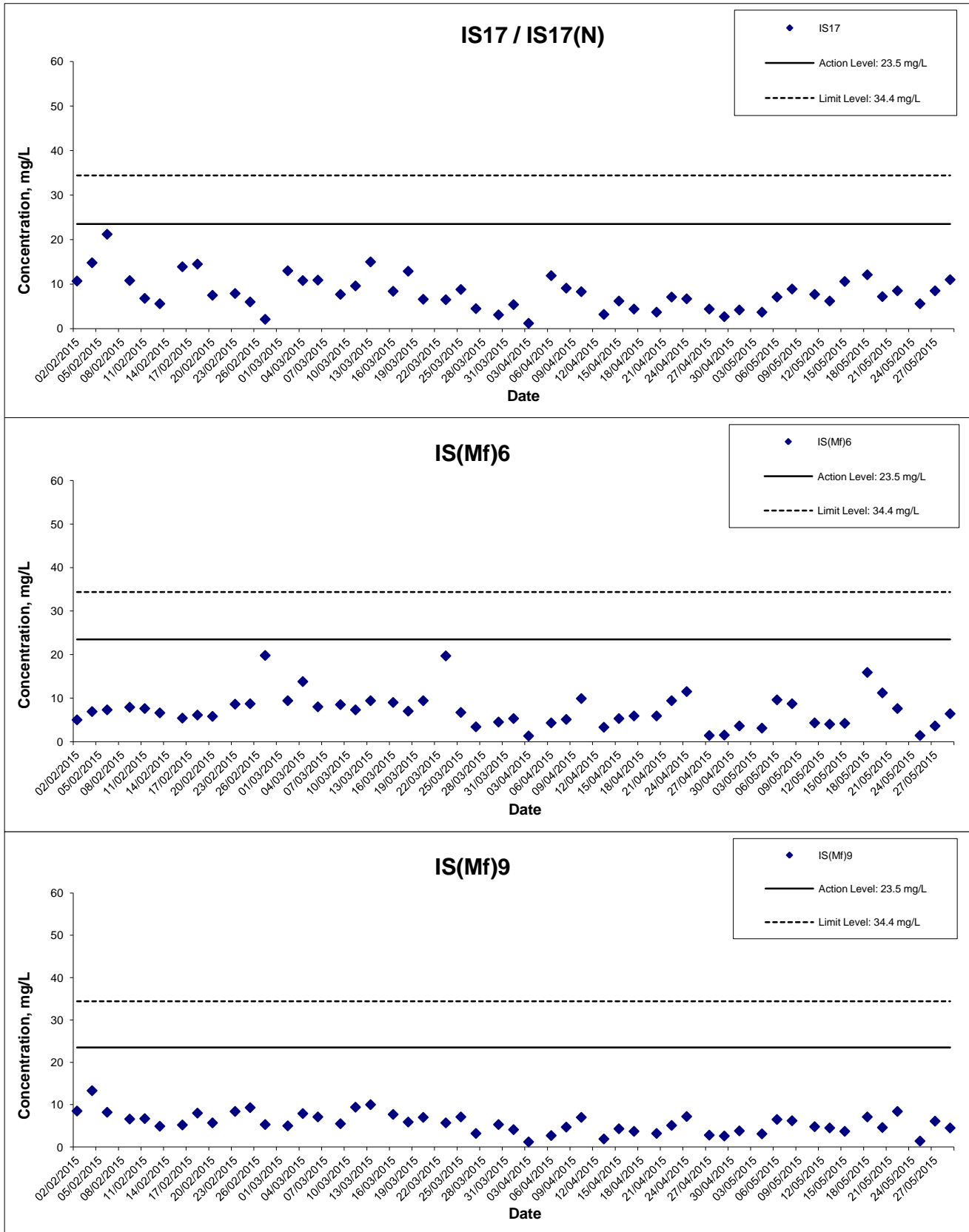
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 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS**

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



## Suspended Solids at Mid-Ebb Tide



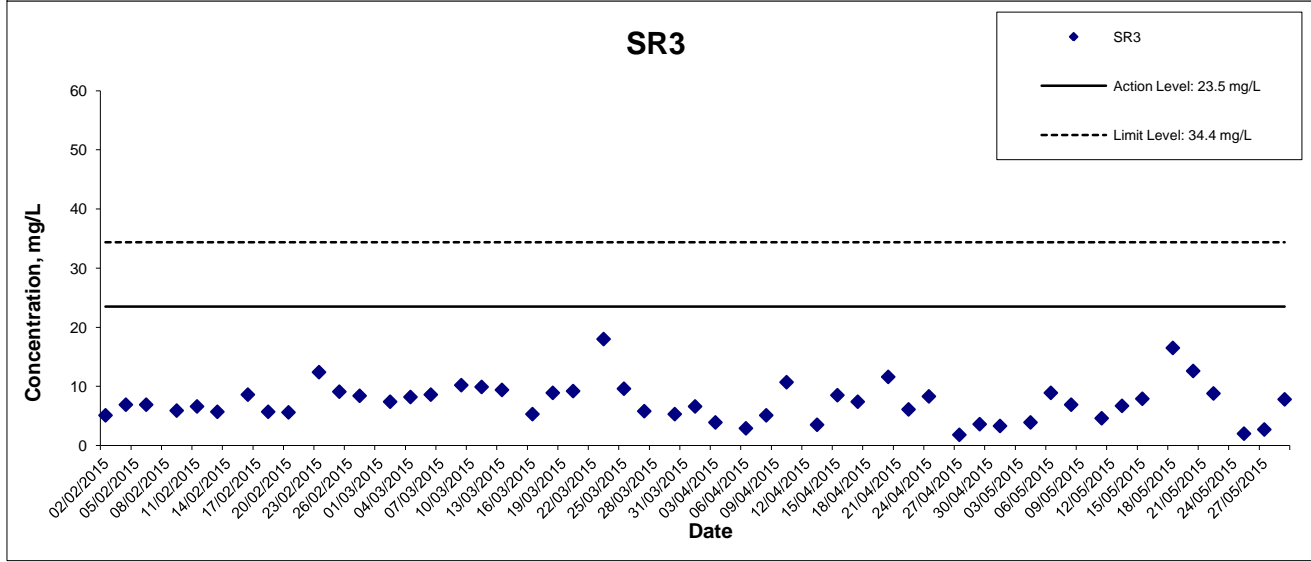
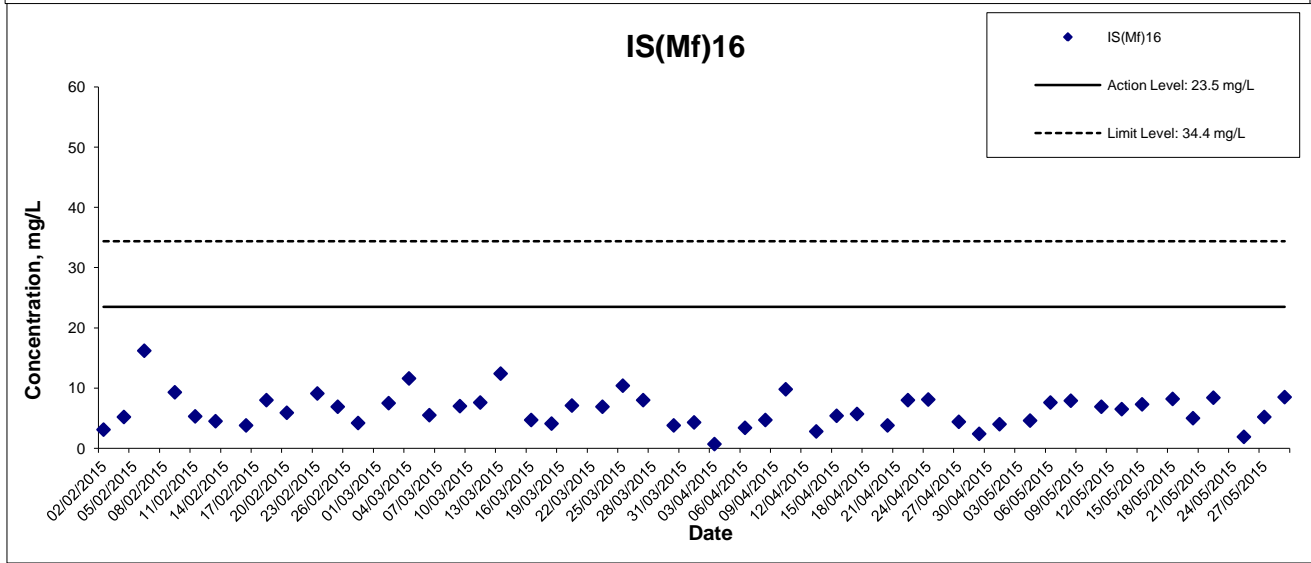
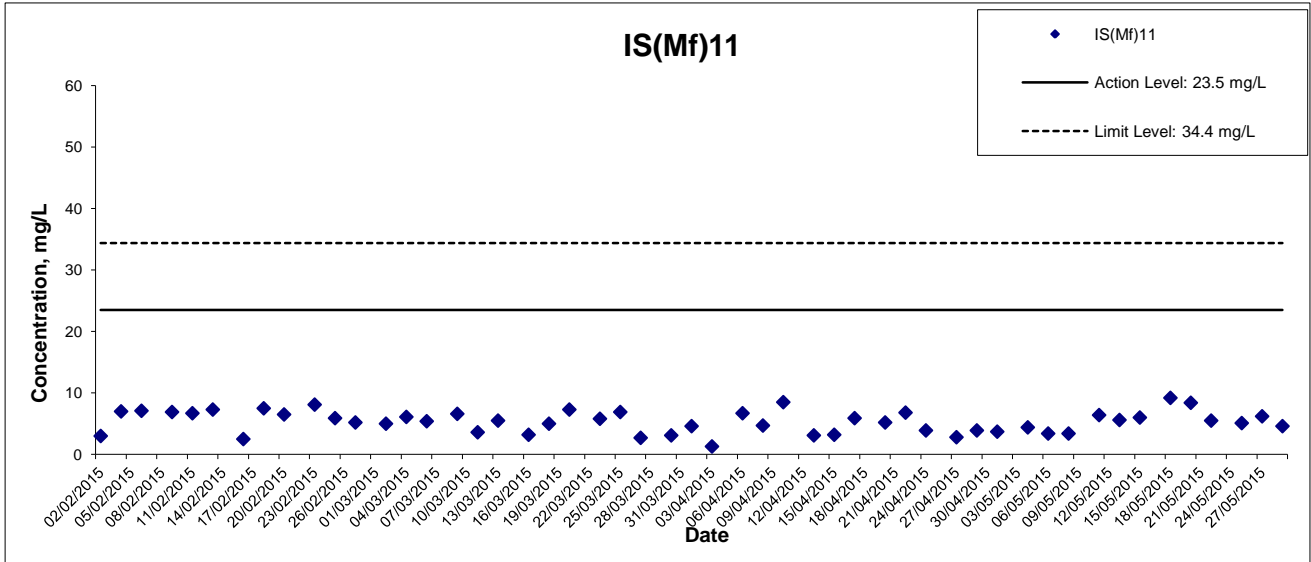
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 Monitoring Results

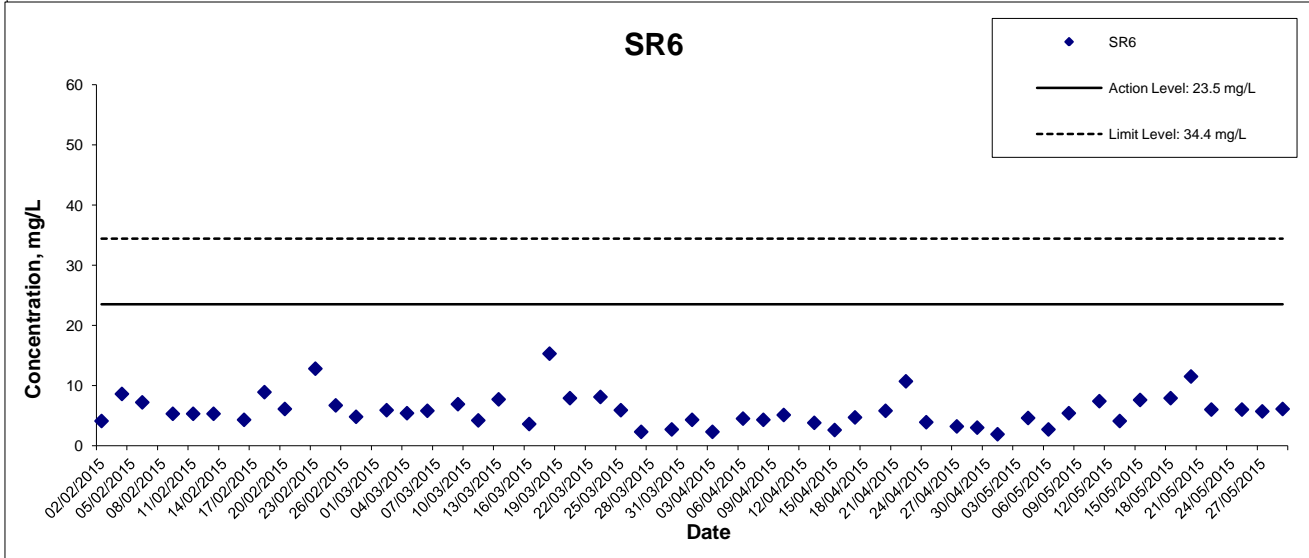
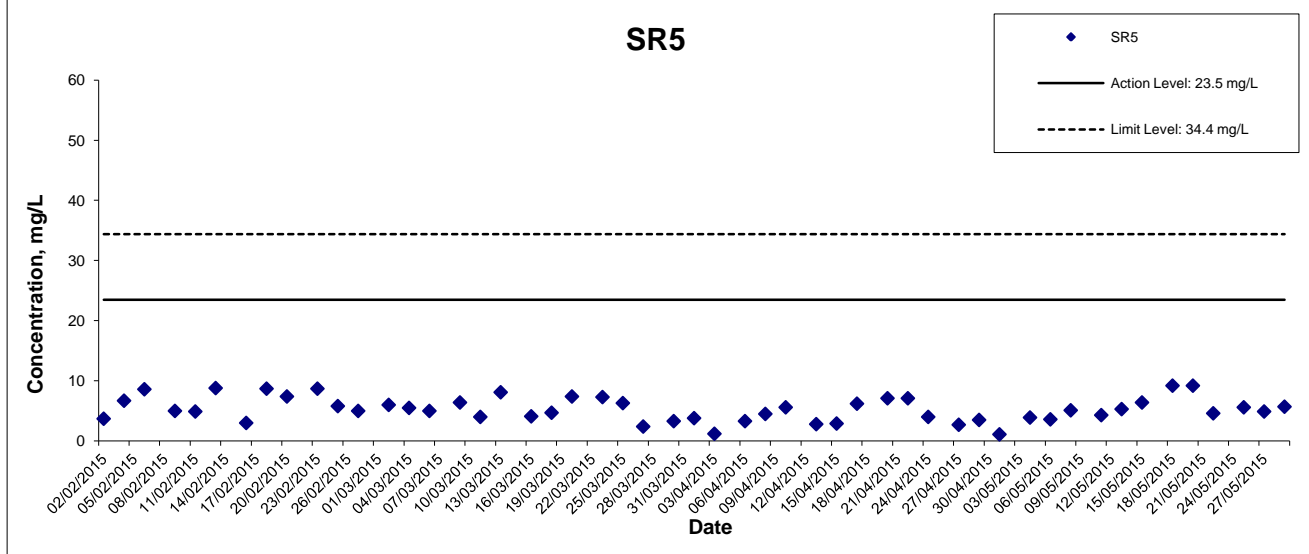
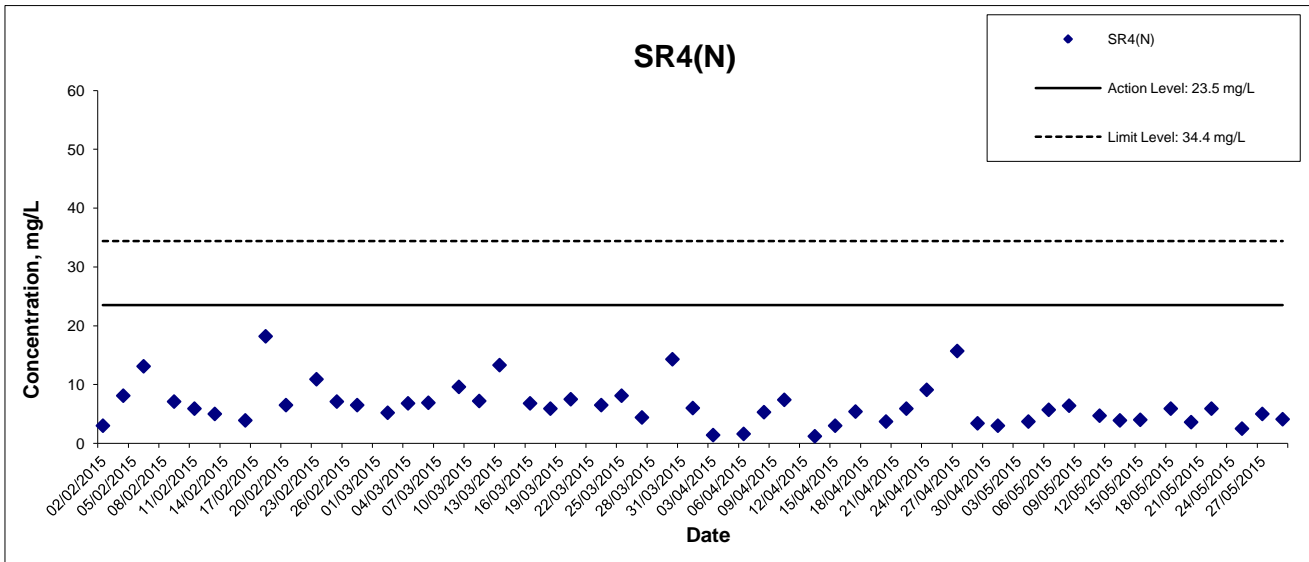


