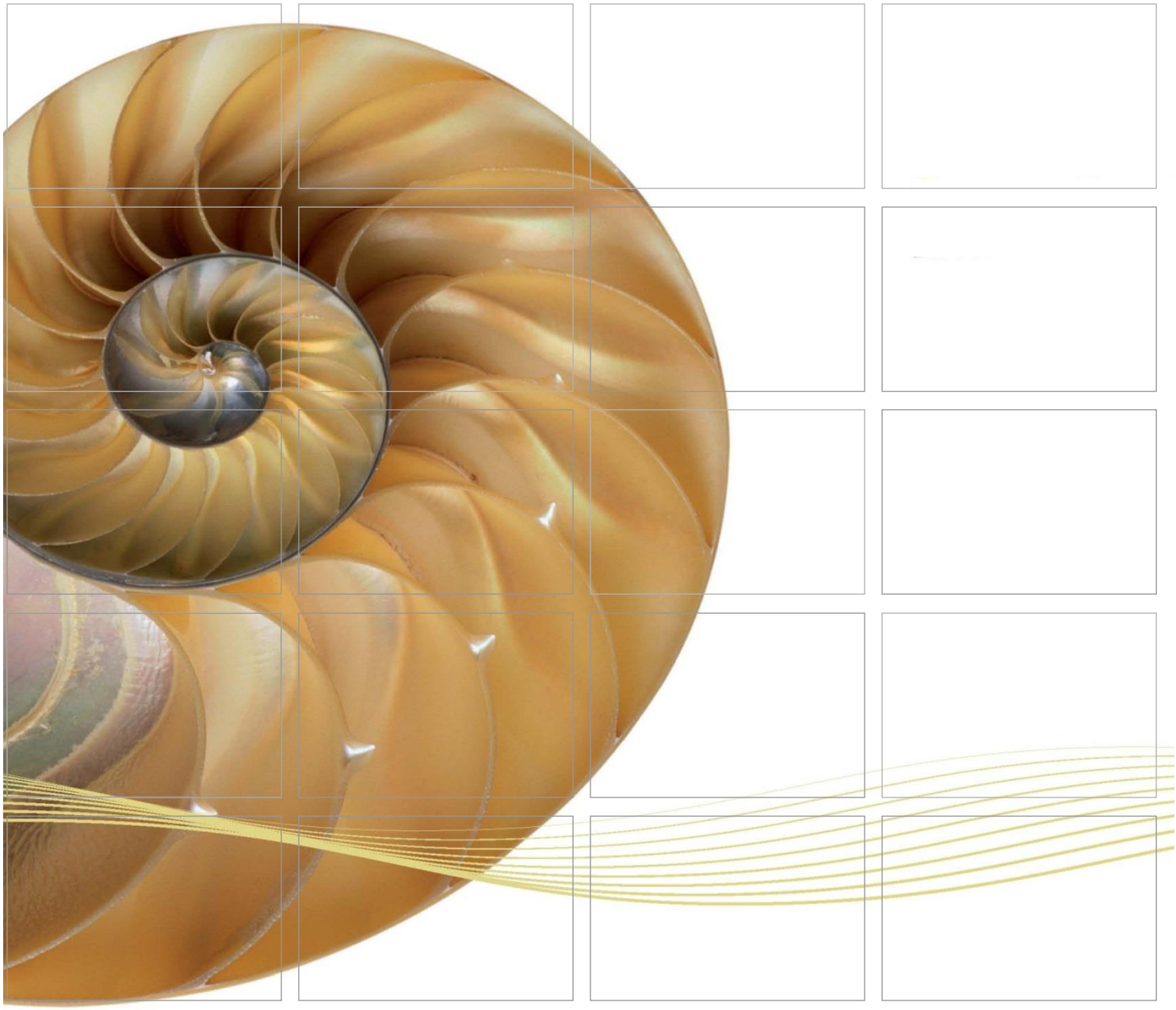
Report



Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

First Annual Environmental Monitoring & Audit (EM&A) Report

12 July 2016

Environmental Resources Management
16/F, Berkshire House
25 Westlands Road
Quarry Bay, Hong Kong
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RAMBOLL ENVIRON

Ref.: HYDHZMBEEM00_0_4359L.16 14 July 2016

AECOM By Fax (2293 6300) and By Post
Supervising Officer Representative's Office
No.8 Mong Fat Street, Tuen Mun,
New Territories, Hong Kong

Attention: Messrs. Edwin Ching / Andy Westmoreland

Dear Sirs,

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/2012/08 TM-CLKL Northern Connection Sub-sea Tunnel Section
First Annual EM&A Report

Reference is made to the First Annual Environmental Monitoring and Audit (EM&A) Report (Nov. 2013 – Oct. 2014) (ET's ref.: 0212330_1st Annual EM&A_20160712.doc dated 12 July 2016) certified by the ET Leader and provided to us via e-mail on 12 July 2016.

Please be advised that we have no further comment on the captioned Annual EM&A Report at this stage. However, we would like to draw your attention that the ET shall supplement the Report with respect to the following observation:

1. Detailed review, analysis and evaluation of dolphin monitoring data covering annual period as per sections 1.5.1.6 and 12.9.1.1 (vi) of the EM&A Manual for TM-CLKL with level of details not less than the same part in your submitted quarterly EM&A Report and AFCD's annual marine mammal monitoring reports applicable to the dolphin monitoring.

Thank you for your attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y. H. Hui should you have any queries.

Yours sincerely,

F. C. Tsang
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

Q:\Projects\HYDHZMBEEM00\02_Proj_Mgt\02_Corr\HYDHZMBEEM00_0_4359L.16.docx

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RAMBOLL ENVIRON

c.c. HyD – Mr. Stephen Chan (By Fax: 3188 6614)
HyD – Mr. Vico Cheung (By Fax: 3188 6614)
AECOM – Mr. Conrad Ng (By Fax: 3922 9797)
ERM – Mr. Jovy Tam (By Fax: 2723 5660)
Dragages – Bouygues JV - Mr. C. F. Kwong (By Fax: 2293 7499)

Internal: DY, YH, ENPO Site

Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

First Annual Environmental Monitoring & Audit (EM&A) Report

Document Code: 0212330_1st Annual EM&A_20160712.doc

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Client: DBJV	Project No: 0212330
Summary: This document presents the First Annual EM&A Report for Tuen Mun – Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section.	Date: 12 July 2016 Approved by:  *Mr Craig Reid* *Partner* Certified by:  *Mr Jovy Tam* *ET Leader*

Revision	Description	By	Checked	Approved	Date
	1st Annual EM&A Report	VAR	JT	CAR	12/07/16

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TABLE OF CONTENTS

Under *Contract No. HY/2012/08*, Dragages – Bouygues Joint Venture (DBJV) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Northern Connection Sub-sea Tunnel Section of the Tuen Mun – Chek Lap Kok Link Project (TM-CLK Link Project) while AECOM Asia Company Limited was appointed by HyD as the Supervising Officer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET) in accordance with *Environmental Permit No. EP-354/2009/A*. ENVIRON Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO). Another application for VEP (EP-354/2009/B) was granted on 28 January 2014.

The construction phase of the Project commenced on 1 November 2013 and will tentatively be completed by the end of 2018. The impact monitoring of the EM&A programme, including air quality, water quality, marine ecological monitoring and environmental site inspections, commenced on 1 November 2013.

This is the First Annual EM&A report presenting the EM&A works carried out during the period from 1 November 2013 to 31 October 2014 for the *Contract No. HY/2012/08 Northern Connection Sub-sea Tunnel Section* (the "Project") in accordance with the Updated EM&A Manual of the TM-CLK Link Project. As informed by the Contractor, the major activities in the reporting year included:

Construction Activities Undertaken
Marine-based Works
Marine Works Area – Portions N-A, N-B, N-C • Dredging • Vertical and Sloping Seawall construction • Reclamation filling Marine Works Area – Portion N-A • Marine Sheet Piling for box culvert extension • Box Culvert extension • Removal of existing seawall and temporary pontoon installation at River Trade Terminal (RTT)

Construction Activities Undertaken
Land-based Works
Works Area - WA 23 • Sorting of rock material Works Area – WA 18 • Site formation works • Site office construction • Completion of chain-link fence • Site hoarding works Works Area – N6 • CLP substation construction • Pile Cap Construction • Land Bored Piling Reclamation Works Area – Portion N-A • Construction of temporary access • Diaphragm Wall Construction • Excavation for North Launching Shaft • Land Bored Piling Works Reclamation Works Area – Portions N-B and N-C • Vibro-Compaction • Surcharge set up

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

24-hour TSP Monitoring	68 sessions
1-hour TSP Monitoring	68 sessions
Impact Water Quality Monitoring	155 sessions
Impact Dolphin Monitoring	24 sessions
Joint Environmental Site Inspection	52 sessions
Post Translocation Coral Monitoring	4 sessions

Implementation of Marine Mammal Exclusion Zone

Daily marine mammal exclusion zone was in effect during the period of dredging, reclamation or marine sheet piling works in open waters under this Contract. Passive Acoustic Monitoring (PAM) was also implemented for the detection of marine mammal when dredging, reclamation or marine sheet piling works were carried out outside the daylight hours under this Contract. One sighting of the Indo-Pacific humpback dolphin *Sousa chinensis* was recorded on 20 February 2014 during the exclusion zone monitoring. The marine dredging work was subsequently suspended until the observer has

confirmed that the area is continuously clear of dolphins for a period of 30 minutes.

Summary of Breaches of Action/Limit Levels

Breaches of Action and Limit Levels for Air Quality

Twenty-six Action Level and two Limit Level exceedances for 1-hour TSP; five Action Level and one Limit Level exceedances for 24-hour TSP were recorded from the air quality monitoring in this reporting period. The exceedances were considered to be due to the sporadic events from cumulative anthropogenic activities in this area of Hong Kong.

Breaches of Action and Limit Levels for Water Quality

Six Action Level and one Limit Level for depth-averaged suspended solids (SS) exceedances were recorded from the water quality monitoring in this reporting period. The exceedances were well within the natural range and were unlikely to be due to the construction works of this Contract upon further investigation.

Dolphin Monitoring

Whilst five (5) Action Level exceedances were recorded for 3 sets of quarterly dolphin monitoring data between October 2013 and August 2014, no unacceptable impact from the construction activities of the TM-CLKL Northern Connection Sub-sea Tunnel Section on Chinese White Dolphins was noticeable from general observations during the dolphin monitoring in this reporting period. The exceedances are considered to be the natural variation of Chinese White Dolphin ranging pattern.

Post Translocation Coral Monitoring

Four (4) Post-Translocation Coral Monitoring Surveys were conducted on 17 January 2014, 16 April 2014, 24 July 2014 and 23 October 2014 and the results were provided in the First to Fourth Quarterly Post-Translocation Coral Monitoring Reports. No exceedances were recorded from the four post-translocation coral monitoring surveys in this reporting period.

Environmental Complaints, Non-compliance & Summons

No non-compliance with Environmental Impact Assessment (EIA) recommendations, EP conditions and other requirements associated with the construction of this Contract was recorded in this reporting period.

Two (2) environmental complaint cases were received in this reporting period. The interim reports were submitted to EPD and reported in the subsequent EM&A reports. The investigation findings showed that the cases were considered not related to the works under this Contract and is thus invalid.

No environmental summons was received in this reporting period.

Review of EM&A programme

The EM&A requirements have been reviewed and were considered as adequate and effective. No change to the requirements was considered to be necessary. The recommended environmental mitigation measures are also considered to be effective and efficient in reducing the potential environmental impacts associated with the construction of the Project. No change was thus considered necessary.

Overall, the EM&A results indicated that the Project has not caused unacceptable environmental impacts. This is in agreement with the assessment presented in the EIA Report

1 INTRODUCTION

1.1 BACKGROUND

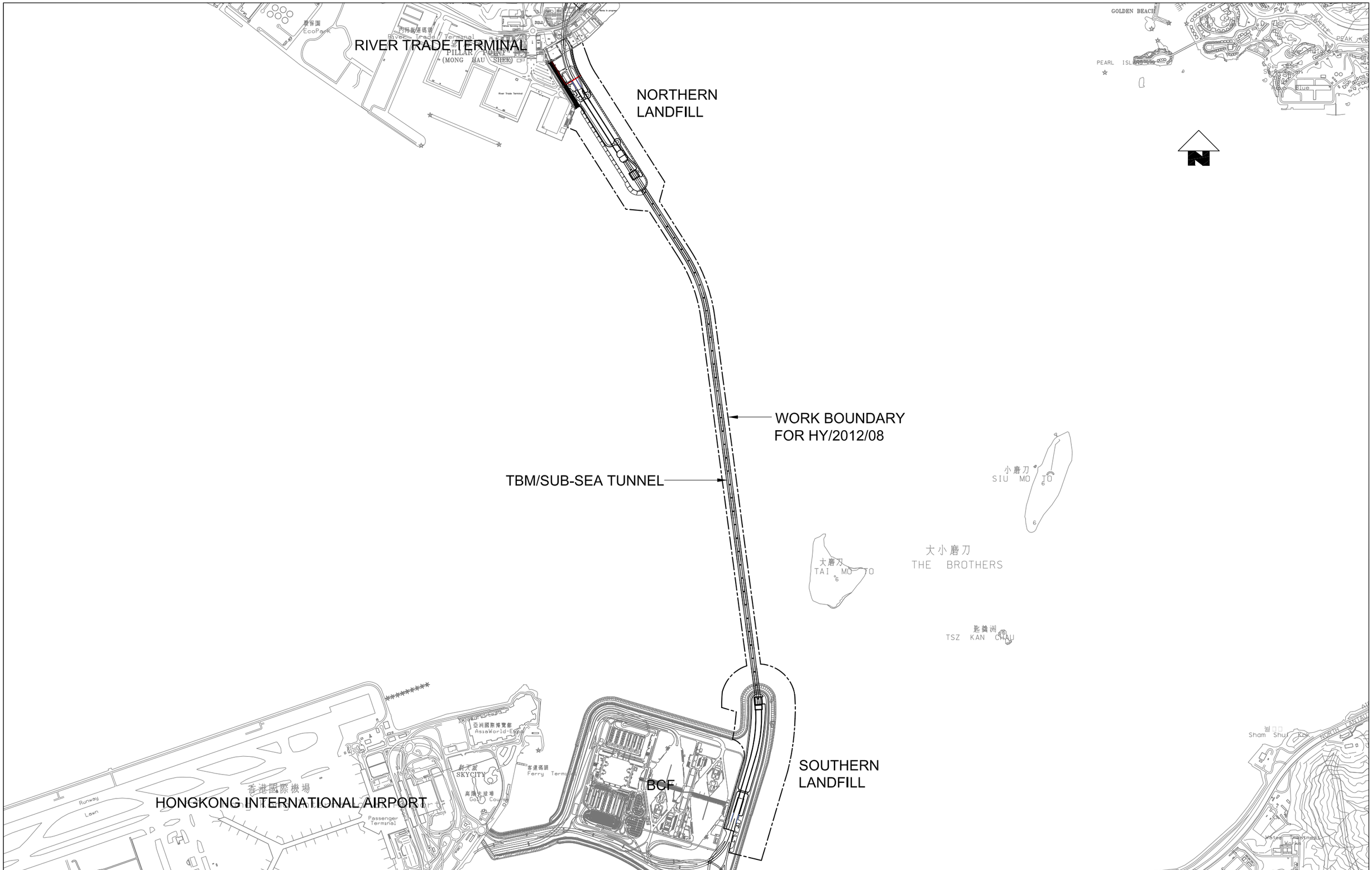
According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway would be operating beyond capacity after 2016. This forecast has been based on the estimated increase in cross boundary traffic, developments in the Northwest New Territories (NWNT), and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new road sections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.

An Environmental Impact Assessment (EIA) of TM-CLKL (the Project) was prepared in accordance with the EIA Study Brief (No. ESB-175/2007) and the *Technical Memorandum of the Environmental Impact Assessment Process* (*EIAO-TM*). The EIA Report was submitted under the Environmental Impact Assessment Ordinance (EIAO) in August 2009. Subsequent to the approval of the EIA Report (EIAO Register Number AEIAR-146/2009), an Environmental Permit (EP-354/2009) for TM-CLKL was granted by the Director of Environmental Protection (DEP) on 4 November 2009, and EP variation (VEP) (EP-354/2009A) was issued on 8 December 2010. Another application for VEP (EP-354/2009/B) was granted on 28 January 2014.

Under *Contract No. HY/2012/08*, Dragages – Bouygues Joint Venture (DBJV) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Northern Connection Sub-sea Tunnel Section of TM-CLKL while AECOM Asia Company Limited was appointed by HyD as the Supervising Officer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET). ENVIRON Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO).

Layout of the Contract components is presented in *Figure 1.1*.

The construction phase of the Contract commenced on 1 November 2013 and will tentatively be completed by 2018. The impact monitoring phase of the EM&A programme, including air quality, water quality, marine ecological monitoring and environmental site inspections, commenced on 1 November 2013.



Rev.	Description	Date	Checked
A	FIRST ISSUE	11SEP13	PKV

Designed By: PKV
Drawn By: DAI
Approved By: SPo PP
Date: 11SEP2013

Main Contractor: Dragages - Bouygues Joint Venture 實嘉 - 布依格聯營

Client: 路政署 HIGHWAYS DEPARTMENT

Contractor's Designer: ARUP Ove Arup & Partners Hong Kong Limited

Project: Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link -
Northern Connection Sub-Sea Tunnel Section

Drawing Title: **Figure 1.1**

Drawing no.: TMCLKL8-DBJ-GEN-DWG-00174
Scale: 1:25000 @ A3
CADD Ref.: TMCLKL8-DBJ-GEN-DWG-00174-DFT-A
Issue Status: DFT (DRAFT)
Revision: A

1.2 SCOPE OF REPORT

This is the First Annual EM&A Report under the *Contract No. HY/2012/08 Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section*. This report presents a summary of the environmental monitoring and audit works from 1 November 2013 to 31 October 2014.

1.3 ORGANIZATION STRUCTURE

The organization structure of the Contract is shown in *Appendix A*. The key personnel contact names and contact details are summarized in *Table 1.1* below.

Table 1.1 Contact Information of Key Personnel

Party	Position	Name	Telephone	Fax
Highways Department	Engr 16/HZMB	Kenneth Lee	2762 4996	3188 6614
SOR (AECOM Asia Company Limited)	Chief Resident Engineer	Edwin Ching	2450 3111	2450 3099
		Andrew Westmoreland	2450 3511	2450 3099
ENPO / IEC (ENVIRON Hong Kong Ltd.)	ENPO Leader	Y.H. Hui	3547 2133	3465 2899
	IEC	F. C. Tsang	3547 2134	3465 2899
Contractor (Dragages – Bouygues Joint Venture)	Environmental Manager	C.F. Kwong	2293 7322	2670 2798
	Environmental Officer	Bryan Lee	2293 7323	2670 2798
	24-hour complaint hotline	Rachel Lam	2293 7330	
ET (ERM-HK)	ET Leader	Jovy Tam	2271 3113	2723 5660

1.4 SUMMARY OF CONSTRUCTION WORKS

With reference to DBJV's information, details of major construction works carried out in this reporting period are summarized in *Table 1.2*.

The general layout plan of the site showing the detailed works areas is shown in *Figure 1.2*. The Environmental Sensitive Receivers in the vicinity of the Project are shown in *Figure 1.3*.

The implementation schedule of environmental mitigation measures is presented in *Appendix B*.

Table 1.2 Summary of Construction Activities Undertaken during the Reporting Period

Construction Activities Undertaken
Marine-based Works
Marine Works Area – Portions N-A, N-B, N-C • Dredging • Vertical and Sloping Seawall construction • Reclamation filling Marine Works Area – Portion N-A • Marine Sheet Piling for box culvert extension • Box Culvert extension • Removal of existing seawall and temporary pontoon installation at River Trade Terminal (RTT)
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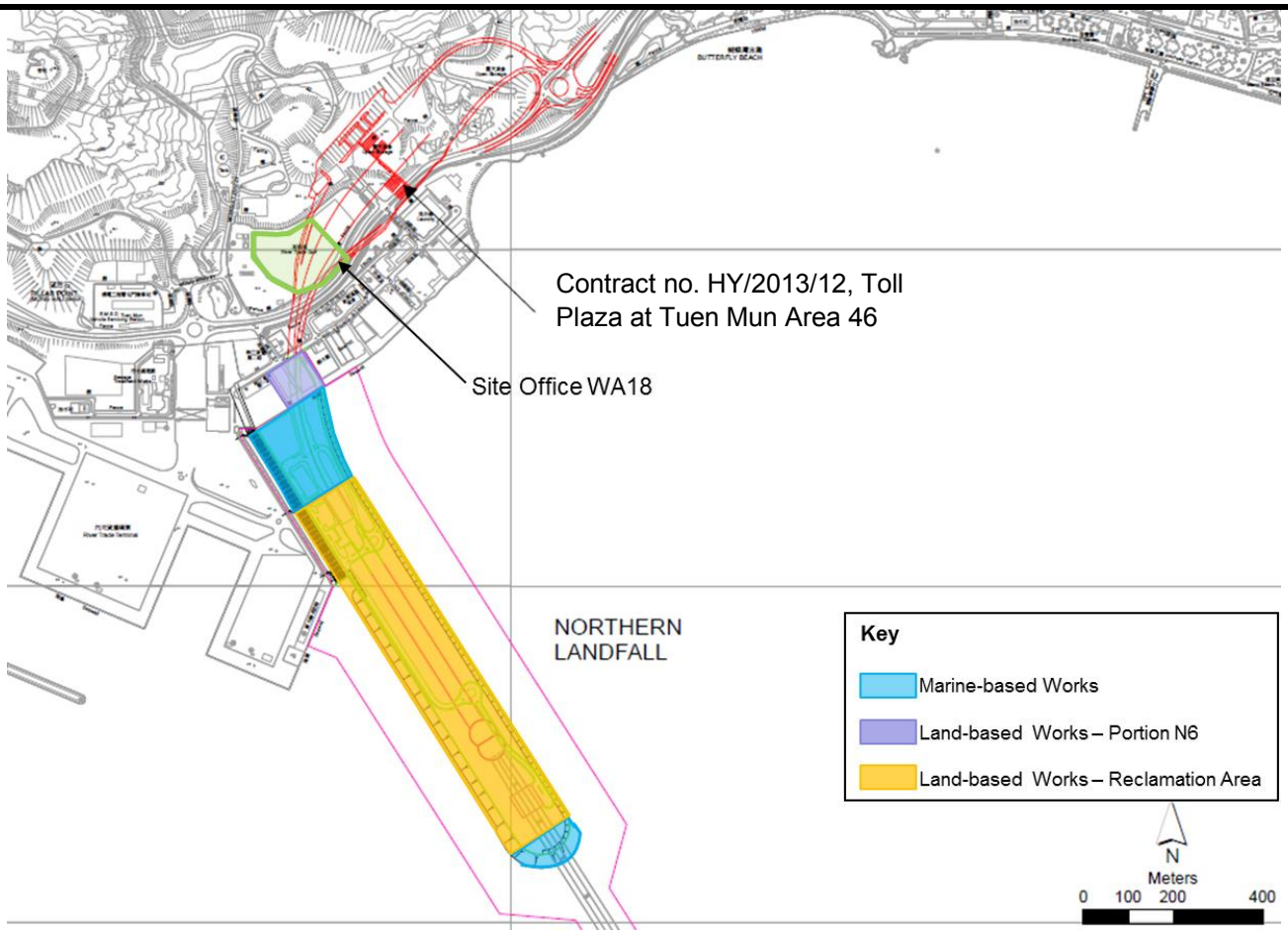
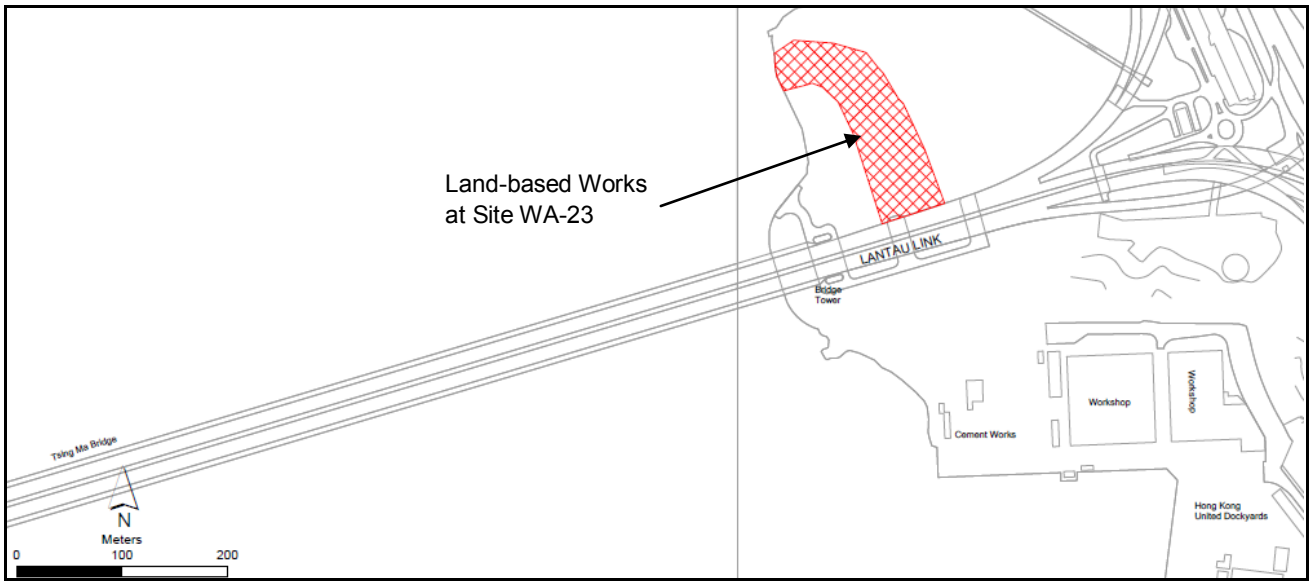
Works Area - WA 23 • Sorting of rock material Works Area – WA 18 • Site formation works • Site office construction • Completion of chain-link fence • Site hoarding works Works Area – N6 • CLP substation construction • Pile Cap Construction • Land Bored Piling Reclamation Works Area – Portion N-A • Construction of temporary access • Diaphragm Wall Construction • Excavation for North Launching Shaft • Land Bored Piling Works Reclamation Works Area – Portions N-B and N-C • Vibro-Compaction • Surcharge set up

Figure 1.2 Locations of Construction Activities – November 2013 to October 2014



a. Tuen Mun – Land-based and Marine-based Works Area



b. Tsing Yi – Site WA-23

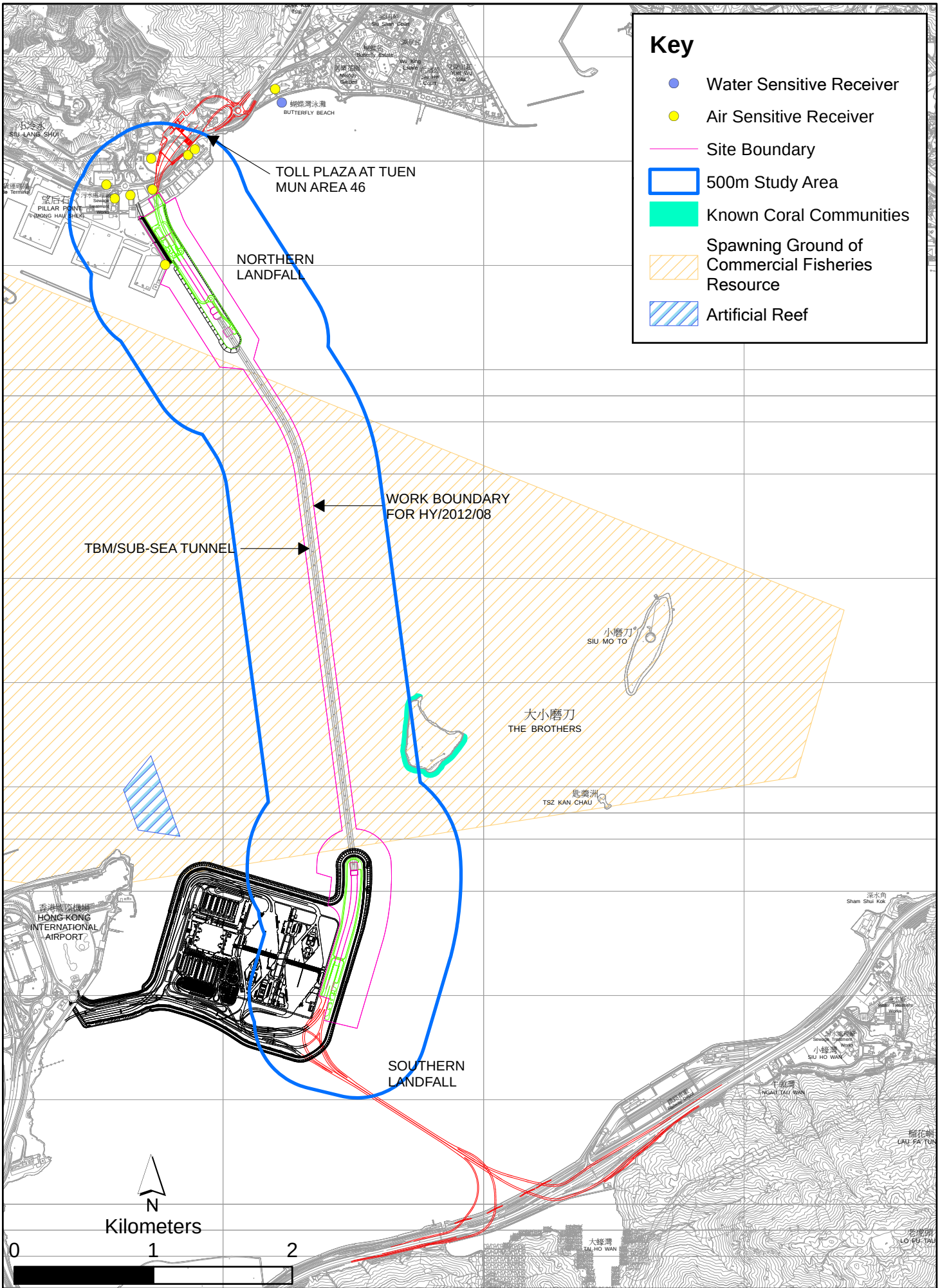


Figure 1.3 Environmental Sensitive Receivers in the vicinity of Contract No. HY/2012/08 Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-Sea Tunnel Section

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Date: 15/4/2014

Environmental Resources Management

2 EM&A RESULTS

The EM&A programme required environmental monitoring for air quality, water quality and marine ecology as well as environmental site inspections for air quality, noise, water quality, waste management, marine ecology and landscape and visual impacts. The EM&A requirements and related findings for each component are summarized in the following sections

2.1 AIR QUALITY

As per *Condition 2.4* of *EP-354/2009/B*, the Enhanced TSP Monitoring Plan [1] has been prepared under *Contract No. HY/2012/08* which describes the air quality monitoring programme for the Project.

2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual and the *Enhanced TSP Monitoring Plan*, impact 1-hour TSP monitoring was conducted three (3) times in every six (6) days and impact 24-hour TSP monitoring was carried out once in every six (6) days when the highest dust impact was expected. 1-hour and 24-hour TSP monitoring frequency were increased to three times per day in every three days and continuously for 24 hours for one day in every three days, respectively, as excavation works for launching shaft commenced on 24 October 2014.

High volume samplers (HVSs) were used to carry out the 1-hour and 24-hour TSP monitoring in the reporting period at the five (5) air quality monitoring stations in accordance with the requirements stipulated in the Updated EM&A Manual (*Figure 2.1*; *Table 2.1*). Wind anemometer was installed at the rooftop of ASR5 for logging wind speed and wind direction. Details of the equipment deployed are provided in *Table 2.2*.

(1) ERM (2013) Enhanced TSP Monitoring Plan. Submitted on 28 October 2013 and subsequently approved by EPD on 1 November 2013.