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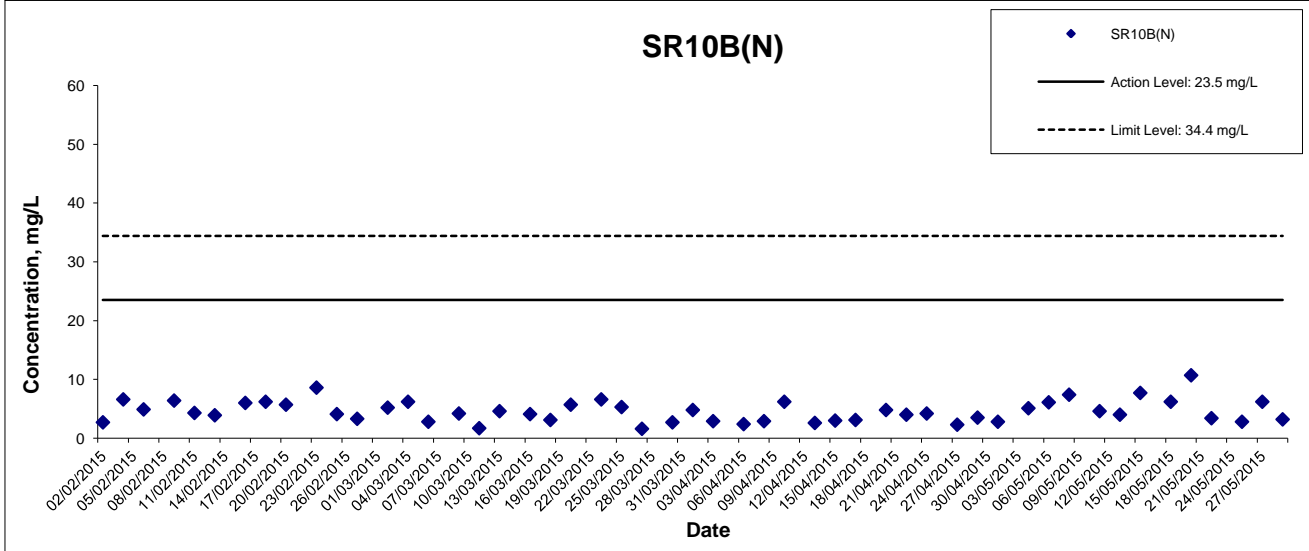
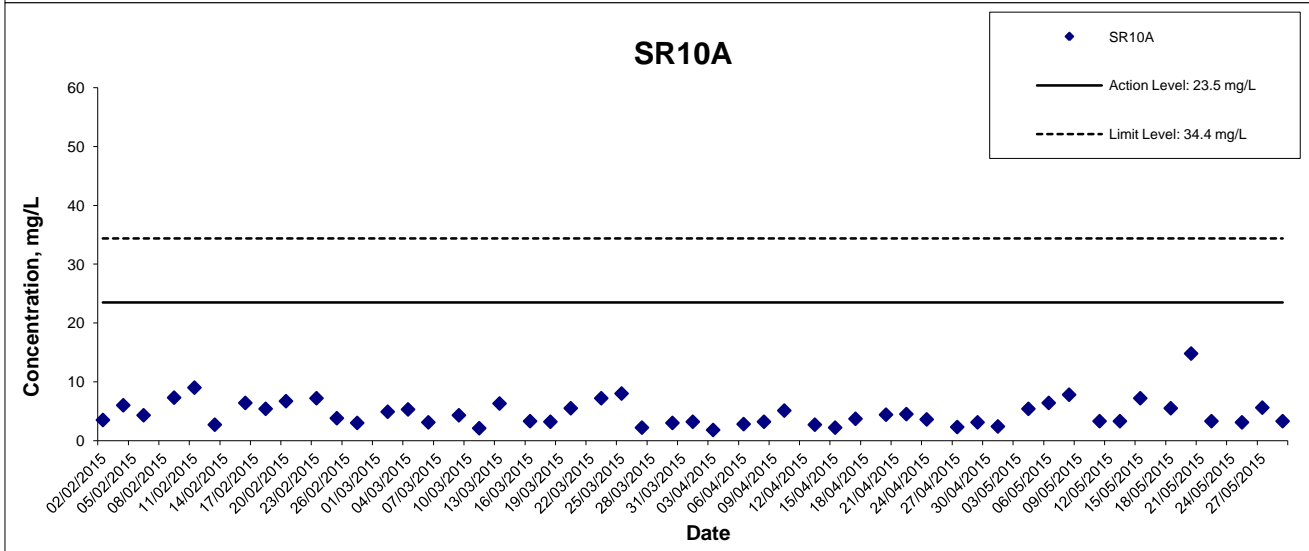
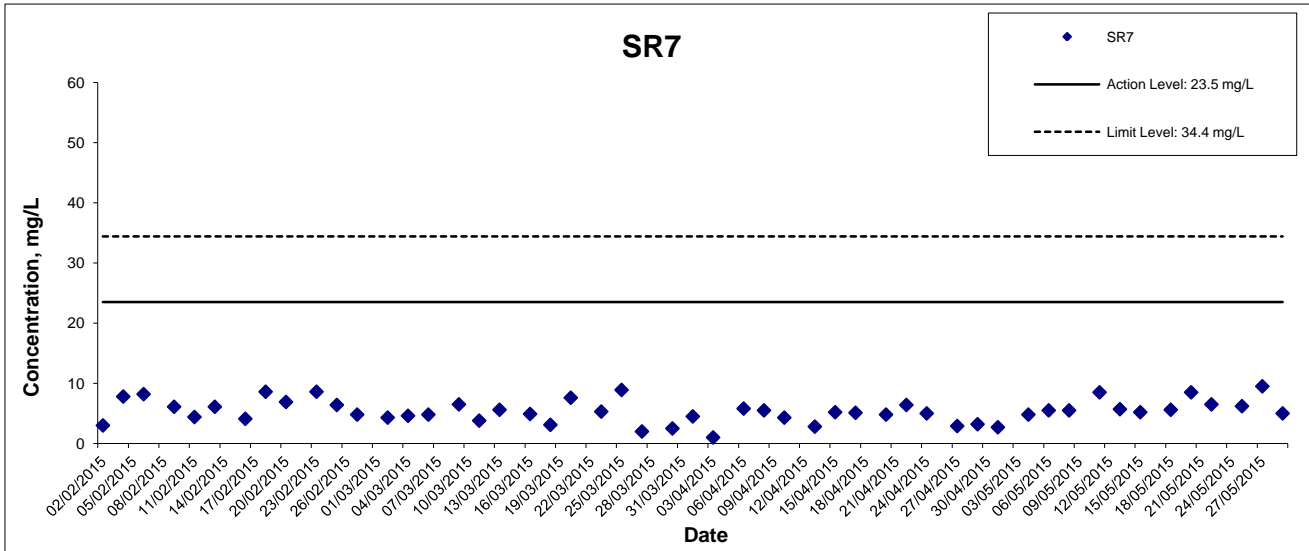
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## Suspended Solids at Mid-Ebb Tide



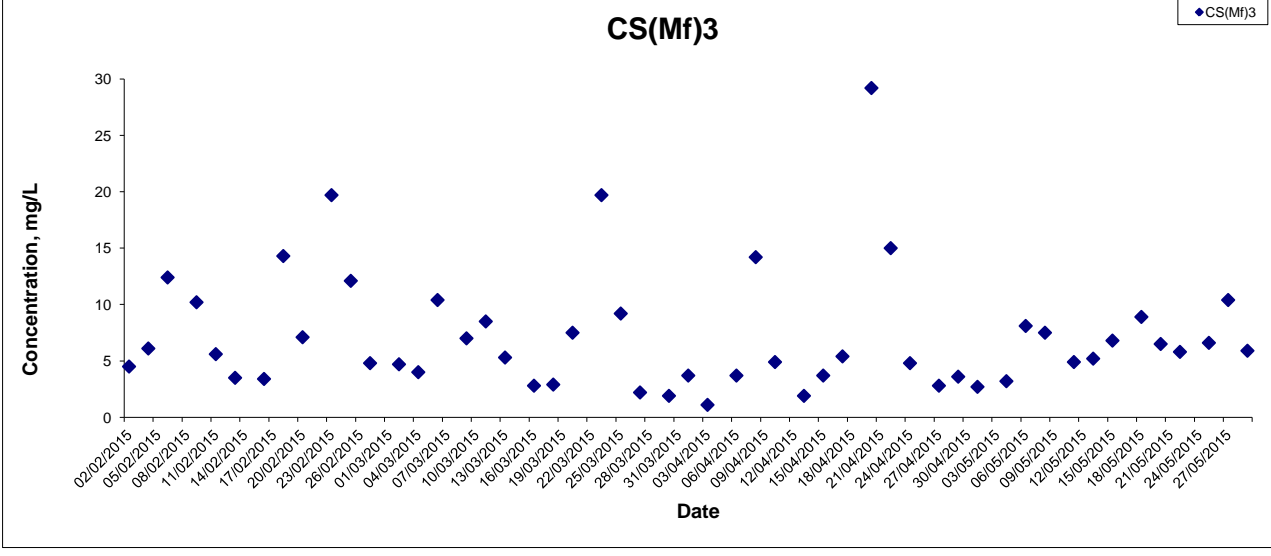
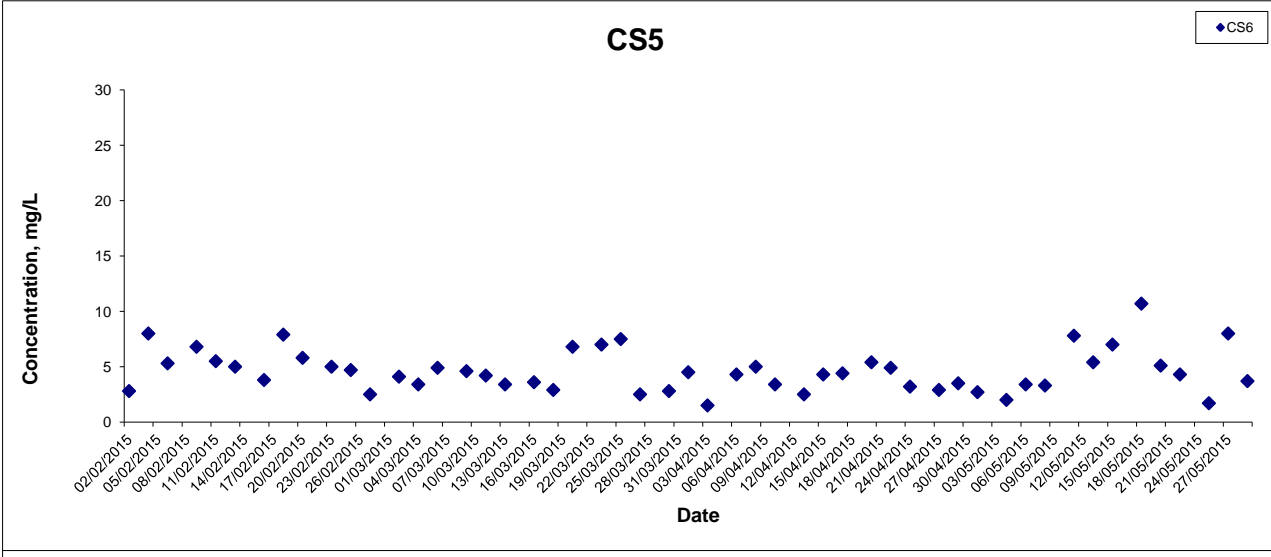
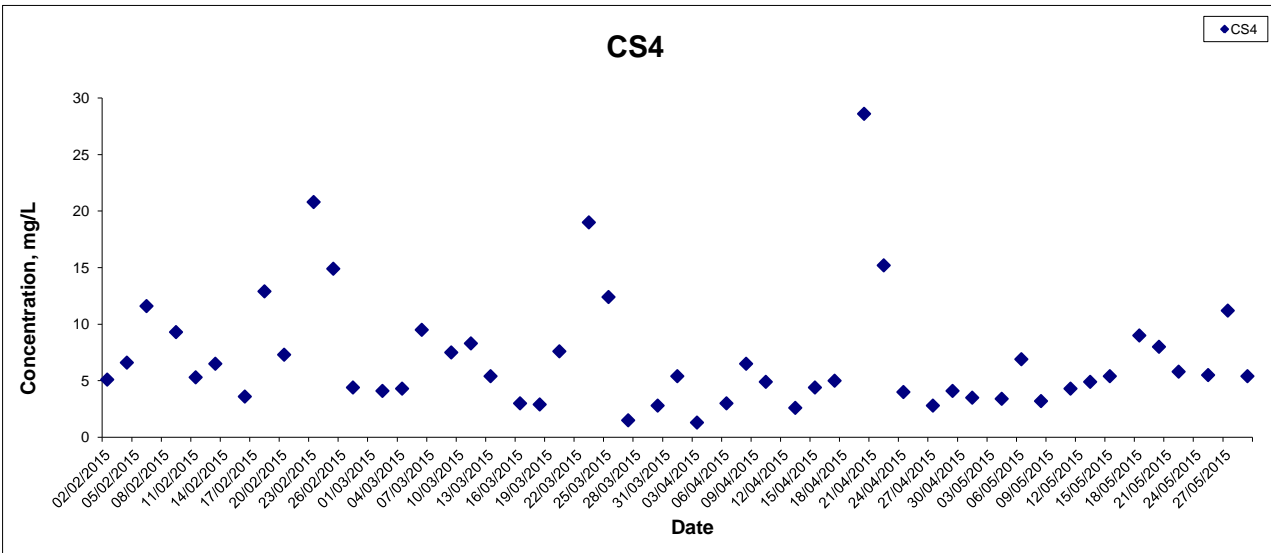
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## Suspended Solids at Mid-Ebb Tide



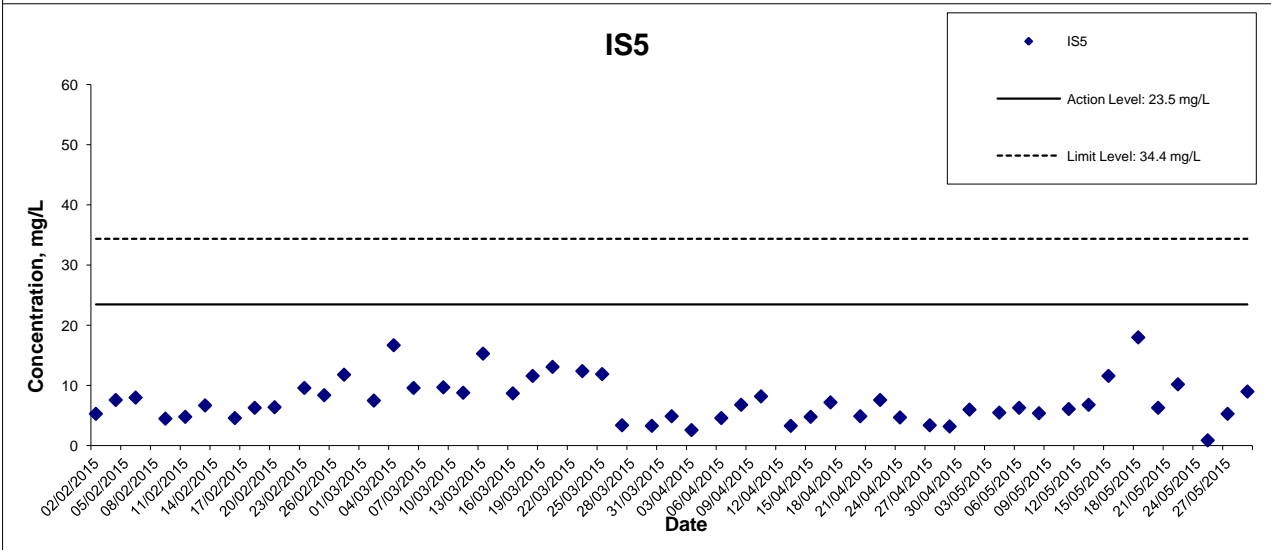
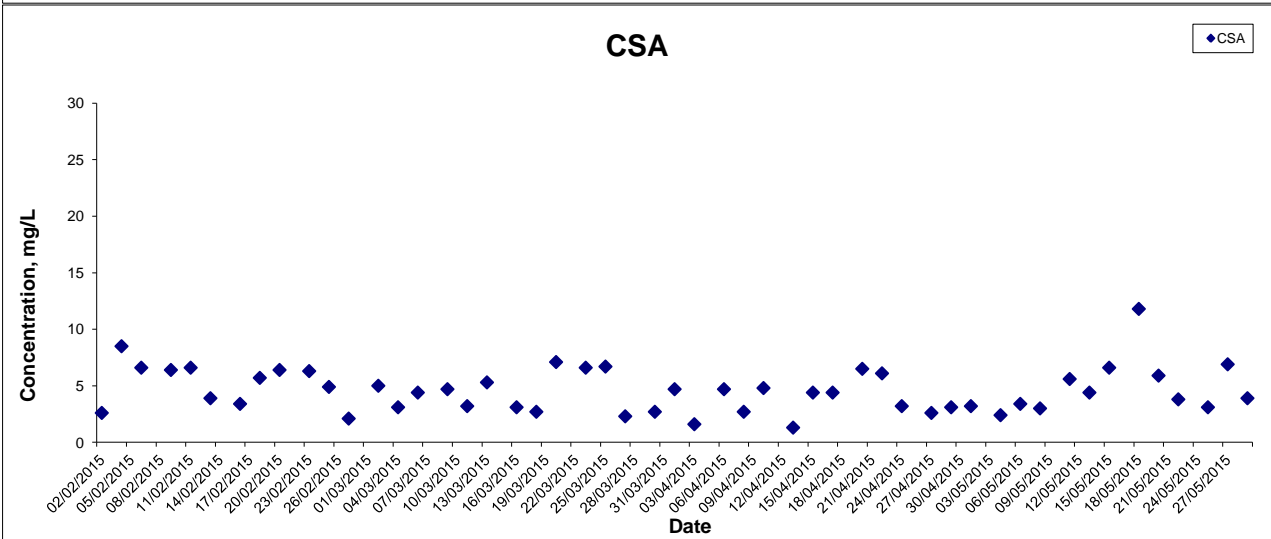
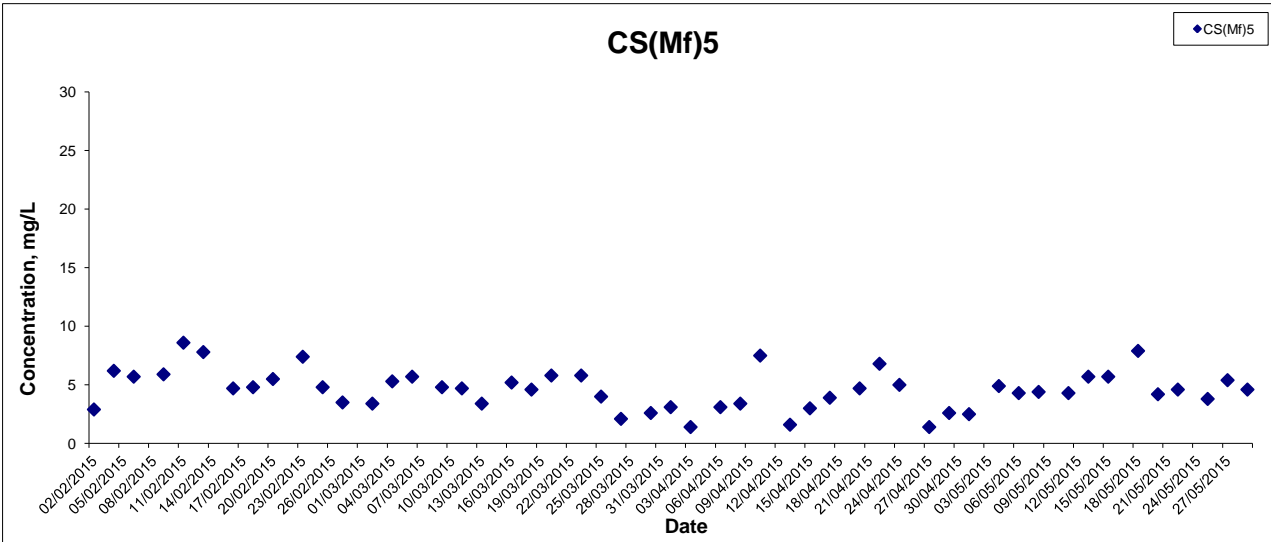
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### Suspended Solids at Mid-Flood Tide



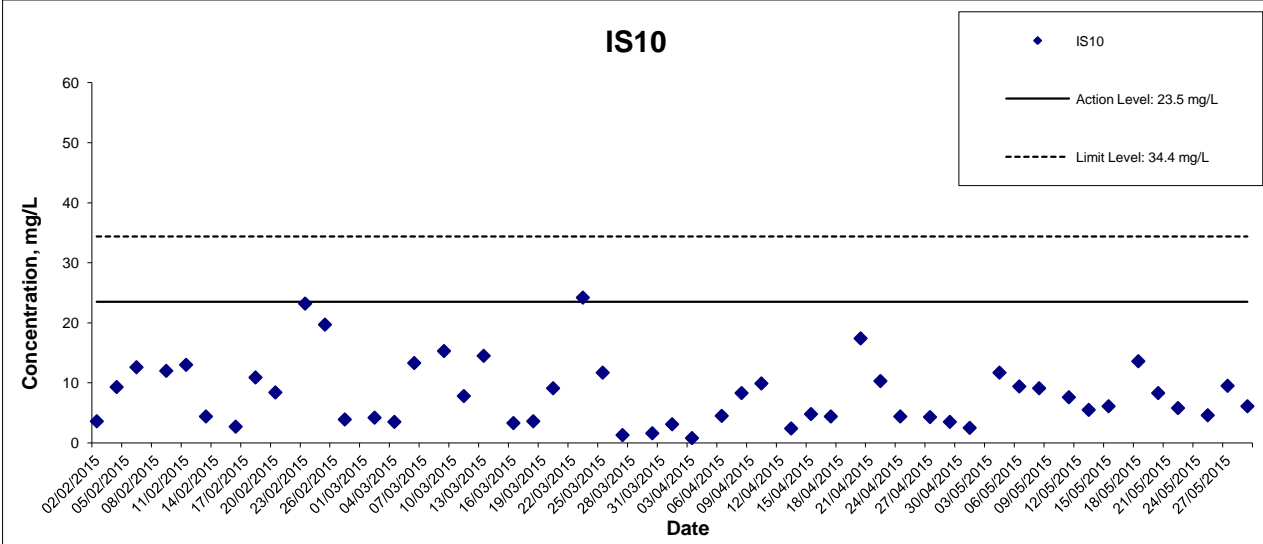
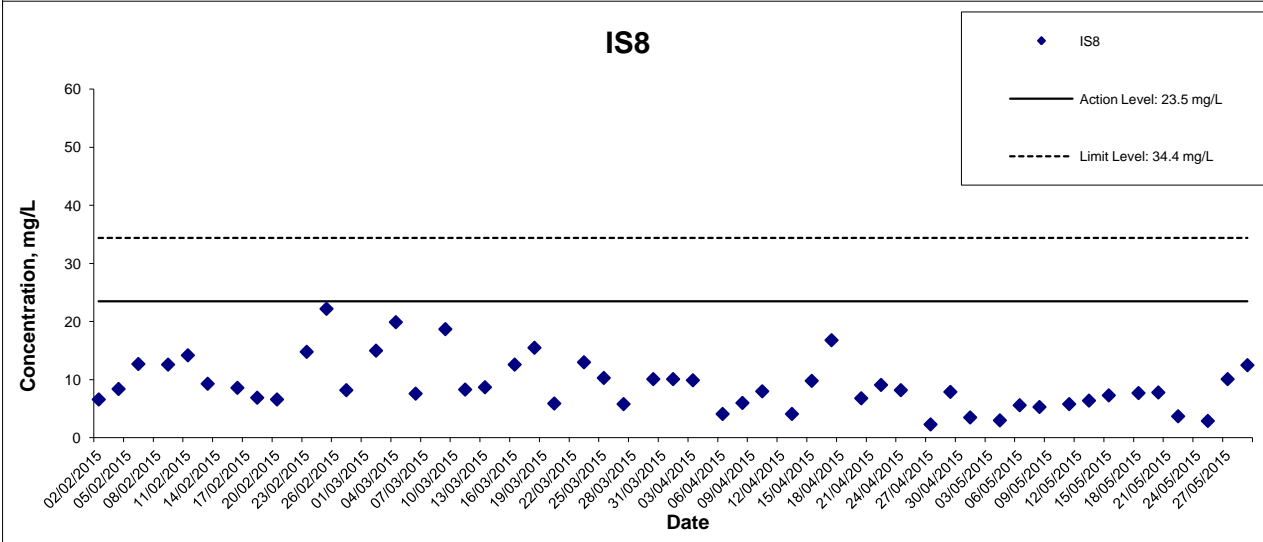
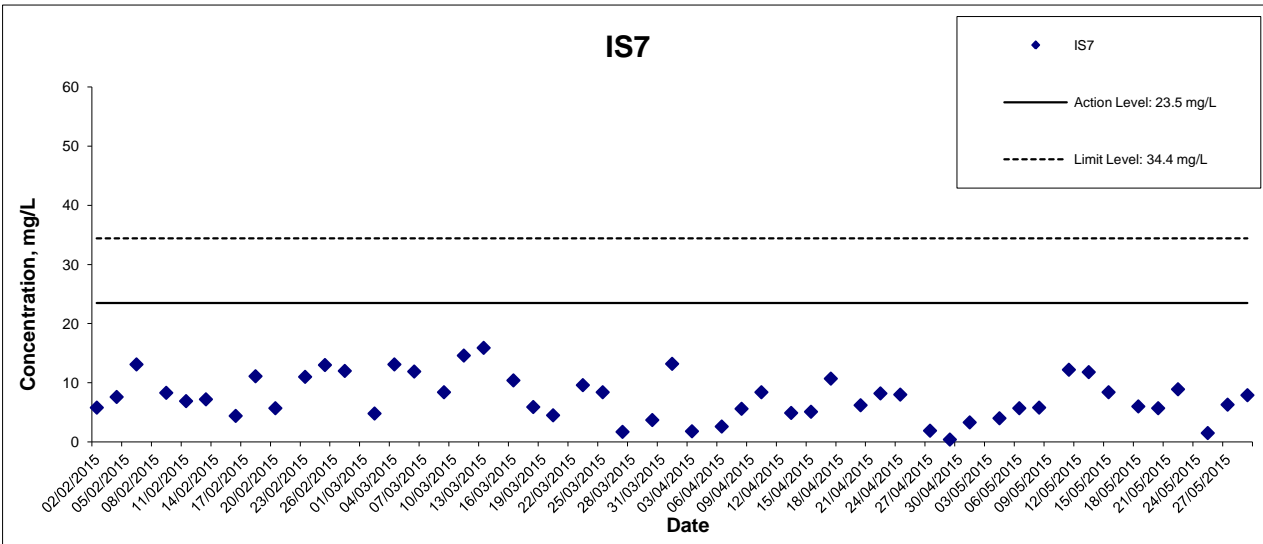
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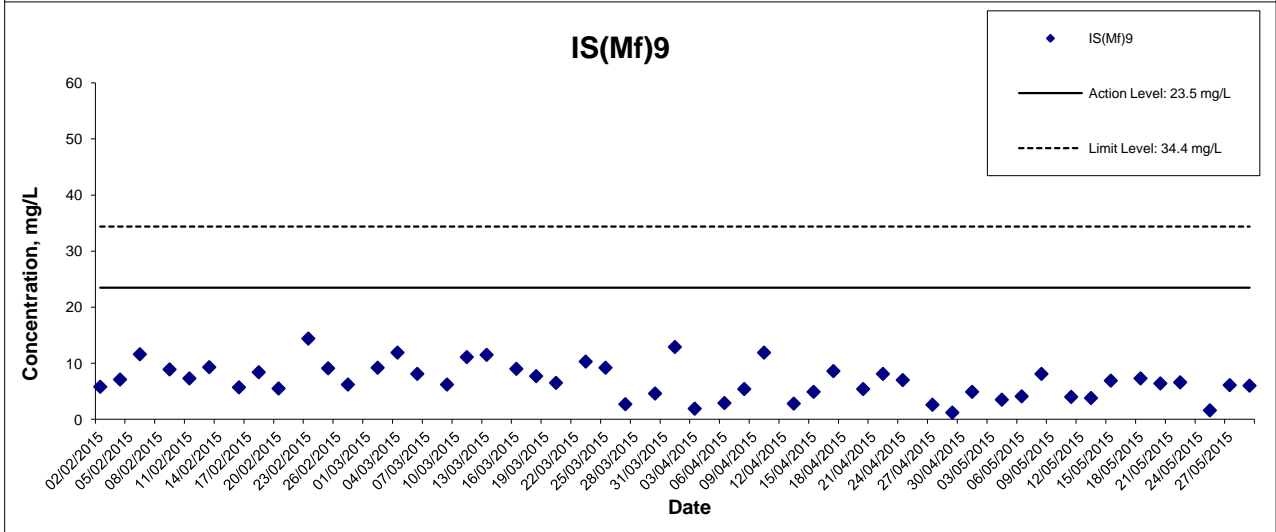
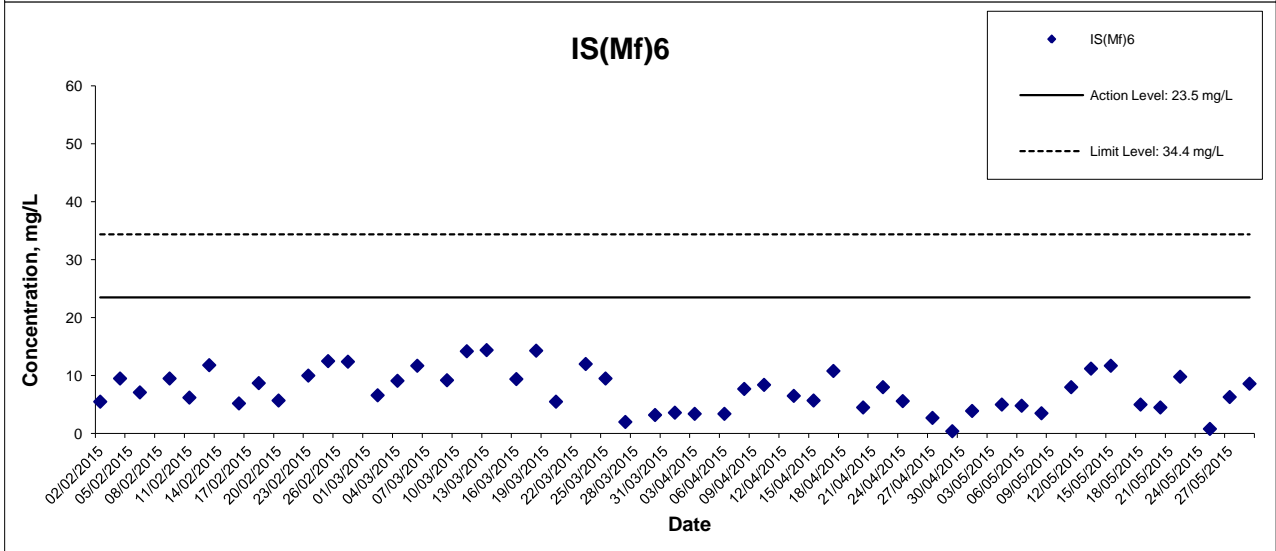
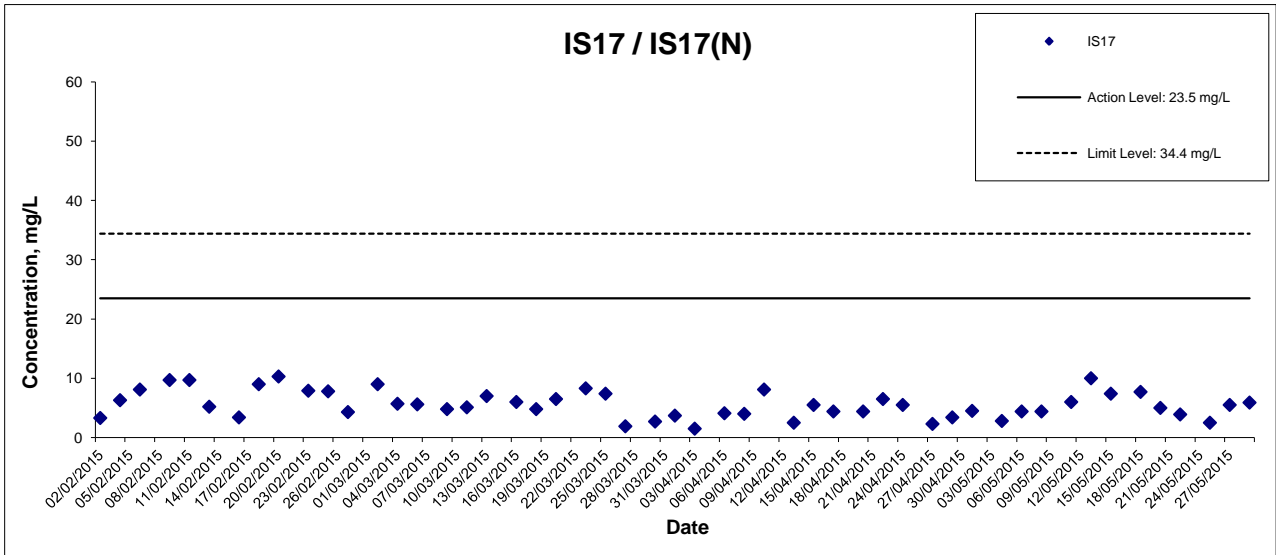
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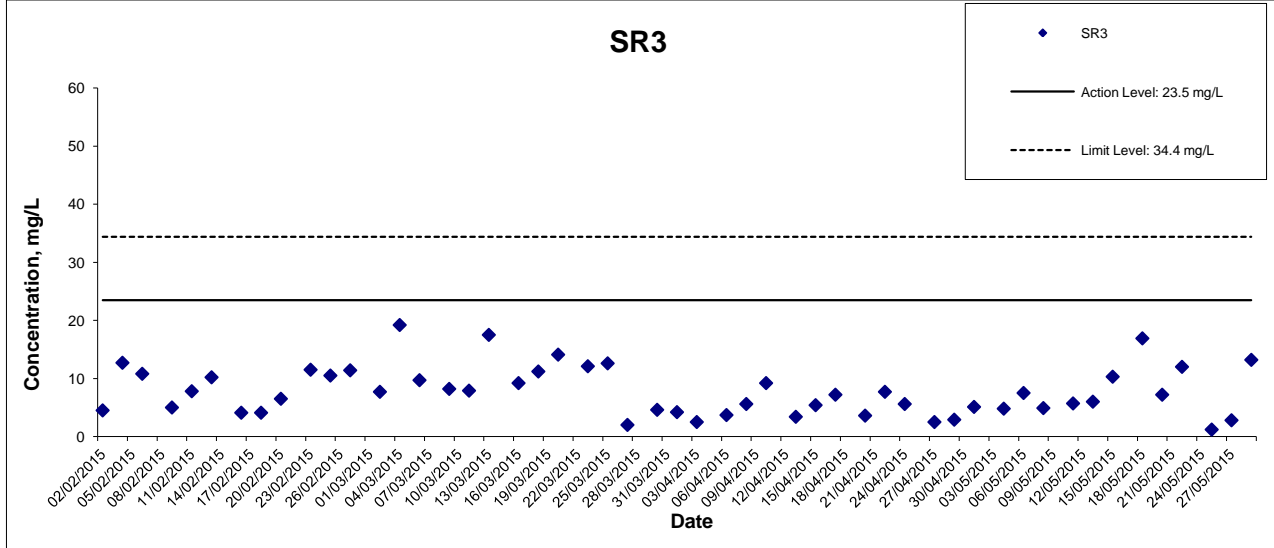
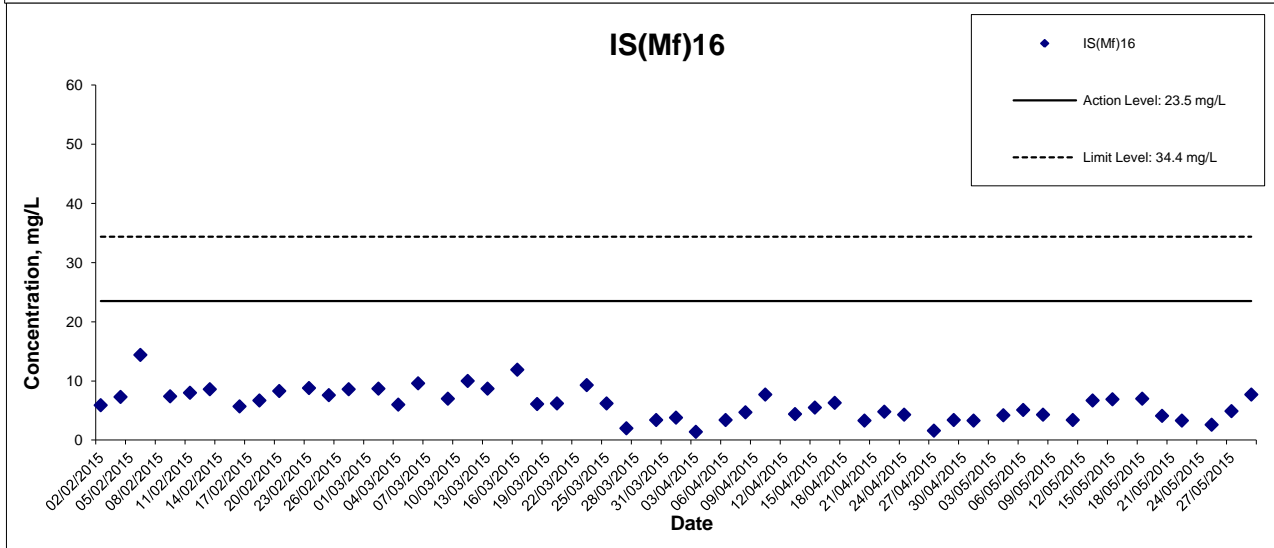
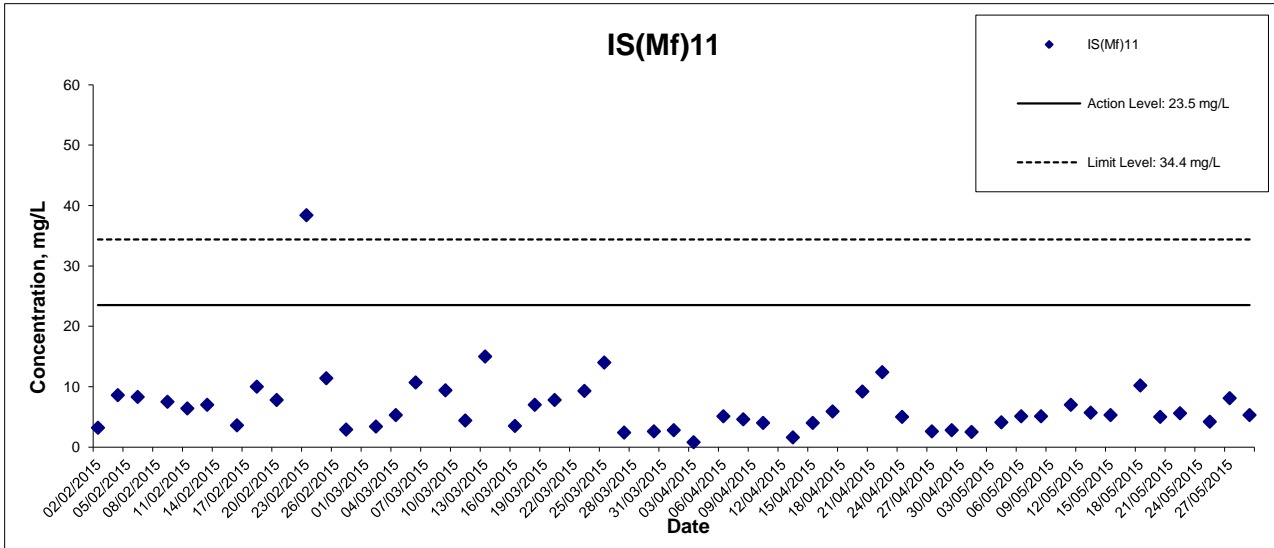