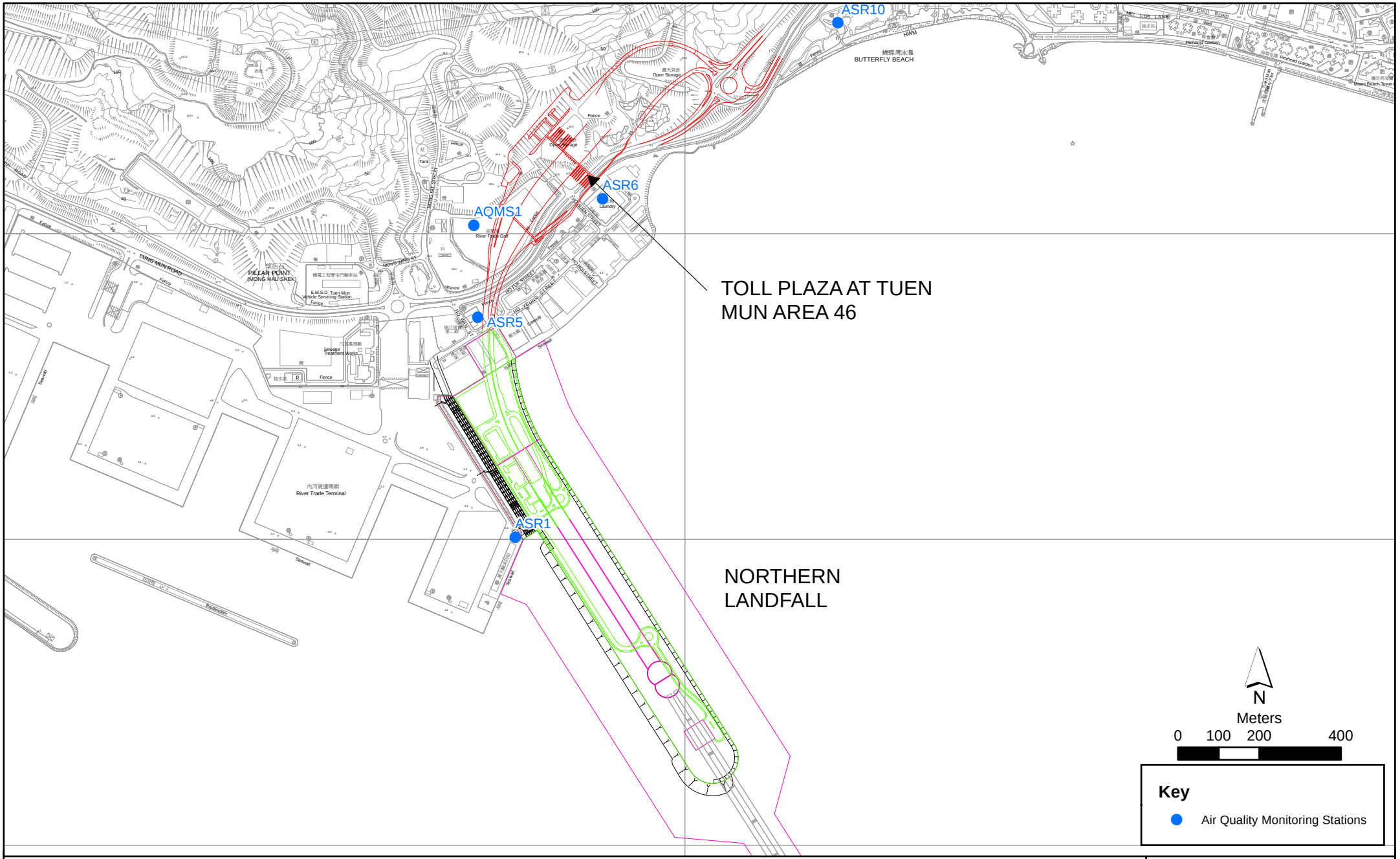

Figure 2.1

Air Quality Monitoring Stations for the Enhanced TSP Monitoring

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Date: 21/2/2014

Environmental Resources Management

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Table 2.1 ***Locations of Impact Air Quality Monitoring Stations and Monitoring Dates in this Reporting Period***

Monitoring Station	Location	Description	Parameters & Frequency
ASR1	Tuen Mun Fireboat Station	Office	TSP monitoring • 1-hour Total Suspended Particulates (1-hour TSP, µg/m³), 3 times in every 6 days • 24-hour Total Suspended Particulates (24-hour TSP, µg/m³), daily for 24-hour in every 6 days
ASR5	Pillar Point Fire Station	Office	
AQMS1	Previous River Trade Golf	Bare ground	
AQMS2/ASR6	Bare ground at Ho Suen Street /Butterfly Beach Laundry	Bare ground/Office	Enhanced TSP monitoring (commenced on 24 October 2014) • 1-hour Total Suspended Particulates (1-hour TSP, µg/m³), 3 times in every 3 days • 24-hour Total Suspended Particulates (24-hour TSP, µg/m³), daily for 24-hour in every 3 days
ASR10	Butterfly Beach Park	Recreational uses	

*Notes: AQMS2 was relocated and HVS was re-installed at ASR6 (Butterfly Beach Laundry) on 17 January 2014. AQMS2 was then superseded by ASR6 for the impact air quality monitoring. Impact air quality monitoring at ASR6 commenced on 21 January 2014.

Table 2.2 ***Air Quality Monitoring Equipment***

Equipment	Brand and Model
High Volume Sampler (1-hour TSP and 24-hour TSP)	Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Sampler (Model No. TE-5170)
Wind Meter	MetPak (Model: MetPak II (S/N: 13130002)
Wind Anemometer for calibration	Lutron (Model No. AM-4201)

2.1.2 Action & Limit Levels

The Action and Limit Levels of the air quality monitoring are provided in *Appendix C*. The Event and Action plan is presented in *Appendix G*.

2.1.3 Results and Observations

Impact air quality monitoring was conducted at all designated monitoring stations in the reporting period under favourable weather conditions. The major dust sources in the reporting period include construction activities under the Contract as well as nearby traffic emissions.

The monitoring results for 1-hour TSP and 24-hour TSP are summarized in *Tables 2.3* and *2.4*, respectively. Baseline and impact monitoring results are presented graphically in *Appendix D*. The detailed impact air quality

monitoring data and meteorological information were reported in the *First* to *Twelve Monthly EM&A Report*.

Table 2.3 Summary of 1-hour TSP Monitoring Results in this Reporting Period

Month/Year	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
November 2013 to October 2014	ASR 1	178	56 – 474	331	500
	ASR 5	194	43 – 559	340	500
	AQMS1	142	38 – 431	335	500
	AQMS2/ASR6	163	52 – 425	338	500
	ASR10	121	43 – 645	337	500

Table 2.4 Summary of 24-hour TSP Monitoring Results in this Reporting Period

Month/Year	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
November 2013 to October 2014	ASR 1	101	32 – 249	213	260
	ASR 5	106	39 – 258	238	260
	AQMS1	86	38 – 228	213	260
	AQMS2/ASR6	94	38 – 269	238	260
	ASR10	72	33 – 166	214	260

In this reporting period, a total of 68 monitoring events were undertaken in which 26 Action Level exceedances and two (2) Limit Level exceedances for 1-hour TSP as well as five (5) Action Level exceedances and one (1) Limit Level exceedances for 24-hour TSP were recorded. Summary of Exceedances for Air Quality Impact Monitoring in this reporting period is detailed in *Table 2.24*.

As shown in *Table 2.5*, the annual average 24-hour TSP levels in the reporting period were generally lower than the corresponding average levels baseline at most monitoring stations, whilst the annual average 1-hour TSP levels in the reporting period were generally higher than the corresponding average baseline levels at most monitoring stations, except for ASR 10.

In order to determine any significant air quality impacts caused by construction activities from this Contract, One-way ANOVA (with α set at 0.05) was conducted to examine any significant difference in average TSP levels between the impact monitoring in this reporting period and the baseline monitoring before commencement of construction activities. For 1-hour TSP, the average levels at monitoring stations AQMS2/ASR6, ASR1 and ASR5 in the reporting period were significantly higher than the average levels recorded in the baseline monitoring while there were no significant differences for other stations (AQMS1: $F_{1, 244} = 0.93$, $p = 0.34$, AQMS2/ASR6: $F_{1, 244} = 5.08$, $p < 0.05$, ASR1: $F_{1, 244} = 18.83$, $p < 0.01$, ASR10: $F_{1,244} = 1.34$, $p = 0.25$ and ASR5: $F_{1, 244} = 18.4$, $p < 0.01$). For 24-hour TSP, the average levels at all monitoring stations in the reporting period were significantly lower than the average levels of baseline monitoring (AQMS1: $F_{1, 80} = 9.93$, $p < 0.01$, AQMS2/ASR6: $F_{1, 80} = 26.69$, $p < 0.01$, ASR1: $F_{1, 80} = 5.15$, $p < 0.05$, ASR10: $F_{1, 80} = 37.72$, $p < 0.01$ and ASR5: $F_{1, 80} = 19.41$, $p < 0.01$). In the reporting period, levels of 1-hour and 24-hour TSP varied across sampling months (see *Appendix*

D) and these variations were, however, not consistent throughout the reporting period.

Table 2.5 ***Summary of Average Levels of TSP Level of Baseline Monitoring and Reporting Period (in µg/m³)***

Monitoring Station	Average Baseline Monitoring	Average Impact Monitoring
ASR1 (1-hour TSP)	125	178
ASR1 (24-hour TSP)	128	101
ASR5 (1-hour TSP)	138	194
ASR5 (24-hour TSP)	167	106
AQMS1 (1-hour TSP)	131	141
AQMS1 (24-hour TSP)	127	86
AQMS2/ASR6 (1-hour TSP)	135	163
AQMS2/ASR6 (24-hour TSP)	166	94
ASR10 (1-hour TSP)	134	121
ASR10 (24-hour TSP)	129	72

Further to the One-way ANOVA, Linear Regression was conducted to examine any relationship between TSP levels and time (i.e. number of days after construction works commencement) during this yearly monitoring period at each monitoring station. Linear regression analysis makes assumptions of equal variance and normal distribution of data. Therefore, the significance level of the test was set at 1 % (i.e. $p = 0.01$) to reduce the chance of committing a Type 1 error. If a significant regression relationship was found between TSP level and time (i.e. $p < 0.01$), r^2 value from the analysis would be further assessed. This value represents the proportion of the total variation in the dependent variable (i.e. TSP level) that is accounted for by the fitted regression line and is referred to as the coefficient of determination. An r^2 value of 1 indicates a perfect relationship (or fit) whereas a value of 0 indicates that there is no relationship (or no fit) between the dependent and independent variables. As there are no specific criteria to indicate how meaningful an r^2 value is, for the purposes of this EM&A programme a value of 0.60 was adopted to indicate a meaningful regression. If $r^2 < 0.60$ then it was considered that there was a weak relationship between TSP level and time or none at all. If the regression analysis indicated $r^2 > 0.60$ then it had been interpreted that there was in fact a strong relationship between the dependent and independent variables (i.e. a strong temporal trend of increasing / decreasing TSP level with time).

As shown in *Table 2.6*, results of the regression analysis indicated that there was no significant ($r^2 < 0.60$) relationship between TSP level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing / decreasing TSP level since commencement of constructions works.

Table 2.6 Linear Regression Result of TSP Monitoring

Parameter	Station	R^2	F-ratio	p-value	Intercept	Coefficient
1-hour TSP	AQMS1	0.079	$F_{1,202} = 17.4$	<0.001	175.0	-0.182
	AQMS2 /ASR6	0.061	$F_{1,202} = 13.2$	<0.001	195.3	-0.177
	ASR1	0.017	$F_{1,202} = 3.39$	0.07	195.7	-0.094
	ASR10	0.129	$F_{1,202} = 30.0$	<0.001	163.3	-0.229
	ASR5	0.060	$F_{1,202} = 12.8$	<0.001	229.1	-0.190
24-hour TSP	AQMS1	0.262	$F_{1,66} = 23.4$	<0.001	126.1	-0.217
	AQMS2 /ASR6	0.236	$F_{1,66} = 20.4$	<0.001	135.2	-0.222
	ASR1	0.108	$F_{1,66} = 8.02$	<0.001	123.8	-0.125
	ASR10	0.120	$F_{1,66} = 9.03$	<0.001	90.6	-0.102
	ASR5	0.242	$F_{1,66} = 21.1$	<0.001	145.7	-0.217

Note:
1. Dependent variable is set as TSP levels (in $\mu g/m^3$) and independent variable is set as number of day of construction works.
2. R^2 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.
3. By setting α at 0.01, insignificant coefficient is underlined.

2.2 WATER QUALITY MONITORING

The baseline water quality monitoring undertaken by the Hong Kong – Zhuhai – Macao Bridge Hong Kong Projects (HKZMB) between 6 and 31 October 2011 has included all monitoring stations for the Project. Thus, the baseline monitoring results and Action/Limit Levels presented in HKZMB Baseline Monitoring Report [1] are adopted for this Project.

2.2.1 Monitoring Requirements & Equipment

In accordance with the Updated EM&A Manual, impact water quality monitoring was carried out three days per week during the construction period at nine (9) water quality monitoring stations (*Figure 2.2*; *Table 2.7*).

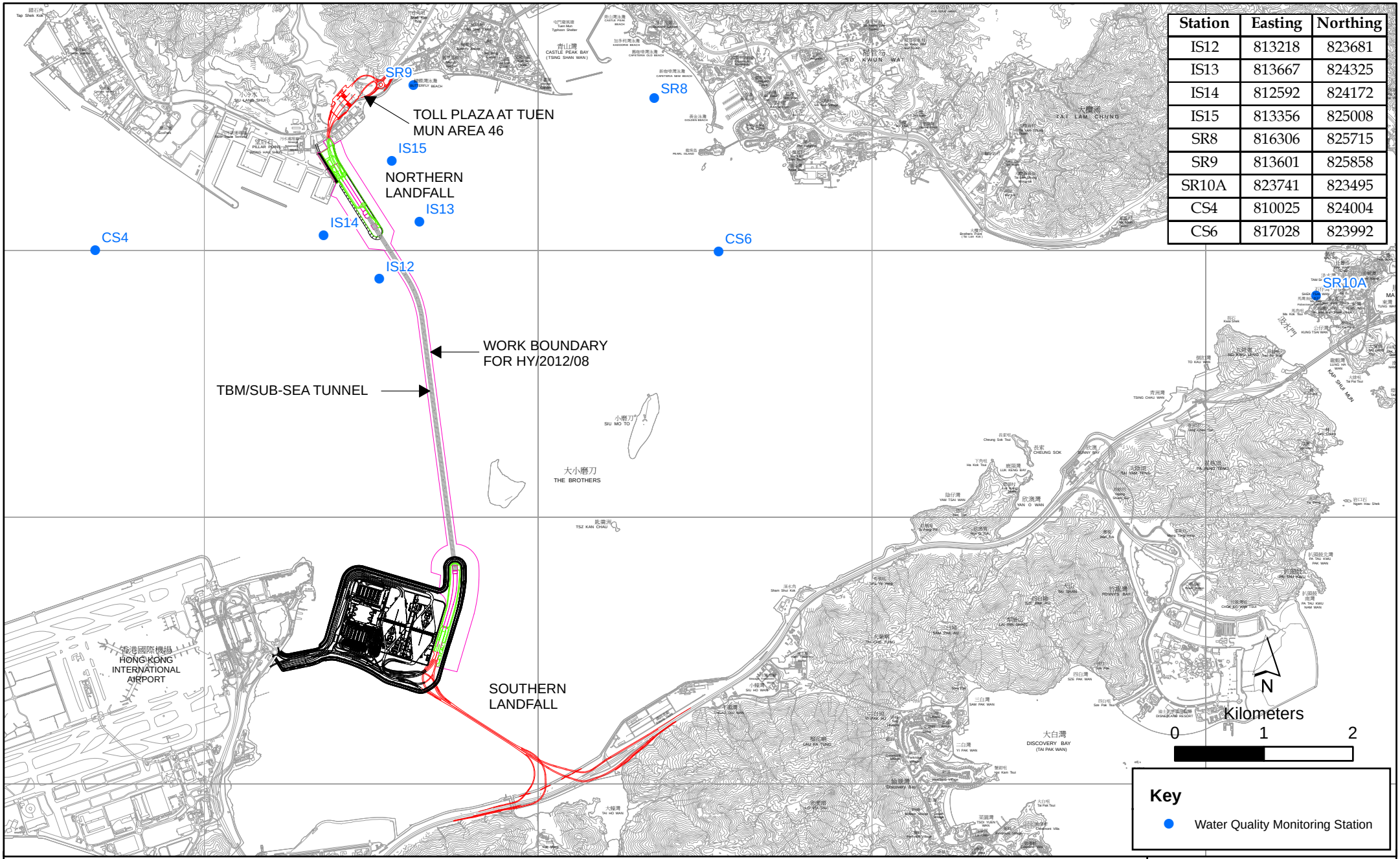
Table 2.7 Locations of Water Quality Monitoring Stations and the Corresponding Monitoring Requirements

Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS12	Impact Station	813218	823681	• Temperature(°C) • pH(pH unit) • Turbidity (NTU) • Water depth (m) • Salinity (ppt) • DO (mg/L and % of saturation) • SS (mg/L)	3 water depths: 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.	Impact monitoring: 3 days per week, at mid-flood and mid-ebb tides during the construction period of the Contract.
IS13	Impact Station	813667	824325			
IS14	Impact Station	812592	824172			
IS15	Impact Station	813356	825008			
CS4	Control / Far Field Station	810025	824004			
CS6	Control / Far Field Station	817028	823992			
SR8	Sensitive receiver (Gazettal beaches in Tuen Mun)	816306	825715			
SR9	Sensitive receiver (Butterfly Beach)	813601	825858			
SR10A	Sensitive receiver (Ma Wan FCZ)	823741	823495			

*Notes:
In addition to the parameters presented monitoring location/position, time, water depth, sampling depth, tidal stages, weather conditions and any special phenomena or works underway nearby were also recorded.

Table 2.8 summarizes the equipment used in the impact water quality monitoring programme.

[1] *Agreement No. CE 35/2011 (EP) Baseline Environmental Monitoring for Hong Kong - Zhuhai - Macao Bridge Hong Kong Projects - Investigation*. Baseline Environmental Monitoring Report (Version C). Submitted on 8 March 2012 and subsequently approved by EPD.



Station	Easting	Northing
IS12	813218	823681
IS13	813667	824325
IS14	812592	824172
IS15	813356	825008
SR8	816306	825715
SR9	813601	825858
SR10A	823741	823495
CS4	810025	824004
CS6	817028	823992

Figure 2.2

Water Quality Monitoring Station

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Date: 15/11/2013

Environmental Resources Management

ERM

Table 2.8 Water Quality Monitoring Equipment

Equipment	Model	Qty.
Water Sampler	Kahlsico Water-Bottle Model 135DW 150	1
Dissolved Oxygen Meter	YSI Pro 2030	1
pH Meter	HANNA HI 8314	1
Turbidity Meter	HACH 2100Q	1
Monitoring Position Equipment	"Magellan" Handheld GPS Model explorist GC	4
	DGPS Koden KGP913MK2 (1)	1

2.2.2 *Action & Limit Levels*

The Action and Limit Levels of the water quality monitoring is provided in *Appendix C*. The Event and Action plan is presented in *Appendix G*.

2.2.3 *Results and Observations*

During this reporting period, major marine works included dredging, seawall construction and reclamation filling. A closed grab dredger was used and silt curtains (cage-type and single floating type) were deployed during dredging works in accordance with the EP. The level of dredging activities was within the working rate described in the EP and the approved EIA Report. In addition, reclamation filling was undertaken between the 200 m of leading seawalls using filling materials specified in the EP and the approved EIA Report with a single layer silt curtain being deployed as a precautionary measure to reduce dispersion of suspended solids. It is useful to note that heavy marine traffic (not associated with the Project) was commonly observed nearby the Project site and its vicinity. On 6 August 2014, dredging at Northern Landfall was fully completed.

Impact water quality monitoring was conducted at all designated monitoring stations in the reporting period under favourable weather conditions. Baseline and impact monitoring results are presented graphically in *Appendix E* and detailed impact water quality monitoring data were reported in the *First* to *Twelve Monthly EM&A Report*.

In this reporting period, a total of 155 monitoring events were undertaken in which six (6) Action Level and one (1) Limit Level exceedances were recorded for depth-averaged suspended solids (SS). Summary of Exceedances for Water Quality Impact Monitoring in this Reporting Period is detailed in *Table 2.25*.

One-way ANOVA (with α setting at 0.05) was conducted to examine any significant difference in DO, turbidity and SS levels between this reporting period and the baseline monitoring period. The annual average levels and statistical analysis results are presented in *Tables 2.9 to 2.11* and *Tables 2.12 to 2.14*, respectively. In general, the DO levels recorded during the reporting period were mostly comparable to the results obtained during the baseline monitoring period, except for SR 8, SR 9, SR10A and SR15 in which DO levels during this reporting period in mid-flood tide were significantly higher than the corresponding average baseline levels. The annual depth-averaged

turbidity and SS levels at all impact stations in the reporting period were significantly lower than the average levels in baseline monitoring. Whilst DO, turbidity and suspended solids levels varied across sampling months (see *Appendix E*), these variations were, however, not consistent throughout the reporting period.

Table 2.9 Summary of Average DO Level of Baseline Monitoring and the current Reporting Period (in mg/L)

Tide	Station	Depth	Average DO of baseline monitoring	Average DO of reporting period
Mid-ebb	IS12	Surface	6.1	6.3
	IS13	Surface	6.1	6.3
	IS14	Surface	6.1	6.3
	IS15	Surface	6.1	6.3
	SR10A	Surface	6.0	6.4
	SR8	Surface	6.2	6.4
	SR9	Surface	6.0	6.3
Mid-flood	IS12	Surface	6.1	6.4
	IS13	Surface	6.1	6.4
	IS14	Surface	6.1	6.4
	IS15	Surface	6.2	6.4
	SR10A	Surface	6.0	6.4
	SR8	Surface	6.2	6.4
	SR9	Surface	6.0	6.4
Mid-ebb	IS12	Middle	5.9	6.2
	IS13	Middle	6.0	6.2
	IS14	Middle	6.0	6.2
	IS15	Middle	6.0	6.2
	SR10A	Middle	5.9	6.2
Mid-flood	IS12	Middle	5.9	6.3
	IS13	Middle	6.0	6.3
	IS14	Middle	5.9	6.2
	IS15	Middle	6.1	6.2
	SR10A	Middle	5.9	6.3
Mid-ebb	IS12	Bottom	5.9	6.1
	IS13	Bottom	5.9	6.1
	IS14	Bottom	5.9	6.0
	IS15	Bottom	5.9	6.0
	SR10A	Bottom	5.7	6.1
	SR8	Bottom	6.0	6.2
	SR9	Bottom	5.8	6.1
Mid-flood	IS12	Bottom	5.9	6.2
	IS13	Bottom	5.9	6.1
	IS14	Bottom	5.9	6.1
	IS15	Bottom	6.0	6.1
	SR10A	Bottom	5.8	6.1
	SR8	Bottom	5.8	6.2
	SR9	Bottom	5.9	6.2

Table 2.10 Summary of Average Depth-averaged Turbidity Level of Baseline Monitoring and the current Reporting Period (in NTU)

Tide	Station	Average depth-averaged turbidity of baseline monitoring	Average depth-averaged turbidity of reporting period
Mid-ebb	IS12	10.7	5.1
	IS13	9.2	5.1

Tide	Station	Average depth-averaged turbidity of baseline monitoring	Average depth-averaged turbidity of reporting period
	IS14	9.3	5.0
	IS15	9.8	5.1
	SR10A	7.1	4.9
	SR8	11.0	5.0
	SR9	7.2	4.9
Mid-flood	IS12	9.8	5.1
	IS13	9.5	5.0
	IS14	9.4	5.0
	IS15	9.8	5.1
	SR10A	7.0	4.8
	SR8	10.1	5.0
	SR9	8.5	4.9

Table 2.11 Summary of Average Depth-averaged SS Level of Baseline Monitoring and the current Reporting Period (in mg/L)

Tide	Station	Average depth-averaged SS of baseline monitoring	Average depth-averaged SS of reporting period
Mid-ebb	IS12	9.2	5.3
	IS13	10.0	5.2
	IS14	10.4	5.3
	IS15	9.6	5.3
	SR10A	10.3	5.3
	SR8	10.1	5.2
	SR9	8.8	5.2
Mid-flood	IS12	9.5	5.4
	IS13	10.5	5.2
	IS14	9.7	5.3
	IS15	11.0	5.4
	SR10A	10.2	5.2
	SR8	11.3	5.3
	SR9	9.9	5.3

Table 2.12 One-way ANOVA Results for DO Comparison between Impact and Baseline Periods

Tide	Station	Depth	F ratio	p-value
Mid-ebb	IS12	Surface	$F_{1,164} = 2.51$	0.12
Mid-ebb	IS13	Surface	$F_{1,164} = 2.72$	0.10
Mid-ebb	IS14	Surface	$F_{1,164} = 1.27$	0.26
Mid-ebb	IS15	Surface	$F_{1,164} = 1.46$	0.23
Mid-ebb	SR10A	Surface	$F_{1,164} = 4.02$	0.05
Mid-ebb	SR8	Surface	$F_{1,164} = 0.45$	0.50
Mid-ebb	SR9	Surface	$F_{1,164} = 3.40$	0.07
Mid-flood	IS12	Surface	$F_{1,164} = 3.47$	0.06
Mid-flood	IS13	Surface	$F_{1,164} = 2.43$	0.12
Mid-flood	IS14	Surface	$F_{1,164} = 2.90$	0.09
Mid-flood	IS15	Surface	$F_{1,164} = 1.12$	0.29
Mid-flood	SR10A	Surface	$F_{1,164} = 6.01$	**0.02**
Mid-flood	SR8	Surface	$F_{1,164} = 1.86$	0.17
Mid-flood	SR9	Surface	$F_{1,164} = 5.54$	**0.02**
Mid-ebb	IS12	Middle	$F_{1,164} = 3.20$	0.08
Mid-ebb	IS13	Middle	$F_{1,164} = 1.53$	0.22
Mid-ebb	IS14	Middle	$F_{1,164} = 1.18$	0.28

Tide	Station	Depth	F ratio	p-value
Mid-ebb	IS15	Middle	$F_{1,164} = 0.76$	0.38
Mid-ebb	SR10A	Middle	$F_{1,164} = 2.99$	0.09
Mid-flood	IS12	Middle	$F_{1,164} = 3.79$	0.05
Mid-flood	IS13	Middle	$F_{1,164} = 2.10$	0.15
Mid-flood	IS14	Middle	$F_{1,164} = 2.52$	0.11
Mid-flood	IS15	Middle	$F_{1,164} = 0.60$	0.44
Mid-flood	SR10A	Middle	$F_{1,164} = 4.97$	**0.03**
Mid-ebb	IS12	Bottom	$F_{1,164} = 1.82$	0.18
Mid-ebb	IS13	Bottom	$F_{1,164} = 1.12$	0.29
Mid-ebb	IS14	Bottom	$F_{1,164} = 0.18$	0.67
Mid-ebb	IS15	Bottom	$F_{1,164} = 1.07$	0.30
Mid-ebb	SR10A	Bottom	$F_{1,164} = 3.13$	0.08
Mid-ebb	SR8	Bottom	$F_{1,164} = 0.42$	0.52
Mid-ebb	SR9	Bottom	$F_{1,164} = 2.97$	0.09
Mid-flood	IS12	Bottom	$F_{1,164} = 2.78$	0.10
Mid-flood	IS13	Bottom	$F_{1,164} = 1.88$	0.17
Mid-flood	IS14	Bottom	$F_{1,164} = 0.95$	0.33
Mid-flood	IS15	Bottom	$F_{1,164} = 0.43$	0.51
Mid-flood	SR10A	Bottom	$F_{1,164} = 2.04$	0.15
Mid-flood	SR8	Bottom	$F_{1,164} = 4.67$	**0.03**
Mid-flood	SR9	Bottom	$F_{1,164} = 2.12$	0.15

Note:
By setting α at 0.05, significant differences (*p*-value < 0.05) are bold.

Table 2.13 One-way ANOVA Results for Depth-averaged Turbidity Comparison between Impact and Baseline Periods

Tide	Station	F ratio	p-value
Mid-ebb	IS12	$F_{1,164} = 51.79$	**<0.01**
Mid-ebb	IS13	$F_{1,164} = 28.76$	**<0.01**
Mid-ebb	IS14	$F_{1,164} = 31.68$	**<0.01**
Mid-ebb	IS15	$F_{1,164} = 31.09$	**<0.01**
Mid-ebb	SR10A	$F_{1,164} = 11.34$	**<0.01**
Mid-ebb	SR8	$F_{1,164} = 49.82$	**<0.01**
Mid-ebb	SR9	$F_{1,164} = 9.10$	**<0.01**
Mid-flood	IS12	$F_{1,164} = 31.15$	**<0.01**
Mid-flood	IS13	$F_{1,164} = 31.63$	**<0.01**
Mid-flood	IS14	$F_{1,164} = 33.05$	**<0.01**
Mid-flood	IS15	$F_{1,164} = 30.16$	**<0.01**
Mid-flood	SR10A	$F_{1,164} = 9.80$	**<0.01**
Mid-flood	SR8	$F_{1,164} = 31.40$	**<0.01**
Mid-flood	SR9	$F_{1,164} = 20.43$	**<0.01**

Note:
By setting α at 0.05, significant differences (*p*-value < 0.05) are bold.

Table 2.14 One-way ANOVA Results for Depth-averaged SS Comparison between Impact and Baseline Periods

Tide	Station	F ratio	p-value
Mid-ebb	IS12	$F_{1,164} = 16.90$	**<0.01**
Mid-ebb	IS13	$F_{1,164} = 30.28$	**<0.01**
Mid-ebb	IS14	$F_{1,164} = 28.55$	**<0.01**
Mid-ebb	IS15	$F_{1,164} = 17.37$	**<0.01**
Mid-ebb	SR10A	$F_{1,164} = 27.43$	**<0.01**
Mid-ebb	SR8	$F_{1,164} = 25.82$	**<0.01**
Mid-ebb	SR9	$F_{1,164} = 14.14$	**<0.01**
Mid-flood	IS12	$F_{1,164} = 12.75$	**<0.01**

Tide	Station	F ratio	p-value
Mid-flood	IS13	$F_{1,164} = 34.13$	**<0.01**
Mid-flood	IS14	$F_{1,164} = 19.18$	**<0.01**
Mid-flood	IS15	$F_{1,164} = 29.62$	**<0.01**
Mid-flood	SR10A	$F_{1,164} = 31.47$	**<0.01**
Mid-flood	SR8	$F_{1,164} = 39.65$	**<0.01**
Mid-flood	SR9	$F_{1,164} = 21.20$	**<0.01**

Note:
By setting α at 0.05, significant differences (p-value < 0.05) are bold.

In addition, linear regression was conducted to examine any relationship between DO / Turbidity / SS levels and time (i.e. number of days after construction works commencement) during this yearly monitoring period at each monitoring station. The method of data interpretation followed the same method as indicated in *Section 2.1.3* for TSP monitoring. As shown in *Tables 2.15 to 2.17*, results of the regression analysis indicated that there was no significant ($r^2 < 0.60$) relationship between DO / Turbidity / SS level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing or decreasing DO / Turbidity / SS level since commencement of constructions works.

Table 2.15 Linear Regression Result of DO

Parameter	Station	R^2	$F_{1,152}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb Surface DO	IS12	0.325	73.1	<0.001	6.898	-0.003
	IS13	0.291	62.6	<0.001	6.866	-0.003
	IS14	0.315	69.9	<0.001	6.858	-0.003
	IS15	0.330	75.0	<0.001	6.920	-0.003
	SR10A	0.293	63.0	<0.001	6.945	-0.003
	SR8	0.322	72.3	<0.001	6.955	-0.003
	SR9	0.368	88.7	<0.001	6.953	-0.003
Parameter	**Station**	**R^2**	**$F_{1,153}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood surface DO	IS12	0.331	75.7	<0.001	6.969	-0.003
	IS13	0.311	69.0	<0.001	6.957	-0.003
	IS14	0.333	76.5	<0.001	6.929	-0.003
	IS15	0.359	85.8	<0.001	6.999	-0.003
	SR10A	0.302	66.1	<0.001	7.010	-0.003
	SR8	0325	73.8	<0.001	7.015	-0.003
	SR9	0.384	95.3	<0.001	7.043	-0.003
Parameter	**Station**	**R^2**	**$F_{1,152}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-ebb middle DO	IS12	0.351	82.3	<0.001	6.826	-0.003
	IS13	0.307	67.5	<0.001	6.791	-0.003
	IS14	0.407	104.5	<0.001	6.821	-0.004
	IS15	0.357	84.5	<0.001	6.800	-0.003
	SR10A	0.317	70.6	<0.001	6.815	-0.003
Parameter	**Station**	**R^2**	**$F_{1,153}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood middle DO	IS12	0.341	79.3	<0.001	6.913	-0.003
	IS13	0.320	71.9	<0.001	6.875	-0.003
	IS14	0.402	102.9	<0.001	6.880	-0.004
	IS15	0.355	84.2	<0.001	6.881	-0.003

Parameter	Station	R^2	$F_{1,152}$	p-value	Intercept	Coefficient of days of construction
	SR10A	0.329	75.1	<0.001	6.871	-0.003
Parameter	**Station**	**R^2**	**$F_{1,152}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-ebb bottom DO	IS12	0.353	83.0	<0.001	6.786	-0.004
	IS13	0.306	67.1	<0.001	6.703	-0.003
	IS14	0.425	112.3	<0.001	6.758	-0.004
	IS15	0.380	93.2	<0.001	6.739	-0.004
	SR10A	0.372	90.1	<0.001	6.771	-0.004
	SR8	0.368	88.4	<0.001	6.876	-0.004
	SR9	0.368	88.7	<0.001	6.798	-0.004
Parameter	**Station**	**R^2**	**$F_{1,153}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood bottom DO	IS12	0.362	86.7	<0.001	6.883	-0.004
	IS13	0.309	68.6	<0.001	6.779	-0.004
	IS14	0.422	111.8	<0.001	6.842	-0.004
	IS15	0.379	93.4	<0.001	6.811	-0.004
	SR10A	0.391	98.1	<0.001	6.863	-0.004
	SR8	0.387	96.5	<0.001	6.945	-0.004
	SR9	0.371	90.4	<0.001	6.903	-0.004

Note:
1. Dependent variable is set as DO (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.
3. By setting α at 0.01, insignificant coefficient is underlined.