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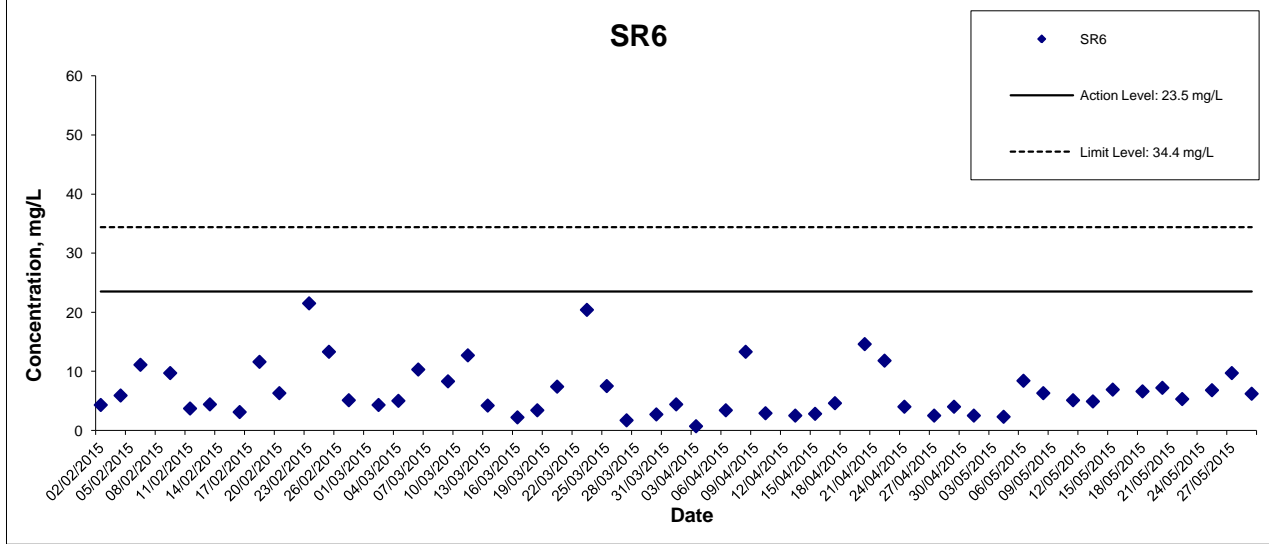
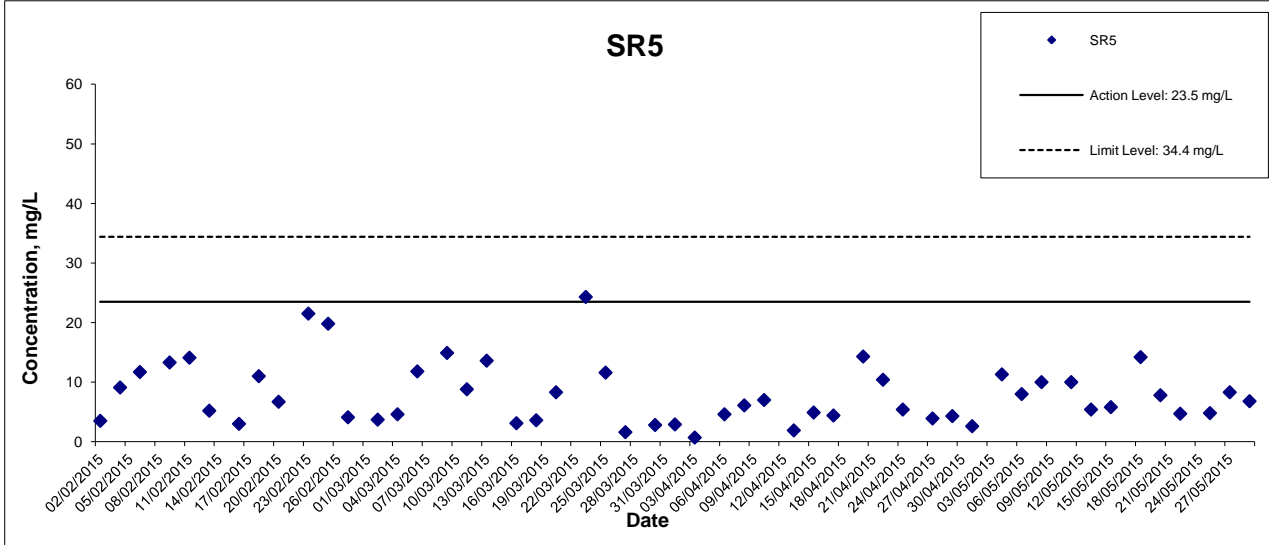
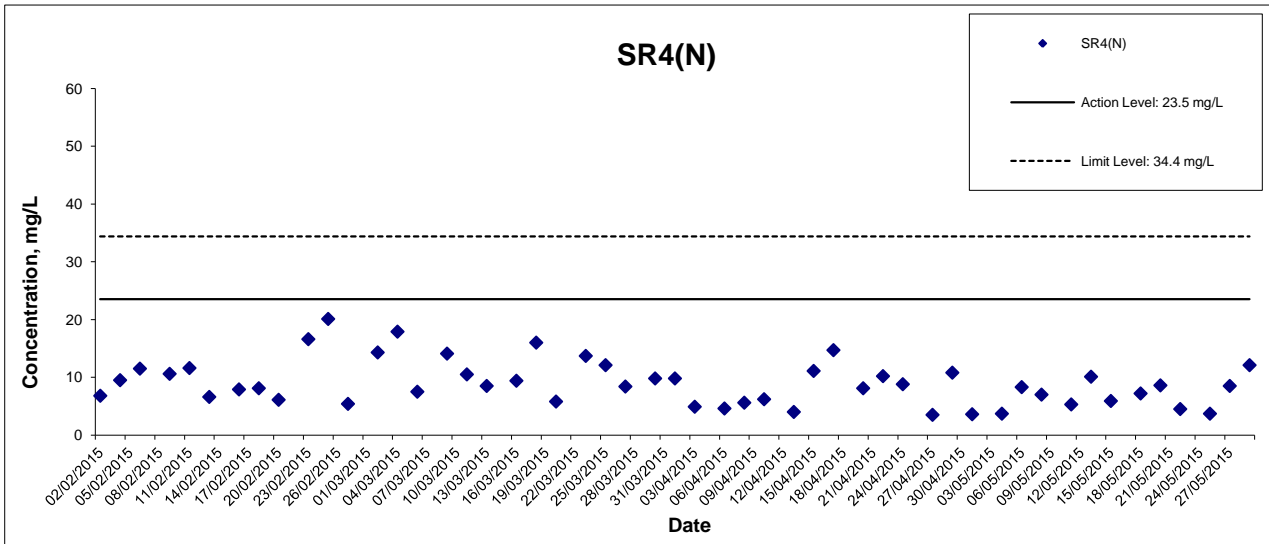
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**HONG KONG - ZHUHAI - MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - RECLAMATION WORKS**

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

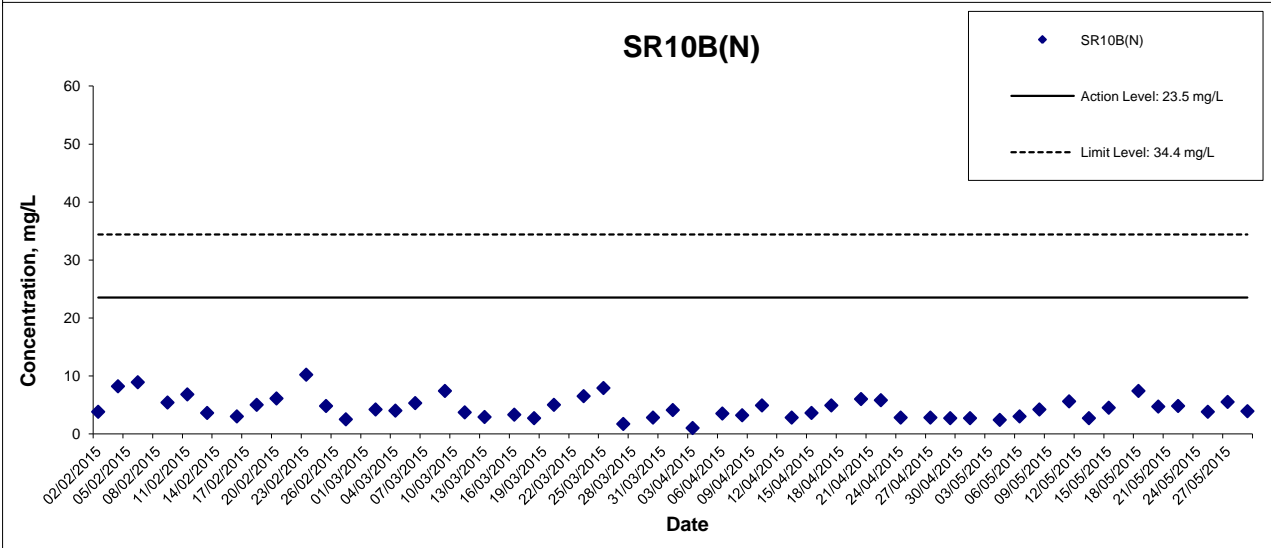
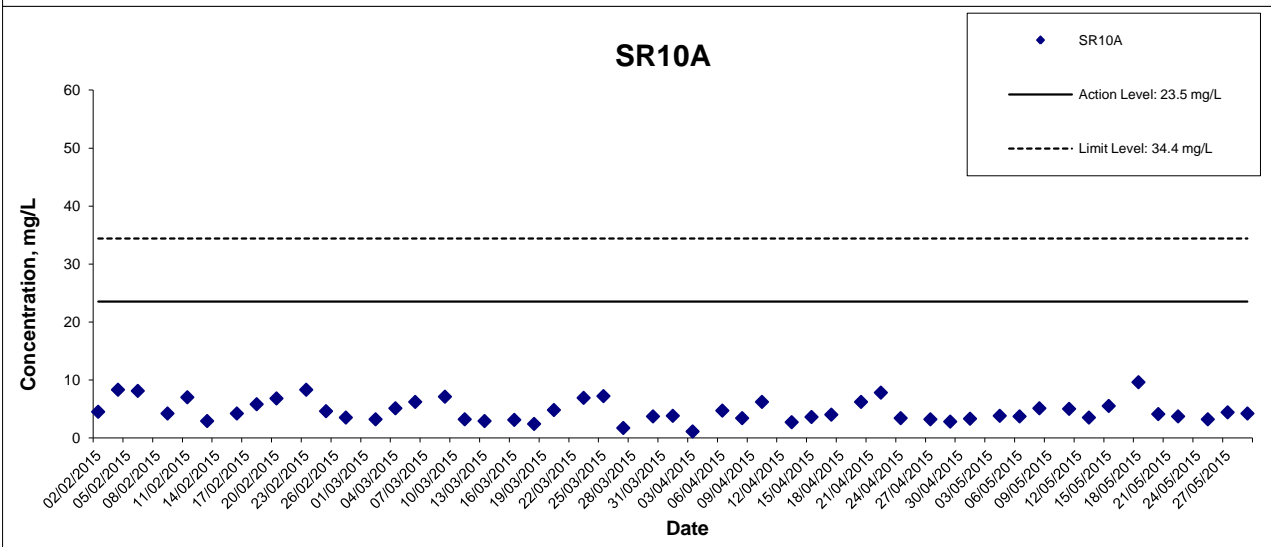
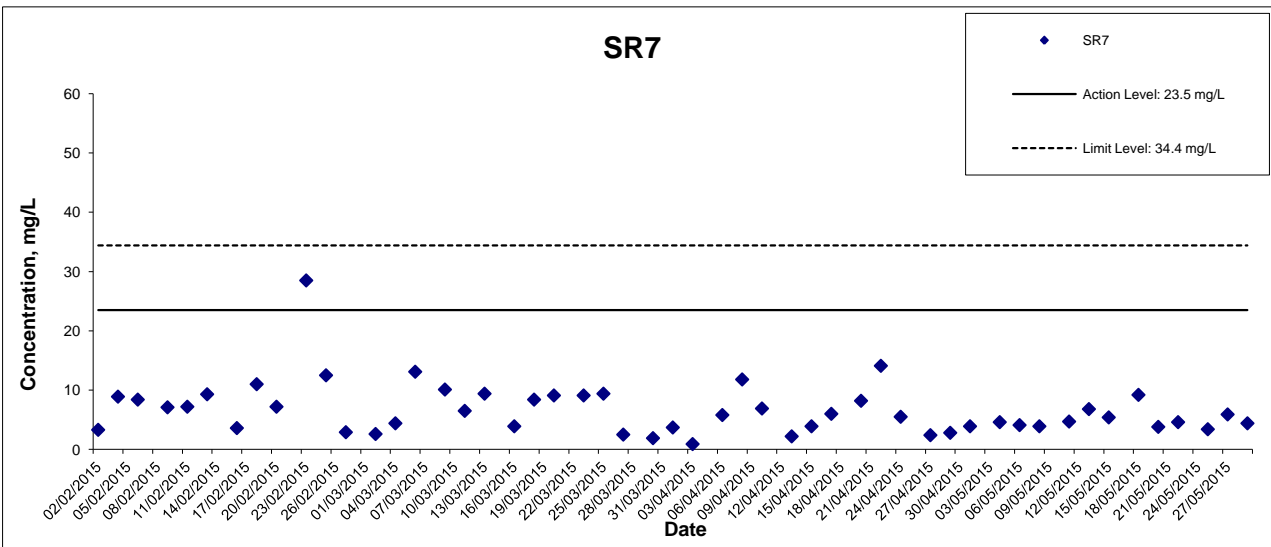


**Project No.: 60249820**

**Date: June 2015**

**Appendix G**

## Suspended Solids at Mid-Flood Tide



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



March – May 2015  
Quarterly Report

**Dolphin Impact Monitoring**

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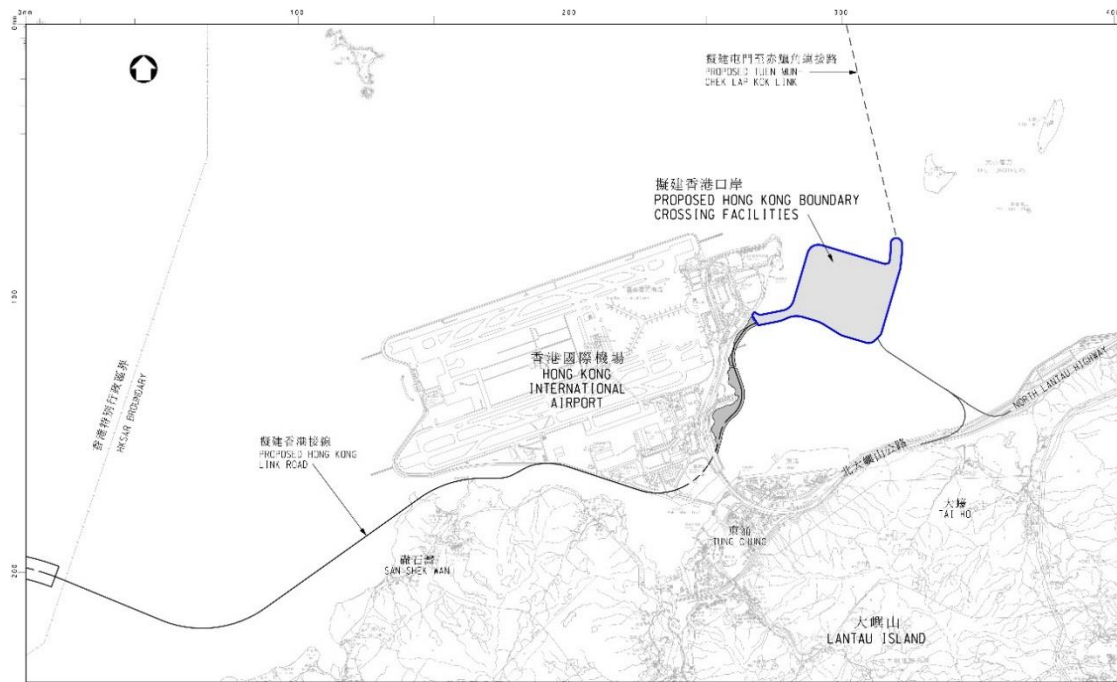
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- Annex II     Impact Monitoring Survey Effort Summary (March – May 2015)
- Annex III    Impact Monitoring Sighting Database (March – May 2015)
- Annex IV    Photo ID Images (March 2012 – May 2015)



## 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 thirteenth quarterly (March – May 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 season (the “autumn” months of September to November, 2011), however, some monitoring was conducted in the period March – May prior to HZMB project commencement therefore, March – May 2011, March – May 2012, March – May 2013 and March – May 2014 can be compared directly to this reporting period as well as referencing the baseline data. 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 ~111km) 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 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 recalculated. This study could not verify the subset of data provided and processed it at face value. 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.

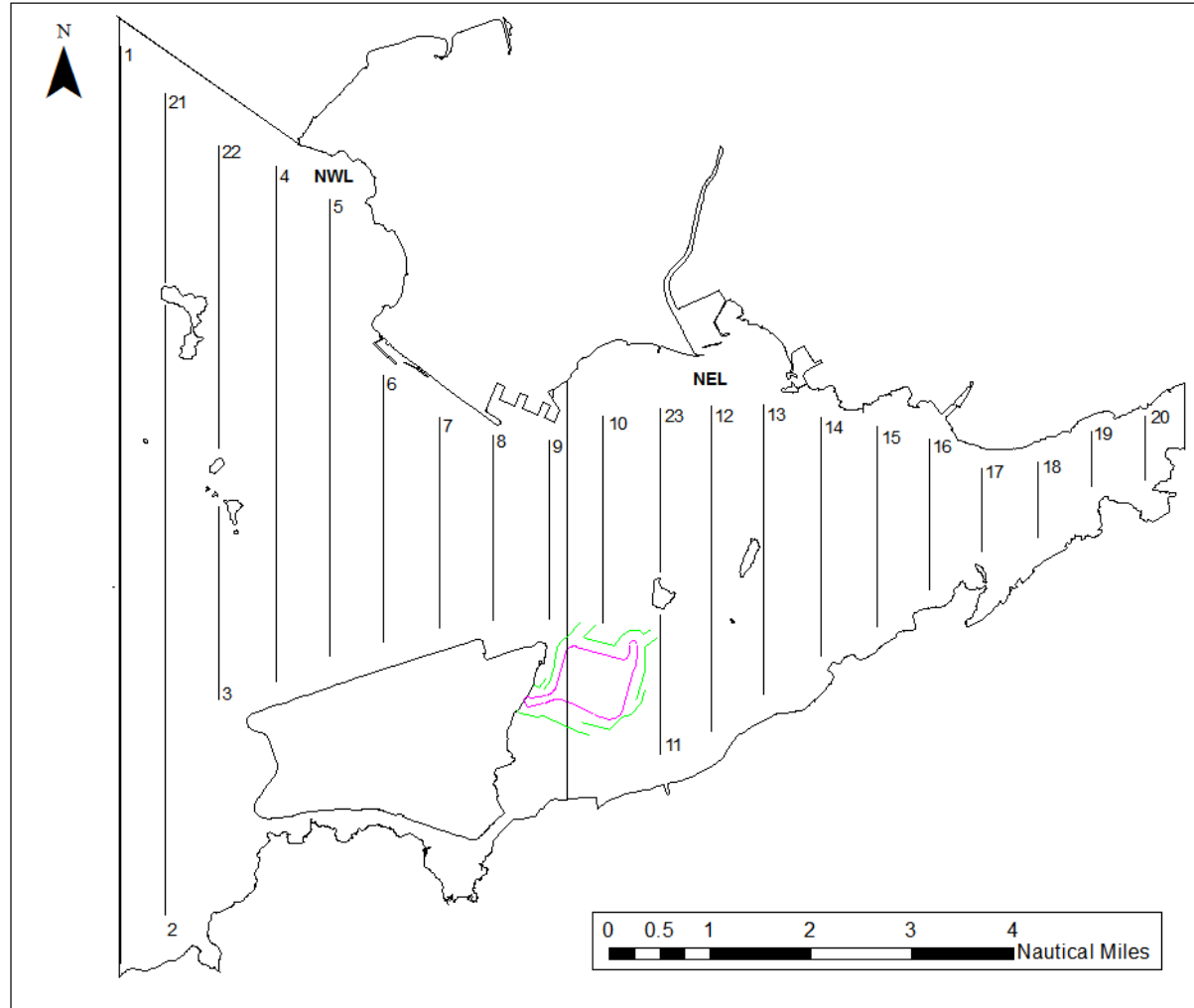
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<sup>3</sup> Group size is defined as an aggregation of dolphins within 100m of each other involved in similar behaviour (Connor *et al* 1998).

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

ID	x	y	Long	Lat	ID	x	y	Long	Lat
1	804671	814577	113.870308	22.269741	12	815542	824882	113.975647	22.362962
1	804671	831404	113.869975	22.421696	13	816506	819480	113.985072	22.314192
2	805475	815457	113.878087	22.277704	13	816506	824859	113.985005	22.362771
2	805477	826654	113.877896	22.378814	14	817537	820220	113.995070	22.320883
3	806464	819435	113.887615	22.313643	14	817537	824613	113.995018	22.360556
3	806464	822911	113.887550	22.345030	15	818568	820735	114.005071	22.325550
4	807518	819771	113.897833	22.316697	15	818568	824433	114.005030	22.358947
4	807518	829230	113.897663	22.402113	16	819532	821420	114.014420	22.331747
5	808504	820220	113.907397	22.320761	16	819532	824209	114.014390	22.356933
5	808504	828602	113.907252	22.396462	17	820451	822125	114.023333	22.338117
6	809490	820466	113.916965	22.323003	17	820451	823671	114.023317	22.352084
6	809490	825352	113.916884	22.367128	18	821504	822371	114.033556	22.340353
7	810499	820690	113.926752	22.325043	18	821504	823761	114.033544	22.352903
7	810499	824613	113.926688	22.360464	19	822513	823268	114.043340	22.348458
8	811508	820847	113.936539	22.326475	19	822513	824321	114.043331	22.357971
8	811508	824254	113.936486	22.357241	20	823477	823402	114.052695	22.349680
9	812516	820892	113.946329	22.326894	20	823477	824613	114.052686	22.360610
9	812516	824254	113.946279	22.357255	21	805476	827081	113.877878	22.382668
10	813525	818270	113.956156	22.303225	21	805476	830562	113.877811	22.414103
10*	813525	824657	113.956065	22.360912	22	806464	824033	113.887520	22.355164
11	814556	818449	113.966160	22.304858	22	806464	829598	113.887416	22.405423
11	814556	820992	113.966125	22.327820	23	814559	821739	113.966142	22.334574
12	815542	818807	113.975726	22.308109	23	814559	824768	113.966101	22.361920

\*Transect 10 is now 3.6km in length due to the HKBCF construction site. The total transect length for both NEL and NWL combined is 111km



**Figure 2** Location of the Transect Lines for Baseline and Impact Monitoring during HKBCF)

### 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, 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 March – May 2015, 12 vessel surveys were conducted in NEL and NWL survey areas. A total of 658.2 km of “on-effort” transect lines were conducted, all of which were conducted under favourable conditions (Beaufort 3 or better) (Annex II). During March – May 2015, 10 groups of dolphins, numbering 30 (min 31: max 34<sup>4</sup>) individuals, were sighted from the vessel surveys. Of these, seven groups were “on-effort” and the remaining three “opportunistic” (Annex III).

All 10 sightings 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. The baseline surveys were conducted outside the winter period and as dolphin occurrence is known to change seasonally within Hong Kong waters, the same periods for 2011, 2012, 2013 and 2014 are also included for comparative purposes (Table 2). During March – May 2011 (the advanced monitoring period), 20 groups were seen in NWL and 9 in NEL. During March – May 2012, which was the first three months of the HKBCF works, 19 groups and a single group were recorded in NWL and NEL, respectively. For March – May 2013, 22 groups were seen in NWL and none in NEL and, in March – May 2014, 15 groups were seen in NWL and, again, none, in NEL. For the periods March – May, from one year prior to HKBCF works to 2014, there have been approximately the same number of dolphin groups sighted in NWL (16 to 22 groups) this quarter, March – May 2015, the lowest number of groups have been sighted. For NEL, there were fewer groups encountered during impact monitoring than during the same period the year before works started. 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.

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<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. A Comparison of Total Sightings Recorded in NEL and NWL Areas During Sep – Nov 2011; March – May 2011; 2012; 2013; 2014 and 2015.**

Monitoring Period	Total Dolphin Sighting in NWL	Total Dolphin Sighting in NEL
	Number of Groups	Number of Groups
March – May 2011 (Advanced Monitoring)	20	9
Sep – Nov 2011 (Baseline Monitoring)	34	10
March – May 2012 (Impact Monitoring)	19	1
March – May 2013 (Impact Monitoring)	22	0
March – May 2014 (Impact Monitoring)	15	0
March – May 2015 (Impact Monitoring)	10	0

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 March – May 2011, 2012, 2013, 2014 and 2015 were compared. The baseline study had considerably more “on effort” sightings compared to the March to May period prior to works commencement as well as the following three March to May periods. It is noted, again, that seasonal patterns must be considered when assessing differences between years. There is a decrease in absolute numbers of “on effort” groups seen between the March to May period prior to works commencement and the following four years, although the trend is not consistent (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; March – May 2011; 2012; 2013; 2014 and 2015**

Monitoring Period	Groups of Dolphin sighted in NEL and NWL
March – May 2011 (Advanced Monitoring)	22
Sep - Nov 2011 (Baseline Monitoring)	44
March – May 2012 (Impact Monitoring)	12
March – May 2013 (Impact Monitoring)	17
March – May 2014 (Impact Monitoring)	11
March – May 2015 (Impact Monitoring)	7

### 3.2. Distribution

During the baseline survey, ~77% of all “on effort” sightings were made in NWL. During the March – May periods 2011, 2012, 2013, 2014 and 2015, 68%, 100%, 100%, 100% and 100% of all sightings were made in NWL, respectively. Between Advanced and Baseline monitoring, prior to construction at HKBCF, there was a trend for an increased use of NWL habitat. An increase in use of habitat over the winter months is a previously



documented trend in the long term monitoring of this population (AFCD 2010; 2011; 2012). After construction activities commenced, for the period March – May, there was a slight increase in the first two years followed by a more marked decrease in absolute number of on effort encounters with dolphins. Again, there is no correction for effort for these group sightings (Table 4). The majority of sightings occurred in the northern section of NWL and are either within or adjacent to the Sha Chau Lung Kwu Chau Marine Park (SCLKCMP). Since 1995, this area has been consistently highlighted as important to some, but not all, of the dolphins which frequent Hong Kong waters. A few sightings occurred near the southern section of NWL, although sightings in this area have decreased recently (Fig. 6).

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

Monitoring Period	No. of Dolphin Groups sighted in NWL	No. of Dolphin Groups sighted in NEL
March-May 2011 (Advanced Monitoring)	15	7
Sep - Nov 2011 (Baseline Monitoring)**	34	10
March-May 2012 (Impact Monitoring)	12	0
March-May 2013 (Impact Monitoring)	17	0
March-May 2014 (Impact Monitoring)	11	0
March-May 2015 (Impact Monitoring)	7	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 has been noted in dolphin occurrence in NEL for the periods March – May. In NWL, looking only at the period March – May, a decrease is noted in encounter rates. The baseline monitoring encounter rate is the highest calculated, although it is noted that this is a different season compared to the quarter covered by this report (Table 5).

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

**Table 5. A Comparison of Encounter Rates\* in NEL and NWL Areas During Sep – Nov 2011; March – May 2011, 2012, 2013, 2014 and 2015.**

Monitoring Period	Encounter Rate NEL	Encounter Rate NWL
March - May 2011 (Advanced Monitoring)	7.5	8.8
Sept-Nov 2011 (Baseline Monitoring)	5.4	9.5
March - May 2012 (Impact Monitoring)	0.0	5.7
March - May 2013 (Impact Monitoring)	0.0	3.1
March - May 2014 (Impact Monitoring)	0.0	2.5
March - May 2015 (Impact Monitoring)	0.0	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 (March – May 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 March – May periods, the encounter rate has declined markedly in NWL and, since project inception, the decrease in NEL has been dramatic. 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*

During March – May 2015, group size of all sightings varied from 1 to 5 individuals with an average of 3.1 in NWL. For baseline monitoring, average group size was 4.5 and 3.5, in NWL and NEL. For the periods March – May 2011, 2012, 2013; 2014 and 2015 the group size in NWL is approximately the same, varying between 3.1 and 3.3 individuals. The NWL group size was higher during baseline, however, this was a different season (4.5). No groups have been noted in NEL in the periods March – May 2013, 2014 and 2015 (Table 6). There is no particular habitat preference for larger (>5) group sizes (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 Baseline (Sept – Nov 2011); March – May 2011; 2012; 2013; 2014 and 2015**

Monitoring Period	Average Group Size (NWL)	Average Group Size (NEL)
March-May 2011 (Advanced Monitoring)	3.1	2.3
Sept – Nov 2011 (Baseline Monitoring)	4.5	3.5
March-May 2012 (Impact Monitoring)	3.2	1
March-May 2013 (Impact Monitoring)	3.3	0
March-May 2014 (Impact Monitoring)	3.1	0
March-May 2015 (Impact Monitoring)	3.1	0

### 3.5. Habitat use

Quantitative grid analyses indicates that the most often frequented area in NWL is the SCLKCMP. Previous high use of the area in the southern portion of NWL has not been noted this quarter (Figs. 8; 9). SCLKCMP has been consistent in the long term and continues to be so. Habitat use between March – May 2012 to 2015, the first four years of construction at HKBCF, were compared. The density of individuals dolphins (DSPE) using the NEL and NWL habitat in 2012, the first year of HKBCF construction, shows relatively widespread use with areas along the northeast of the airport platform, northeast Lung Kwu Chau, south west Sha Chau, the western maritime border and Tai O all as areas of use, although not high density use. In 2013, year two HKBCF, the area of highest use was the marine park area at SCLKC and the density of dolphins was higher when compared with the first year of monitoring. In 2014, the area usage is the same as 2013, however, the density of dolphins using the habitat has decreased. And in 2015, there is a higher density use of the northern section of NWL (Figure 10). For groups of dolphins (SPSE), there are obvious parallels with DSPE, however, it is noted the density of individuals using the habitat of SCLKCMP increased between year 2012 and 2013. The density of individual use remained similar between 2013 and 2014 but then increased in 2015. This indicates that, in general, the dolphins overall habitat use has decreased but within the habitat used, the dolphins are using certain areas more intensively than previously (i.e., the dolphins spatially more compact) (Fig. 11). In summary, during the first year of HKBCF work, there was widespread use of the NWL habitat in a lower density compared to the higher, more concentrated habitat use calculated for 2013 onwards.

### 3.6. Mother-calf pairs

Only one group observed contained a mother and juvenile pair. The group was sighted in NWL (Fig. 12). No calves were observed in this reporting period (0%) whereas, in the same period previously (March - May 2014) calves comprised 4.3% of all dolphins observed.

### 3.7. Activities

Of the 10 groups sighted (using all sightings), six (60%) were engaged in feeding activities (including association with active and anchored fishing vessels) which is approximately the same as the frequency noted last quarter (53.3%); two (20%) were travelling which is less than that observed in the last quarter (33%); one group (10%) was feeding/travelling/surface active which is less than the last quarter (20%). Feeding is the predominant activity during daylight hours in March – May 2015 (Fig. 13). In NWL, feeding occurred throughout the sighting area of the NWL habitat (Fig. 14).

### 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. No new dolphins have been identified in the last quarter and the catalogue stands at 117 individuals. To report date (31 May 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 (Table 7).

**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

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]). 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).

## 4. CONCLUSION

The data from March – May 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, group size and behavioural trends all fall within those reported in AFCD Long Term Monitoring reports. 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 depicted key areas of frequent use within NWL, in particular, SCLKMP, and with higher use of smaller areas becoming apparent in the northern section of NWL. Areas to the

south of SCLKCMP 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 March to May, however, these trends are apparent year round now. No calves were recorded in the study area between March – May 2015 and although two neonate strandings were retrieved from the study area by the AFCD stranding programme.

The decreases in encounter rates in both NEL and NWL is noted. HKBCF monthly reporting notes that the conditions of EM&A Manuel have been consistently upheld and that all measures published 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 year. In addition, other ongoing and new marine works occur in both NEL and NWL. There has been a shift in the habitat use within the observed areas as well as a decrease in absolute sightings and numbers of dolphins. The AFCD stranding figures do not report a marked increase in mortality compared to other years for this period (three CWD strandings were reported in this quarter 2014 and four for the same period 2015). The AFCD Annual Report (2015) indicates that some dolphins seen previously in NWL now occur with more frequency in waters of southern Hong Kong. The information current to this project therefore, indicates that the dolphins have shifted to other parts of Hong Kong and adjacent waters. If at all possible, collaboration with cross border authorities involved in the HZMB Project, in particular with regards to sharing photo ID catalogues, may provide additional information on habitat use outside Hong Kong.

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 are 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.

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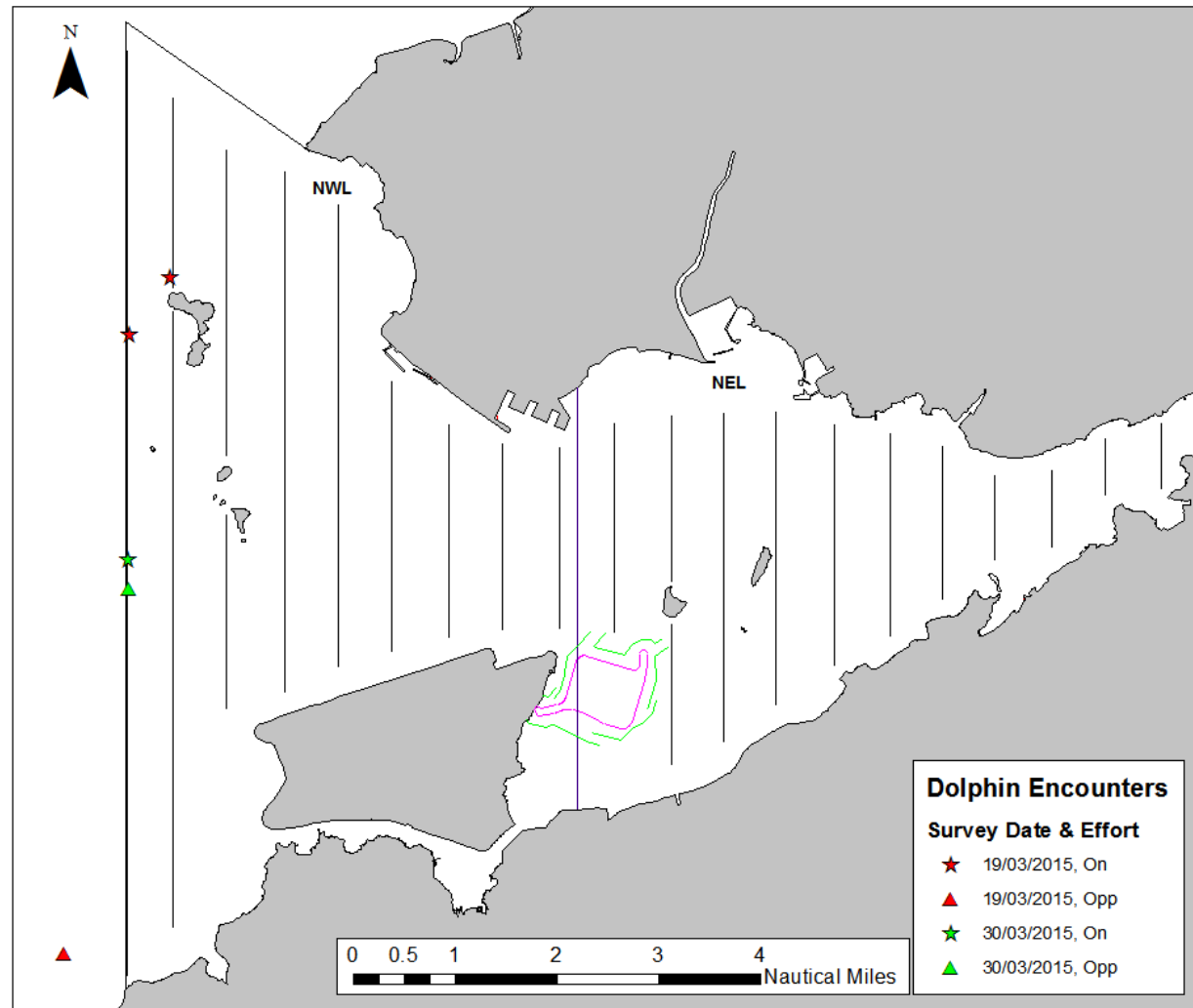
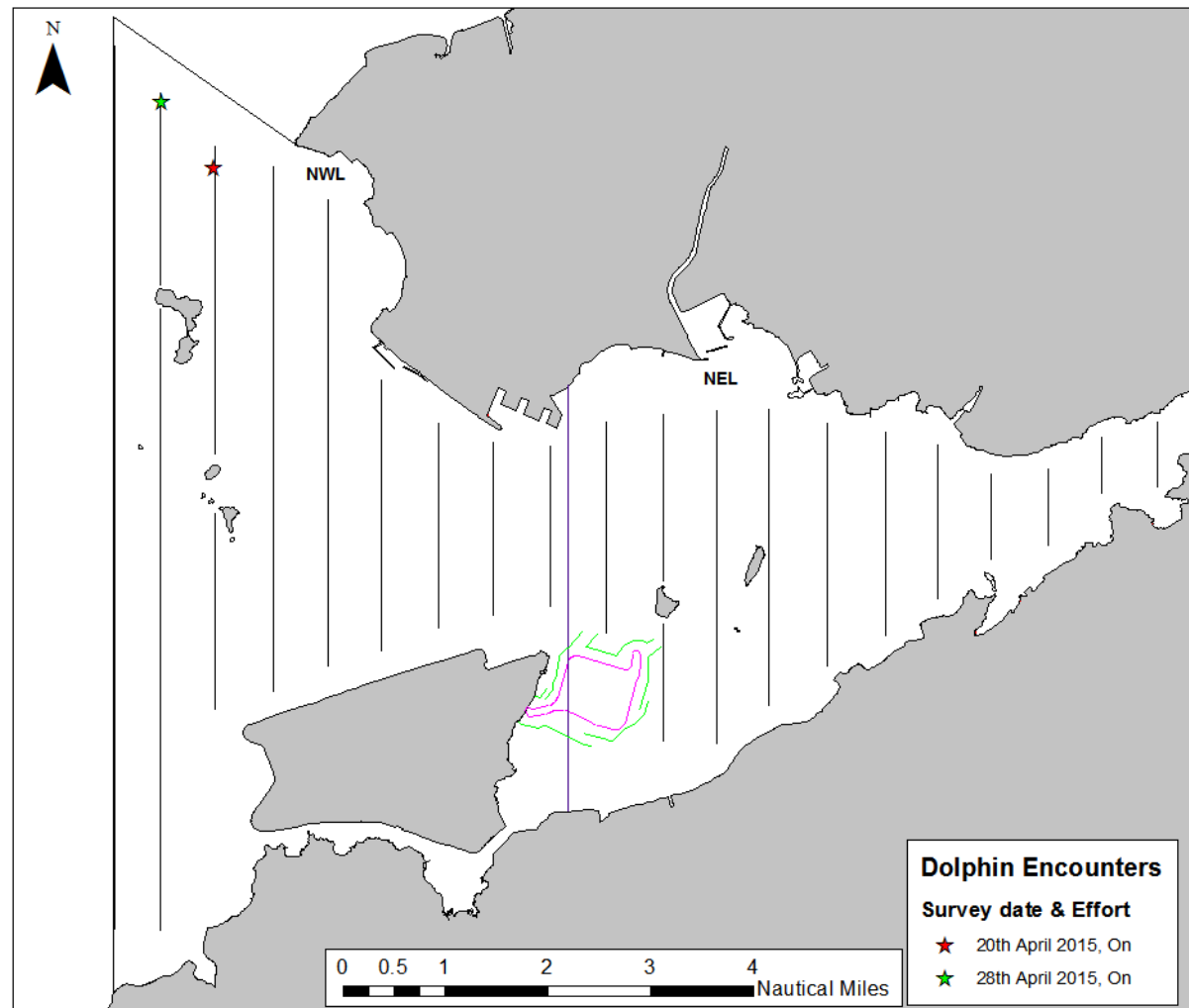