Table 2.16 Linear Regression Result of Turbidity

Parameter	Station	R^2	$F_{1,152}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb depth -average turbidity	IS12	0.011	1.67	0.199	4.644	0.002
	IS13	0.001	0.23	0.636	4.895	0.001
	IS14	0.008	1.16	0.283	4.634	0.002
	IS15	<0.001	0.03	0.856	5.010	<0.001
	SR10A	0.014	2.17	0.143	4.442	0.002
	SR8	<0.001	<0.001	0.996	5.048	<0.001
	SR9	<0.001	0.06	0.808	4.859	<0.001
Parameter	**Station**	**R^2**	**$F_{1,153}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood depth -average turbidity	IS12	0.002	0.4	0.529	4.858	0.001
	IS13	0.003	0.42	0.518	4.792	0.001
	IS14	0.004	0.654	0.420	4.706	0.001
	IS15	<0.001	0.002	0.965	5.117	<0.001
	SR10A	0.009	1.42	0.235	4.479	0.002
	SR8	<0.001	0.019	0.890	5.069	<0.001
	SR9	<0.001	0.008	0.927	4.901	<0.001

Note:
1. Dependent variable is set as Turbidity (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.
3. By setting α at 0.01, insignificant coefficient is underlined.

Table 2.17 Linear Regression Result of SS

Parameter	Station	R^2	$F_{1,152}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb depth	IS12	0.019	2.94	0.088	4.563	0.004
	IS13	0.013	2.00	0.160	4.651	0.003

Parameter	Station	R^2	$F_{1,152}$	p-value	Intercept	Coefficient of days of construction
-average SS	IS14	0.013	2.06	0.153	4.633	0.003
	IS15	<0.001	0.14	0.704	5.142	0.001
	SR10A	0.009	1.39	0.240	4.762	0.003
	SR8	0.002	0.29	0.593	4.965	0.001
	SR9	0.004	0.55	0.461	4.888	0.002
Parameter	**Station**	**R^2**	**$F_{1,153}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood	IS12	0.006	0.87	0.354	4.876	0.003
depth	IS13	0.008	1.17	0.281	4.754	0.002
-average SS	IS14	0.004	0.63	0.430	4.984	0.002
	IS15	<0.001	0.13	0.717	5.200	<0.001
	SR10A	0.01	1.48	0.226	4.666	0.003
	SR8	0.006	0.85	0.359	4.886	0.002
	SR9	0.002	0.35	0.555	5.049	0.001

Note:

1. Dependent variable is set as Turbidity (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.
3. By setting α at 0.01, insignificant coefficient is underlined.

2.3 DOLPHIN MONITORING

2.3.1 Monitoring Requirements

Impact dolphin monitoring is required to be conducted by a qualified dolphin specialist team to evaluate whether there have been any effects on the dolphins. In order to fulfil the EM&A requirements and make good use of available resources, the on-going impact line transect dolphin monitoring data collected by HyD's *Contract No. HY/2011/03 Hong Kong-Zhuhai-Macao Bridge. Hong Kong Link Road - Section between Scenic Hill and Hong Kong Boundary Crossing Facilities* on the monthly basis is adopted to avoid duplicates of survey effort.

2.3.2 Monitoring Equipment

Table 2.18 summarises the equipment used for the impact dolphin monitoring.

Table 2.18 Dolphin Monitoring Equipment

Equipment	Model
Global Positioning System (GPS)	Garmin 18X-PC Geo One Phottix
Camera	Nikon D90 300m 2.8D fixed focus Nikon D90 20-300m zoom lens
Laser Binoculars	Infinitor LRF 1000
Marine Binocular	Bushell 7 x 50 marine binocular with compass and reticules
Vessel for Monitoring	65 foot single engine motor vessel with viewing platform 4.5m above water level

2.3.3 Monitoring Parameter, Frequencies & Duration

Dolphin monitoring should cover all transect lines in Northeast Lantau (NEL) and the Northwest Lantau (NWL) survey areas twice per month throughout the entire construction period. The monitoring data should be compatible with, and should be made available for, long-term studies of small cetacean ecology in Hong Kong. In order to provide a suitable long-term dataset for comparison, identical methodology and line transects employed in baseline dolphin monitoring was followed in the impact dolphin monitoring.

2.3.4 Monitoring Location

The impact dolphin monitoring was carried out in the NEL and NWL along the line transect as depicted in *Figure 2.3*. The co-ordinates of all transect lines are shown in *Table 2.19* below.

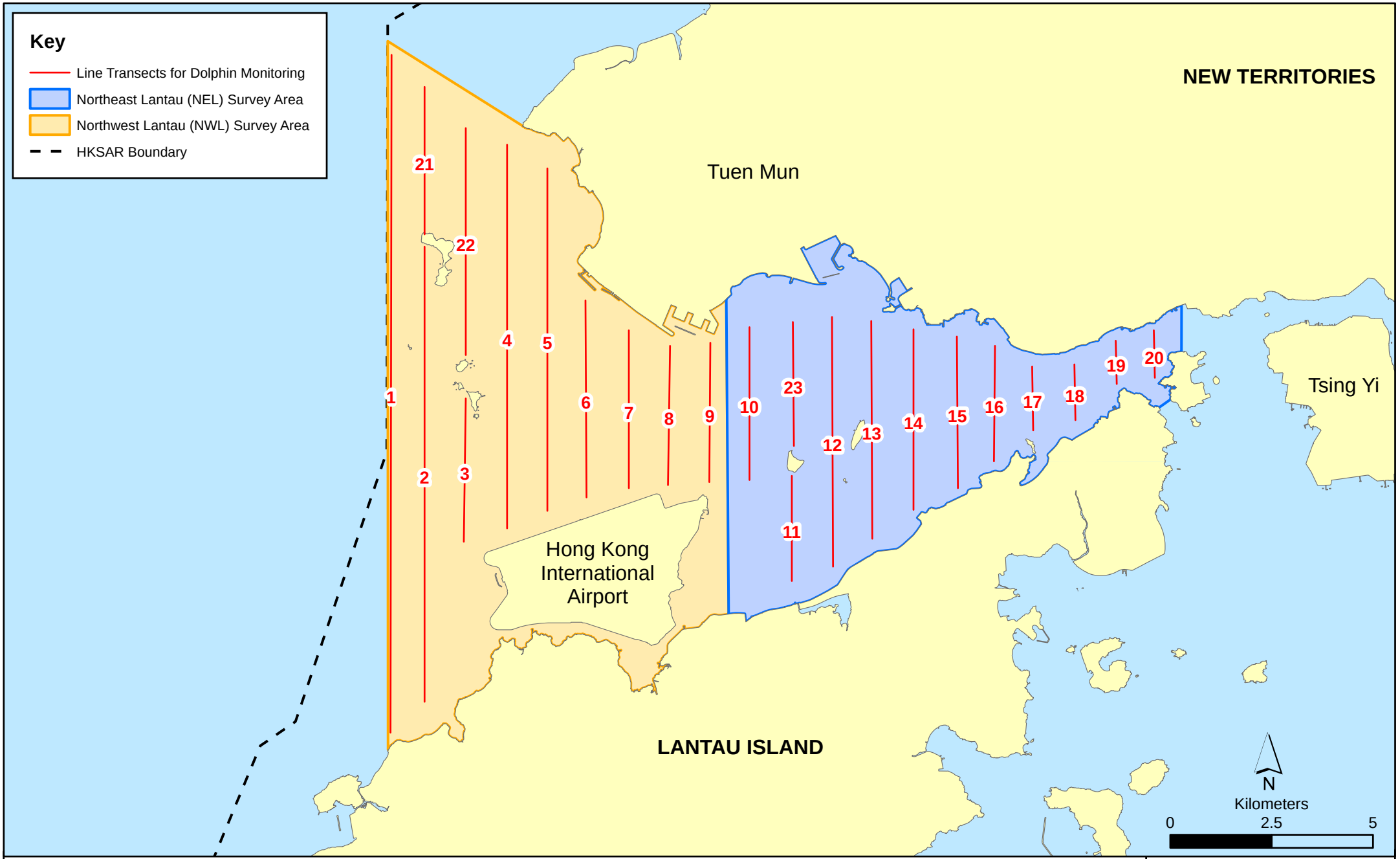

Figure 2.3

Layout of Transect Lines of Dolphin Monitoring in Northwest and Northeast Lantau Areas

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Table 2.19 Impact Dolphin Monitoring Line Transect Co-ordinates

Line No.		Easting	Northing	Line No.		Easting	Northing
1	Start Point	804671	814577	13	Start Point	816506	819480
1	End Point	804671	831404	13	End Point	816506	824859
2	Start Point	805475	815457	14	Start Point	817537	820220
2	End Point	805477	826654	14	End Point	817537	824613
3	Start Point	806464	819435	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	819771	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	820220	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	820466	18	Start Point	821504	822371
6	End Point	809490	825352	18	End Point	821504	823761
7	Start Point	810499	820690	19	Start Point	822513	823268
7	End Point	810499	824613	19	End Point	822513	824321
8	Start Point	811508	820847	20	Start Point	823477	823402
8	End Point	811508	824254	20	End Point	823477	824613
9	Start Point	812516	820892	21	Start Point	805476	827081
9	End Point	812516	824254	21	End Point	805476	830562
10	Start Point	813525	820872	22	Start Point	806464	824033
10	End Point	813525	824657	22	End Point	806464	829598
11	Start Point	814556	818449	23	Start Point	814559	821739
11	End Point	814556	820992	23	End Point	814559	824768
12	Start Point	815542	818807				
12	End Point	815542	824882				

2.3.5 Action & Limit Levels

The Action and Limit levels of dolphin impact monitoring are shown in *Appendix C*. The Event and Action plan is presented in *Appendix G*.

2.3.6 Results & Observations

A total of 3,520.41 km of survey effort was collected, with 93.2% of the total survey effort being conducted under favourable weather conditions (ie Beaufort Sea State 3 or below with good visibility) in this reporting year. Amongst the two areas, 1,353.42 km and 2,166.99 km of survey effort were collected from NEL and NWL survey areas, respectively. The total survey effort conducted on primary and secondary lines were 2,569.49 km and 950.92 km, respectively. The survey efforts are summarized in *Appendix F*.

A total of 136 groups of 512 Chinese White Dolphin sightings were recorded during the 24 sets of surveys in this reporting year. All except eight sighting were made during on-effort search. A hundred and ten on-effort sightings were made on primary lines, while eighteen other on-effort sightings were made on secondary lines.

Dolphin sighting distribution of the present impact phase monitoring period (November 2013 to October 2014) was compared to the ones during the baseline phase (February 2011 to January 2012) and transitional phase (November 2012 to October 2013). As TMCLKL construction works commenced in November 2013, a 12-month period between baseline phase and impact phase is defined as transitional phase.

In this 12-month period, 97% of the dolphin sightings were made in NWL, while only 4 groups of 20 dolphins were sighted in NEL. The majority of dolphin sightings made in the 12-month period were concentrated in the northwestern end of the North Lantau region.

During the present 12-month impact phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline and transitional phases as shown in *Table 2.20*.

Table 2.20 Average Dolphin Encounter Rates

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Northeast Lantau	**Northwest Lantau**	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2013-2014)	0.22 ± 0.74	6.93 ± 4.08	0.76 ± 2.59	26.31 ± 17.56
Transitional Phase (2012-2013)	1.70 ± 2.26	7.68 ± 4.36	4.75 ± 7.61	27.51 ± 18.06
Baseline Phase (2011-2012)	6.05 ± 5.04	7.75 ± 5.69	19.91 ± 21.30	29.57 ± 26.96

Note: Comparison of average daily dolphin encounter rates from impact phase (November 2013 – October 2014), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012). ± denotes the standard deviation of the value.

Group size of Chinese White Dolphins ranged from one to thirteen (1-13) individuals per group in North Lantau region during November 2013 - October 2014. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline and transitional phases, as shown in *Table 2.21*.

Table 2.21 Comparison of Average Dolphin Group Sizes from Impact Monitoring Period and Baseline Monitoring Period

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2013-2014)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-2013)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-2012)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

Note: Comparison of average dolphin group sizes from impact phase (November 2013 –October 2014), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012). (± denotes the standard deviation of the average value)

Whilst three and two Action Level exceedances for Northeast Lantau and Northwest Lantau were recorded in the reporting period respectively. No Limit Level exceedance was observed for the quarterly dolphin monitoring data between November 2013 and October 2014. In this reporting period, no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from the general observations.

It is essential to continue monitoring the dolphin usage in the North Lantau region for the rest of the impact phase monitoring period to keep track on the trend of dolphin ranging pattern.

Photos IDs of sighted dolphin are presented in *Appendix J* of the *First to Twelfth Monthly EM&A Report*.

Implementation of Marine Mammal Exclusion Zone

Daily marine mammal exclusion zone was in effect during the period of dredging, reclamation or marine sheet piling works in open waters under this Contract. Passive Acoustic Monitoring (PAM) was also implemented for the detection of marine mammal when dredging, reclamation or marine sheet piling works were carried out outside the daylight hours under this Contract. One sighting of the Indo-Pacific humpback dolphin *Sousa chinensis* was recorded on 20 February 2014 during the exclusion zone monitoring. The marine dredging work was subsequently suspended until the observer has confirmed that the area is continuously clear of dolphins for a period of 30 minutes.

2.4 POST-TRANSLOCATION CORAL MONITORING

Four (4) Post-Translocation Coral Monitoring Surveys were conducted on 17 January 2014, 16 April 2014, 24 July 2014 and 23 October 2014 and the results were provided in the *First to Fourth Quarterly Post-Translocation Coral Monitoring Report*. The findings indicated that no Action or Limit Levels exceedances was recorded for coral monitoring as increase in percentage of partial mortality was not detected for both the tagged translocated and natural coral colonies when comparing to the pre-translocation dataset.

2.5 EM&A SITE INSPECTION

Site inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures under the Contract. Fifty-two (52) site inspections were carried out in the reporting period.

Key observations were summarized in the *First to Twelfth Monthly EM&A Reports*.

2.6 WASTE MANAGEMENT STATUS

The Contractor had submitted application form for registration as chemical waste producer under the Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting.

Wastes generated during this reporting period include mainly construction wastes (inert and non-inert), imported fill, recyclable materials, chemical wastes and marine sediments. Reference has been made to the waste flow table prepared by the Contractor (*Appendix I*). The quantities of different types of wastes are summarized in *Table 2.22*.

Table 2.22 Quantities of Different Waste Generated in the Reporting Period

Month/Year	Inert Construction Waste [a] (tonnes)	Imported Fill (tonnes)	Inert Construction Waste Re-used (tonnes)	Non-inert Construction Waste [b] (tonnes)	Recyclable Materials [c] (kg)	Chemical Wastes (kg)	Marine Sediment (m^3)	
							Category L	Category M
November 2013	2,835	47,449	0	152	130	0	21,100	13,200
December 2013	883	204,421	0	12	130	0	40,500	5,000
January 2014	9,012	314,306	0	45	130	0	34,000	12,500
February 2014	0	258,383	0	28	0	20	18,500	24,500
March 2014	105	516,400	0	36	0	0	37,300	40,450
April 2014	22	467,867	0	26	160	0	28,600	15,400
May 2014	1,016	516,368	0	42	0	0	18,700	29,150
June 2014	4,393	407,489	0	30	0	30	40,700	7,700
July 2014	14,405	428,392	0	33	300	0	37,950	7,150
August 2014	12,728	623,029	0	22	0	0	12,100	0
September 2014	6,843	676,219	0	39	0	0	0	0
October 2014	1,228	527,237	0	33	80	60	0	0
Total	**53,470**	**4,987,560**	**0**	**498**	**930**	**110**	**289,450**	**155,050**

Notes:

(a) Inert construction wastes include hard rock and large broken concrete, and materials disposed as public fill.

(b) Non-inert construction wastes include general refuse disposed at landfill.

(c) Recyclable materials include metals, paper, cardboard, plastics, timber and others.

The Contractor was advised to properly maintain on site C&D materials and waste 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 was also reminded to properly maintain the site tidiness and dispose of the wastes accumulated on site regularly and properly.

For chemical waste containers, the Contractor was reminded to treat properly and store 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.

2.7 *ENVIRONMENTAL LICENSES AND PERMITS*

The status of environmental licensing and permit is summarized in *Table 2.23* below.

Table 2.23 Summary of Environmental Licensing and Permit Status

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Environmental Permit	EP-354/2009/A	8 December 2010	Throughout the Contract	HyD	Tuen Mun-Chek Lap Kok Link
Environmental Permit	EP-354/2009/B	28 January 2014	Throughout the Contract	HyD	Application for VEP on 20 January 2014 to replace EP-354/2009/A
Construction Dust Notification	363510	19 August 2013	Throughout the Contract	DBJV	-
Chemical Waste Registration	5213-422-D2516-01	10 September 2013	Throughout the Contract	DBJV	-
Construction Waste Disposal Account	7018108	19 August 2013	Throughout the Contract	DBJV	Waste disposal in Contract HY/2012/08
Waste Water Discharge License	WT00017707-2013	18 November 2013	30 November 2018	DBJV	For works in site WA18
Waste Water Discharge License	WT00018433-2014	6 March 2014	31 March 2019	DBJV	For works in site Portion N6
Construction Noise Permit	GW-RW0691-13	15 October 2013	14 April 2014	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW0035-13	27 January 2014	26 July 2014	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW0095-14	10 February 2014	9 August 2014	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW0822-13	14 November 2013	10 May 2014	DBJV	For works in site WA18
Construction Noise Permit	GW-RS0814-13	15 November 2013	10 May 2014	DBJV	For works in site WA23
Construction Noise Permit	GW-RW0029-14	27 January 2014	26 July 2014	DBJV	For Portion N6
Construction Noise Permit	GW-RW0077-14	17 February 2014	16 August 2014	DBJV	For Portion N6
Construction Noise Permit	GW-RW0223-14	29 March 2014	28 September 2014	DBJV	For works in site Portion N6
Construction Noise Permit	GW-RW0234-14	29 March 2014	28 September 2014	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RS0362-14	11 May 2014	10 November 2014	DBJV	For works in site WA23
Construction Noise Permit	GW-RW0550-14	25 July 2014	24 January 2015	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW0223-14	29 September 2014	28 March 2015	DBJV	For works in site Portion N6
Construction Noise Permit	GW-RS0674-14	18 September 2014	17 March 2015	DBJV	For GI works at Southern Landfall
Marine Dumping Permit	EP/MD/14-072	1 November 2013	30 April 2014	DBJV	For Type 1
Marine Dumping Permit	EP/MD/14-140	1 March 2014	31 March 2014	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/14-157	3 April 2014	30 April 2014	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/15-007	1 May 2014	31 May 2014	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/14-071	1 December 2013	31 December 2013	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/14-108	1 January 2014	31 January 2014	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/14-124	1 February 2014	28 February 2014	DBJV	For Type 1 (dedicated site) and Type 2

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Marine Dumping Permit	EP/MD/15-006	1 May 2014	31 October 2014	DBJV	For Type 1
Marine Dumping Permit	EP/MD/15-026	31 May 2014	29 June 2014	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/15-045	30 June 2014	29 July 2014	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/15-061	1 August 2014	31 August 2014	DBJV	For Type 1 (dedicated site) and Type 2
Marine Dumping Permit	EP/MD/15-100	20 October 2014	19 November 2014	DBJV	For Type 1 (dedicated site) and Type 2

Notes:
HyD = Highways Department
DBJV = Dragages – Bouygues Joint Venture
VEP = Variation of Environmental Permit

2.8 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

In response to the EM&A site audit findings mentioned in *Section 2.5* of this report, the Contractor has carried out the corrective actions.

A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in *Appendix B*. The necessary mitigation measures relevant to this Contract were implemented properly.

2.9 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT

For air quality impact monitoring, a total of sixty-eight monitoring events were undertaken in which twenty-six Action Level exceedances and two Limit Level exceedances for 1-hour TSP; five Action Level exceedances and one Limit Level exceedance for 24-hour TSP were recorded (*Table 2.24*). Further to the investigation, the recorded exceedance for air quality monitoring was considered to be sporadic event from the cumulative anthropogenic activities (eg traffic emissions from River Trade Terminal) in this area of Hong Kong. The investigation findings are detailed in *the First to Twelfth EM&A Monthly Report*.

Table 2.24 Summary of Exceedances for Air Quality Impact Monitoring in this Reporting Year

Station	Exceedance Level	Date of Exceedances		Number of Exceedances	
		1-hour TSP	24-hour TSP	1-hour TSP	24-hour TSP
AQMS1	Action Level	2013-11-07 2014-01-03 2014-02-28	2014-01-03	3	1
	Limit Level	-	-	0	0
ASR1	Action Level	2013-11-19 *2013-12-11 2014-01-03 2014-01-15 2014-01-27 2014-03-24	2013-12-11 2013-12-28	7	2
	Limit Level	-	-	0	0
ASR5	Action Level	2013-11-07 2013-11-19 2013-12-11 2013-12-23 2013-12-28 2014-01-03 2014-01-27 2014-03-24	2013-12-11 2013-12-28	8	2
	Limit Level	2013-12-11	-	1	0
AQMS2/ASR6	Action Level	2013-12-11 2013-12-23 2013-12-28 2014-01-27 2014-02-12	-	6	0

Station	Exceedance Level	Date of Exceedances		Number of Exceedances	
		1-hour TSP	24-hour TSP	1-hour TSP	24-hour TSP
	Limit Level	-	2013-12-23	0	1
ASR10	Action Level	2013-12-28 2014-04-03	-	2	0
	Limit Level	2013-11-07	-	1	0
	Total number of Action level Exceedances:			26	5
	Total number of Limit level Exceedances:			2	1

*Notes:
Two exceedances were recorded on 2013-12-11.

For marine water quality impact monitoring, a total of a hundred and fifty-five monitoring events were undertaken in which six Action Level exceedances and one Limit Level exceedance were recorded (*Table 2.25*).

Table 2.25 Summary of Exceedances for Marine Water Quality Impact Monitoring in this Reporting Period

Station	Exceedance Level [(a)]	DO (Surface and Middle)		DO (Bottom)		Turbidity (depth-averaged)		SS (depth-averaged)	
		Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
CS4	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
CS6	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
IS12	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	2014-03-31
IS13	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
IS14	AL	-	-	-	-	-	-	-	2014-03-31
	LL	-	-	-	-	-	-	-	-
IS15	AL	-	-	-	-	-	-	2013-12-06	2013-12-04
	LL	-	-	-	-	-	-	-	-
SR8	AL	-	-	-	-	-	-	-	2013-12-06
	LL	-	-	-	-	-	-	-	-
SR9	AL	-	-	-	-	-	-	2013-12-06	2013-12-06
	LL	-	-	-	-	-	-	-	-
SR10	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
	Total AL Exceedances:	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**4**
	Total LL Exceedances:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

Notes:
(a) AL = Action Level; LL = Limit Level

For the dolphin impact monitoring, three (3) and two (2) Action Level exceedances for Northeast Lantau and Northwest Lantau were recorded in the reporting period respectively. Following the review of monitoring data and marine works details in accordance with the procedures stipulated in the Event and Action Plan of the Updated EM&A Manual, the recorded exceedances were considered to be due to natural variation of dolphin ranging pattern. Detailed investigation findings are presented in *the First to Third Quarterly EM&A Report*.

Cumulative statistics are provided in *Appendix H*.

2.10 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

The Environmental Complaint Handling Procedure is provided in *Figure 2.4*.

No non-compliance event was recorded during the reporting period.

Two complaints were recorded during this reporting period. The first complaint/ enquiry case was notified by the Contractor on 25 April 2014. The investigation findings showed that the case was considered not related to the works under this Contract and is thus invalid. Another complaint case was referred by EPD on 29 October 2014. The interim report was submitted to EPD on 6 November 2014. The investigation findings showed that the case was considered not related to the works under this Contract and is thus invalid. Detailed investigation findings are provided in *Appendix L* of the *Seventh and Thirteenth EM&A Monthly Reports*.

No summons/ prosecution was received during the reporting period.

Statistics on complaints, notifications of summons and successful prosecutions are summarized in *Appendix H*.

2.11 COMPARISON OF EM&A DATA WITH EIA PREDICTIONS

Findings of the EM&A activities undertaken during the period from 1 November 2013 to 31 October 2014 were compared with the relevant EIA predictions where appropriate to provide a review of the validity of the EIA predictions and identify potential shortcomings in the EIA recommendations.

Impact monitoring for air quality, water quality and marine ecology were undertaken during the reporting period. Whilst occasional Action Level exceedances on air quality and water quality were observed in the reporting period, the exceedances were considered not related to this Contract upon further investigation. The impact monitoring results for air quality and water quality are considered to be in line with the EIA predictions.

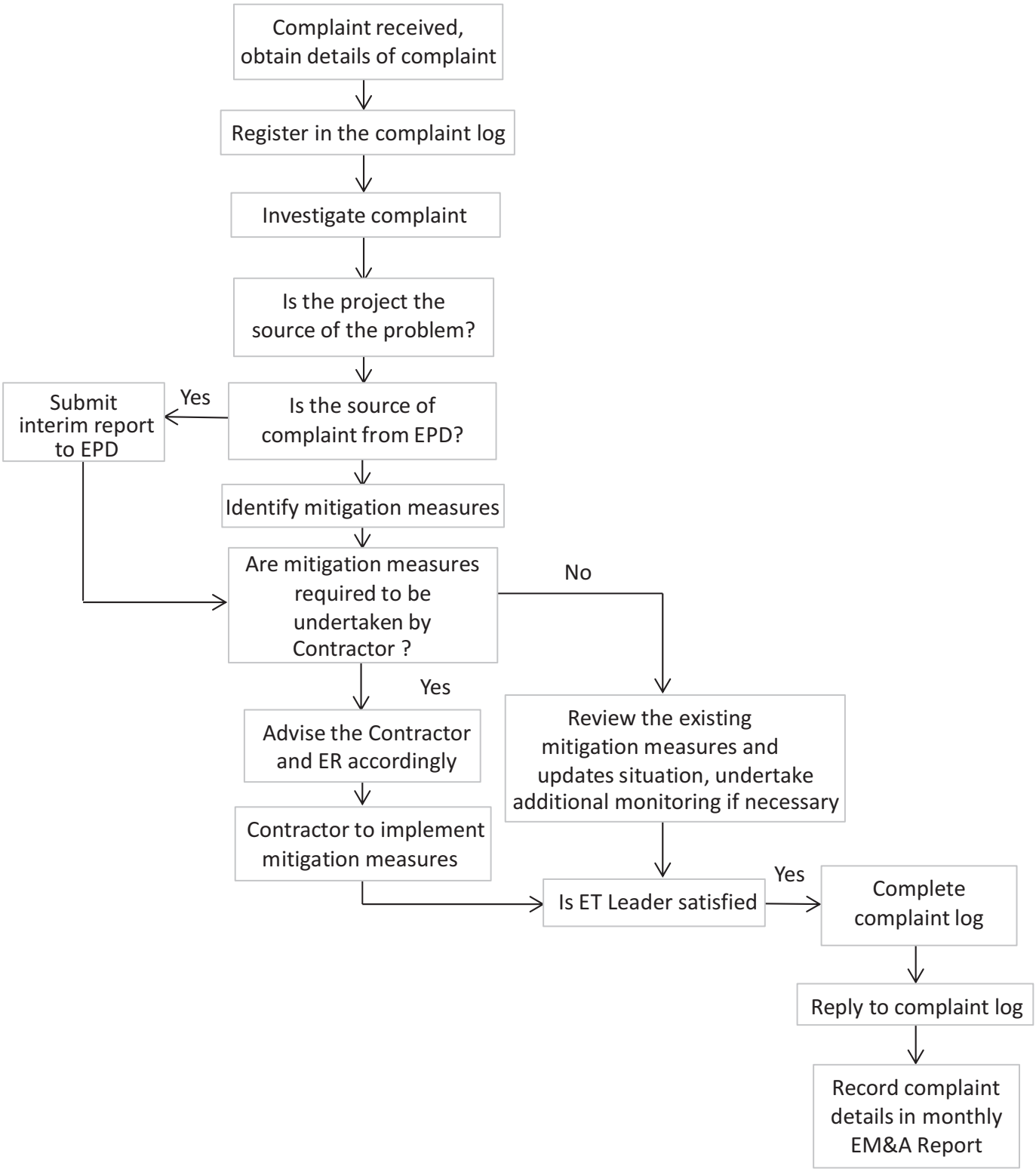

Figure 2.4 Environmental Complaint Handling Procedure

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2.11.1 Air Quality

Based on the findings presented in TM-CLKL EIA study, the major sources of dust nuisance arising from the Northern Connection are related to excavation, wind erosion from reclaimed areas, open sites and stockpiling areas. Therefore during these construction activities, the TSP monitoring frequency will be increased at all air quality monitoring stations such that any deteriorating air quality can be readily detected and timely action taken to rectify the situation. Comparison of EIA prediction, average baseline monitoring and average impact monitoring results of TSP is presented in Table 2.26.

Table 2.26 Comparison of EIA prediction and EM&A Results on Air Quality (μg/m³)

Station	EIA Predicted Maximum	Maximum Impact Monitoring	Average Impact Monitoring	Maximum Baseline Monitoring	Average Baseline Monitoring
ASR1 (1-hour)	195	474	178	182	125
ASR1 (24-hour)	148	249	101	173	128
ASR5 (1-hour)	235	559	194	211	138
ASR5 (24-hour)	133	258	106	249	167
AQMS1 (1-hour)	N/A	431	141	196	131
AQMS1 (24-hour)	N/A	228	86	211	127
AQMS2/ASR6 (1-hour)	226	425	163	226	135
AQMS2/ASR6 (24-hour)	153	269	94	221	166
ASR10 (1-hour)	189	645	121	215	134
ASR10 (24-hour)	112	166	72	181	129

As shown in *Table 2.26*, maximum 1-hour and 24-hour TSP impact monitoring levels at ASR1, ASR5, ASR6 and ASR10 were higher than their corresponding EIA predicted maximum levels. In baseline monitoring, maximum baseline levels of 1-hour TSP at ASR10 and 24-hour TSP at ASR1, ASR5, ASR6 and ASR10 were also higher than EIA maximum prediction. These recorded maximum monitoring values during both impact and baseline monitoring periods are thus considered as sporadic events and fluctuation of regional air quality. Overall, most of the monitoring results were within EIA predicted levels during impact monitoring period. It thus appeared that the construction activities of the Contract did not cause significant impact on air quality with similar average TSP levels between the baseline and impact monitoring. The EIA has concluded that no adverse residual construction dust impacts will occur after implementation of mitigation measures. Thus, the monitoring results are considered to be in line with the EIA prediction.

2.11.2 Water Quality

As identified in the EIA Report, key water quality issues during construction phase will be dredging and filling works for the reclamation. Thus, Marine water quality monitoring shall be carried out during the construction phase to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to dredging and filling activities could be readily detected and timely action be taken to rectify the situation.

According to the EIA prediction, no SS exceedance is anticipated from this Project at the water sensitive receivers nearby the vicinity of Contract (WSR 12, WSR 13 and WSR 47a). Although six (6) Action Level exceedances and one (1) Limit Level exceedance on depth-averaged SS were recorded in the reporting period, the exceedances were considered not related to this Contract upon further investigation. Furthermore, the construction impact on depth-averaged SS was assessed to compare the annual mean values of depth-averaged SS with the relevant ambient mean values. Results showed that the annual mean values of depth-averaged SS at all monitoring stations are well below the ambient mean values (*Table 2.27*), thus the impact monitoring results are considered to in line with the EIA prediction.

DO levels from surface, mid-depth and bottom waters were generally similar amongst Control, Impact stations and Sensitive Receivers, and DO levels were variable throughout the reporting period which represented natural background fluctuation in water quality. Similar to DO levels, turbidity and SS levels were generally comparable amongst Control, Impact stations and Sensitive Receivers and variable throughout the monitoring period. High levels of turbidity and SS were occasionally recorded during both mid-ebb and mid-flood tides. Such fluctuations were also observed during baseline monitoring and are considered to be sporadic events and characteristic of water quality in this area of Hong Kong.

The annual means of DO levels during impact period were higher than the means of DO levels measured during baseline period. The annual means of depth-averaged SS and Turbidity during impact period were lower than the means of depth-averaged SS and Turbidity measured during baseline period. One way Analysis of Variance (ANOVA) was conducted to test for the differences between the baseline and impact monitoring data of Dissolved Oxygen, Turbidity and Suspended Solids at the designated water quality monitoring locations. The detailed statistical and graphical results, as presented in *Section 2.2.3* and *Appendix E* respectively, show that depth-averaged SS and Turbidity levels were significantly lower between baseline period and impact period. Thus, the impact monitoring results are considered to in line with the EIA prediction.