Figure 3 Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (March 2015)



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



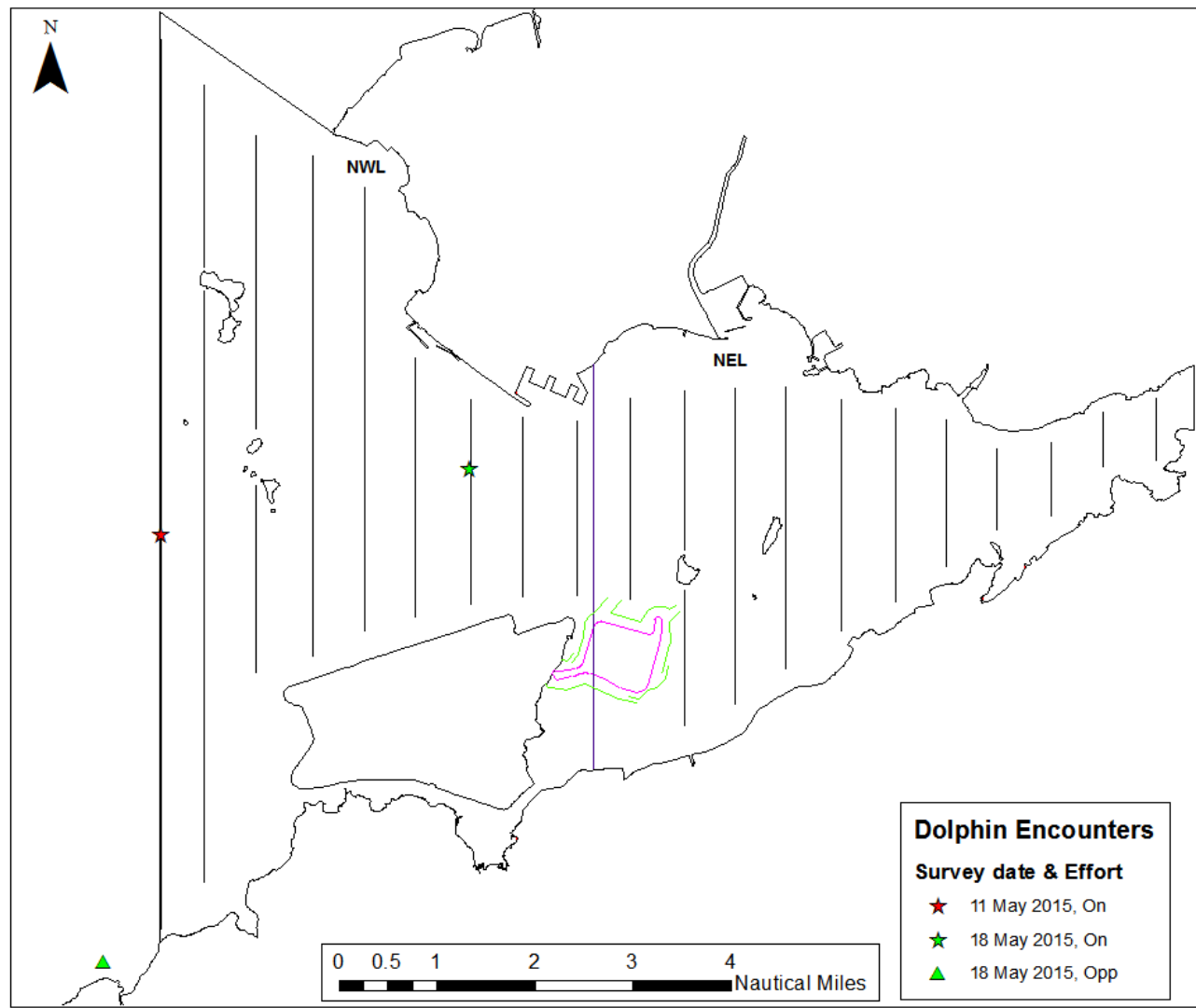


Figure 5 Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (May 2015)

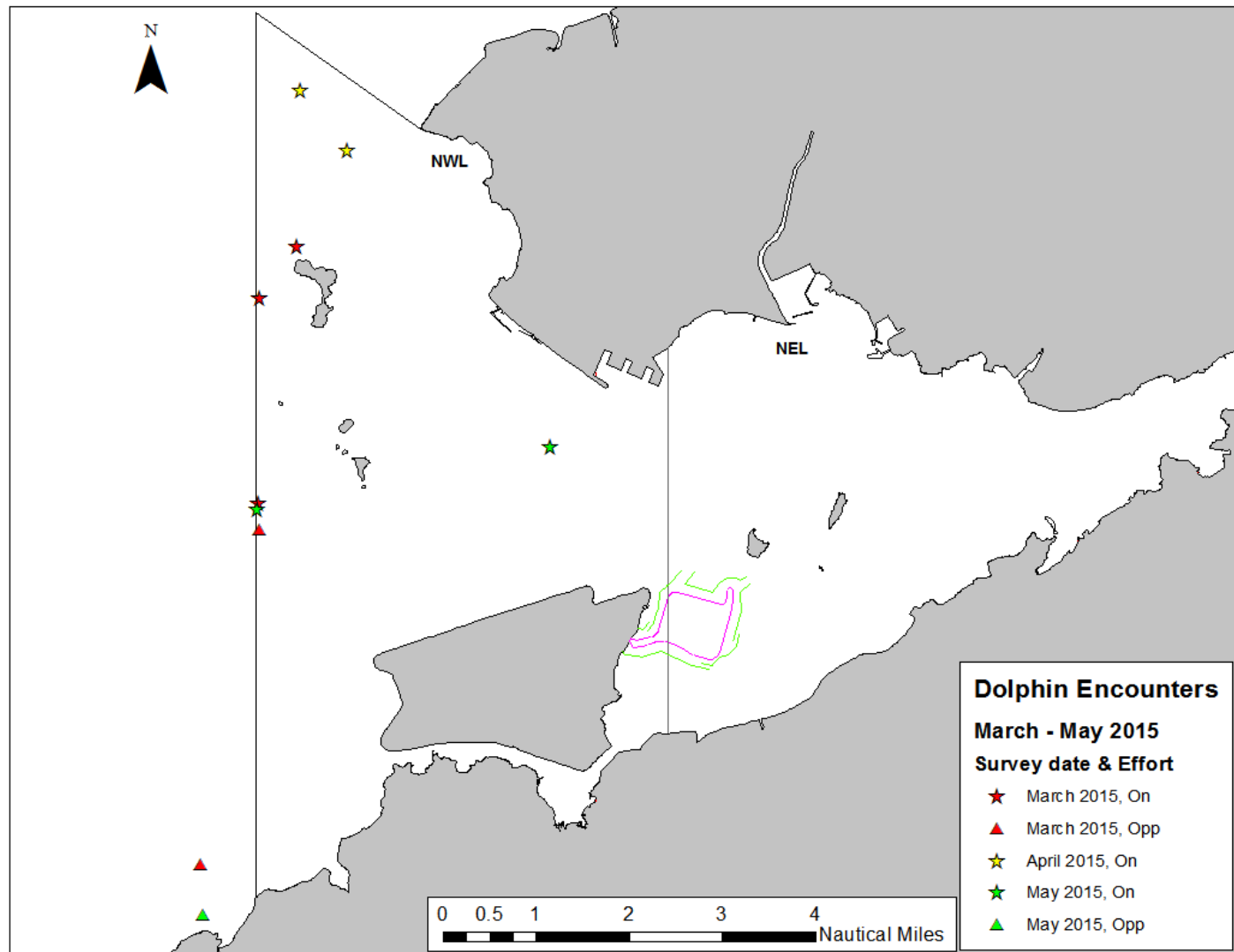


Figure 6. Distribution of Sightings Recorded During Impact Monitoring Surveys for HKBCF (March – May 2015)

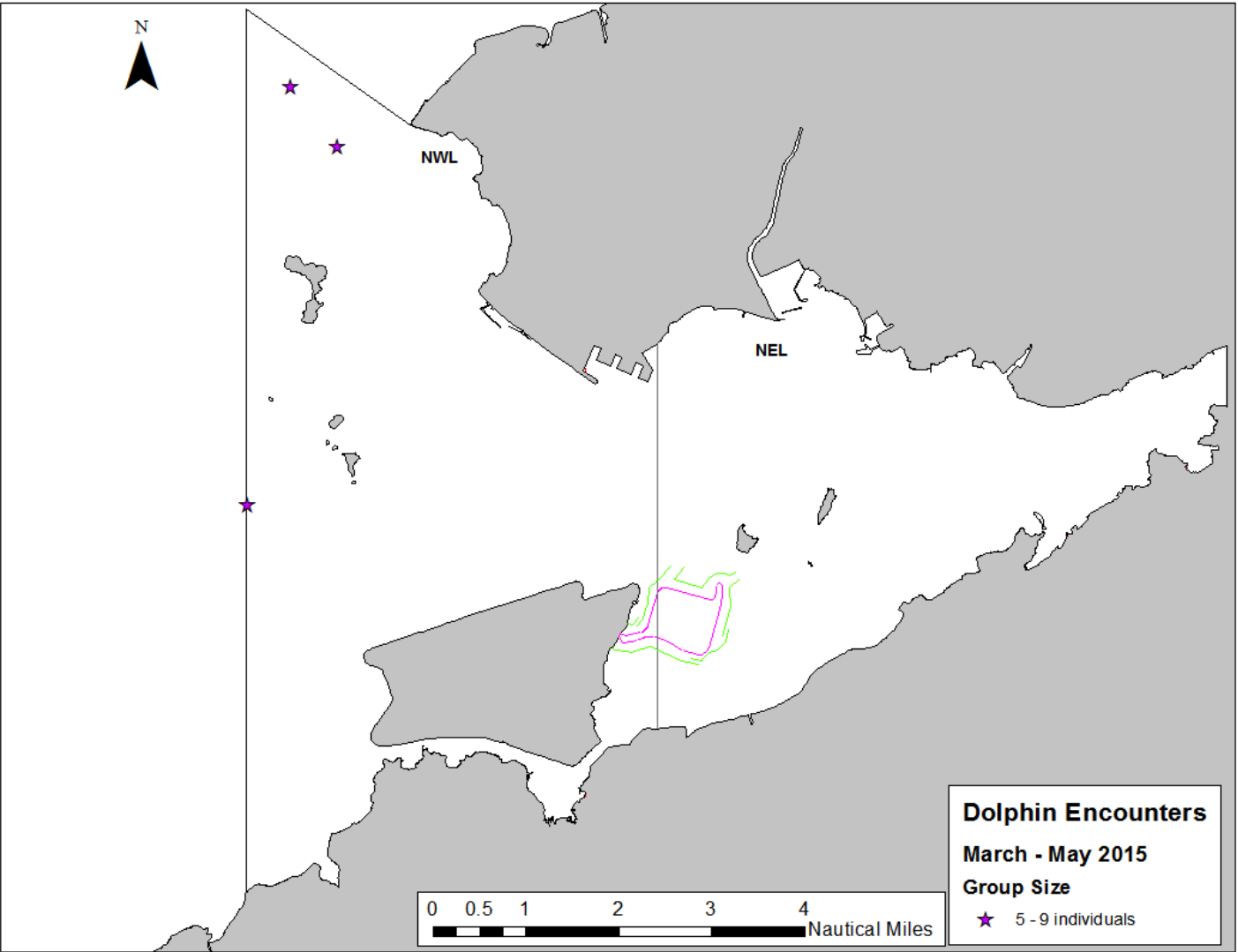


Figure 7. The Location of Dolphin Groups Numbering Five and Above Individuals (March – May 2015)

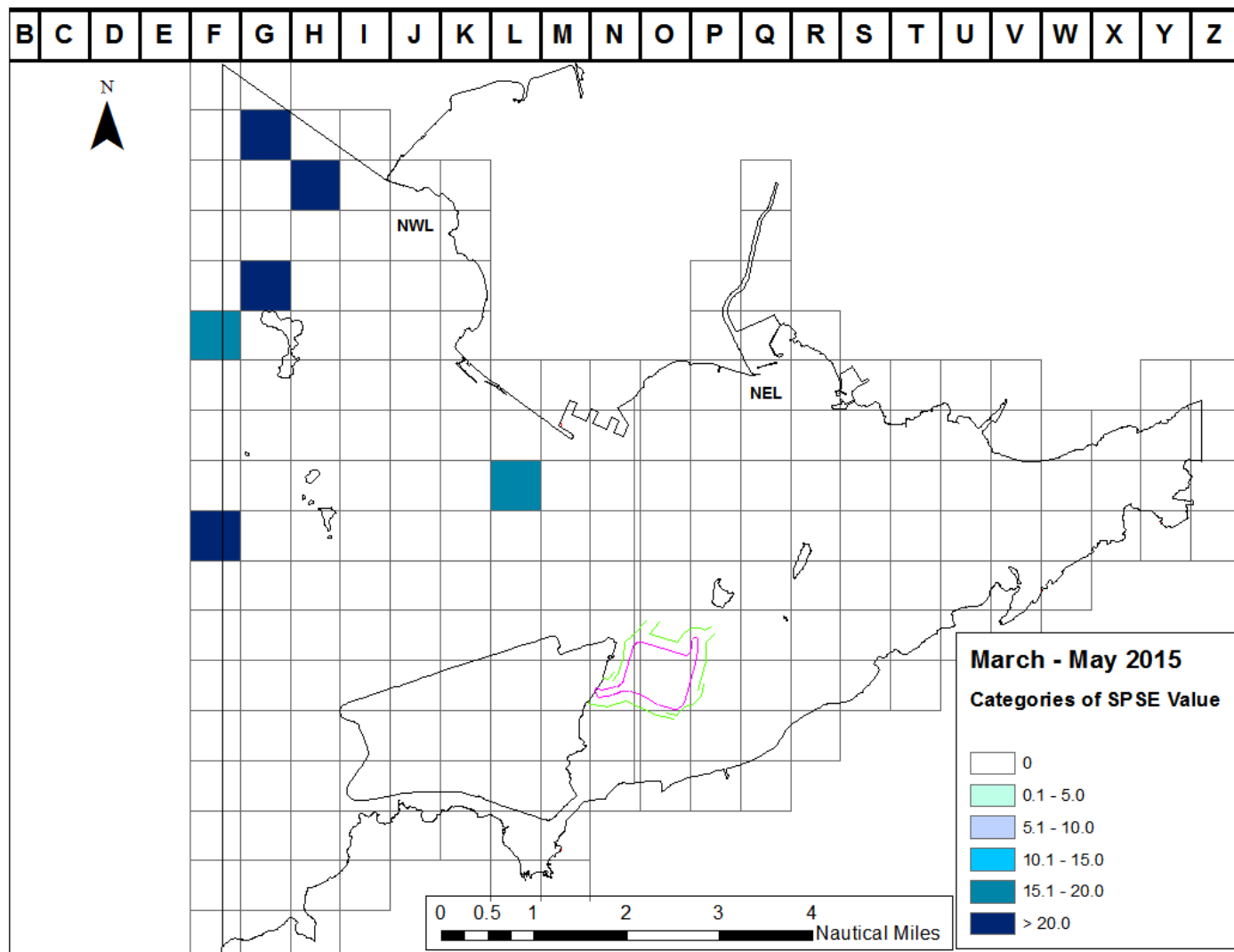


Figure 8. Sighting density SPSE (number of on-effort sightings per 100 units of survey effort) for March – May 2015

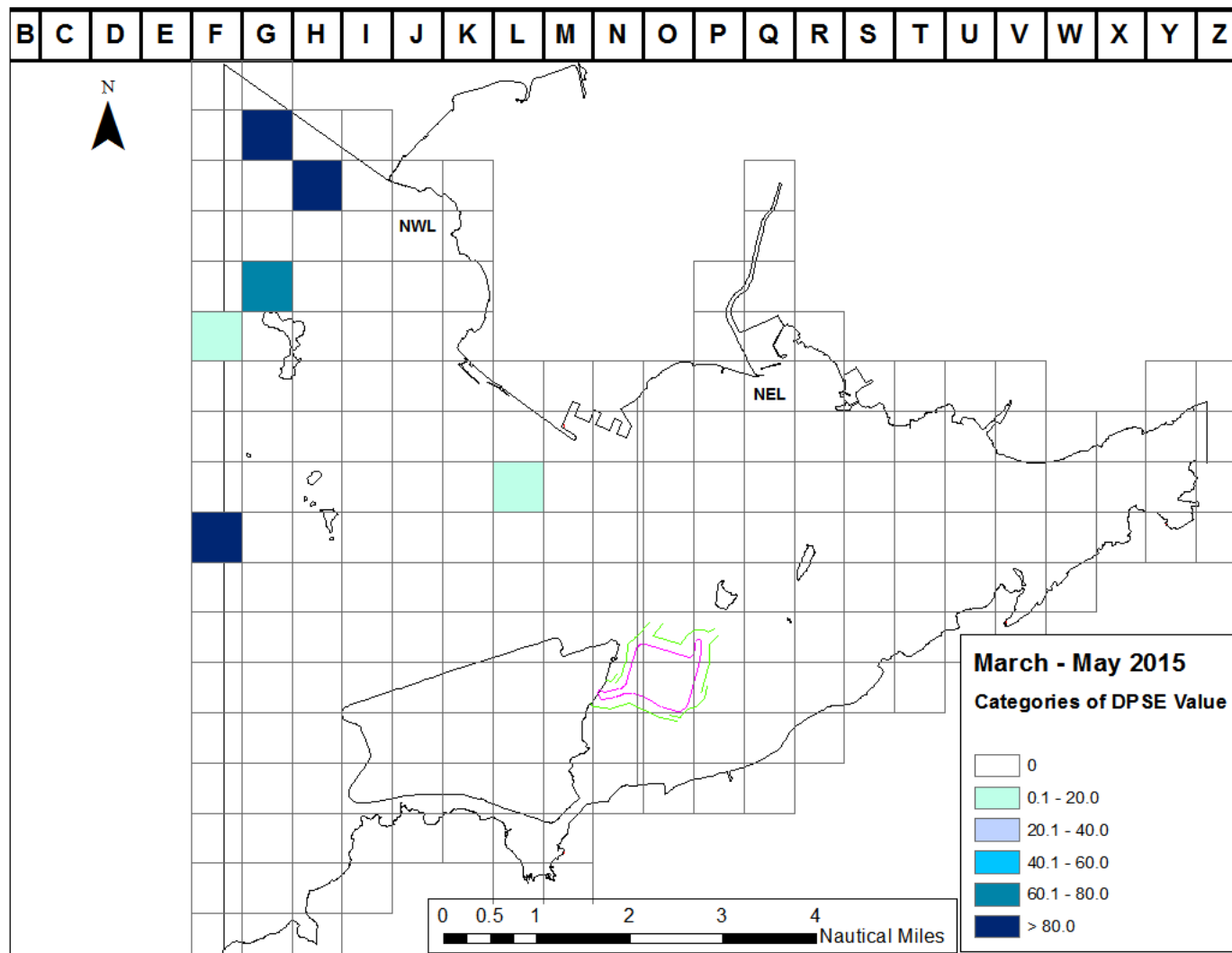


Figure 9. Dolphin density DPSE (number of dolphins per 100 units of survey effort) for March – May 2015.

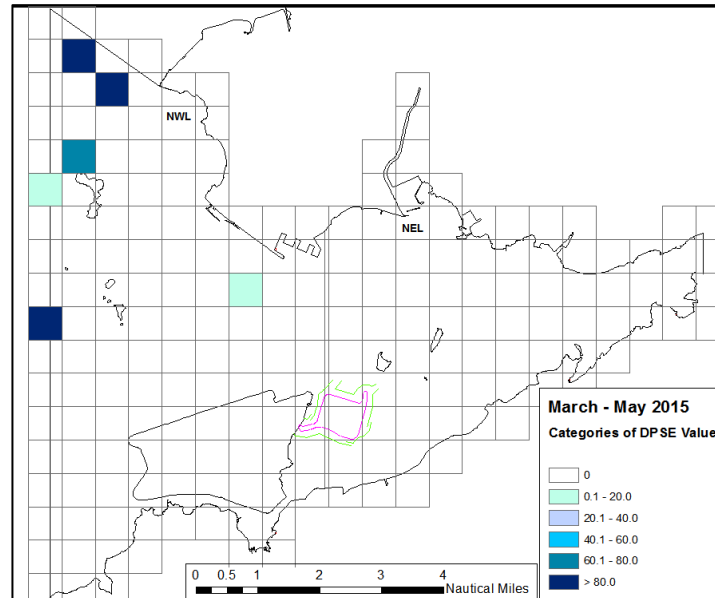
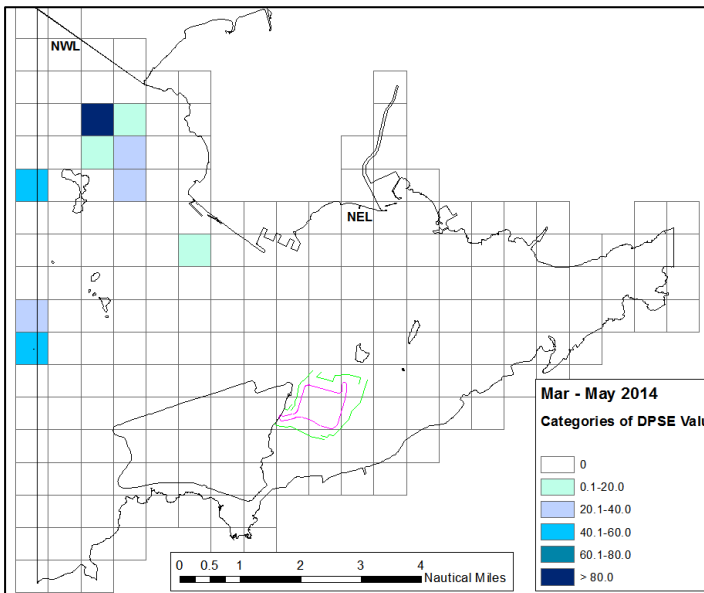
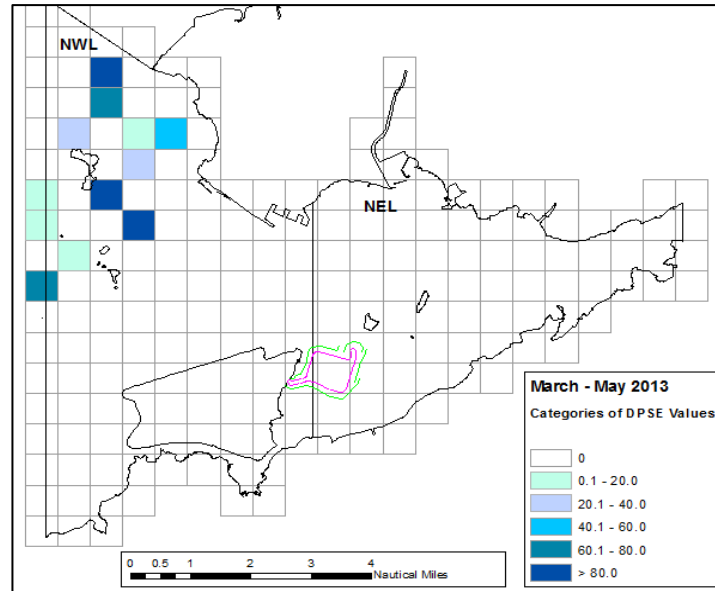
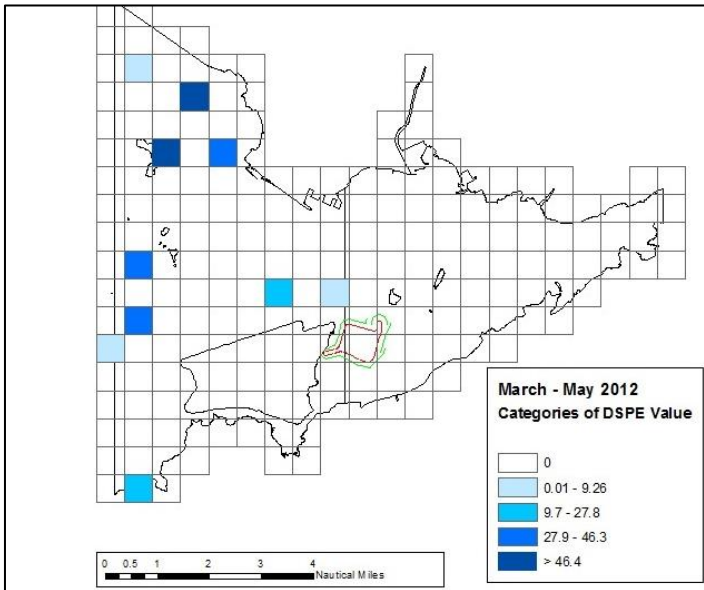


Figure 10. DPSE Shifts from NEL to NWL Waters during the Periods March – May 2012 - 2015

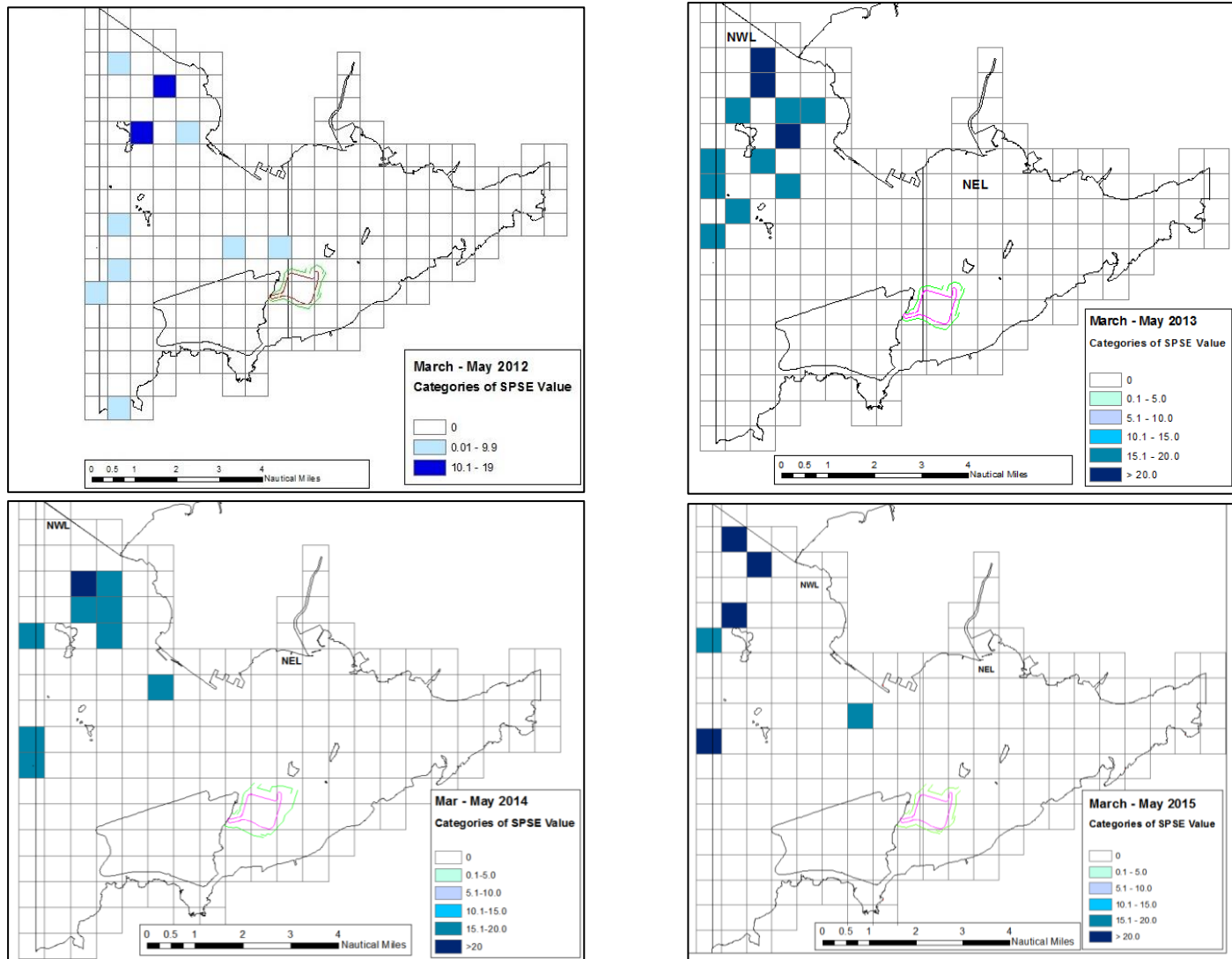


Figure 11. SPSE Shifts from NEL to NWL Waters during the Periods March – May 2012 - 2015

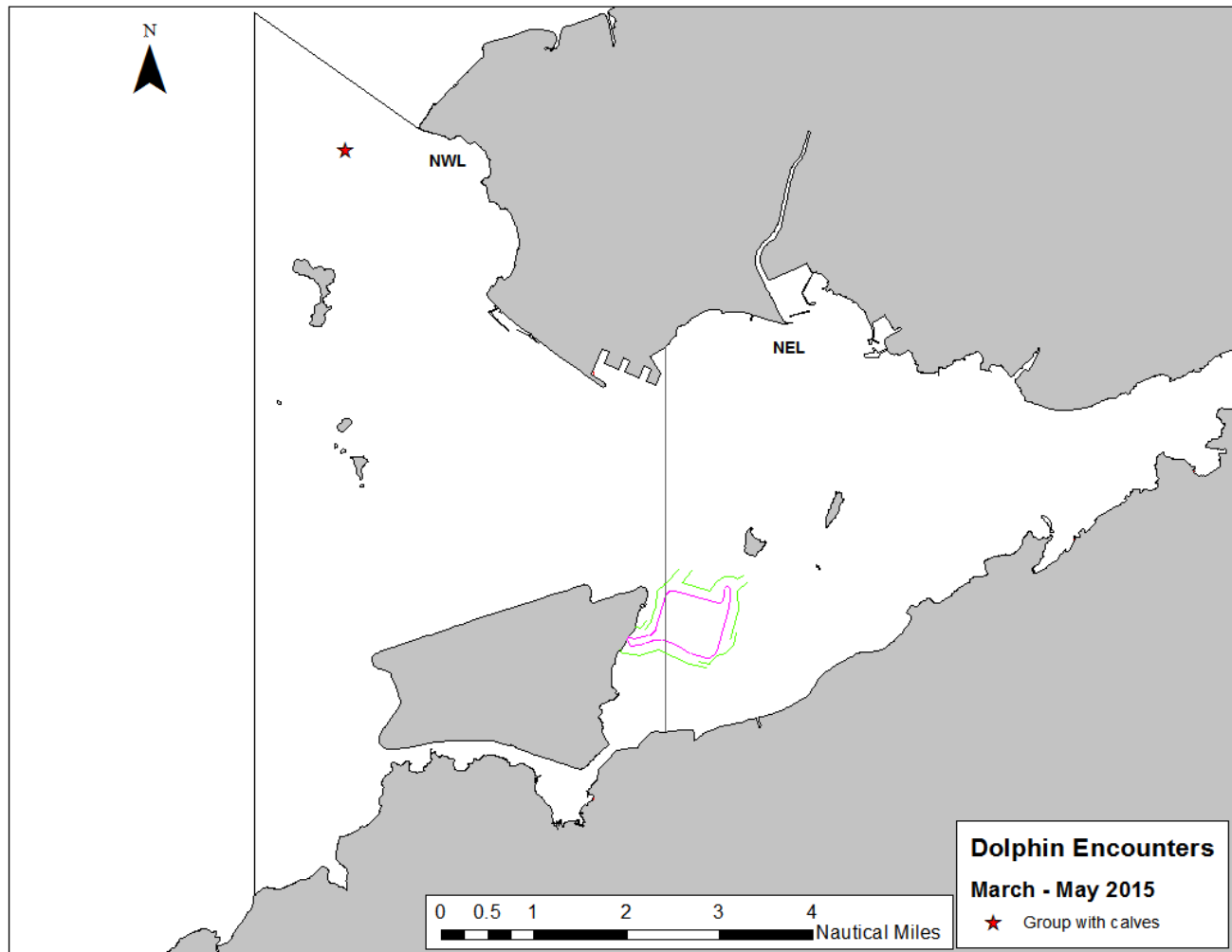
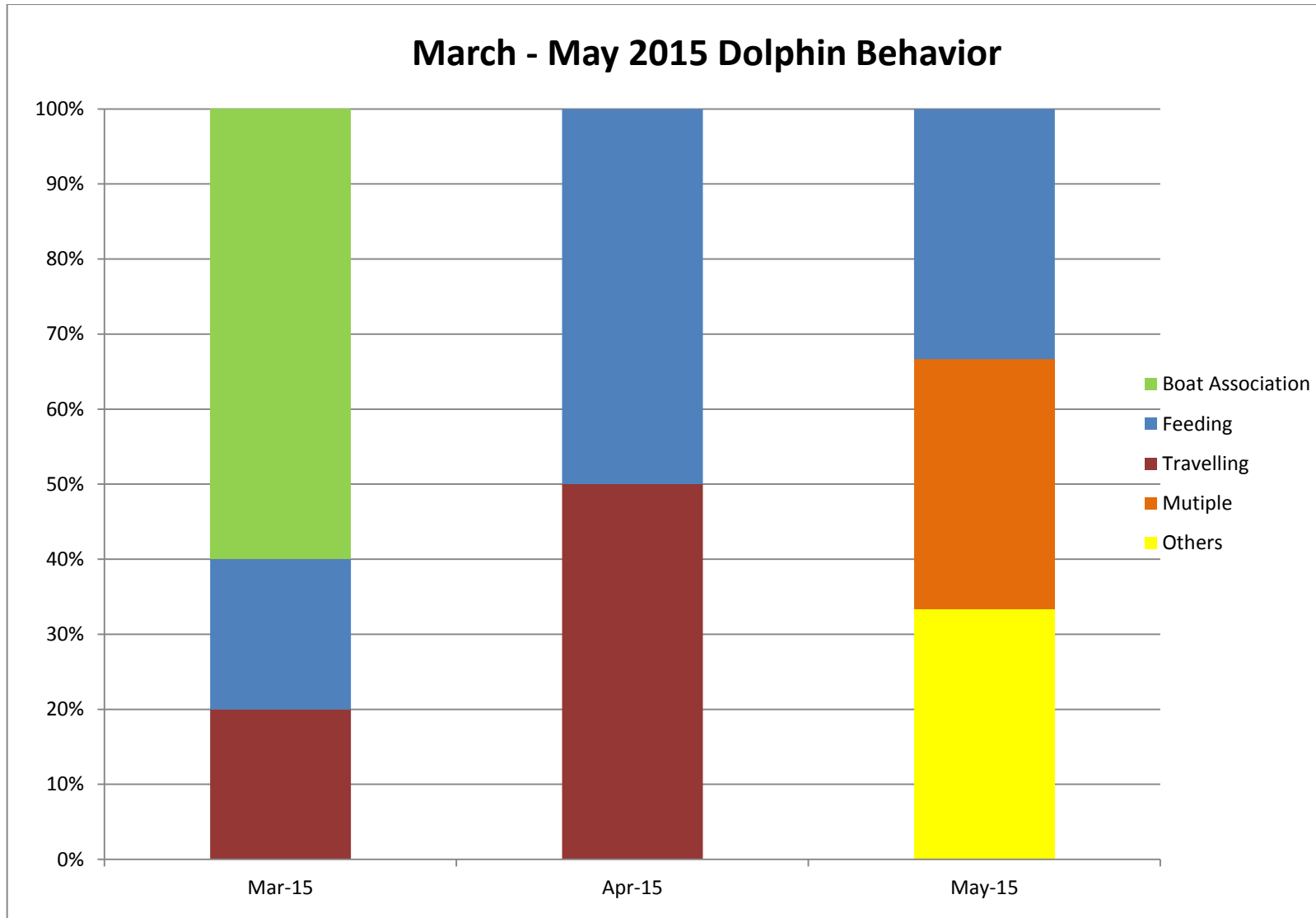


Figure 12. Location of groups containing mother and calf (juvenile) pairs during March – May 2015.