Table 2.27 Comparison between Annual Mean and Ambient Mean Values of Depth-averaged Suspended Solids (mg/L)

Station	Baseline Mean		Ambient Mean [(a)]		Annual Mean (November 2013 to October 2014)	
	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
CS4	10.2	9.0	13.3	11.7	5.3	5.2
CS6	10.9	11.7	14.1	15.2	5.1	5.3
IS12	9.2	9.5	12.0	12.3	5.3	5.4
IS13	10.0	10.5	13.0	13.7	5.2	5.2
IS14	10.4	9.7	13.5	12.6	5.3	5.3
IS15	9.6	11.0	12.5	14.2	5.3	5.4
SR10A	10.3	10.2	13.3	13.3	5.3	5.2
SR8	10.1	11.3	13.1	14.7	5.2	5.3
SR9	8.8	9.9	11.4	12.8	5.2	5.3
Grand Total	**10.0**	**10.3**	**13.0**	**13.4**	**5.2**	**5.3**

Notes:
(a) Ambient mean value is defined as a 30% increase of the baseline mean value

2.11.3 Marine Ecology

Impact monitoring on marine ecology was undertaken during the monitoring period. Post-Translocation Coral Monitoring is considered to be undertaken successfully as the translocated corals did not show any sign of deterioration in condition at the receptor site during the First to Forth Quarterly Post-translocation Coral Monitoring survey. The results are considered to be in line with the EIA prediction.

According to the baseline results in the *Appendix F* of the approved EIA Report, the dolphin groups were largely sighted near Lung Kwu Chau and the waters between Lung Kwu Chau and Black Points and infrequently along the alignment of this Contract. Two-way ANOVAs with repeated measures were conducted to compare results of average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) between baseline and impact periods. Although the STG and ANI in impact monitoring period were lower than that before the commencement of this Contract (see *Section 2.3.6*), the distribution pattern was similar between the impact monitoring period and before the commencement (i.e. transition period in 2012 – 2013) of this Contract. In addition, the habitat use pattern between impact monitoring in this reporting period and before the commencement of this contract is largely similar, in which dolphins are observed heavily utilized area around Lung Kwu Chau and less frequently in the North Lantau region where the works area of this Contract is situated. The monitoring results in this reporting period are considered to be in line with the EIA predictions, and the review of monitoring data suggested that no unacceptable impacts was noted from the marine dredging and reclamation activities under this Contract. It is essential to monitor the dolphin usage in North Lantau region for the rest of impact monitoring period to keep track on the trend of dolphin ranging pattern.

2.11.4 Waste Management

For wastes generated from the construction activities include C&D materials (inert and non-inert), chemical wastes, recyclable materials and marine sediments (both categories L and M), the wastes generated were in line with the EIA predictions. For dredged sediment, the quantity of sediments generated was in line with CEDD's allocated disposal volumes as per the marine dumping permit (see Table 2.22). The wastes were also disposed of in accordance with the recommendations of the EIA

2.12 SUMMARY OF MONITORING METHODOLOGY AND EFFECTIVENESS

The EM&A monitoring programme has been reviewed and was considered effective and adequate to cater for the nature of works in progress. No change to the monitoring programme was considered to be necessary.

The EM&A programme will be evaluated as appropriate in the next reporting period and improvements in the EM&A programme will be recommended if deemed necessary.

2.13 SUMMARY OF MITIGATION MEASURES

The mitigation measures stipulated in the Updated EM&A Manual were undertaken by the Contractor in the reporting period. The mitigation measures were reviewed and considered effective. No addition or change on mitigation measures was considered to be necessary.

3 REVIEW OF EM&A PROGRAMME

3.1 SITE INSPECTIONS & AUDITS

Weekly joint environmental site inspections have been conducted in the reporting period to assess the effectiveness of the environmental controls established by the Contractor and the implementation of the environmental mitigation measures recommended in the EIA Report. Findings of the site inspections confirmed that the environmental mitigation measures recommended in the EIA Report were properly implemented by the Contractor, and the recommended mitigation measures have been working effectively. There was no non-compliance recorded during the site inspections and environmental performance complied with environmental requirements.

The requirements for site inspections and audits have been reviewed and were considered as adequate. No change to the requirements was considered to be necessary.

The recommended environmental mitigation measures are also considered to be effective and efficient in reducing the potential environmental impacts associated with the construction phase of the Project. No change was thus considered necessary.

3.2 AIR QUALITY MONITORING

Construction phase air quality monitoring was conducted during this reporting period when land-based construction works were undertaken. Whilst occasional exceedances of Action and Limit Levels for air quality were recorded, following the review of monitoring data and construction works details in accordance with the procedures stipulated in the Event and Action Plan of Updated EM&A Manual, these exceedances were unlikely to be due to the Project's construction works.

The monitoring programme has been reviewed and was considered to be adequate to cater for the nature of works. No change to the requirements was considered to be necessary.

3.3 MARINE WATER QUALITY MONITORING

Construction phase water quality monitoring was conducted during this reporting period when dredging and reclamation works were undertaken. Whilst occasional exceedances of Action and Limit Levels for water quality were recorded, following the review of monitoring data and marine works details in accordance with the procedures stipulated in the Event and Action Plan of Updated EM&A Manual, these exceedances were considered to be due

to natural variation in water quality characteristic of western Hong Kong waters and were unlikely to be due to the Project's marine works.

The monitoring programme has been reviewed and was considered to be adequate to cater for the nature of works. No change to the requirements was considered to be necessary.

3.4 WASTE MANAGEMENT

The waste inspection and audit programme has been implemented during this reporting period. Wastes generated from construction activities have been managed in accordance with the recommendations in the EIA Report, the EM&A Manual, the WMP and other relevant legislative requirements.

The requirements for construction waste management have been reviewed and were considered as adequate. No change to the requirements was considered to be necessary.

3.5 MARINE ECOLOGY MONITORING

Post-Translocation Coral Monitoring has been carried out as per the requirements stipulated in the Detailed Coral Translocation Methodology. Daily marine mammal exclusion zone monitoring and dolphin monitoring during the reporting period were conducted. The monitoring programme has been reviewed and was considered to be adequate to cater for the nature of works. No change to the requirements was considered to be necessary.

3.6 SUMMARY OF RECOMMENDATIONS

Findings of the EM&A programme indicate that the recommended mitigation measures have been properly implemented and working effectively. The EM&A programme has been reviewed and was considered as adequate and effective. No change to the EM&A programme was considered to be necessary.

The EM&A programme will be evaluated as appropriate in the next reporting period and improvements in the EM&A programme will be recommended if deemed necessary.

This First Annual EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 November 2013 to 31 October 2014, in accordance with the Updated EM&A Manual and the requirements of *EP-354/2009/B*.

Air quality (including 1-hour TSP and 24-hour TSP), marine water quality, coral and dolphin monitoring were carried out in the reporting period. Twenty-six Action Level and two Limit Level exceedances for 1-hour TSP, and five Action Level and one Limit Level exceedances for 24-hour TSP were recorded during the reporting period. Six Action Level and one Limit Level exceedances were recorded in marine water quality impact monitoring during the reporting period. No Action Level or Limit Level exceedances were recorded in the post-translocation coral monitoring in the reporting period. Investigation findings suggested that the observed exceedances for air quality monitoring were considered to be sporadic event from the cumulative anthropogenic activities (e.g. traffic emissions from River Trade Terminal) in this area of Hong Kong. The review of water quality monitoring data suggested that no unacceptable impact was resulting from the construction activities under this Contract in the reporting period. Nevertheless, the Contractor was reminded to ensure that all dust mitigation measures are provided at the construction sites.

A total of one hundred and thirty-six (136) groups of five hundred and twelve (512) Chinese White Dolphins (CWDs) were sighted. Whilst five (5) Action Level exceedances were recorded for 3 sets of quarterly dolphin monitoring data between October 2013 and August 2014, no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from the general observations. It is essential to monitor the dolphin usage in North Lantau region for the rest of impact monitoring period to keep track on the trend of dolphin ranging pattern.

Fifty-two weekly environmental site inspections were carried out in the reporting period. Recommendations on remedial actions provided for the deficiencies identified during the site audits were properly implemented by the Contractor. No non-compliance event was recorded during the reporting period.

One potential complaint/ enquiry case was notified by the Contractor on 25 April 2014. The investigation findings showed that the case was considered not related to the works under this Contract and is thus invalid.

One potential environmental complaint case was referred by EPD on 29 October 2014. The investigation findings showed that the case was considered not related to the works under this Contract and is thus invalid.

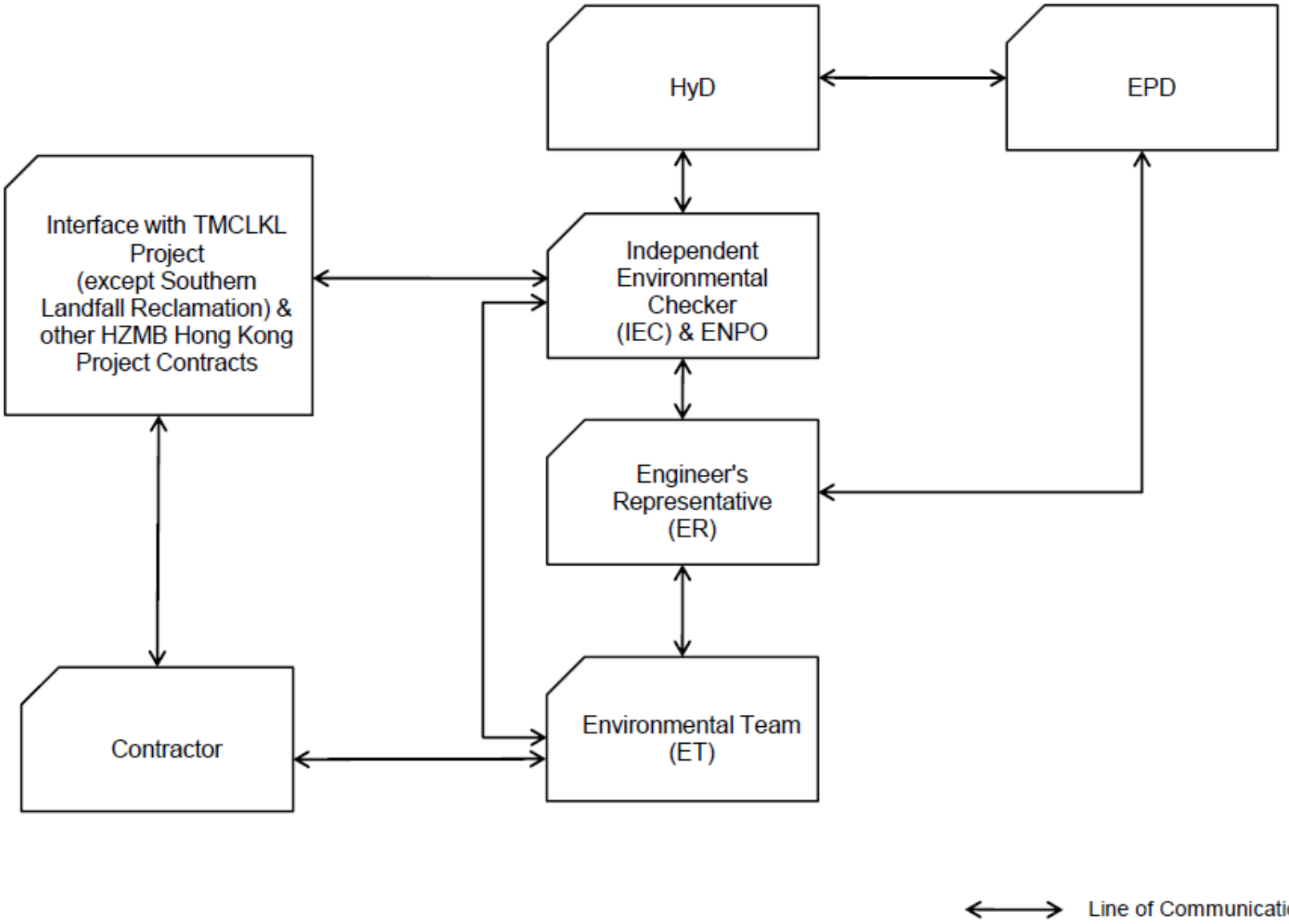
No summons/ prosecution was received during the reporting period.

The review of monitoring data suggested that the construction works under this Contract have proceeded in an environmentally acceptable manner in this reporting period.

The monitoring programme has been reviewed and was considered as adequate to cater for the nature of works in progress. Change to the monitoring programme was thus not recommended at this stage. The monitoring programme will be evaluated as appropriate in the next reporting period. The ET will keep track on the construction works to confirm compliance of environmental requirements and the proper implementation of all necessary mitigation measures.

Appendix A

Project Organization for Environmental Works



Appendix A1

Contract No. HY/2012/08 Northern Connection Sub-sea Tunnel Section
Project Organization

DATE: 06/03/2013

Environmental Resources Management

ERM

Appendix B

Environmental Mitigation and Enhancement Measure Implementation Schedules

Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
Environmental Mitigation and Enhancement Measure Implementation Schedule

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
Air Quality									
4.8.1	3.8	An effective watering programme of twice daily watering with complete coverage, is estimated to reduce by 50%. This is recommended for all areas in order to reduce dust levels to a minimum;	All areas / throughout construction period	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		✓
4.8.1	3.8	Watering of the construction sites in Lantau for 8 times/day and in Tuen Mun for 12 times/day to reduce dust emissions by 87.5% and 91.7% respectively and shall be undertaken.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	The Contractor shall not burn debris or other materials on the works areas.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8. 1	3.8	In hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet.	All unpaved haul roads / throughout construction period in hot, dry or windy weather	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		✓
4.8.1	3.8	Where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. 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.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>
4.8. 1	3.8	Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	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.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
4.8.1	3.8	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.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	No earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to any earthworks excavation activity on the site.	All site exits / throughout construction period	Contractor	TMEIA Avoid dust		Y		✓
4.8.1	3.8	Areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is	All exposed surfaces / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	All stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>
4.11	Section 3	EM&A in the form of 1 hour and 24 hour dust monitoring and site audit.	All representative existing ASRs / throughout construction period	Contractor	EM&A Manual		Y		✓
WATER QUALITY									
Marine Works (Sequence A)									
6.1 Figure 6.2a Appendix D6a	Annex A	Construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. The protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2a and detailed in Appendix D6a. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation;	All areas/ prior to dredging and backfilling works	Contractor	TM-EIAO		Y		✓
6.1	-	a maximum of 50% public fill to be used for all seawall filling below +2.5mPD for TM-CLKL southern and northern landfalls.	TM-CLKL seawall filling	Contractor	TM-EIAO		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.1	-	a maximum of 30% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL southern landfall	TM-CLKL southern landfall reclamation filling	Contractor	TM-EIAO		Y		N/A
6.1	-	a maximum of 100% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL northern landfall	TM-CLKL northern landfall reclamation filling	Contractor	TM-EIAO		Y		✓
6.1	-	Use of cage type silt curtains round allgrab dredgers during the HKBCF, HKLR and TM-CLKL southern reclamation works.	All areas dredging works	Contractor	TM-EIAO		Y		✓
	Figure 1.1 of Annex C	A layer of floating type silt curtain will be applied when dredging and reclamation works are being undertaken at Portion N-a as shown in Figure 1.1 of Annex C of the EM&A Manual.	All areas/ through out marine works	Contractor	TM-EIAO		Y		✓
6.1	-	Trailer suction hopper dredgers shall not allow mud to overflow.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1	-	The use of Lean Material Overboard (LMOB) systems shall be prohibited.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1 Figure 6.2b Appendix D6b	Annex A	For other parts of the reclamation works construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. It should be noted that the protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2b and detailed in Appendices D6b. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation; - Reclamation filling for Portion D of HKBCF; Reclamation filling for FSD berth of HKBCF; and	TM-CLKL northern landfall, Portion D of HKBCF and HKLR	Contractor	TM-EIAO		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
		- Reclamation dredging and filling for Portion 1 of HKLR;							
6.1	-	The filling material for the other parts of the works are the same as Sequence A;	All other areas/backfilling works	Contractor	TM-EIAO		Y		N/A
6.1	5.7	Cage type silt curtain (with steel enclosure) shall be used for grab dredgers working in the site of HKBCF and TM- CLKL southern reclamation. Cage type silt curtains will be applied round all grab dredgers at other works area.	HKBCF, HKLR and TM-CLKL grab dredging	Contractor	TM-EIAO		Y		✓
6.1	Annex A	A layer of floating type silt curtain will be applied around all works as defined in Appendix D6b.	All areas/ through out marine works	Contractor	TM-EIAO		Y		✓
6.1	-	TM-CLKL northern landfall: - Reclamation filling shall not proceed until at least 200m section of leading seawall at both the east and west sides of the reclamation are formed above +2.5 mPD, except for 100m gaps for marine access;	All areas/ through out marine works	Contractor	TM-EIAO		Y		✓
General Marine Works									
6.1	-	Use of TMB for the construction of the submarine tunnel.	Tunnel works / Construction phase	Contractor	TM-EIAO		Y		N/A
6.1	-	Export dredged spoils from NWWCZ.	All areas as much as possible / dredging activities	Contractor	DASO Permit conditions		Y		✓
6.1	-	Where public fill is proposed for filling below +2.5mPD, the fine content in the public fill will be controlled to 25%	All areas/ backfilling works	Contractor	TM-EIAO		Y		N/A
6.1	-	Where sand fill is proposed for filling below +2.5mPD, the fine content in the sand fill will be controlled to 5%.	All areas/ backfilling works	Contractor	TM-EIAO		Y		N.A
6.1	-	Mechanical grabs shall be designed and maintained to avoid spillage and should seal tightly while being lifted.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1	-	Barges and hopper dredgers shall have tight fitting seals to their bottom openings to prevent leakage of material.	All areas/ throughout construction period	Contractor	Marine Fill Committee		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
					Guidelines. DASO permit conditions.				
6.1	-	Any pipe leakages shall be repaired quickly. Plant should not be operated with leaking pipes.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1	-	Loading of barges and hoppers shall be controlled to prevent splashing of dredged material to the surrounding water. Barges or hoppers shall not be filled to a level which will cause overflow of materials or pollution of water during loading or transportation.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1	-	Excess material shall be cleaned from the decks and exposed fittings of barges and hopper dredgers before the vessel is moved.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1	-	Adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action;	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		N/A
6.1	-	All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		N/A
6.1	-	The works shall not cause foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the works site.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
					conditions.				
6.1	5.2	Silt curtain shall have proved effectiveness from the producer and shall be fully maintained throughout the works by the contractor.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	The daily maximum production rates shall not exceed those assumed in the water quality assessment.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	The dredging and filling works shall be scheduled to spread the works evenly over a working day.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
Land Works									
6.1	-	Wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	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.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	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.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	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.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.1	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>

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Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.1	-	Measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.1	-	Open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	5.8	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.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	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.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	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 off site disposal.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		N/A

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.1	-	The Contractor shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance.	All areas/ throughout construction period	Contractor	TM-EIAO Waste Disposal Ordinance		Y		✓
6.1	-	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.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Roadside gullies to trap silt and grit shall be provided prior to discharging the stormwater into the marine environment. The sumps will be maintained and cleaned at regular intervals.	Roadside/design and operation	Design Consultant/ Contractor	TM-EIAO	Y		Y	✓
6.1	Section 5	All construction works shall be subject to routine audit to ensure implementation of all EIA recommendations and good working practice.	All areas/ throughout construction period	Contractor	EM&A Manual		Y		✓
Water Quality Monitoring									
6.1	Section 5	Water quality monitoring shall be undertaken for suspended solids, turbidity, and dissolved oxygen. Nutrients and metal parameters shall also be measured for Mf sediment operations (only HKBCF and HKLR required handling of Mf sediment) during baseline, backfilling and post construction period. One year operation phase water quality monitoring at designated stations.	Designated monitoring stations as defined in EM&A Manual, Section 5/ Before, through-out marine construction period, post construction and monthly operational phase water quality monitoring for a year.	Contractor	EM&A Manual		Y	Y	✓
ECOLOGY									

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
8.14	6.3	Specification for and implement pre, during and post construction dolphin abundance monitoring.	All Areas/Detailed Design/ during construction works/post construction	Design Consultant/ Contractor	TMEIA	Y	Y	Y	✓
8.14	6.3,6.5	Specification and implementation of 250m dolphin exclusion zone.	All dredging and reclamation areas/Detailed Design/during all reclamation and dredging works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.3, 6.5	Specification and deployment of an artificial reef of an area of 3,600m2 in an area where fishing activities are prohibited.	Area of prohibited fishing activities/Detailed Design/towards end of construction period	TM-CLKL/ HKBCF Design Consultant/TM-CLKL/ HKBCF Contractor	TMEIA	Y		Y	N/A. To be implemented by AFCD.
8.14	6.3, 6.5	Specification and implementation of marine vessel control specifications	All areas/Detailed Design/during construction works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.14	6.3, 6.5	Design and implementation of acoustic decoupling methods for dredging and reclamation works	All areas/ Detailed Design/during dredging and reclamation works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.5	Audit coral translocation success	Post translocation	Contractor	TMEIA		Y		✓
7.13	6.5	The loss of habitat shall be supplemented by enhancement planting in accordance with the landscape mitigation schedule.	All areas / As soon as accessible	Contractor	TMEIA		Y		N/A.
7.13	6.5	Spoil heaps shall be covered at all times.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Avoid damage and disturbance to the remaining and surrounding natural habitat	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
7.13	6.5	Construction activities should be restricted to the proposed works boundary.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
LANDSCAPE AND VISUAL									
10.9	7.6	The colour and shape of the toll control buildings, ventilation building and administration building shall adopt a design which could blend it into the vicinity elements, and the details will be developed in detailed design stage (DM2)	All areas/detailed design	Design Consultant	TMEIA	Y			N/A
10.9	7.6	Aesthetic design of the viaduct, retaining wall and other structures will be developed under ACABAS submission (DM5)	All areas/detailed design	Design Consultant	TMEIA	Y			N/A
10.9	7.6	Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Control night-time lighting and glare by hooding all lights (CM6)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Ensure no run-off into water body adjacent to the Project Area (CM7)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (CM8)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes shall be incorporated to all buildings, engineering structures and associated infrastructure facilities (OM5)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	N/A
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (OM6)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	N/A
WASTE									
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
12.6		The Contractor shall prepare and implement a Waste Management Plan which specifies procedures such as a ticketing system, to facilitate tracking of loads and to ensure that illegal disposal of wastes does not occur, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. A recording system for the amount of waste generated, recycled and disposed (locations) should be established.	Contract mobilisation	Contractor	TMEIA, Works Branch Technical Circular No. 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material		Y		✓
12.6		The Contractor shall apply for and obtain the appropriate licenses for the disposal of public fill, chemical waste and effluent discharges.	Contract mobilisation	Contractor	TMEIA, Land (Miscellaneous Provisions) Ordinance (Cap 28); Waste Disposal Ordinance (Cap 354); Dumping at Sea Ordinance (Cap 466); Water Pollution Control Ordinance.		Y		✓
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures including waste reduction, reuse and recycling.	Contract Mobilisation	Contractor	TMEIA		Y		✓
12.6	8.1	The extent of cutting operation should be optimised where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	The surplus surcharge should be transferred to a fill bank	Reclamation areas / after surcharge works	Contractor	TMEIA		Y		N/A
12.6	8.1	Rock armour from the existing seawall should be reused on the new sloping seawall as far as possible	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		<>

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
12.6	8.1	No waste shall be burnt on site.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Provisions to be made in contract documents to allow and promote the use of recycled aggregates where appropriate.	Detailed Design	Design Consultant	TMEIA	Y			✓
12.6	8.1	The Contractor shall be prohibited from disposing of C&D materials at any sensitive locations. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust/ surface run off.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Dredged marine mud shall be disposed of in a gazetted marine disposal ground under the requirements of the Dumping at Seas Ordinance.	Reclamation areas / throughout dredging works	Contractor	TMEIA		Y		✓
12.6	8.1	Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork/plastic facing for construction works should be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should avoid over-ordering and wastage.	All areas / throughout construction period	Contractor	TMEIA		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
12.6	8.1	The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by scrap steel mills. Different areas of the sites should be considered for segregation and storage activities.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows: *f* suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed; *f* Having a capacity of <450L unless the specifications have been approved by the EPD; and *f* Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations. *f* Clearly labelled and used solely for the storage of chemical wastes; *f* Enclosed with at least 3 sides; *f* Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest; *f* Adequate ventilation; *f* Sufficiently covered to prevent rainfall	All areas / throughout construction period	Contractor	TMEIA		Y		<>

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
		entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and *f* Incompatible materials are adequately separated.							
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
12.6	8.1	General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. 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. Burning of refuse on construction sites is prohibited.	All areas / throughout construction period	Contractor	TMEIA		Y		<>
12.6	8.1	All waste containers shall be in a secure area on hardstanding;	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Office wastes can be reduced by recycling of paper if such volume is sufficiently large to warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminium cans, plastic bottles, etc should be provided on-site.	Site Offices/ throughout construction period	Contractor	TMEIA		Y		✓

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
12.6	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All areas / throughout construction period	Contractor	EM&A Manual		Y		✓
CULTURAL HERITAGE									
11.8	Section 9	EM&A in the form of audit of the mitigation measures	All areas / throughout construction period	Highways Department	EIAO-TM		Y		N/A

*** Remarks:**

✓	Compliance of Mitigation Measures
<>	Compliance of Mitigation but need improvement
x	Non-compliance of Mitigation Measures
▲	Non-compliance of Mitigation Measures but rectified by Contractor
Δ	Deficiency of Mitigation Measures but rectified by Contractor
N/A	Not Applicable in Reporting Period

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Appendix C

Summary of Action and Limit Levels

Table C1 Action and Limit Levels for 1-hour and 24-hour TSP

Parameters	Action	Limit
24 Hour TSP Level in μg/m³	ASR1 = 213 ASR5 = 238 AQMS1 = 213 ASR6 = 238 ASR10 = 214	260
1 Hour TSP Level in μg /m³	ASR1 = 331 ASR5 = 340 AQMS1 = 335 ASR6 = 338 ASR10 = 337	500

Table C2 Action and Limit Levels for Water Quality

Parameter	Action Level#	Limit Level#
DO in mg/L [(a)]	Surface and Middle **5.0 mg/L** Bottom **4.7 mg/L**	Surface and Middle **4.2 mg/L** Bottom **3.6 mg/L**
Turbidity in NTU (Depth-averaged [(b), (c)])	120% of upstream control station at the same tide of the same day and 95%-ile of baseline data, i.e., **27.5 NTU**	130% of upstream control station at the same tide of the same day and 99%-ile of baseline data, i.e., **47.0 NTU**
SS in mg/L (Depth-averaged [(b), (c)])	120% of upstream control station at the same tide of the same day and 95%-ile of baseline data, i.e., **23.5 mg/L**	130% of upstream control station at the same tide of the same day and 10mg/L for WSD Seawater Intakes at Tuen Mun and 99%-ile of baseline data, i.e., **34.4 mg/L**

Notes:

Baseline data: data from HKZMB Baseline Water Quality Monitoring between 6 and 31 October 2011.

(a) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

(b) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths

(c) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

(d) All figures given in the table are used for reference only, and EPD may amend the figures whenever it is considered as necessary

(e) The 1%-ile of baseline data for surface and middle DO is 4.2 mg/L, whilst for bottom DO is 3.6 mg/L.

Table C3 Action and Limit Levels for Impact Dolphin Monitoring

	North Lantau Social Cluster	
	NEL	**NWL**
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	

Notes:

1. STG means quarterly encounter rate of number of dolphin sightings, which is **6.00 in NEL** and **9.85 in NWL** during the baseline monitoring period
2. ANI means quarterly encounter rate of total number of dolphins, which is **22.19 in NEL** and **44.66 in NWL** during the baseline monitoring period
3. For North Lantau Social Cluster, AL will be trigger if NEL or NWL fall below the criteria; LL will be triggered if both NEL and NWL fall below the criteria.

Table C4 Derived Value of Action Level (AL) and Limit Level (LL)

	North Lantau Social Cluster	
	NEL	**NWL**
Action Level	STG < 4.2 & ANI< 15.5	STG < 6.9 & ANI < 31.3
Limit Level	NEL = [STG < 2.4 & ANI <8.9] and NWL = [STG < 3.9 & ANI <17.9]	

Appendix D

Impact Air Quality Monitoring Results

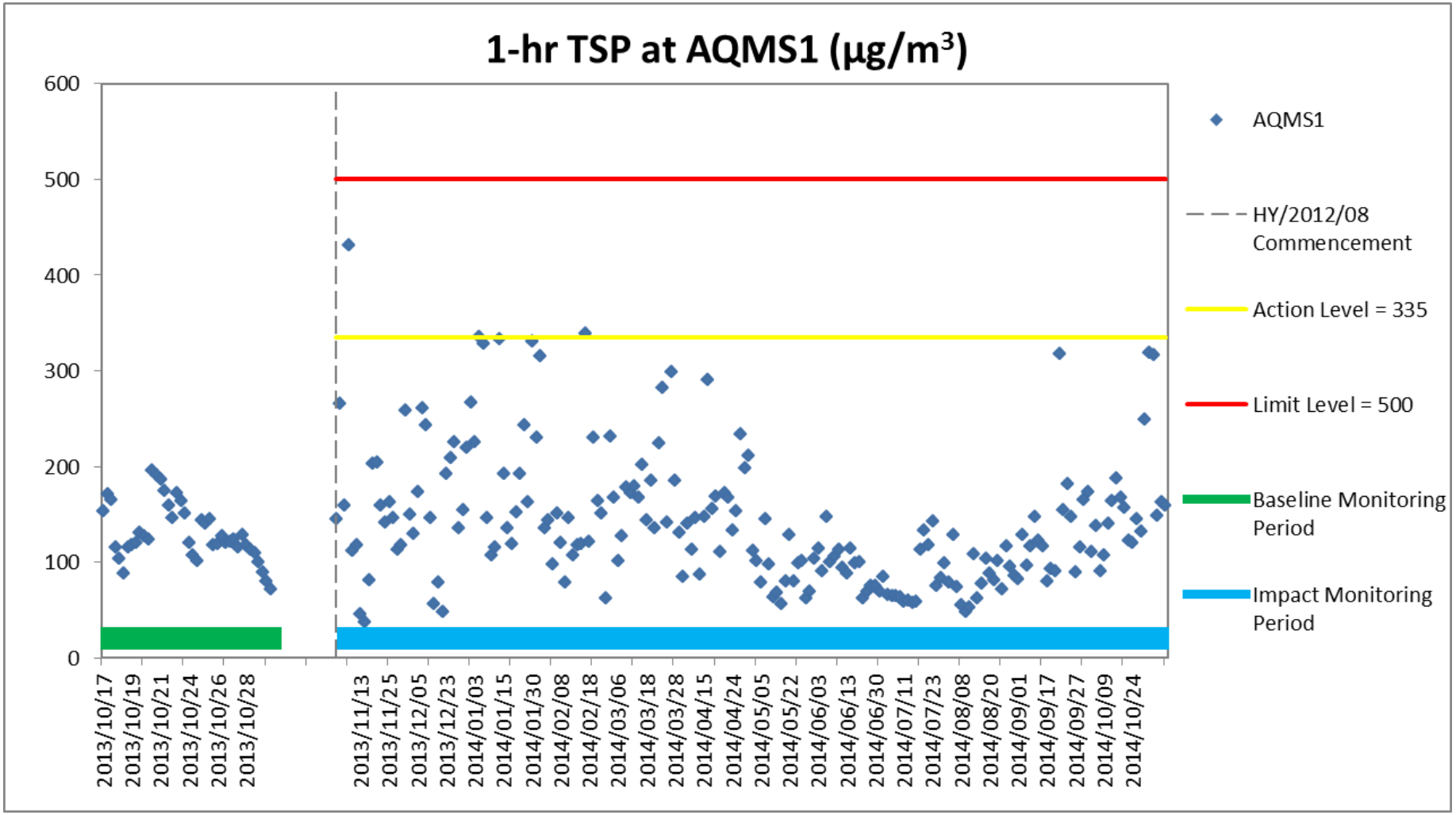

Figure D.1 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at AQMS1 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

ERM

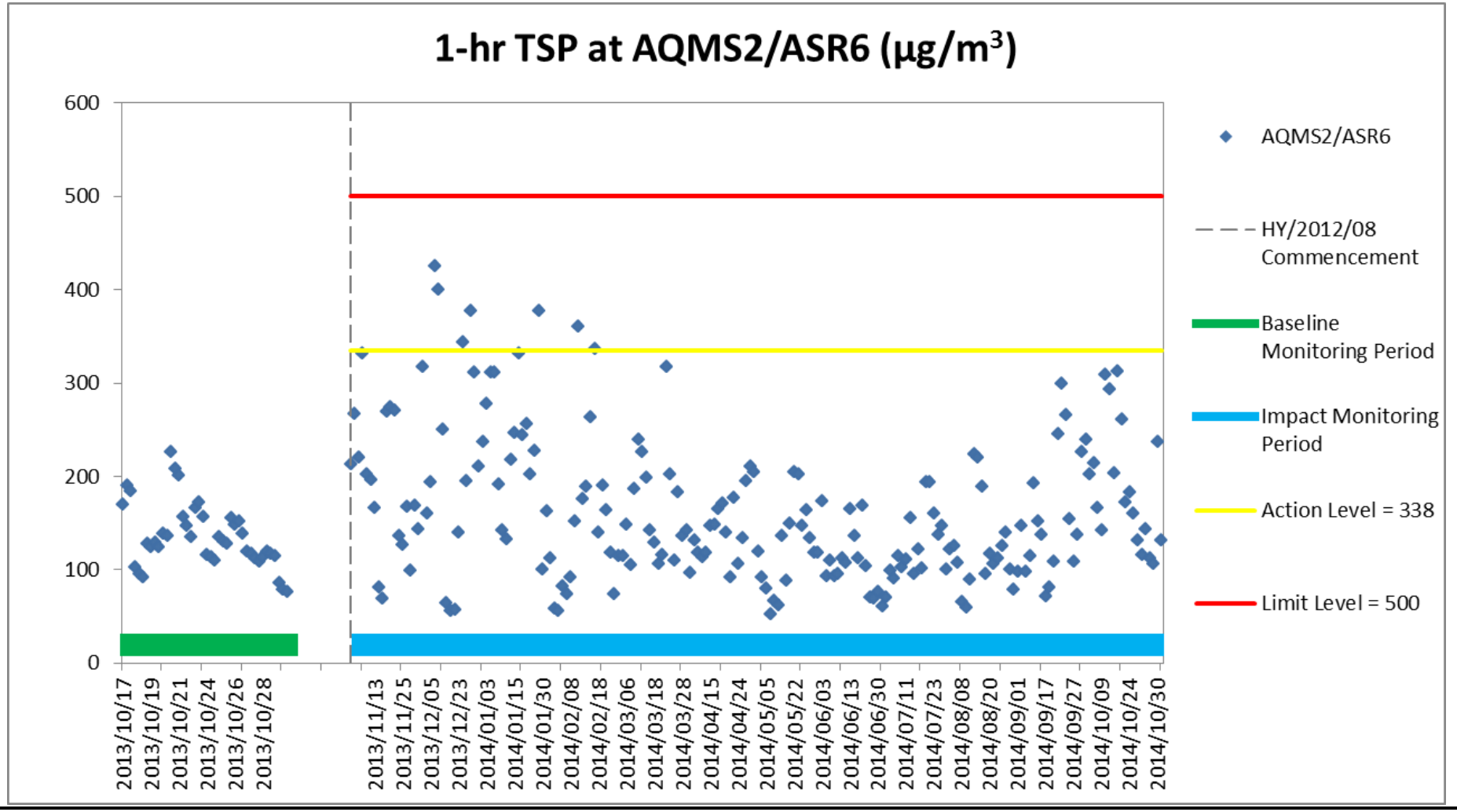

Figure D.2 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at AQMS2/ASR6 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

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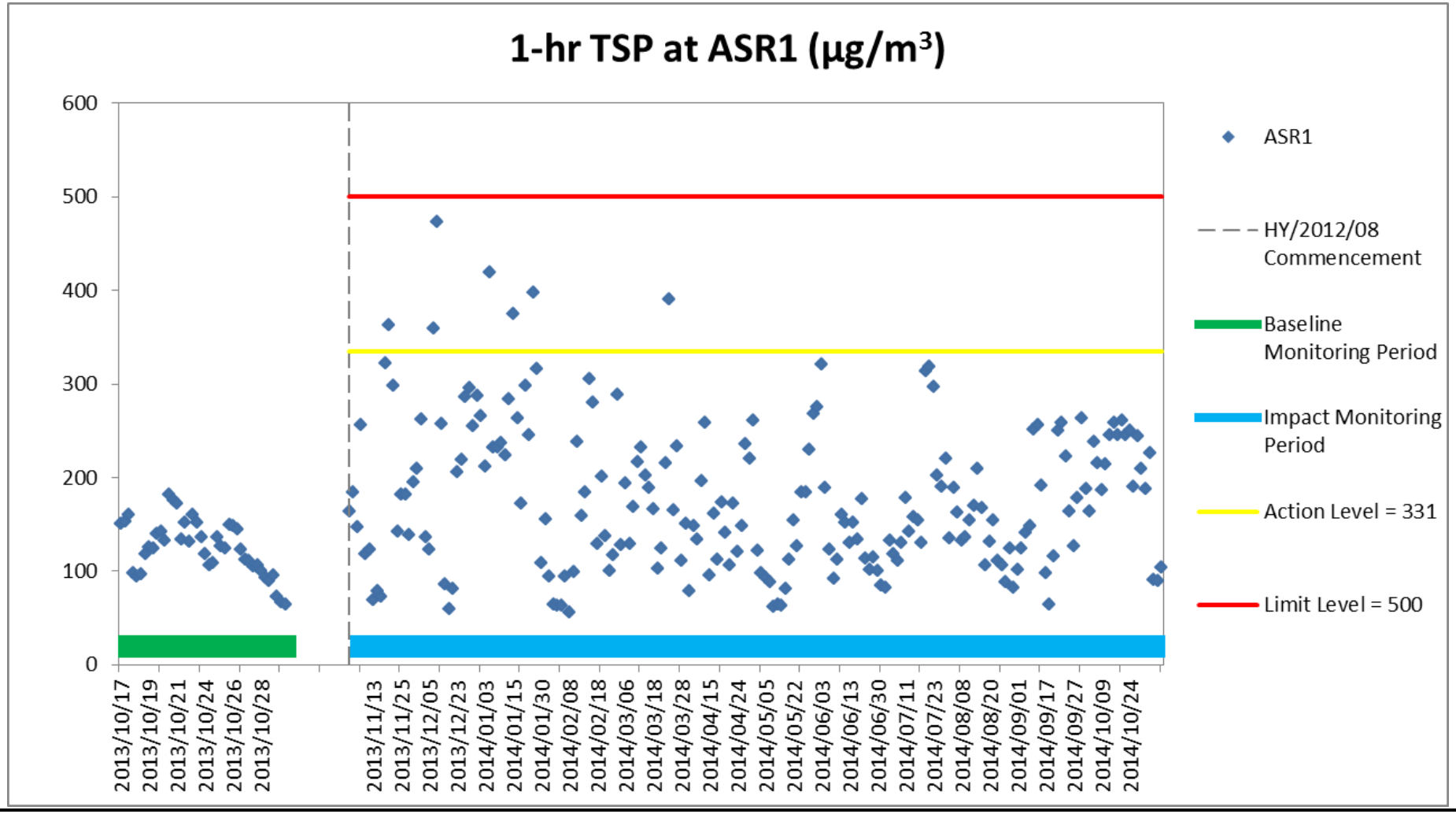

Figure D.3 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at ASR1 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

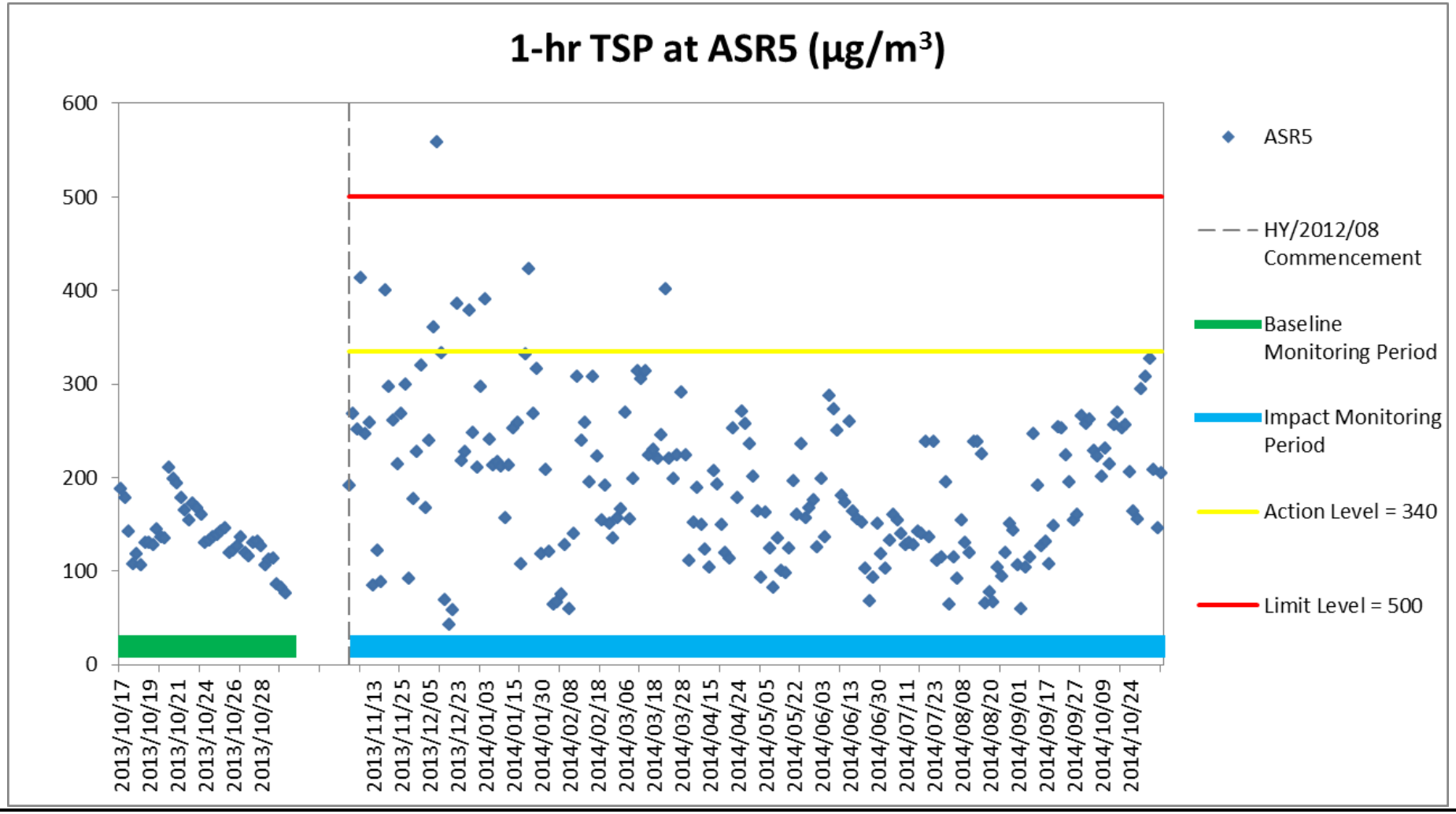

Figure D.4 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at ASR5 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

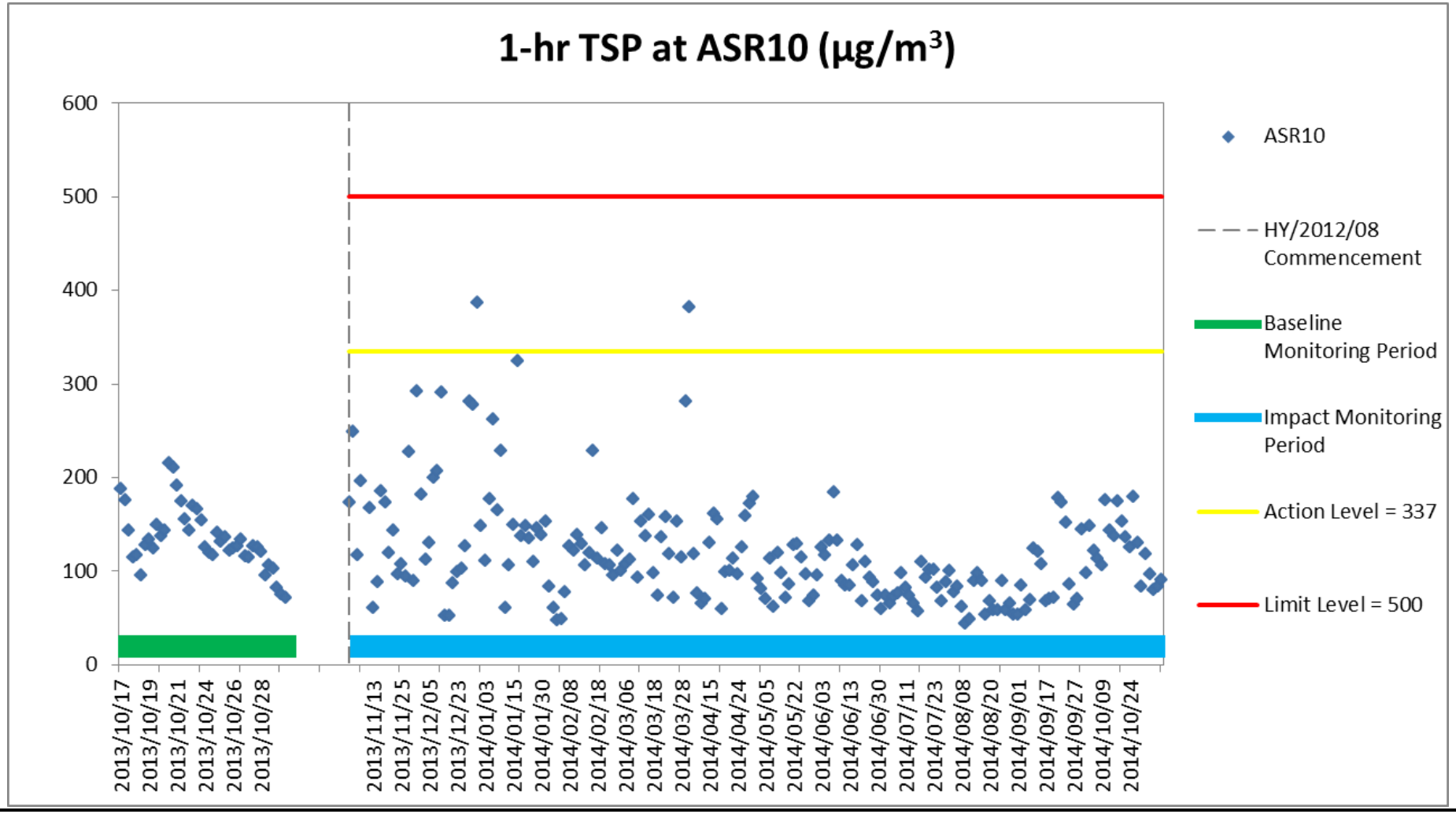

Figure D.5 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at ASR10 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

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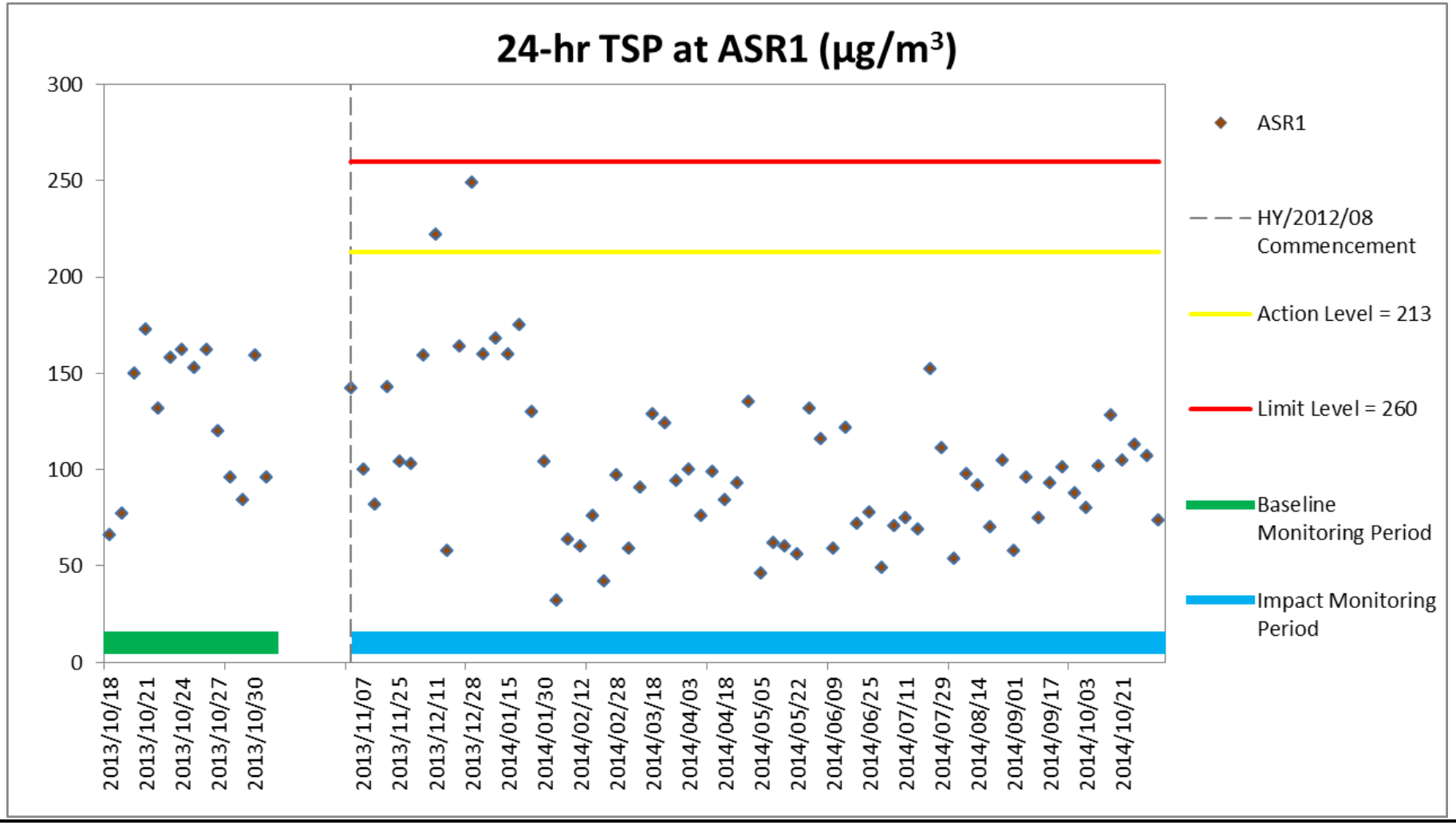

Figure D.6 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at ASR1 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

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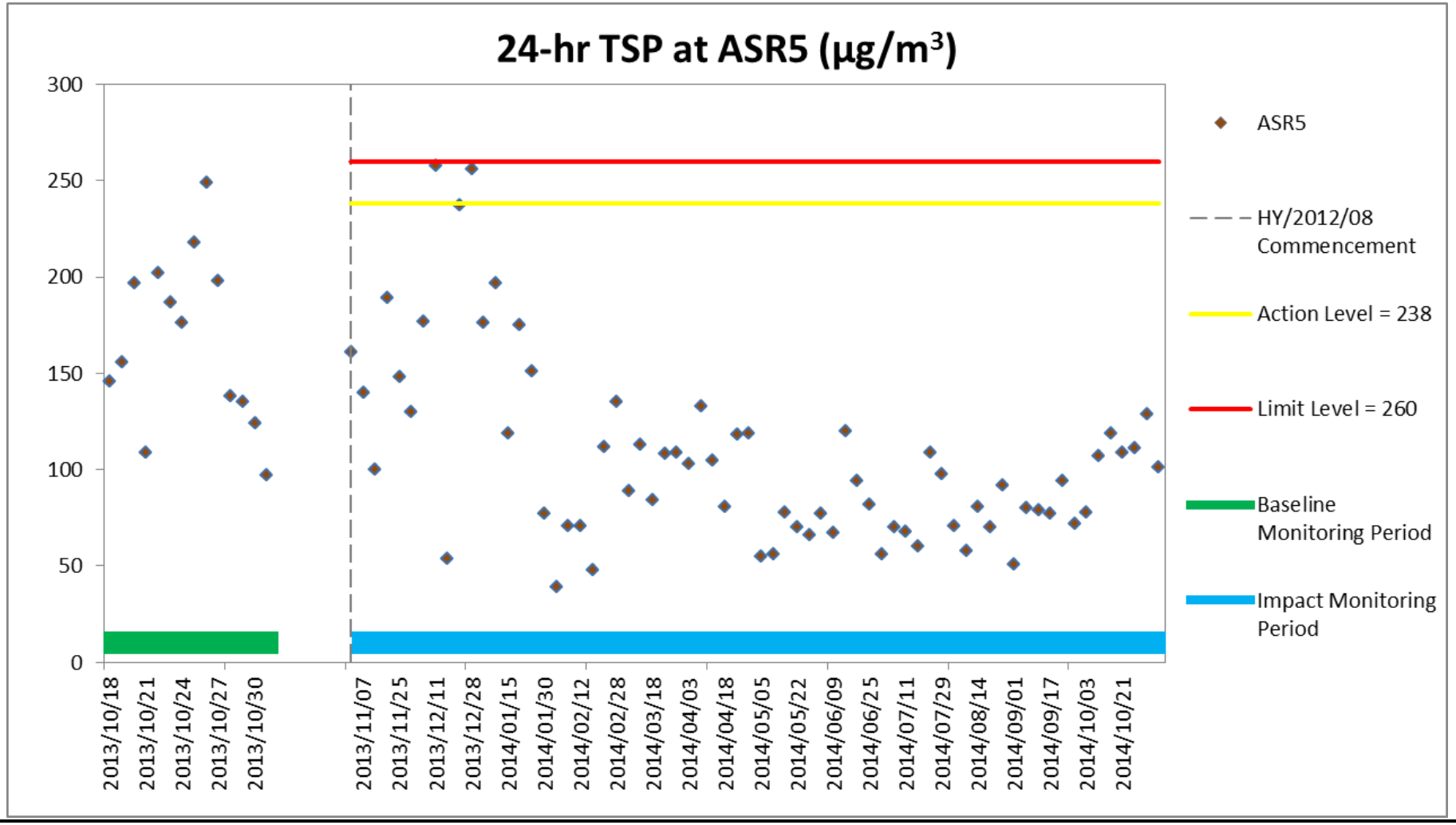

Figure D.7 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at ASR5 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

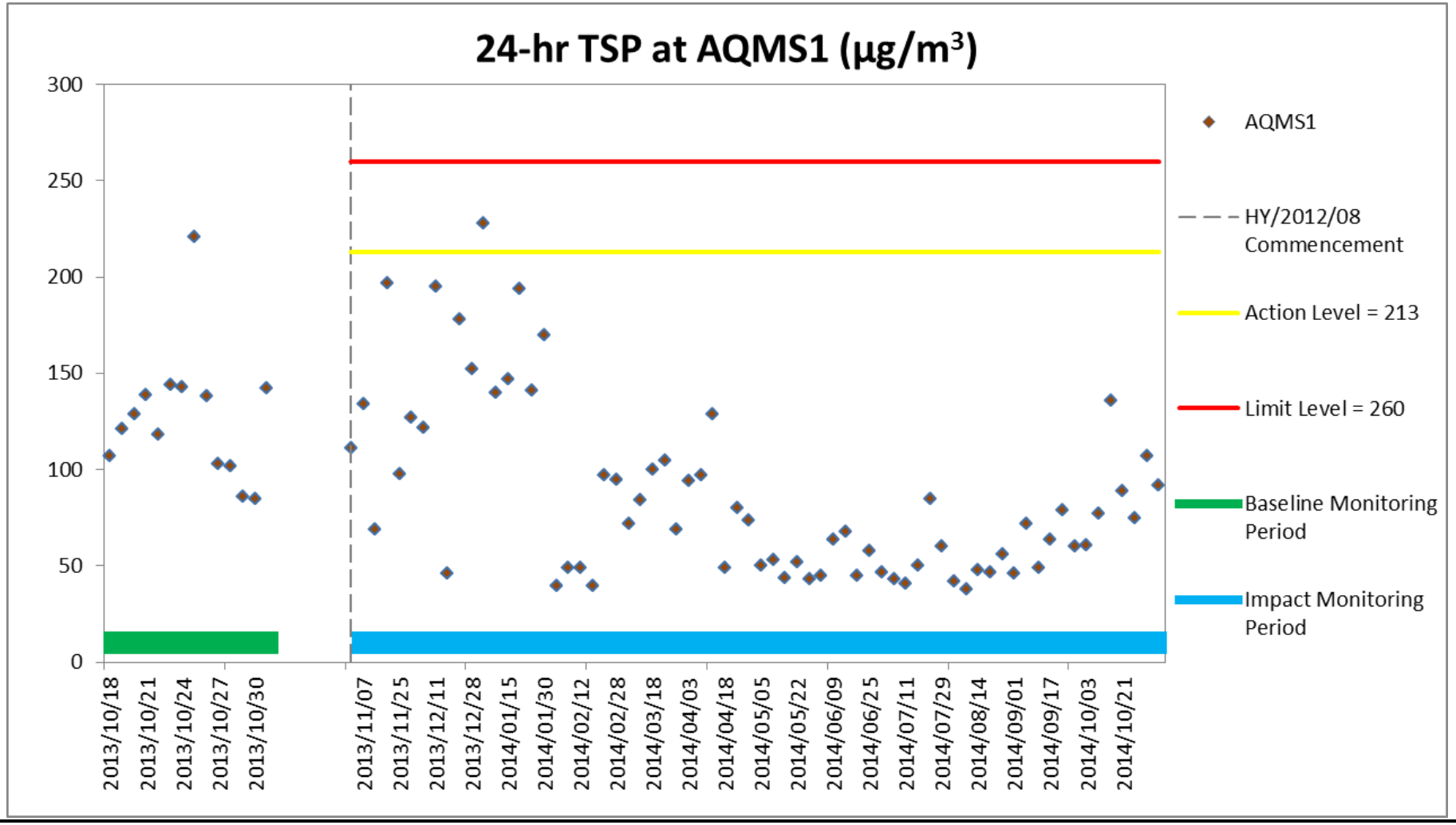

Figure D.8 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at AQMS1 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

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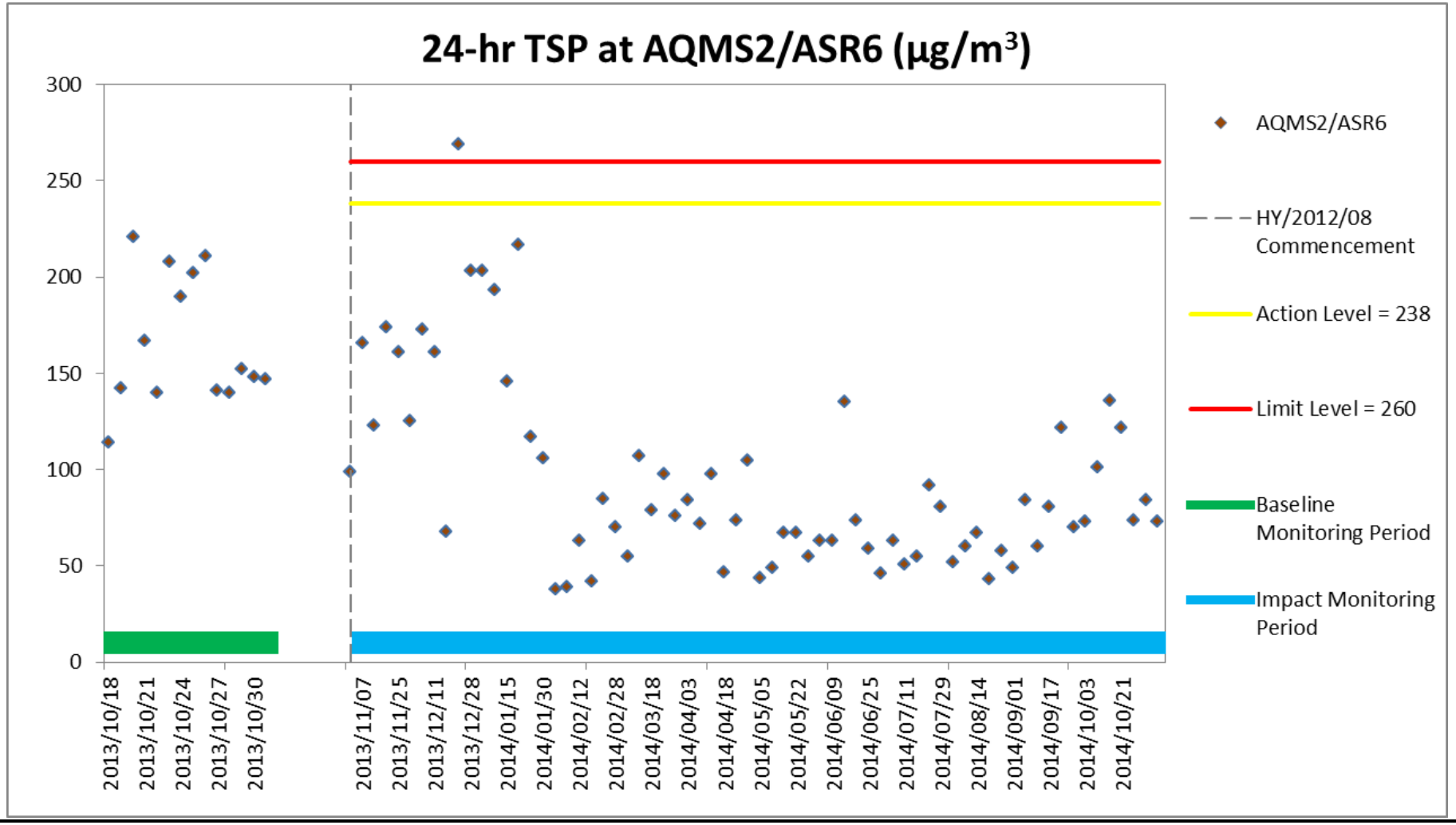

Figure D.9 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at AQMS2/ASR6 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

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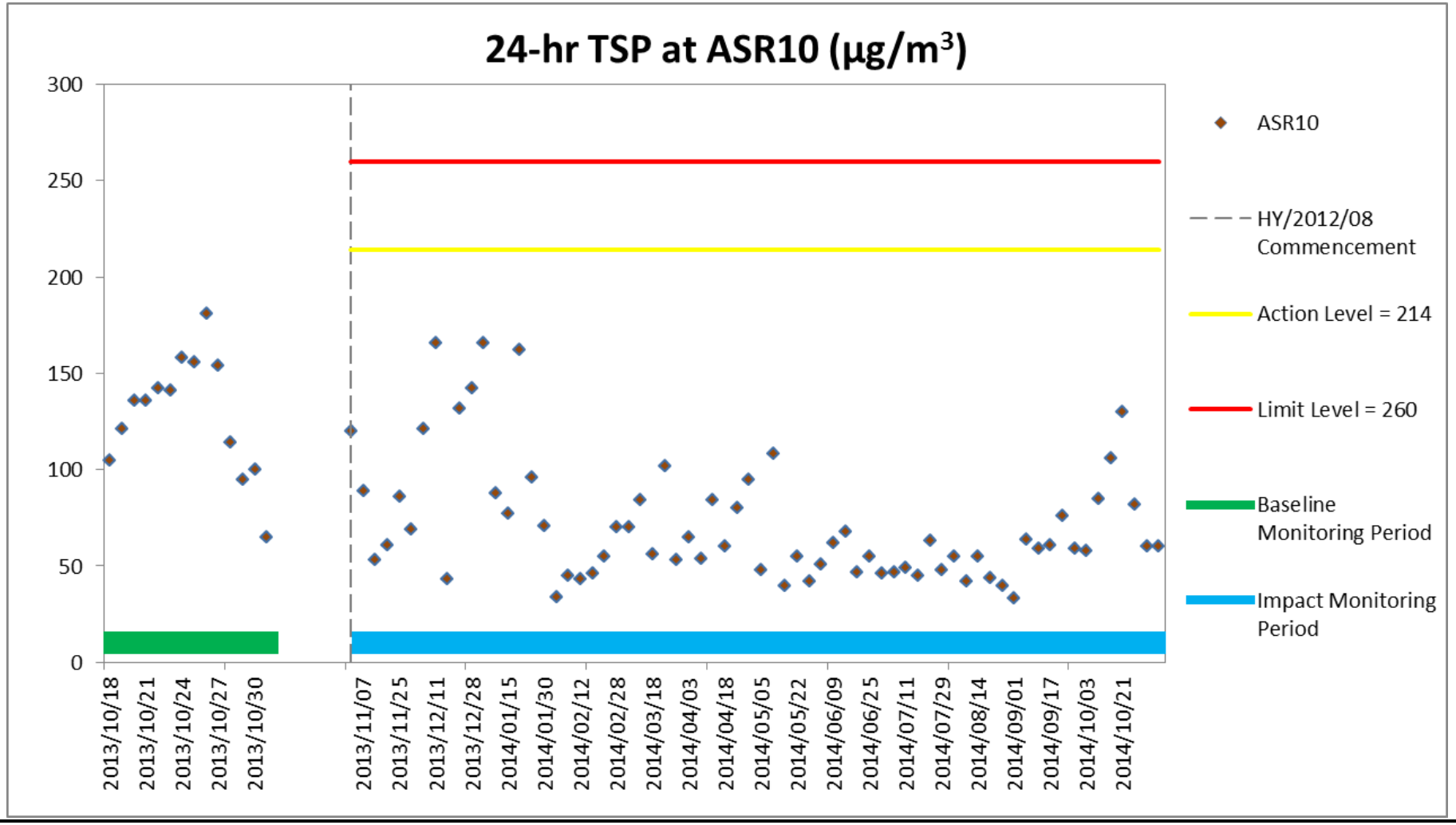
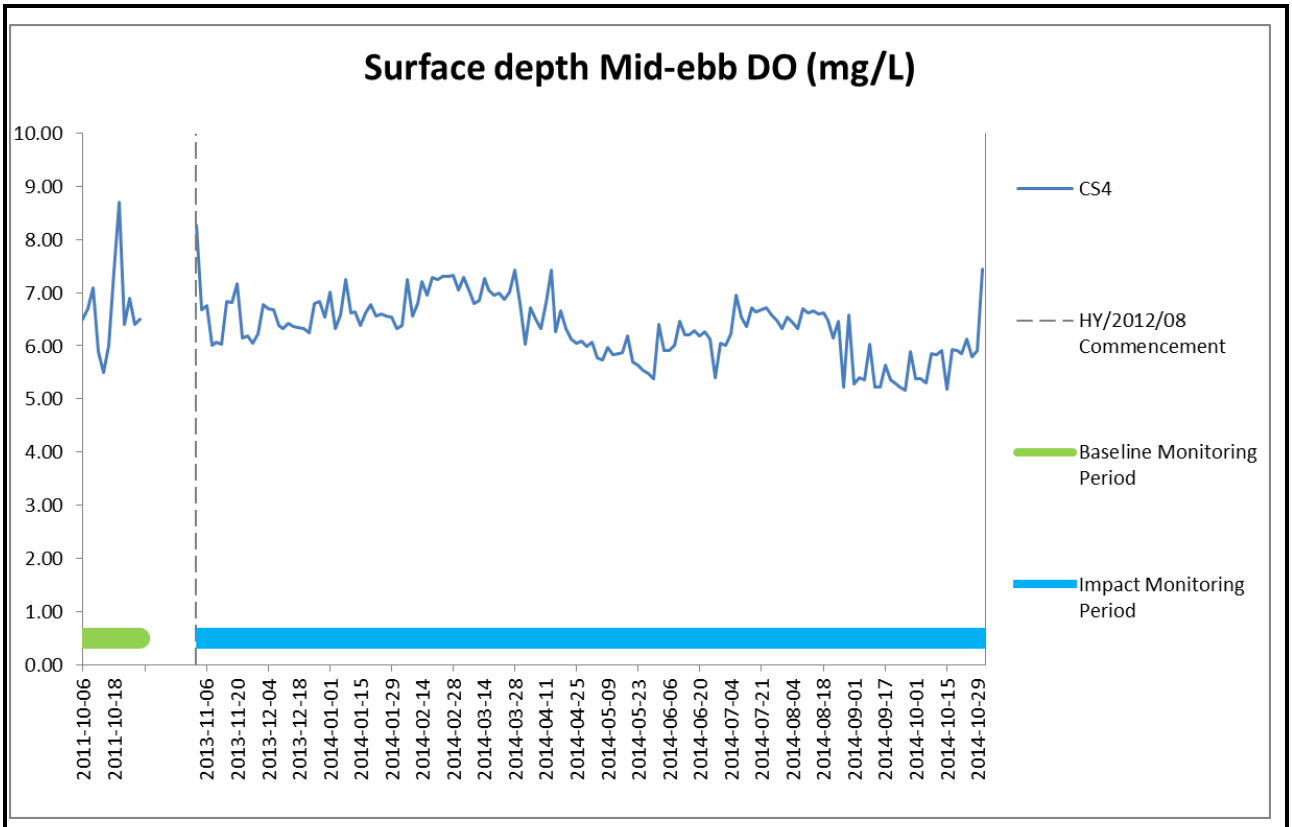