**Figure 13. Activity Budget for Dolphin Behaviour March – May 2015.**

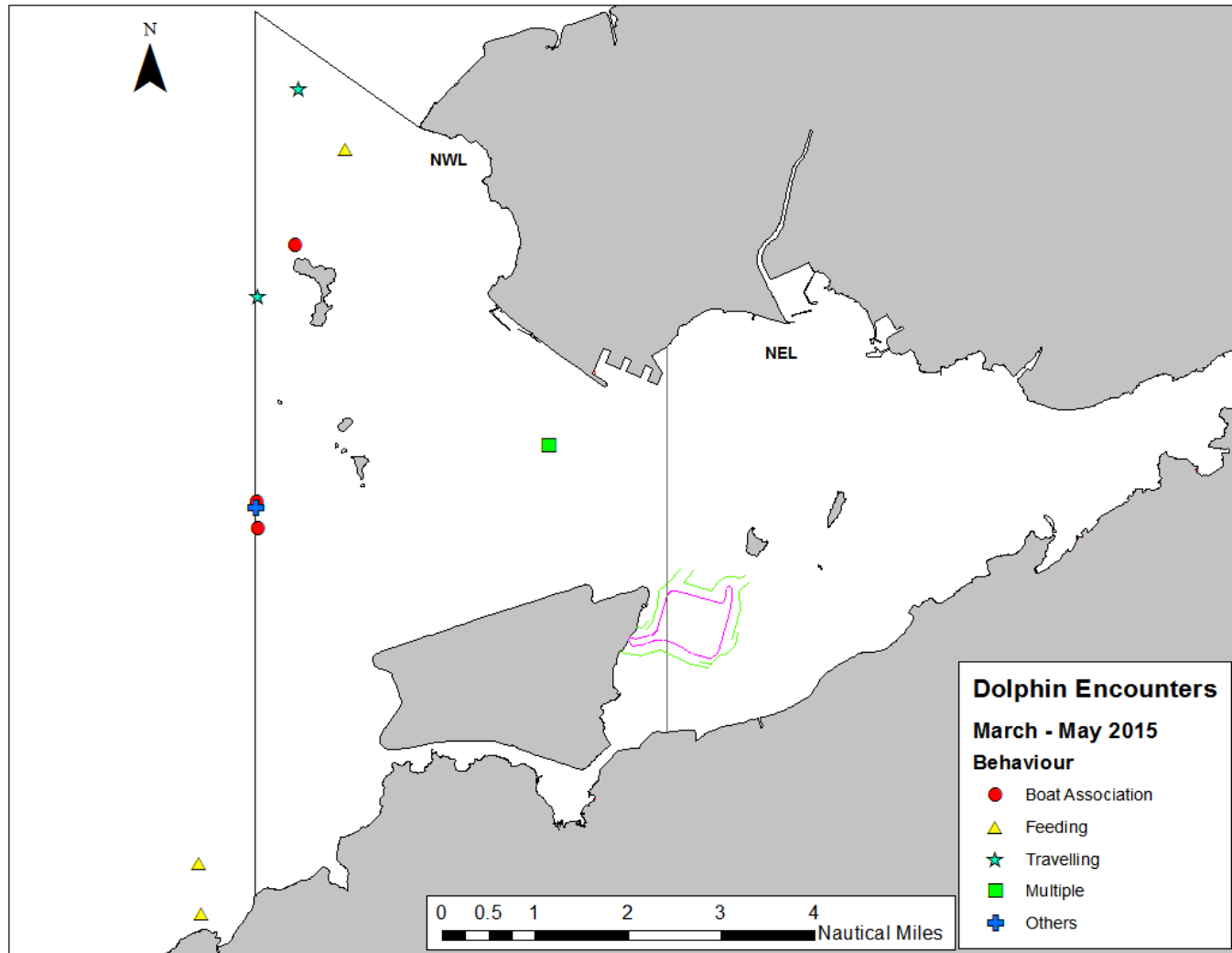


Figure 14. The Location of Different Behavioural Activities March – May 2015

### Annex I. Impact Monitoring Survey Schedule and Details (March – May 2015)

Date	Location of Survey	No. Sightings ON	No. Sightings Opp	Total km ON EFFORT (favourable conditions)
03/19/2015	NWL (1-6, 21, 22)	2	1	67.0
03/20/2015	NE and NW Lantau (7-20,23)	0	0	42.6
03/30/2015	NWL (1-6, 21, 22)	1	1	63.3
03/31/2015	NE and NW Lantau (7-20,23)	0	0	46.0
04/20/2015	NWL (1-6, 21, 22)	1	0	63.3
04/21/2015	NE and NW Lantau (7-20,23)	0	0	47.5
04/28/2015	NWL (1-6, 21, 22)	1	0	63.6
04/29/2015	NE and NW Lantau (7-20,23)	0	0	46.5
05/11/2015	NWL (1-6, 21, 22)	1	0	62.9
05/12/2015	NE and NW Lantau (7-20,23)	0	0	46.1
05/18/2015	NE and NW Lantau (1-7)	1	1	67.0
05/20/2015	NWL (8-20,23)	0	0	42.4

## Annex II. Impact Monitoring Survey Effort Summary (March – May 2015)

Date	Area	State (on eff	Effort (km)	Season	Vessel	Type
03/19/2015	NWL	1	67	SPRING	HKDW	IMPACT
03/20/2015	NWL	1	6.1	SPRING	HKDW	IMPACT
03/20/2015	NEL	1	30.3	SPRING	HKDW	IMPACT
03/20/2015	NEL	2	6.2	SPRING	HKDW	IMPACT
03/30/2015	NWL	0	1.8	SPRING	HKDW	IMPACT
03/30/2015	NWL	1	53	SPRING	HKDW	IMPACT
03/30/2015	NWL	2	8.5	SPRING	HKDW	IMPACT
03/31/2015	NWL	1	4.9	SPRING	HKDW	IMPACT
03/31/2015	NWL	2	5	SPRING	HKDW	IMPACT
03/31/2015	NEL	1	30.3	SPRING	HKDW	IMPACT
03/31/2015	NEL	2	5.8	SPRING	HKDW	IMPACT
04/20/2015	NWL	1	11.1	SPRING	HKDW	IMPACT
04/20/2015	NWL	2	52.2	SPRING	HKDW	IMPACT
04/21/2015	NWL	1	6.2	SPRING	HKDW	IMPACT
04/21/2015	NWL	2	4	SPRING	HKDW	IMPACT
04/21/2015	NEL	1	33.1	SPRING	HKDW	IMPACT
04/21/2015	NEL	2	4.2	SPRING	HKDW	IMPACT
04/28/2015	NWL	1	11.7	SPRING	HKDW	IMPACT
04/28/2015	NWL	2	40.8	SPRING	HKDW	IMPACT
04/28/2015	NWL	3	11.1	SPRING	HKDW	IMPACT
04/29/2015	NWL	1	6.2	SPRING	HKDW	IMPACT
04/29/2015	NWL	2	3.9	SPRING	HKDW	IMPACT
04/29/2015	NEL	1	36.4	SPRING	HKDW	IMPACT
05/11/2015	NWL	1	8	SPRING	HKDW	IMPACT
05/11/2015	NWL	2	52.3	SPRING	HKDW	IMPACT
05/11/2015	NWL	3	2.6	SPRING	HKDW	IMPACT
05/12/2015	NWL	1	9.8	SPRING	HKDW	IMPACT
05/12/2015	NEL	1	36.3	SPRING	HKDW	IMPACT
05/18/2015	NWL	1	17.2	SPRING	HKDW	IMPACT
05/18/2015	NWL	2	34.4	SPRING	HKDW	IMPACT
05/18/2015	NWL	3	15.4	SPRING	HKDW	IMPACT
05/20/2015	NWL	1	6	SPRING	HKDW	IMPACT
05/20/2015	NEL	1	26	SPRING	HKDW	IMPACT
05/20/2015	NEL	2	10.4	SPRING	HKDW	IMPACT

### Annex III. Impact Monitoring Sighting Database (March – May 2015)

Project	Contract	Date	Sighting No.	Time	Group Size	Area	Beaufort	PSD	Effort	Type	Latitude	Longitude	Season	Boat Assoc.
HKBCF	HY/2010/02	19-Mar-15	1084	9:23	2	NWL	1	N/A	Opp	Impact	22.27318	113.8592	Spring	No
HKBCF	HY/2010/02	19-Mar-15	1085	10:43	1	NWL	1	669	On	Impact	22.37515	113.8703	Spring	No
HKBCF	HY/2010/02	19-Mar-15	1086	11:25	3	NWL	1	85	On	Impact	22.38461	113.8776	Spring	PS
HKBCF	HY/2010/02	30-Mar-15	1089	10:16	3	NWL	1	N/A	Opp	Impact	22.33345	113.8704	Spring	HT
HKBCF	HY/2010/02	30-Mar-15	1090	10:46	3	NWL	1	299	On	Impact	22.33823	113.8702	Spring	HT
HKBCF	HY/2010/02	20-Apr-15	1097	13:00	5	NWL	1	525	On	Impact	22.40188	113.8873	Spring	No
HKBCF	HY/2010/02	28-Apr-15	1100	11:14	5	NWL	2	129	On	Impact	22.41267	113.8781	Spring	No
HKBCF	HY/2010/02	11-May-15	1104	10:51	5	NWL	2	346	On	Impact	22.33716	113.87	Spring	No
HKBCF	HY/2010/02	18-May-15	1108	10:04	3	NWL	1	N/A	Opp	Impact	22.26418	113.8597	Spring	No
HKBCF	HY/2010/02	18-May-15	1109	16:16	1	NWL	2	0	On	Impact	22.3486	113.9267	Spring	No

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

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
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		2013/08/30	780	NEL
HZMB 107		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
HZMB 100		2013/07/08	706	NWL
HZMB 099		2013/06/13	681	NWL
		2013/06/13	680	NWL

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
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
HZMB 089		2013/02/15	579	NWL
HZMB 088		2013/02/15	579	NWL
HZMB 087		2013/02/15	579	NWL
<b>Identification</b>	<b>Baseline</b>	<b>Date</b>	<b>Sighting</b>	<b>Area</b>



Number	Identification Number	(YYYY-MM-DD)	Number	Sighted
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
		2011/09/06	Baseline	NWL
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		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

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 060		2012/09/18	447	NWL
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

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
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
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
		2012/07/10	330	NWL
HZMB 022		2015/04/20	1097	NWL
		2014/12/18	1044	NWL
		2014/11/17	1035	NWL
		2014/08/04	991	NWL
		2014/01/06	888	NWL
		2013/10/24	827	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
		2012/07/10	330	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

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
HZMB 018		2014/02/17	910	NWL
		2013/05/09	647	NWL
		2013/02/21	594	NEL
		2012/12/10	529	NEL
		2012/07/10	330	NWL
HZMB 017		2012/07/10	330	NWL
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	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
		2011/11/01	Baseline	NEL
HZMB 009		2015/03/19	1084	NWL
		2012/05/28	281	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
		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
	CH98	2011/11/02	Baseline	NWL
	NL11	2011/11/02	Baseline	NWL
		2011/11/07	Baseline	NWL
	NL12	2011/11/02	Baseline	NWL



Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
	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	2001/11/07	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
	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

Identification Number	Baseline Identification Number	Date (YYYY-MM-DD)	Sighting Number	Area Sighted
	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
	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

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

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



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



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



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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



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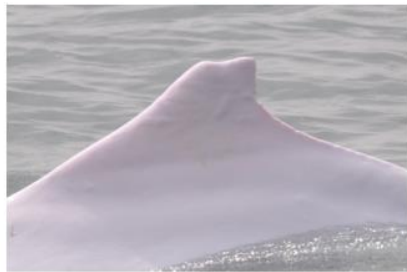
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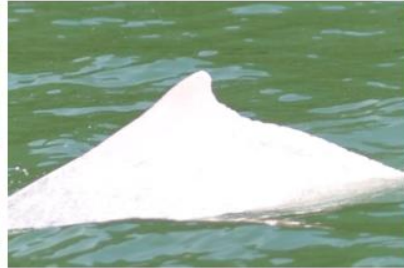
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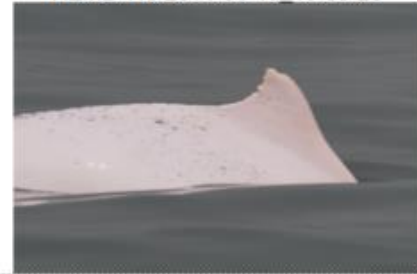
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# China Harbour Engineering Company Limited

## Monthly Summary Waste Flow Table for May / 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											
Sub-total	0.0000	0.0000	0.0000	0.0000	0.0000	4316.6281	0.0040	1.2300	4.0020	2.4000	0.1885
Jul-15											
Aug-15											
Sep-15											
Oct-15											
Nov-15											
Dec-15											
Total	0.0000	0.0000	0.0000	0.0000	0.0000	4316.6281	0.0040	1.2300	4.0020	2.4000	0.1885

- 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 N

### 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 quarter	Total no. received since project commencement
<b>Environmental complaints</b>	9 March 2015	As informed by the Contractor on 09 March 2015, there is an air quality complaint received on 06 March 2015. The complainant Mr. Fung requested for follow-up actions to be taken by relevant departments in response to his Complaint about sand and dust emission from 4-5 uncovered sand barges parking near the coastline of Tuen Mun, the complainant concerns about the	Closed	1	28

		health problems to residents as the sand is blown to their apartments. After investigation, there is no adequate information to conclude the observed impact is related to this Contract.			
	15 April 2015	Environmental Protection Department (EPD) referred a noise complaint to this project on 10 April 2015 and ENPO forwarded the noise complaint to Environmental Team on 15 April 2015. The complaint involves a complainant, who is resident of Caribbean Coast, Tung Chung and he was disturbed by noise from construction activities of the HZMB Project during weekends and holidays. After investigation, there is no adequate information to conclude the observed noise nuisance is related to this Contract.	Closed	2	29
	22 May 2015	A complainant contacted EPD through EPD's hotline on 21 May 2015 and complained that noise was generated from construction works when construction of artificial island at Lantau Island area was carried out overnight and dark smoke was emitted by construction plant. EPD's staff has contacted complainant and came to know that the dark smoke referring to could also be construction dust emitting from the filling work at the HKBCF. This complaint was subsequently referred by EPD to HZMB project team on 22	Closed	3	30

		May 2015 to follow-up. Investigation was conducted and with referred to the available information; it is unable to determine whether the night time noise and dark smoke complaint is related to this Contract.			
<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> </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</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> </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</li> </ol>

	<p>6. Repeat review to ensure all the 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>by ET and Contractor and 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>3. Supervise the implementation of additional monitoring and/or any other mitigation measures.</p>	<p>and/or any other mitigation measures.</p>
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**Report No. D009**  
**Monitoring Period March 2015 - May 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 and 10 July 2015 between ENPO, ET for this Contract and ET of other HZMB Contracts and engineer representatives, to discuss dolphin encounter rates during the period September-November 2014, December 2014-February 2015 and March 2015-May 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

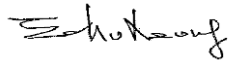
1. Statistical data analysis has been repeated to confirm findings;
2. All available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A have been reviewed;
3. Identification of source of impact was carried out;
4. The IEC, ER and Contractor 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 27 April 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.
  - The joint meeting with ENPO, project ET for this and other HZMB projects and engineer representatives on 9 December 2014 suggested that the protection measures (e.g., speed limit control) for the proposed Brothers Island Marine Park (BMP) be brought forward as soon as possible to reduce boat related impacts soonest. It was noted that under the Regular Marine Travel Route Plan, the contractors of HKBCF 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.
  - 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:



11-Jan-16

**Report No. D009**  
**Monitoring Period March 2015 - May 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 10 July 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 March 2015 to May 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. The data from this new investigation will be reported via ENPO directly and is not part of this Projects monitoring obligation.

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. The 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 Suspended Solids (SS) were recorded in the reporting period, one (1) at monitoring station IS10 and one (1) at SR5 respectively on 23 March 2015. After investigation, the information available concluded that the recorded exceedances were not related to this Contract. IWQM exceedances were at locations close to southern end of transect line 9, were of a localised nature and in the shipping area utilised for high speed ferries. It is anticipated that short duration, locally confined increases in sedimentation in an area that is unsuitable for dolphins to traverse anyway, would not impact dolphins which may have occurred in the area.

## **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

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

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 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.

Following the meeting held on the 9 December 2014, 27 April 2015 and 10 July 2015, the ET for HY/2010/02 advised that the contractor was already using large capacity sand barges so as to reduce the number of vessel traversing the north Lantau. Underwater noise levels from vessels are related to the horse power of the engine, the size and shape of the hull, the propeller type and the speed of the vessel. Although few quantitative comparative studies have been conducted, one such study investigates different sound sources from vessels of different lengths (Kipple and Gabriele, 2007). Vessels over 250 foot (approx. 76m) fall into the same sound source category (170 –dB re 1 microPa at 1 yard). As both the large capacity barge and the smaller capacity sand vessel it replaces are within the over 250 foot length category and fall into the same sound source category<sup>2</sup>, a reduction in both the number of active vessels and the number of journeys across NEL per day will lead to a reduction in sources of underwater noise levels, therefore reducing the underwater noise attributable to sand barges. Further, the suggestion during the meeting that protective measures (e.g., speed limit control) for the proposed Brothers Island Marine Park (BMP) shall be brought forward as soon as possible is currently being considered.

Other non project related works and activities around the HZMB project area may contribute to changes in dolphin distribution and include, but may not be limited to;

- Shift in distribution or change in composition of prey resources.
- Recent publications suggest that the health status of the dolphins in Hong Kong and adjacent waters may be poor due to the long term accumulation of pollutants therefore, making them more susceptible to new stressors (Gui *et al.* 2014)

<sup>2</sup> Please note, actual sound sources levels from Hong Kong vessels have not been measured but sound reduction assumption have been inferred from measurements from similar vessels elsewhere.

**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 is one of the contributing factors 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, D006, D007 and D008, 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. At this time, the long term impacts of these works cannot be assessed although expanding the scope of monitoring areas will provide better data on impacts outside the NEL and NWL zones.

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