Figure D.10 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at ASR10 between 17 October 2013 and 31 October 2014 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Sorting of rock material, Site formation works, Site office construction, Diaphragm Wall Construction, Vibro-Compaction, Excavation for North Launching Shaft, Land Bored Piling Works & Surcharge set up. *Ref: 0212330_Impact AQM graphs_1stAnnual_REV a.xlsx*

Appendix E

Impact Water Quality Monitoring Results



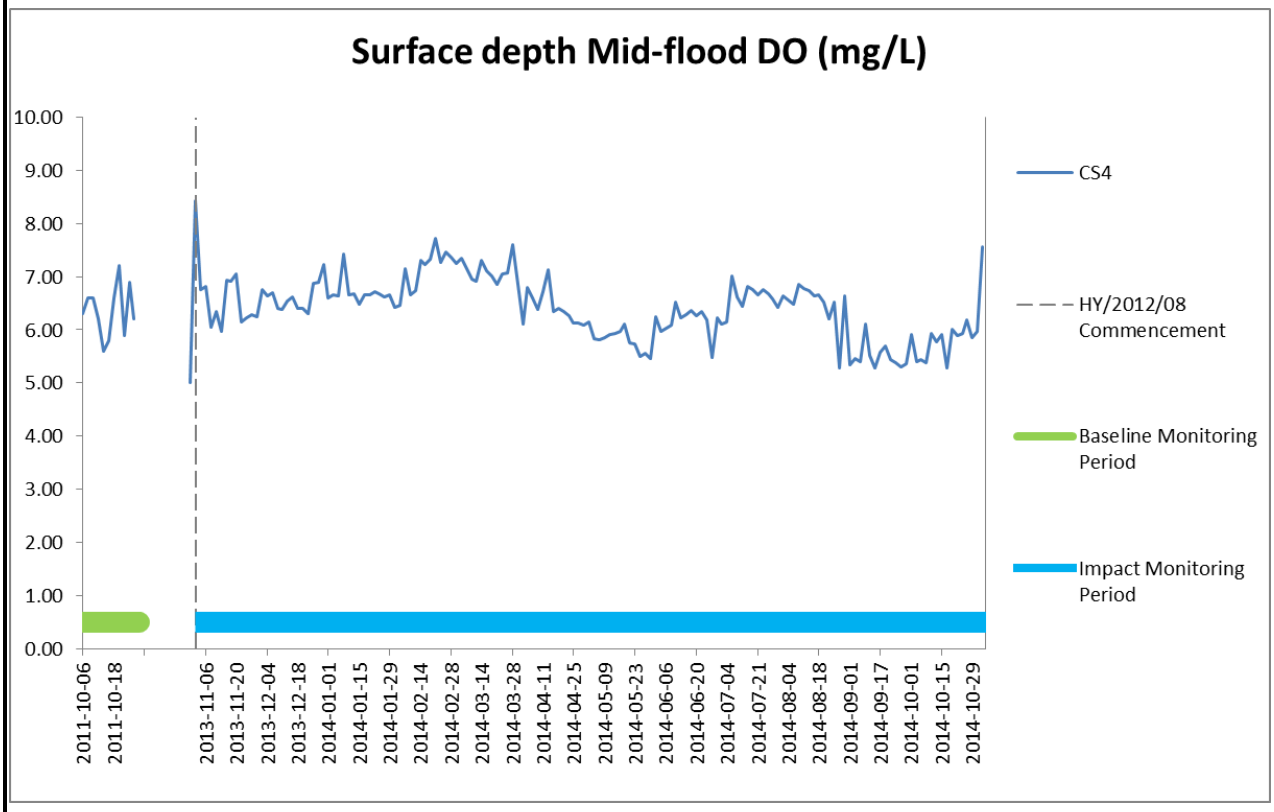
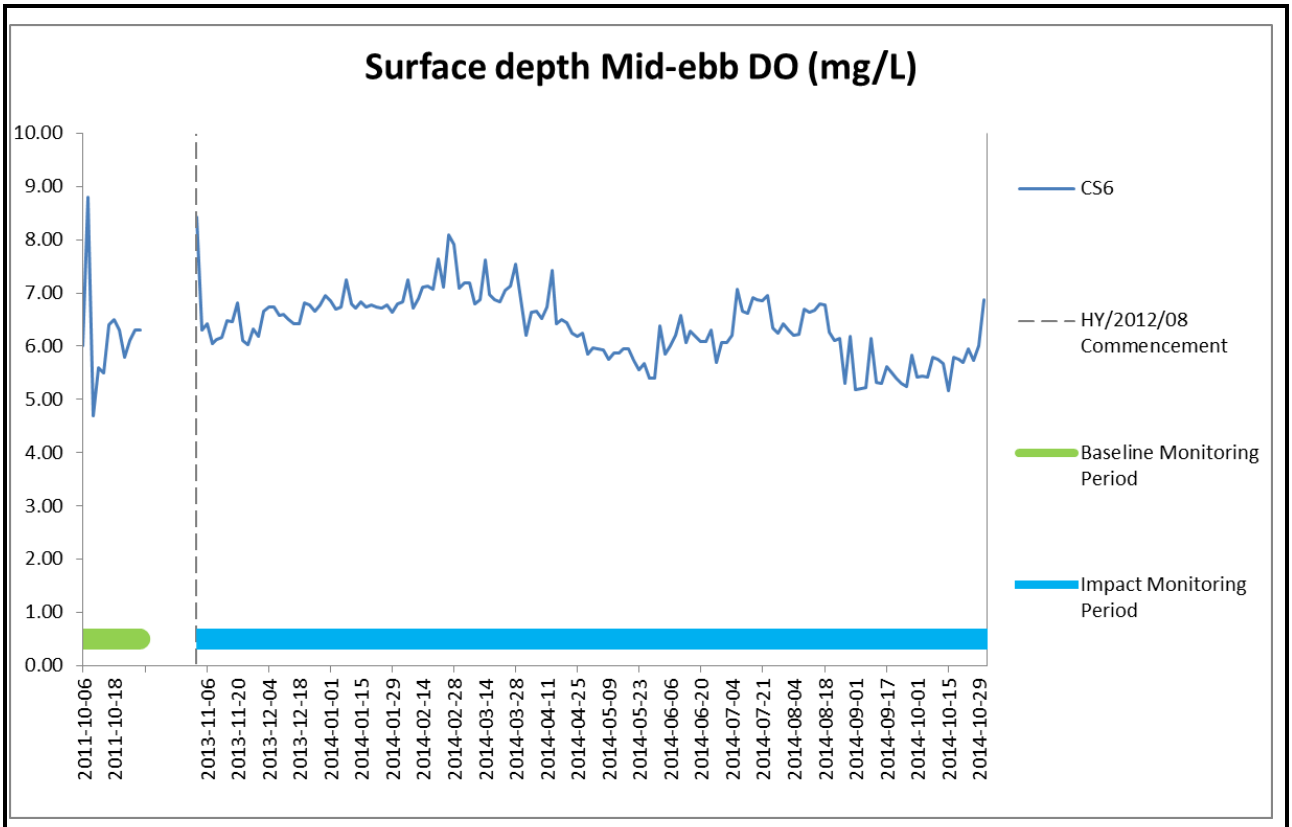


Figure E1 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM



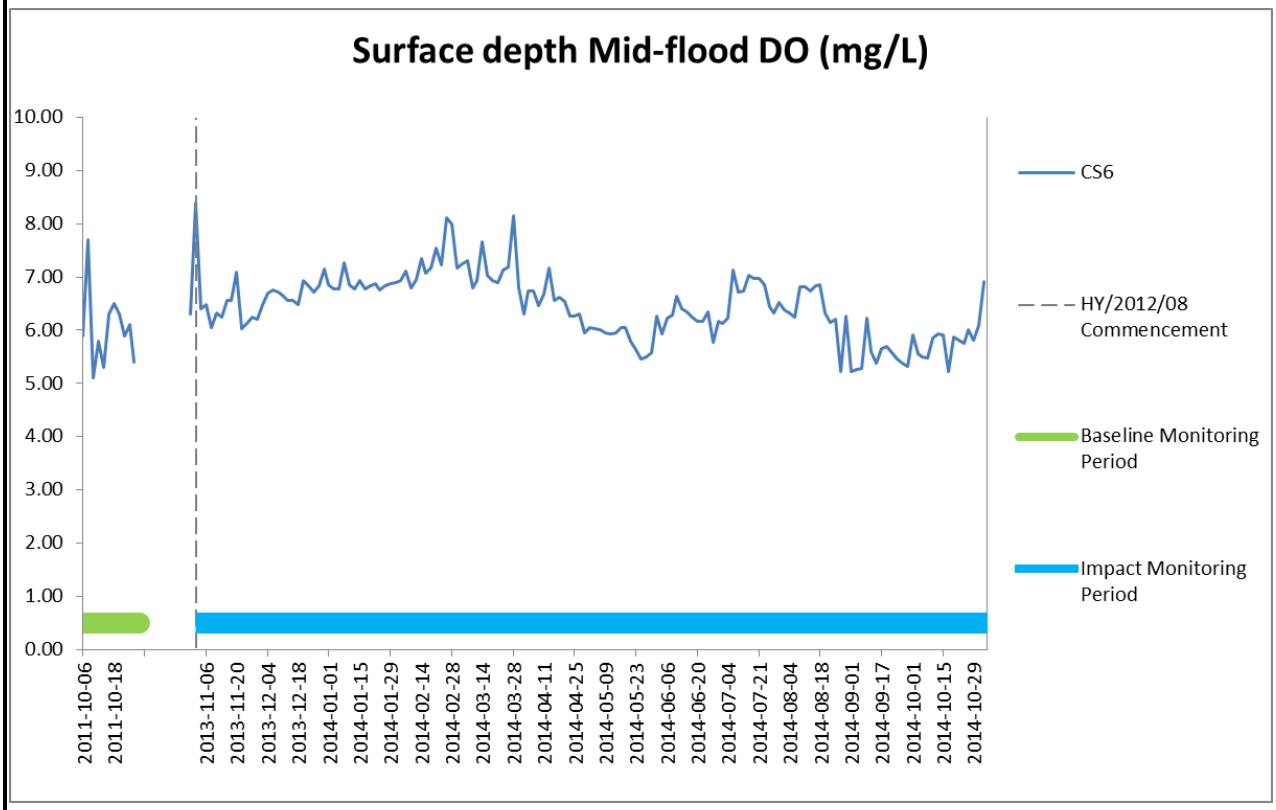
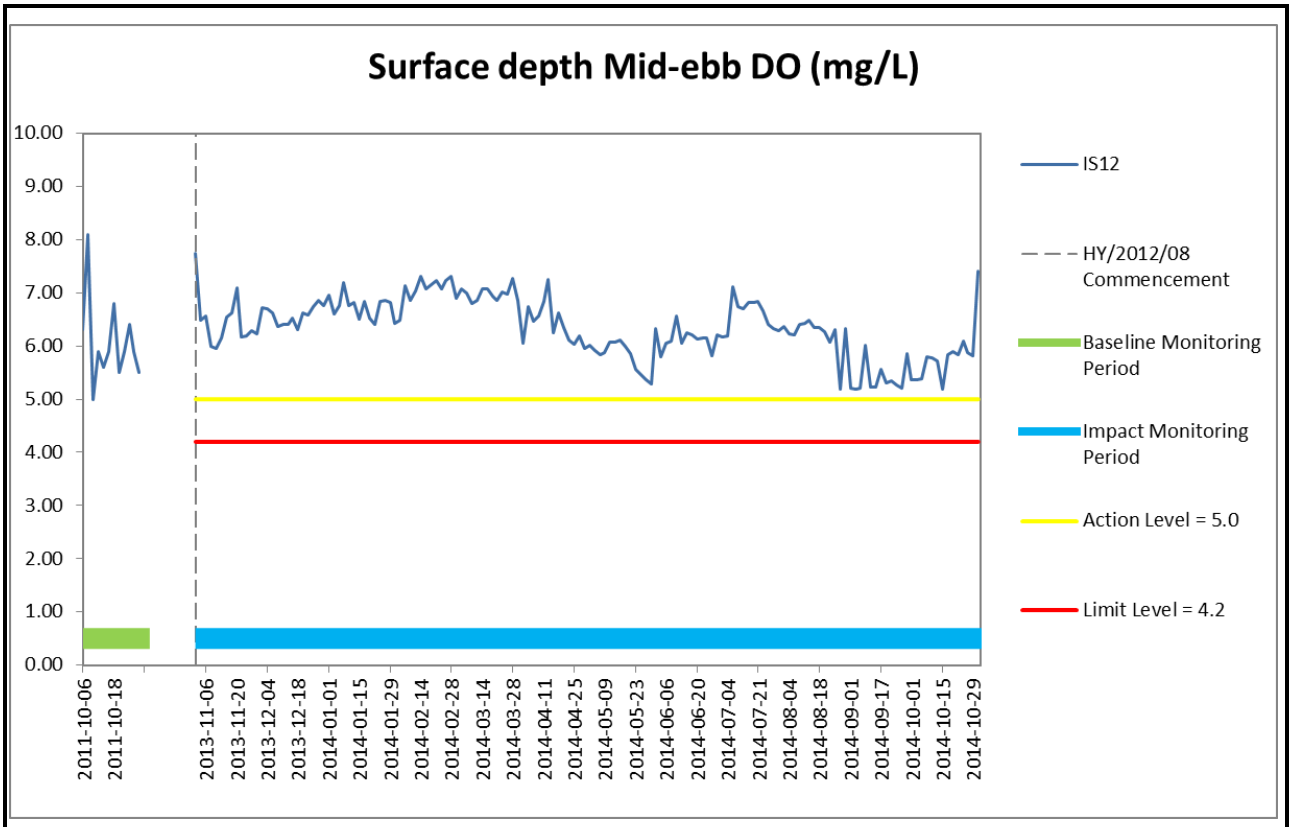


Figure E2 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



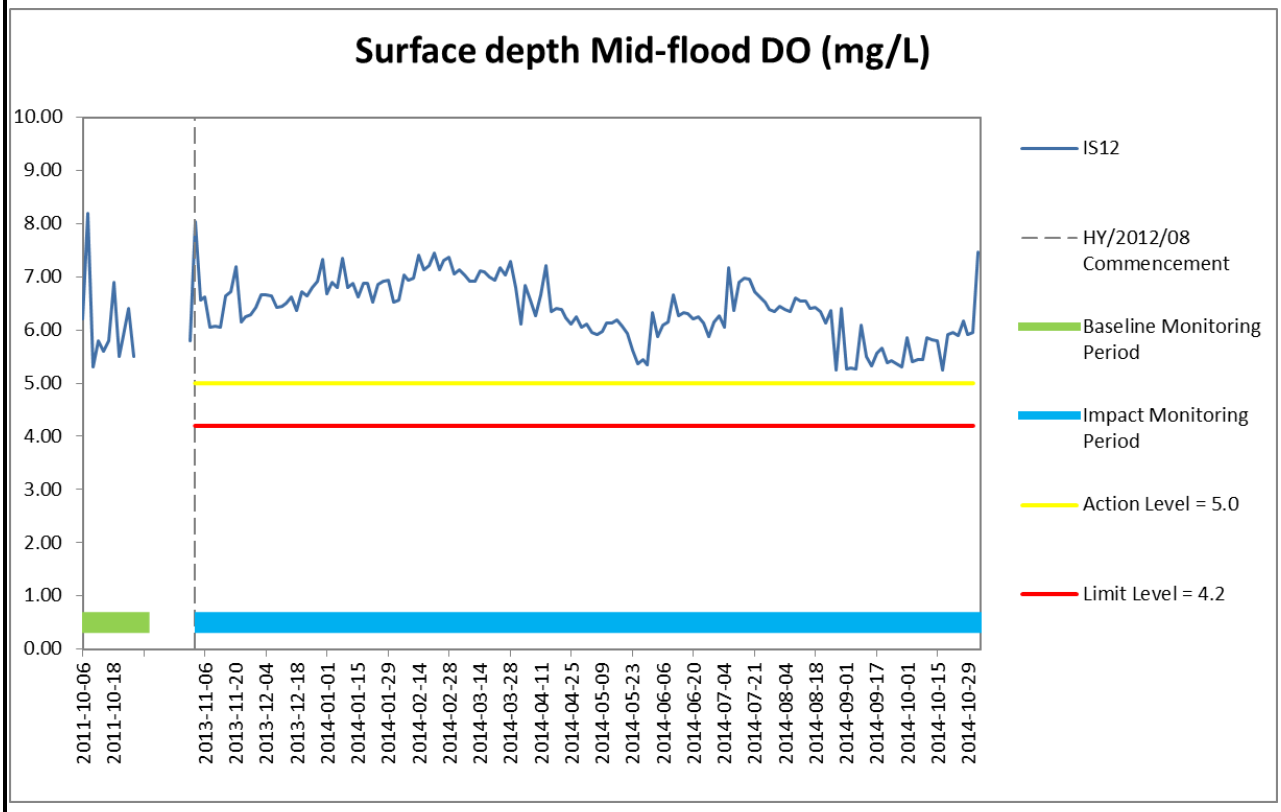
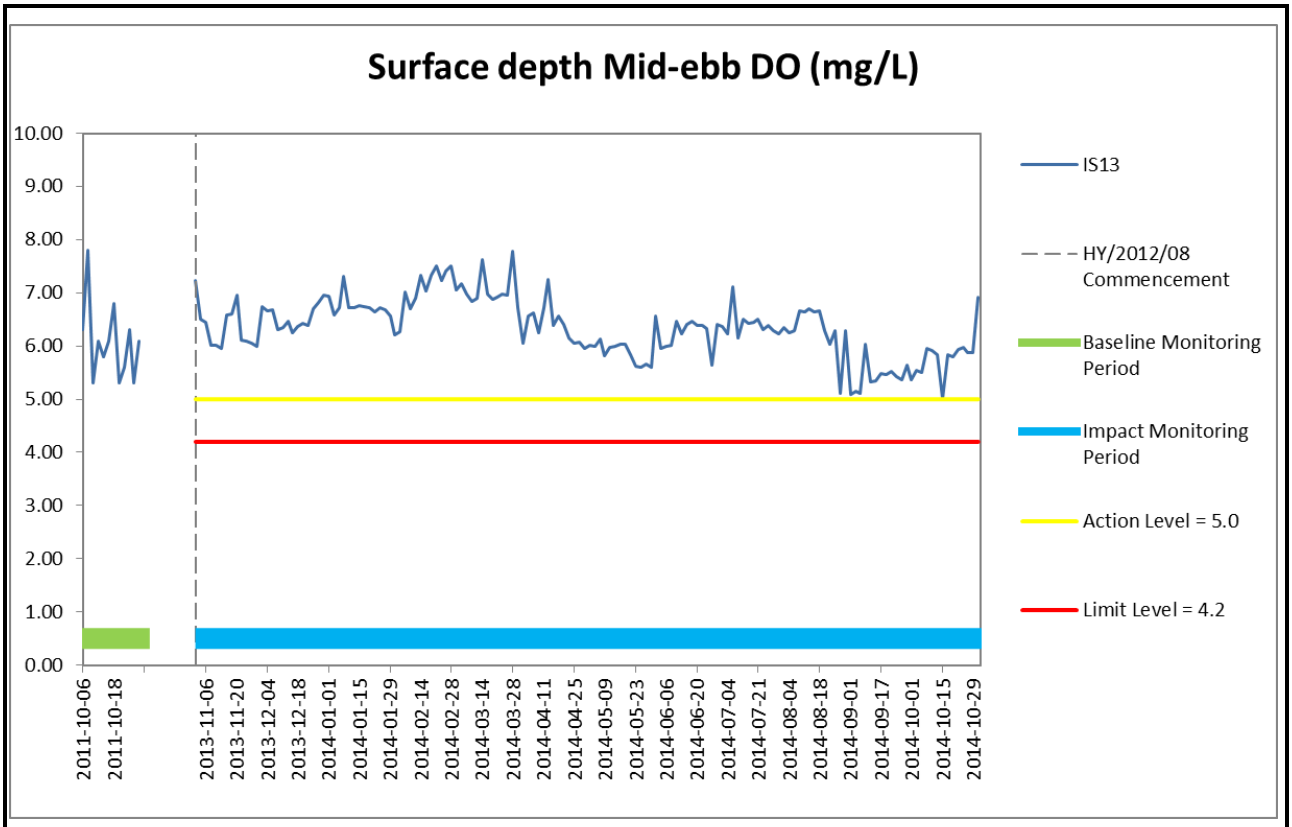


Figure E3 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



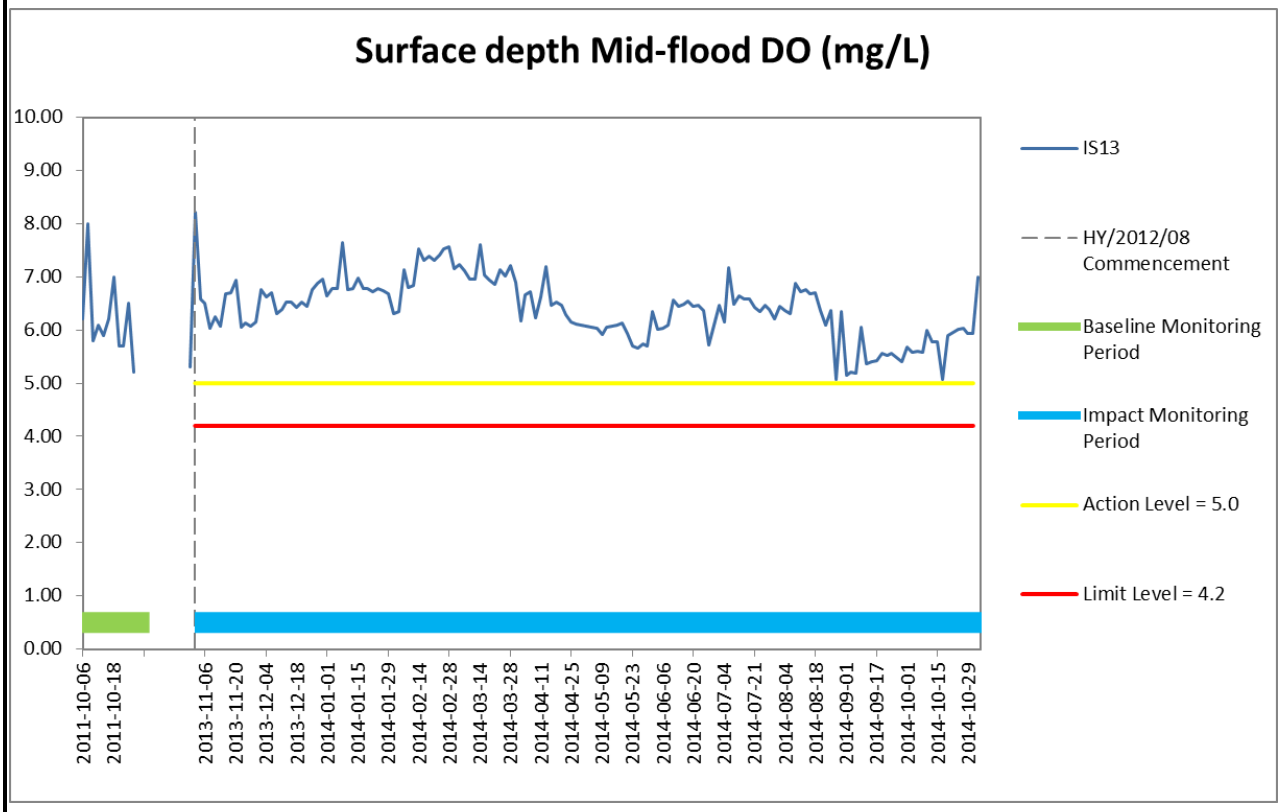
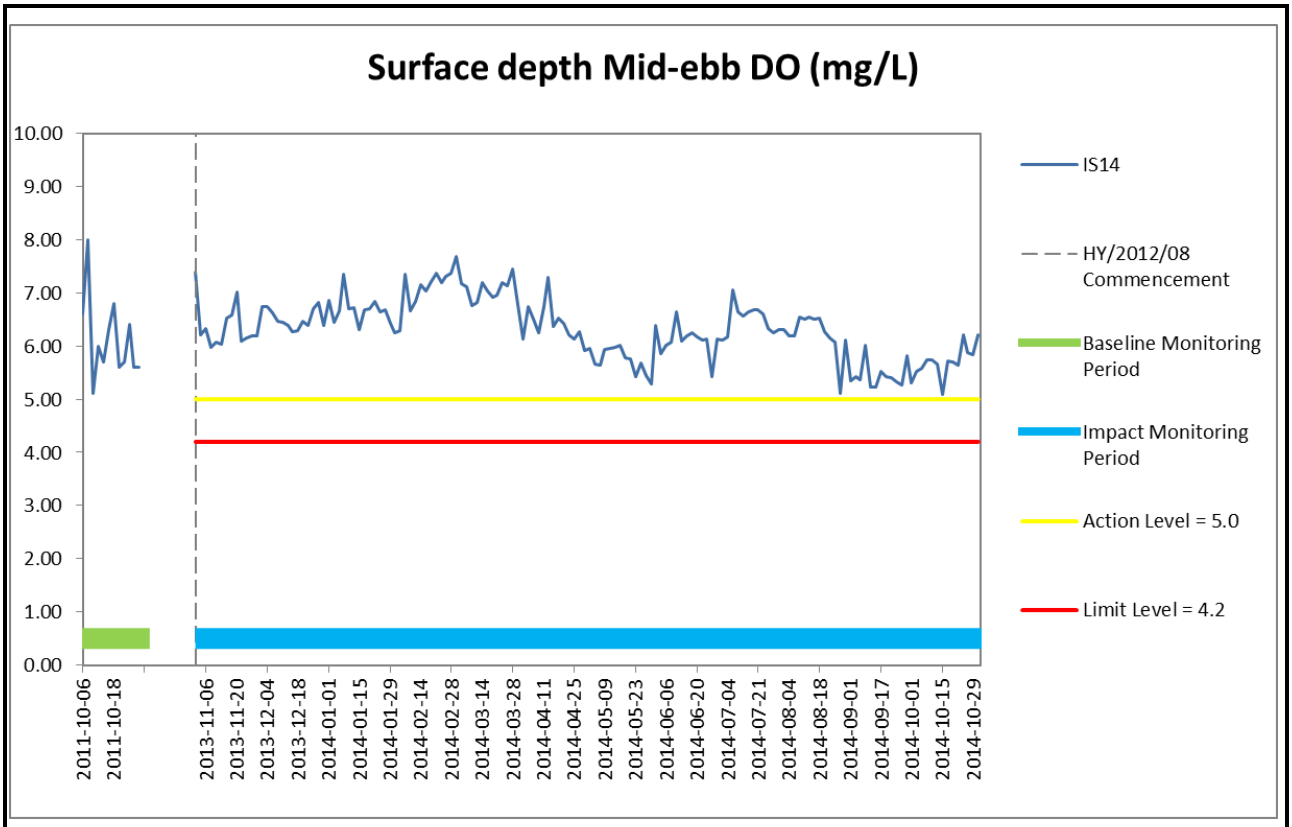


Figure E4 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



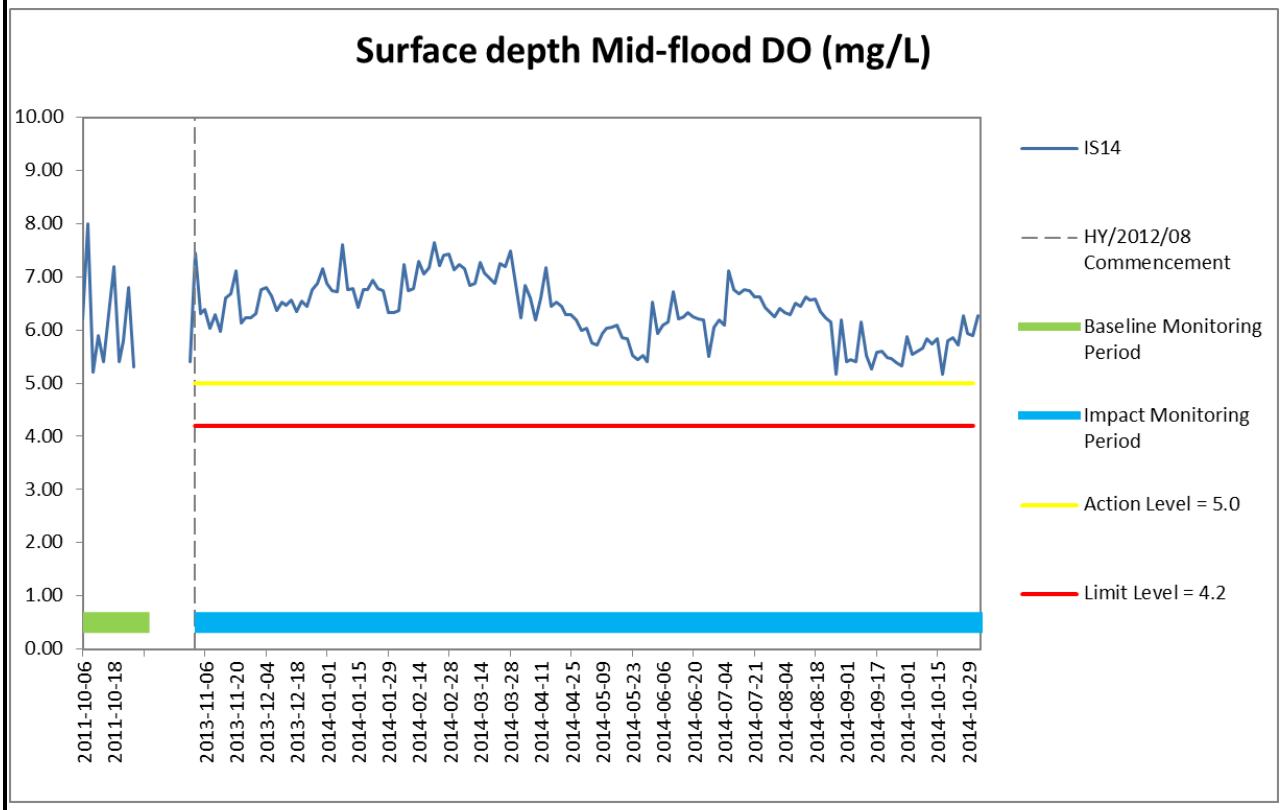
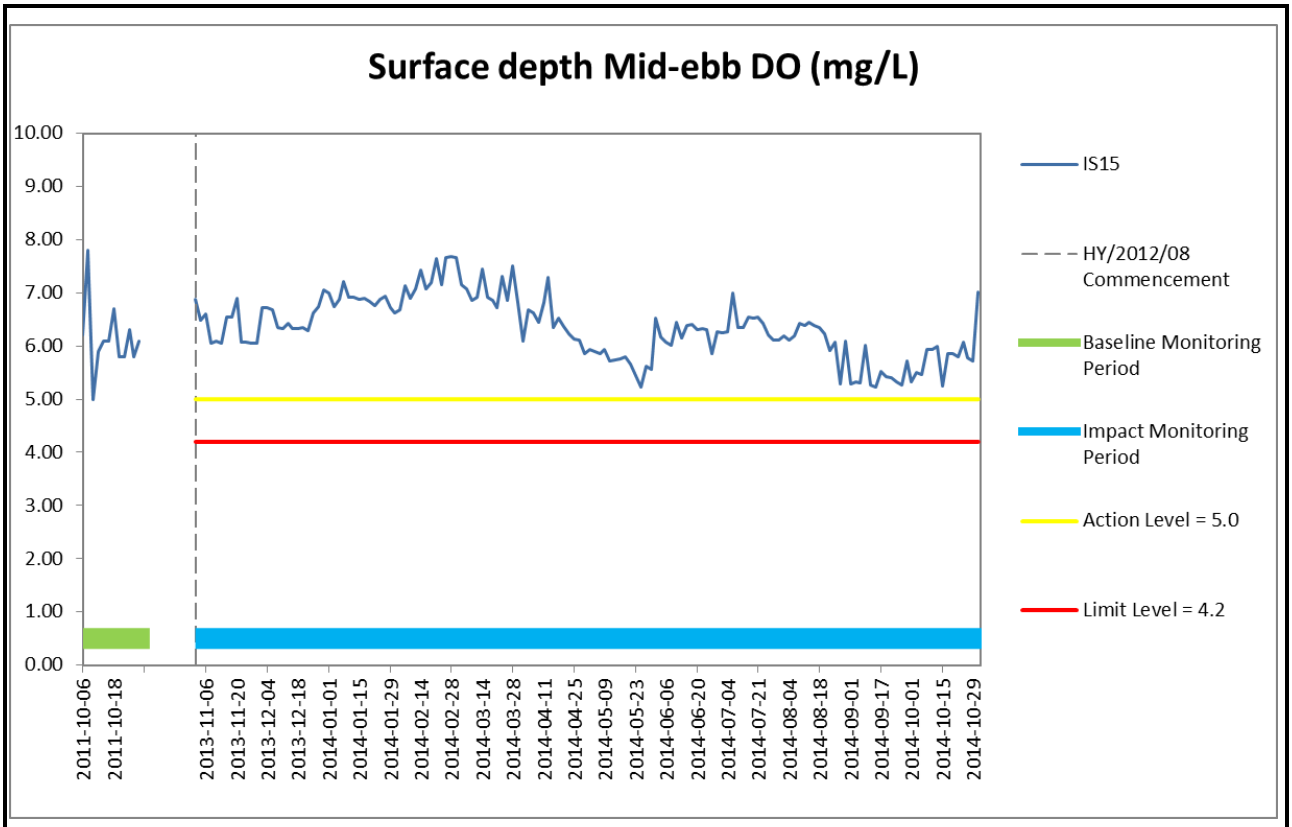


Figure E5 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



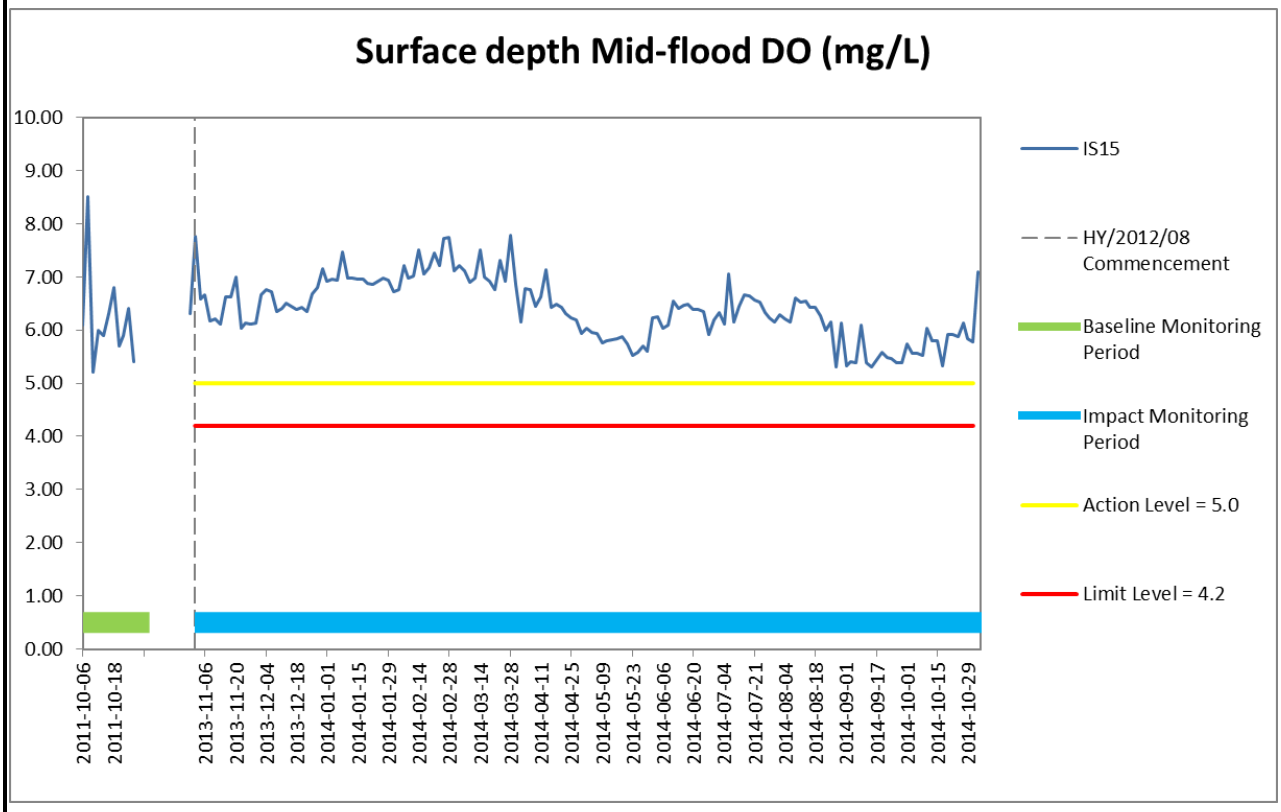
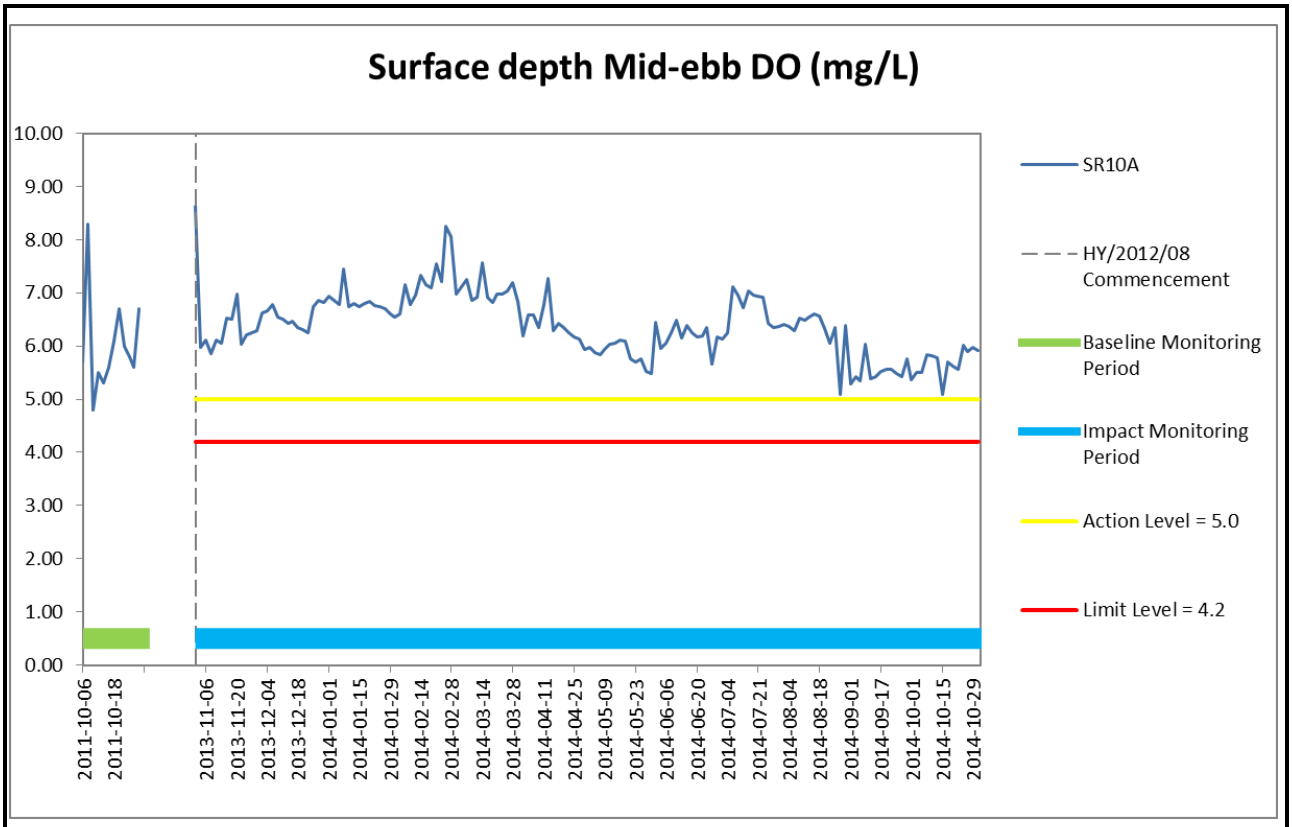


Figure E6 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



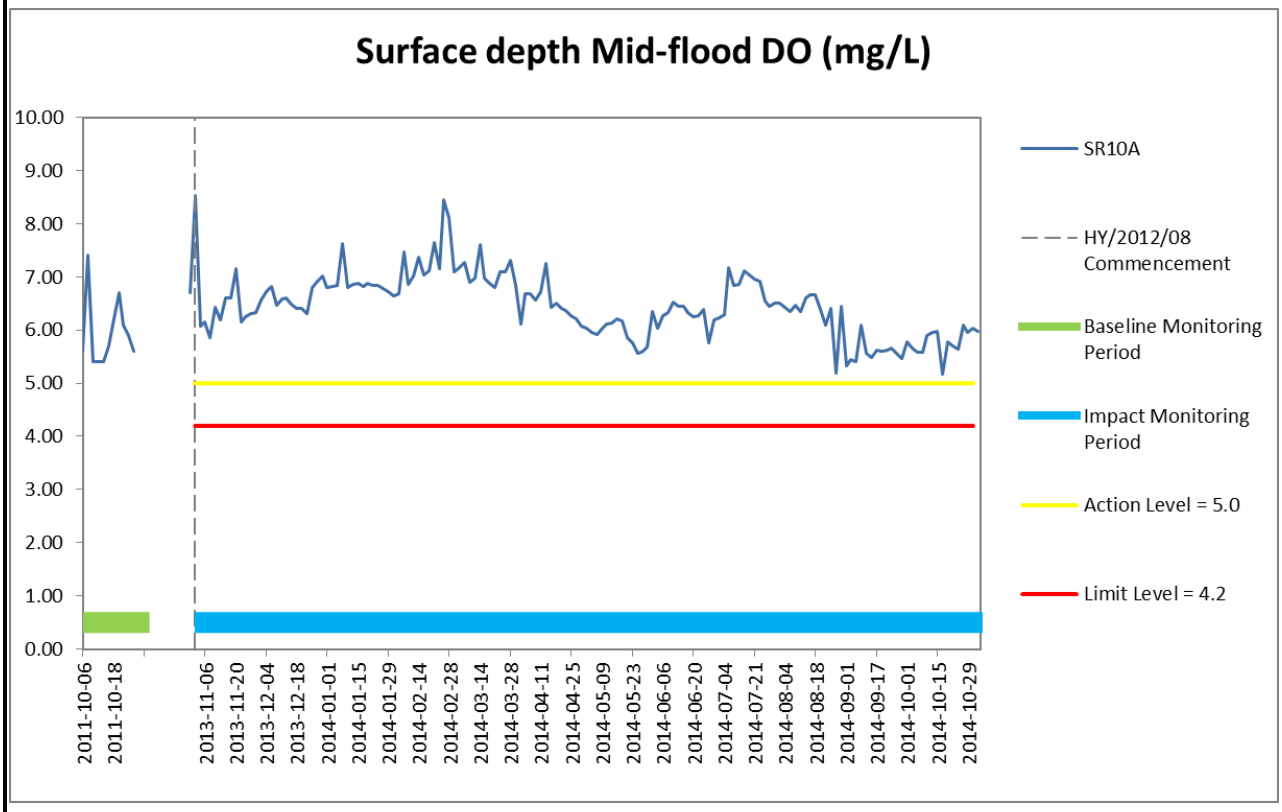
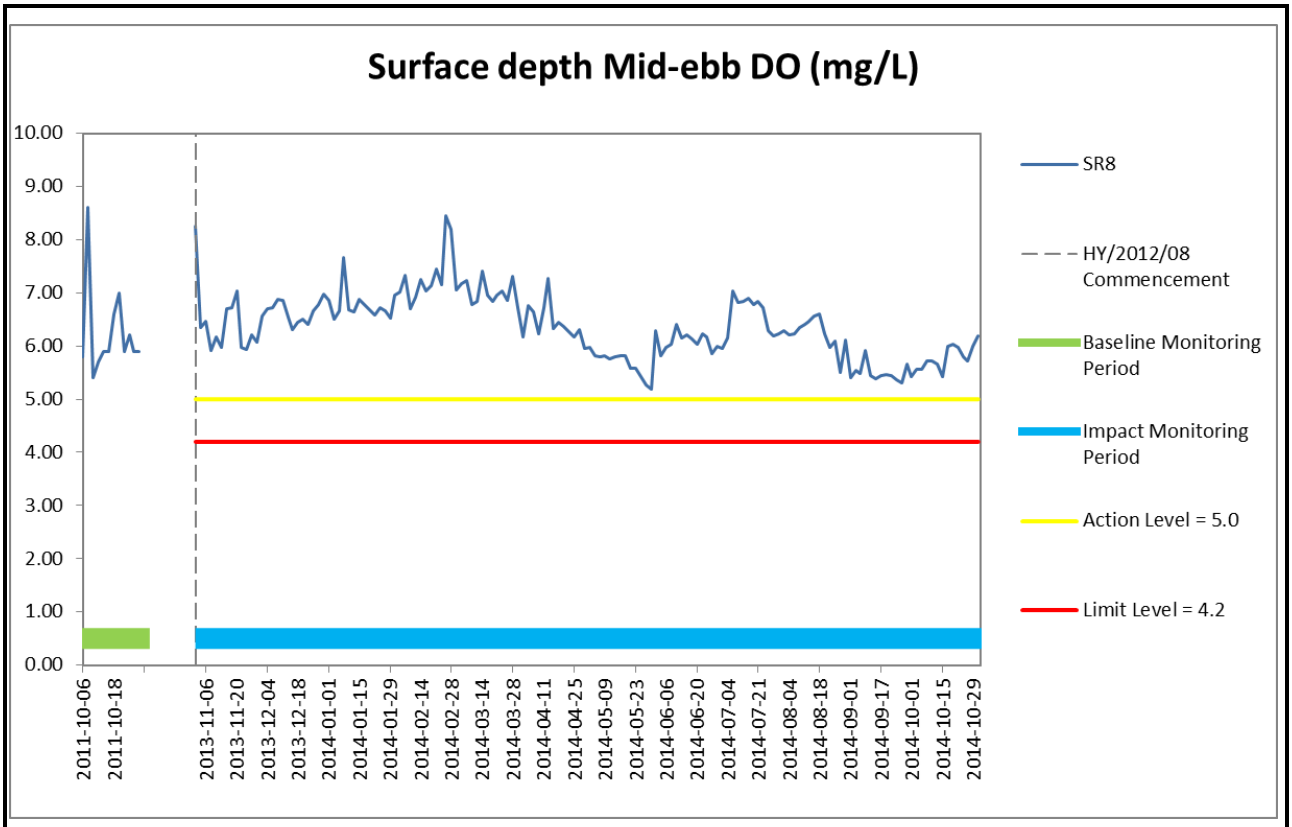


Figure E7 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



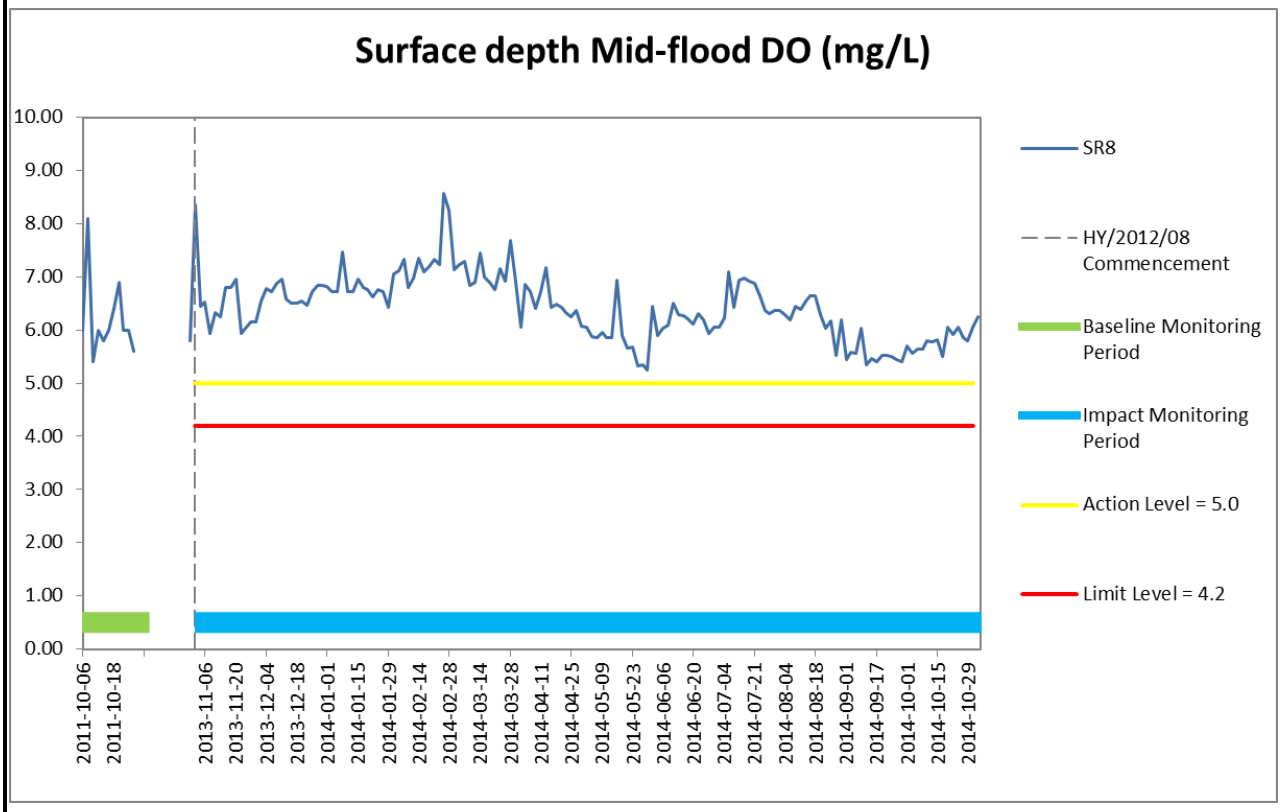
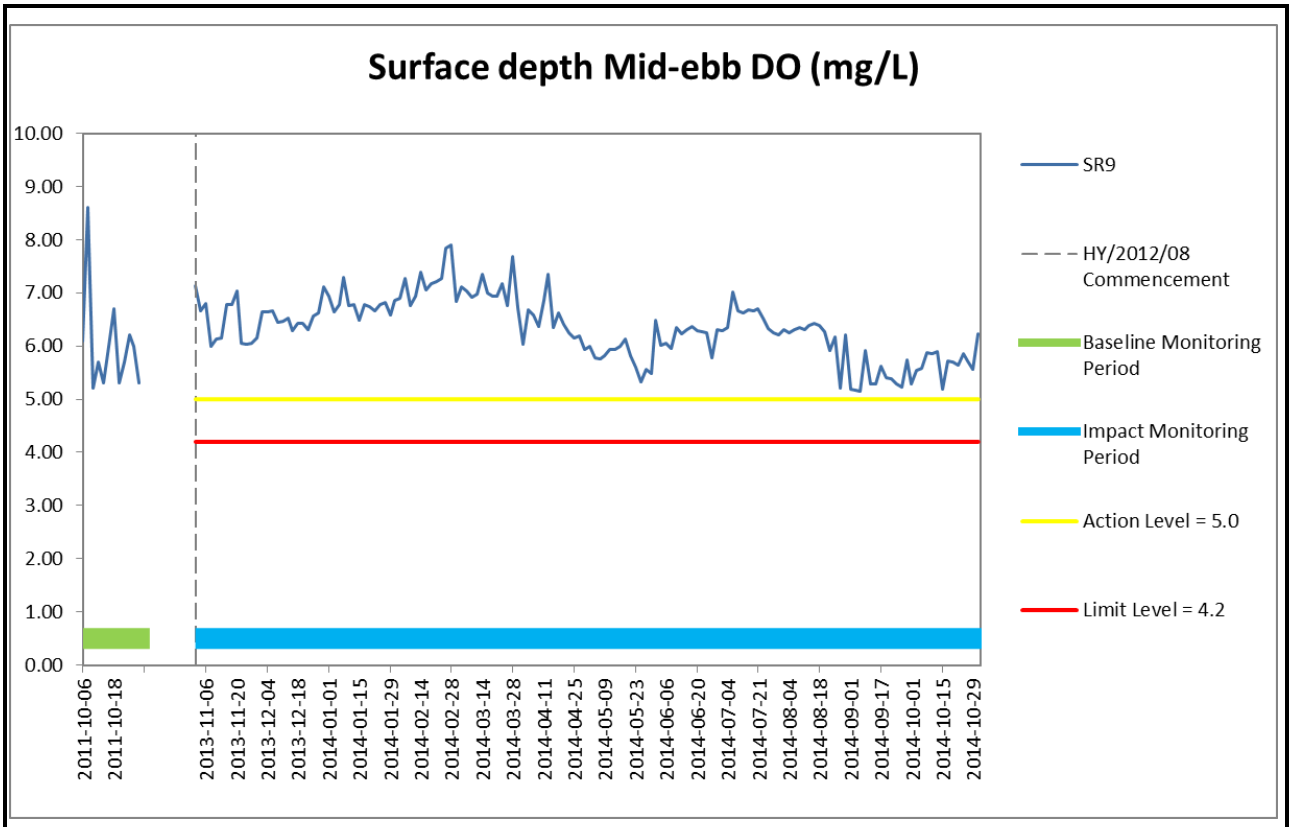


Figure E8 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



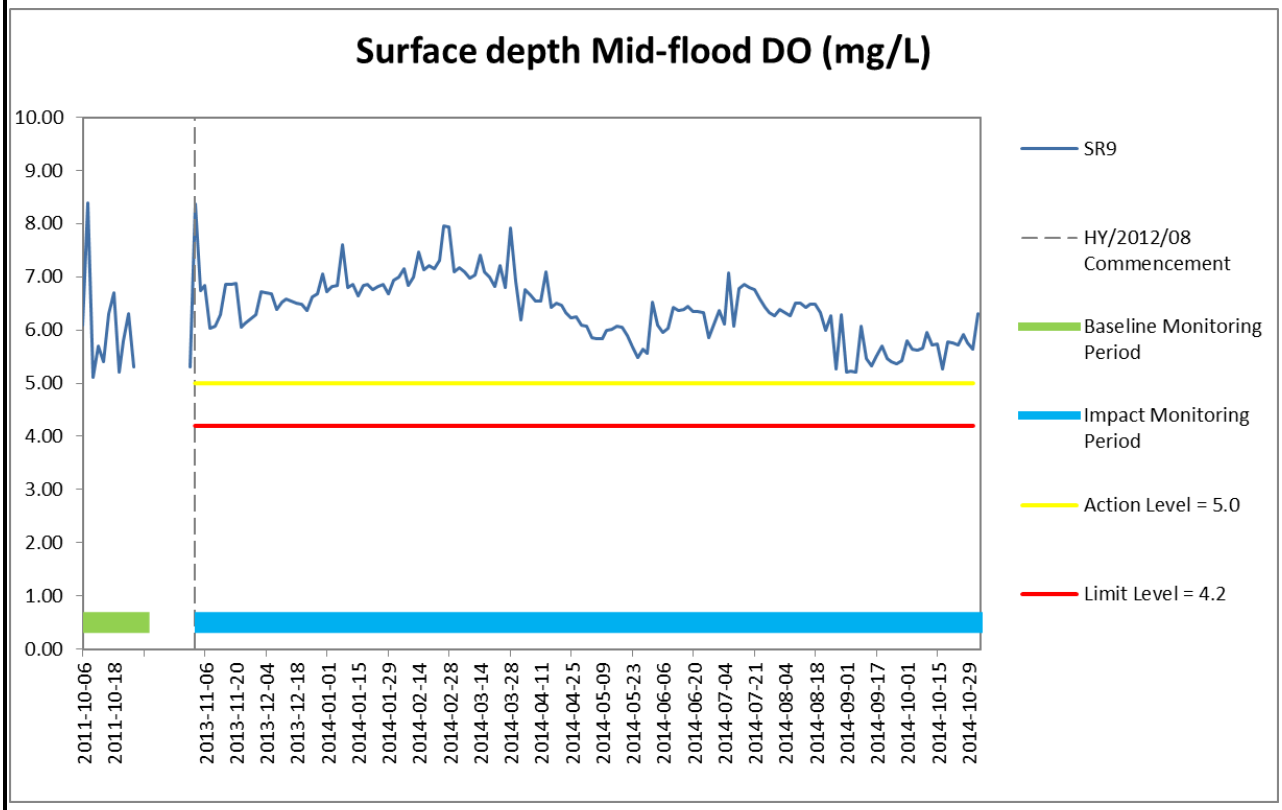
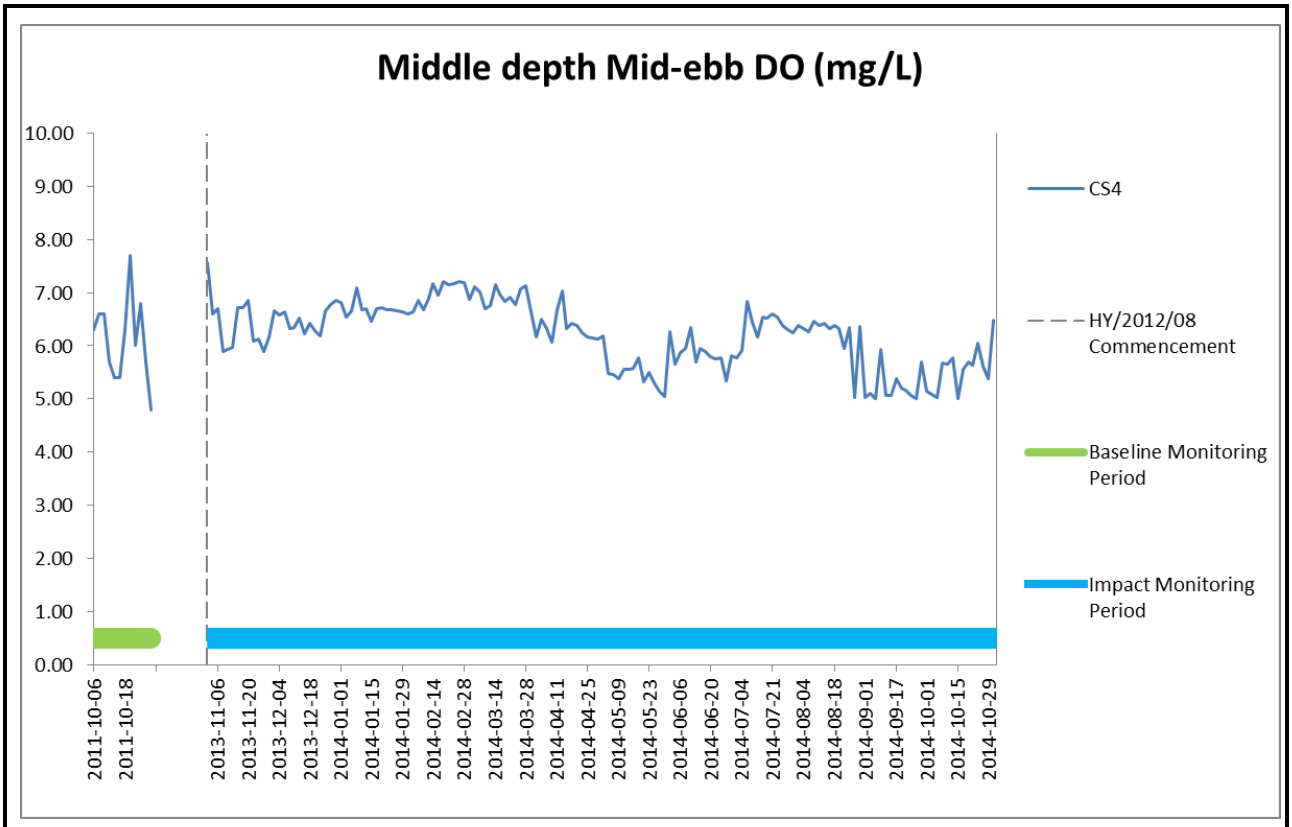
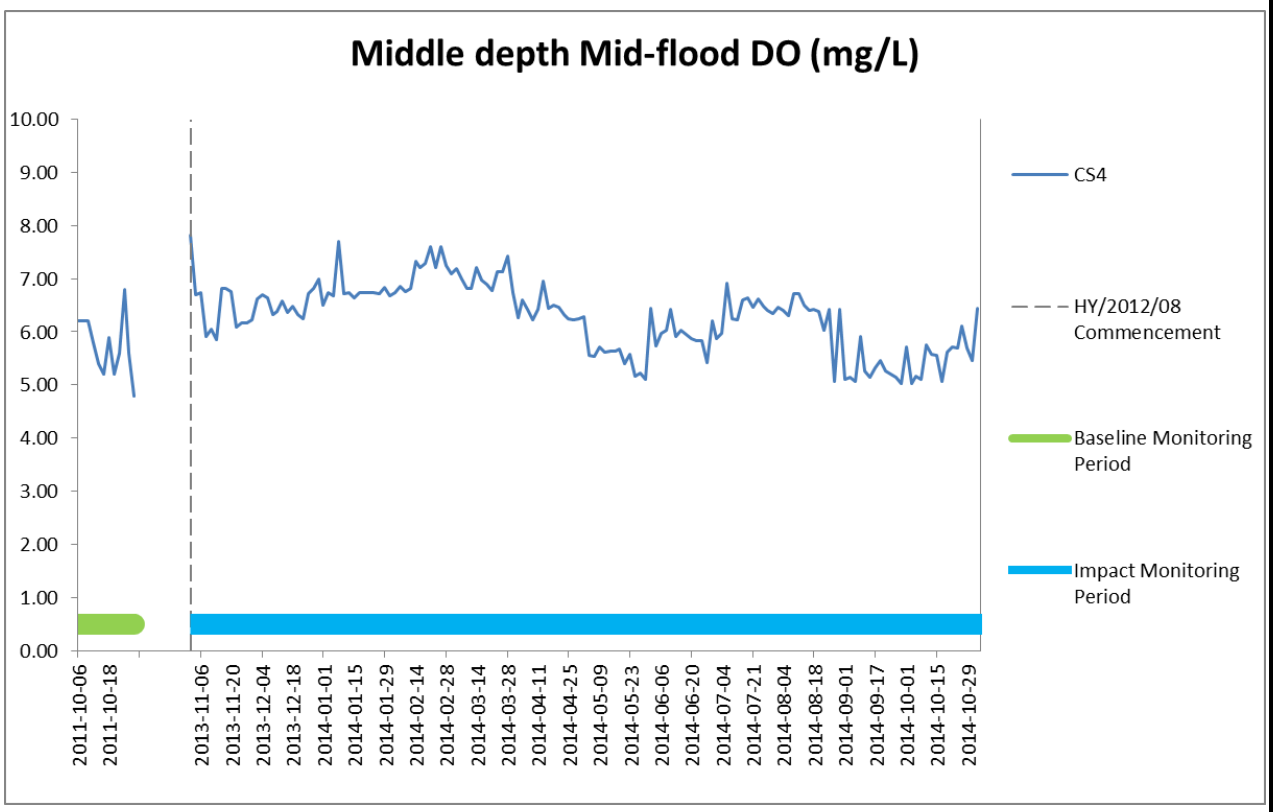


Figure E9 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

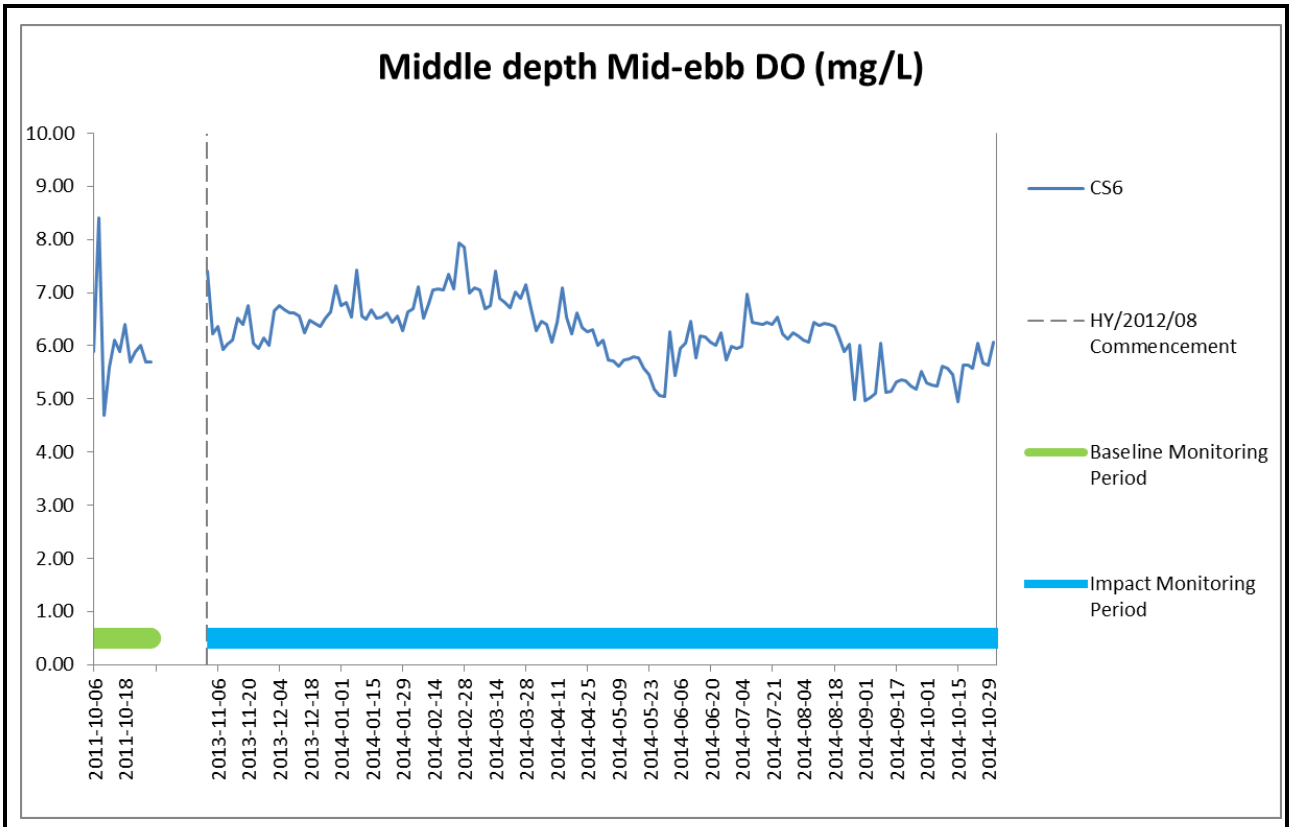


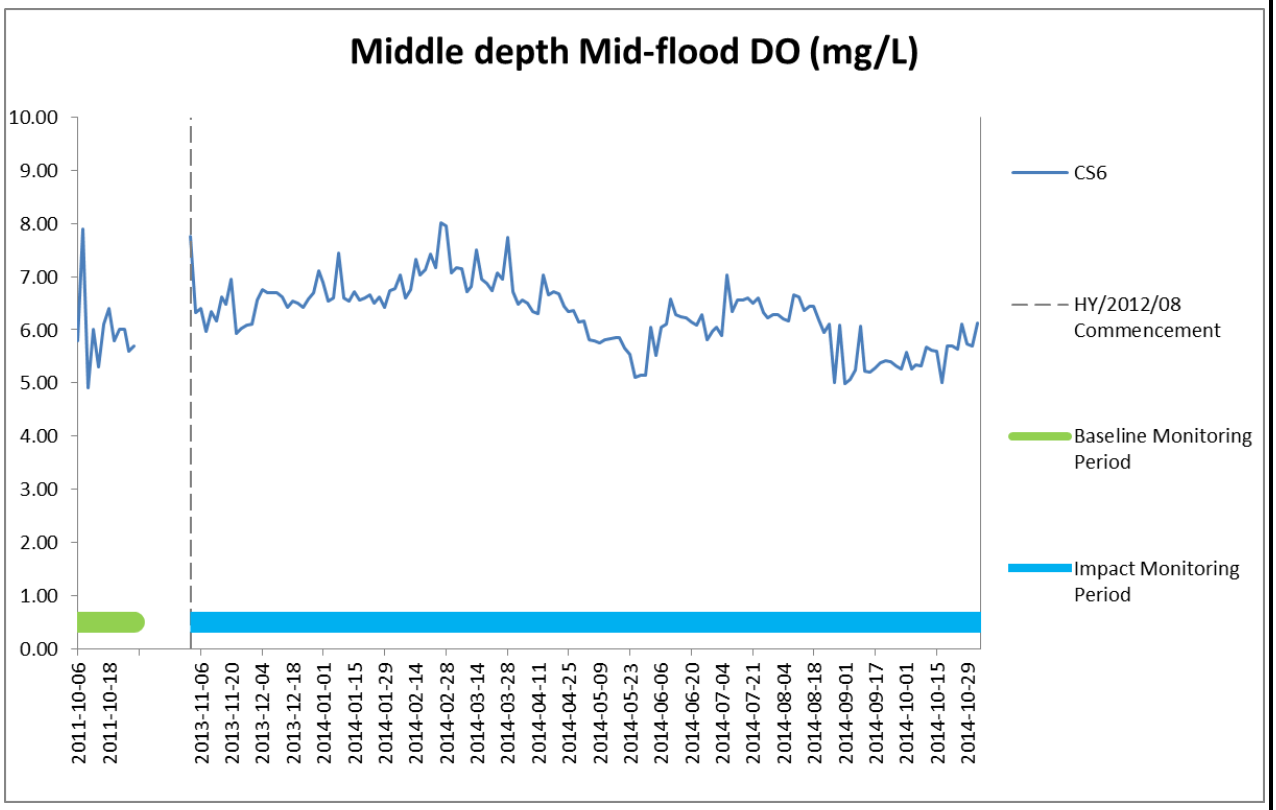


*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E10 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM

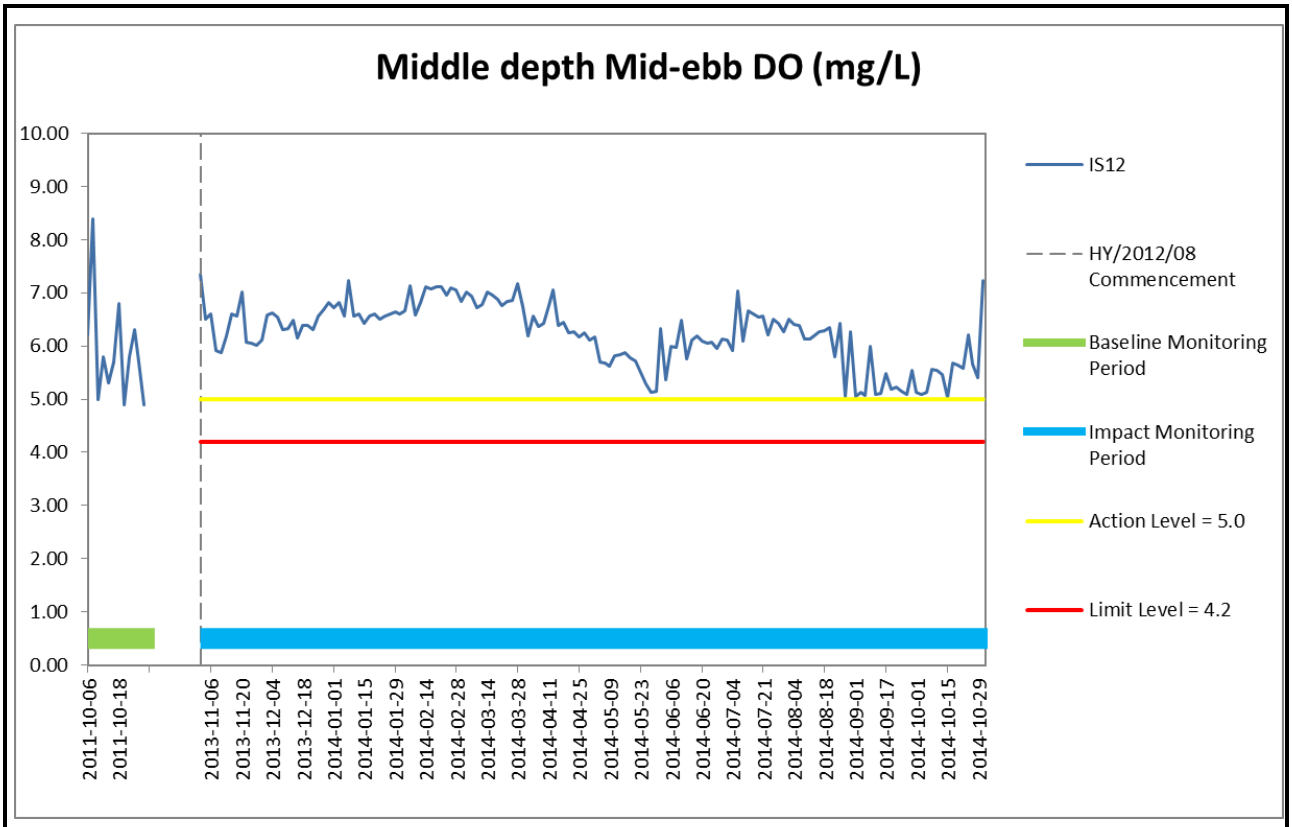


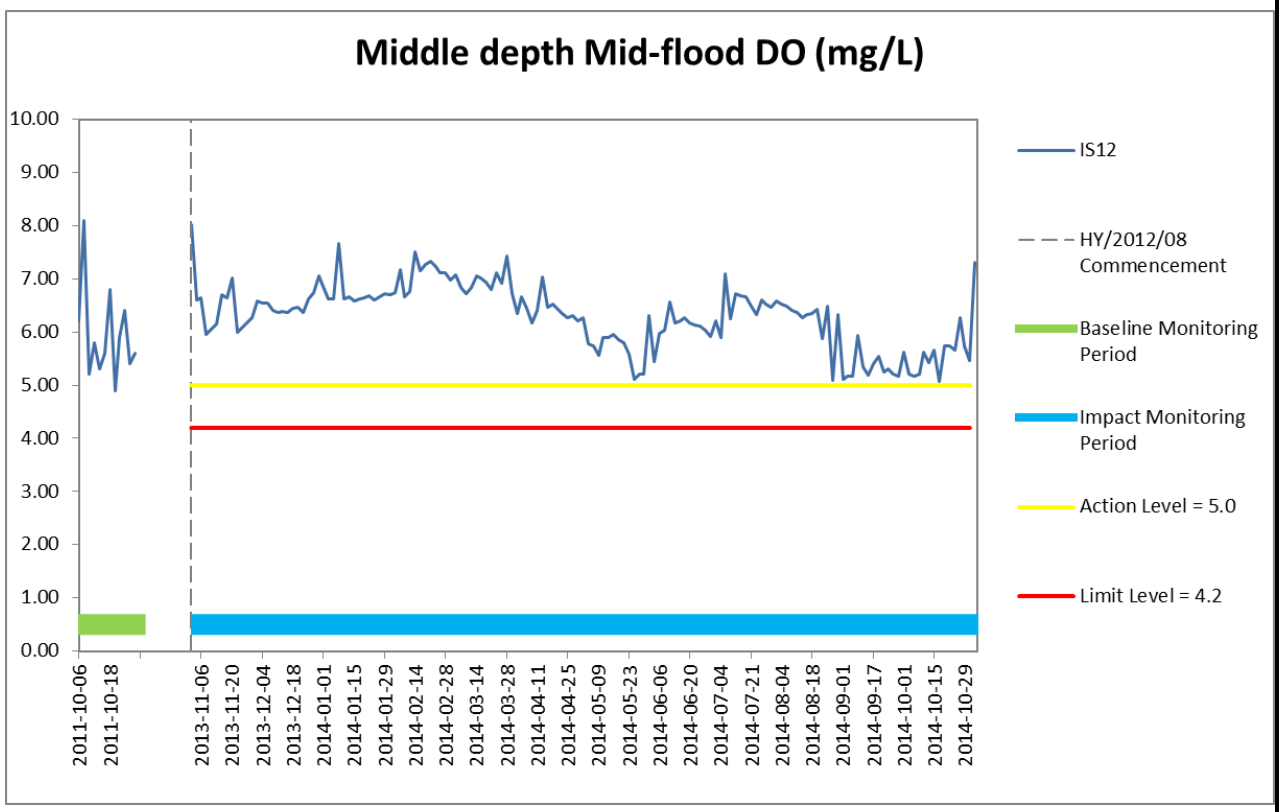


*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E11 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM

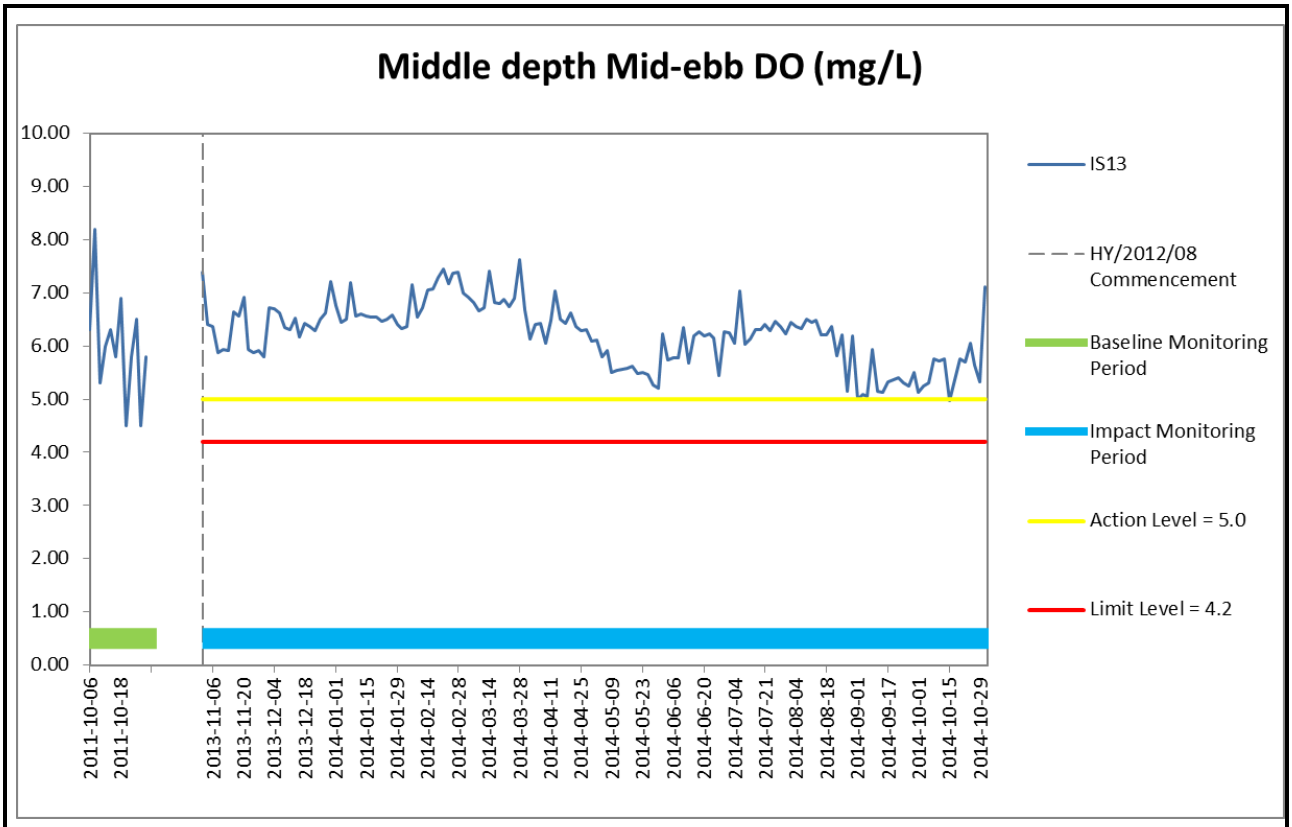


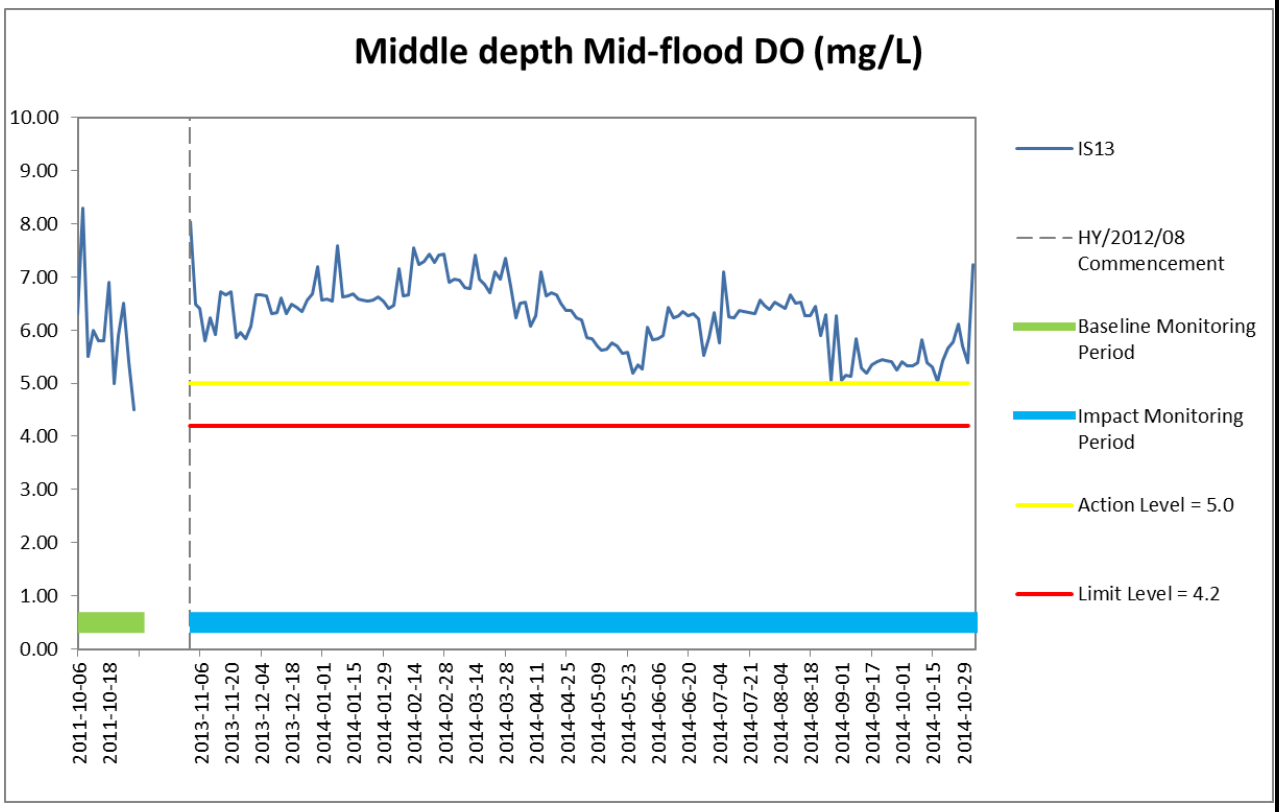


*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E12 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM

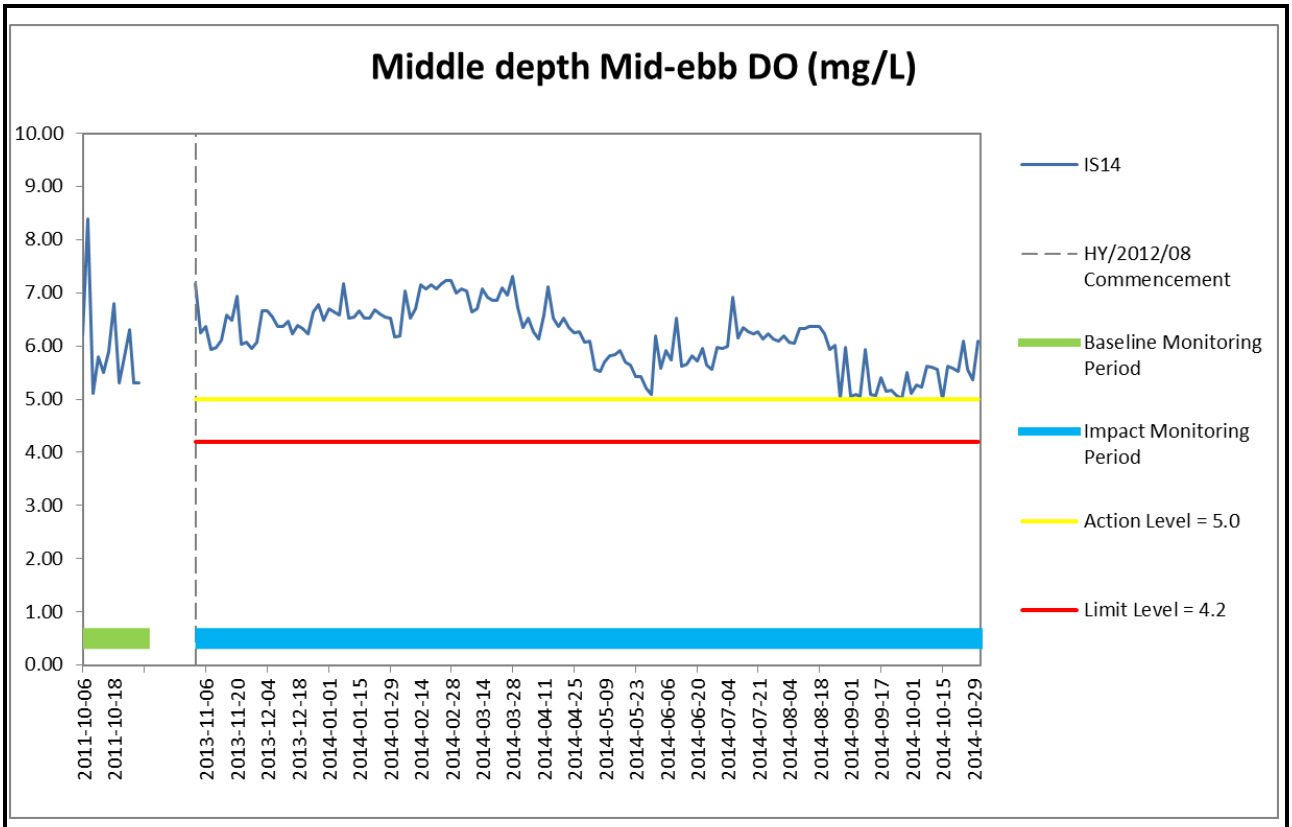


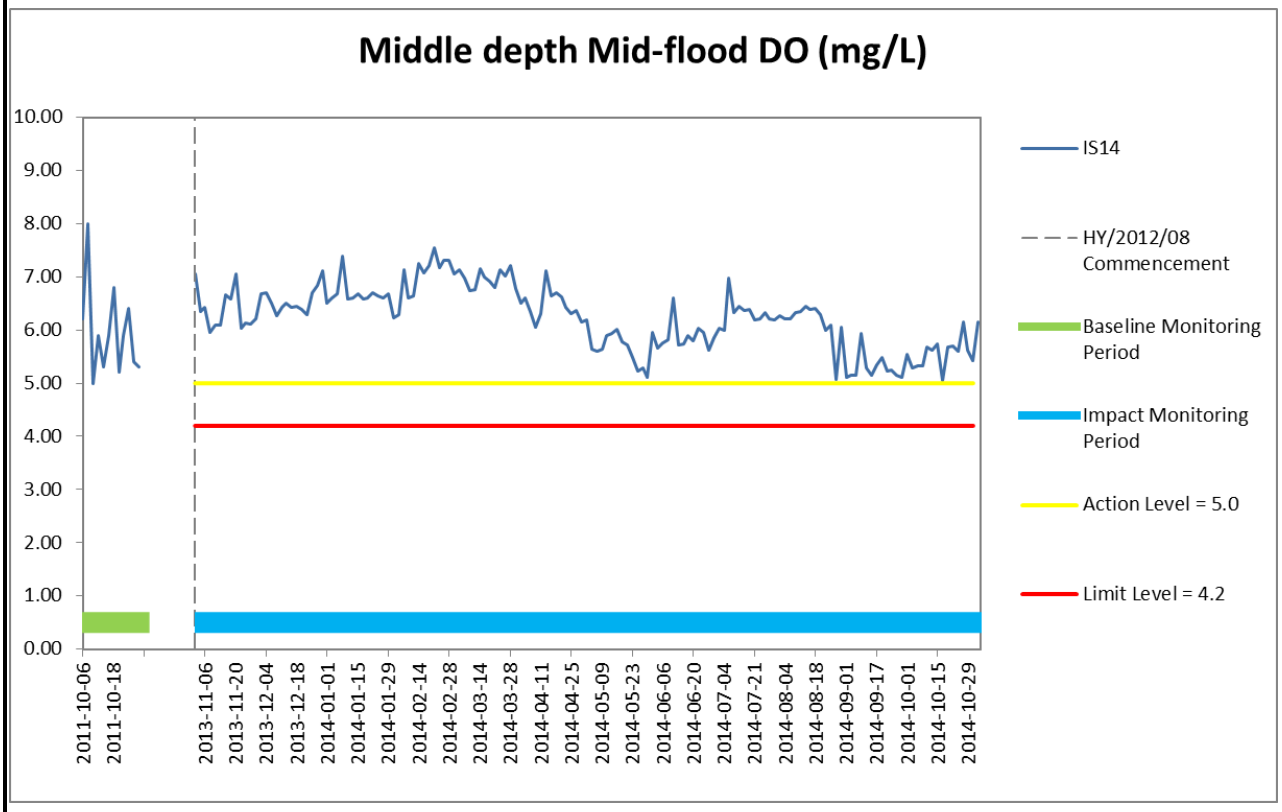


*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E13 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM





*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E14 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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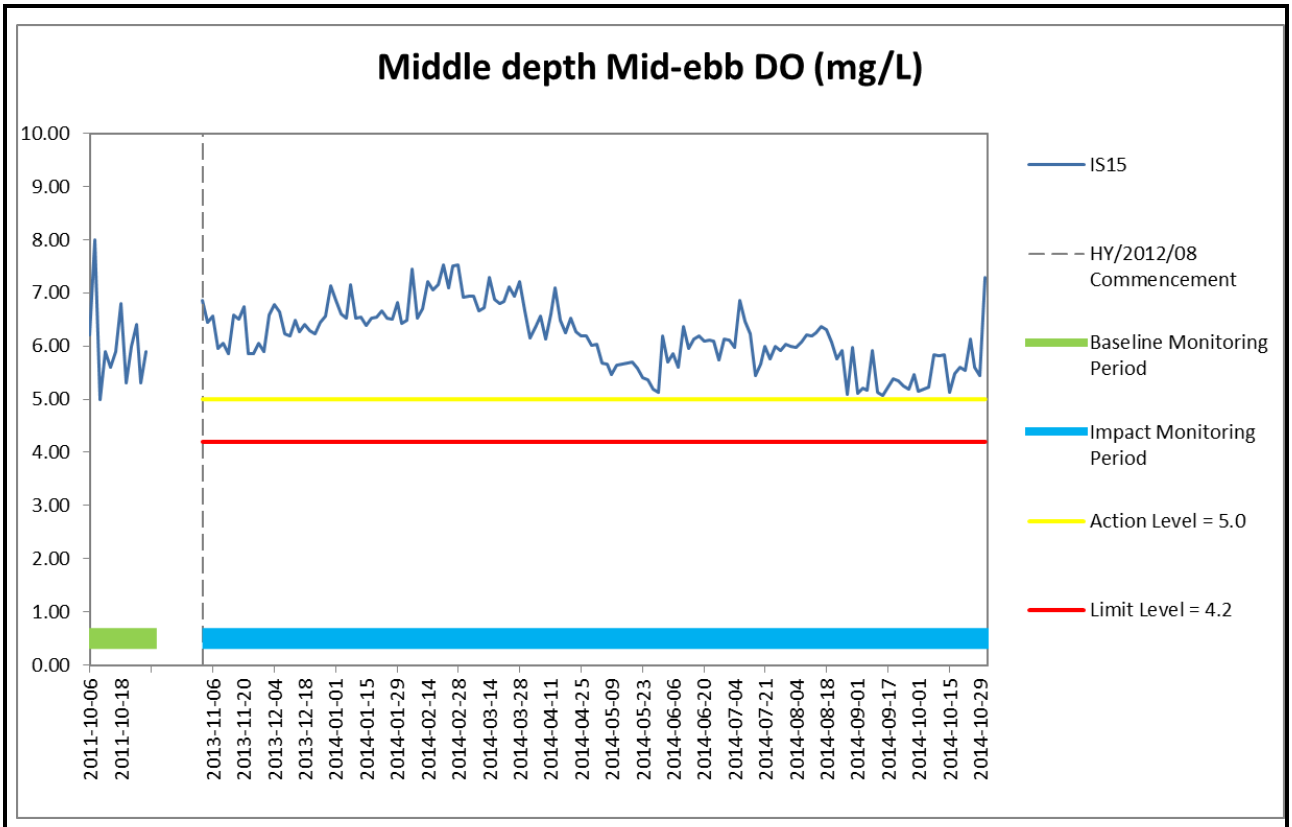
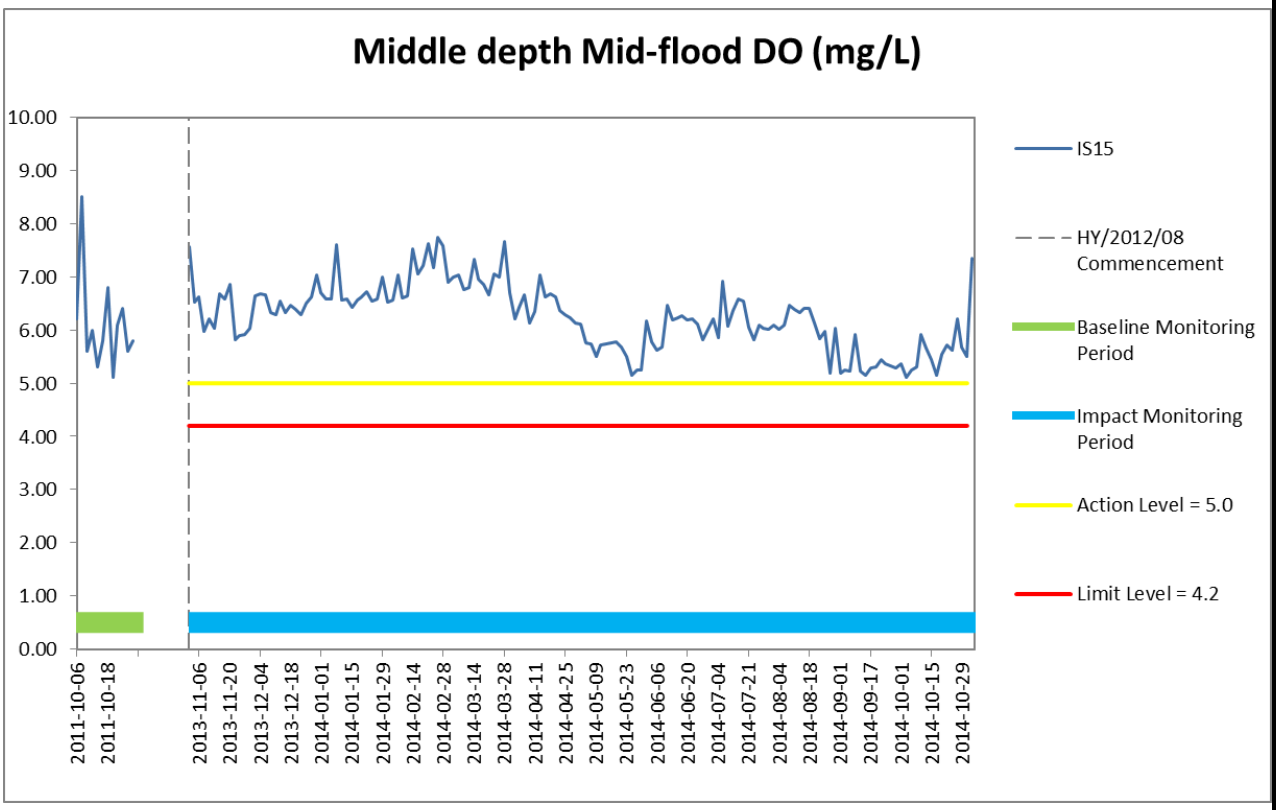
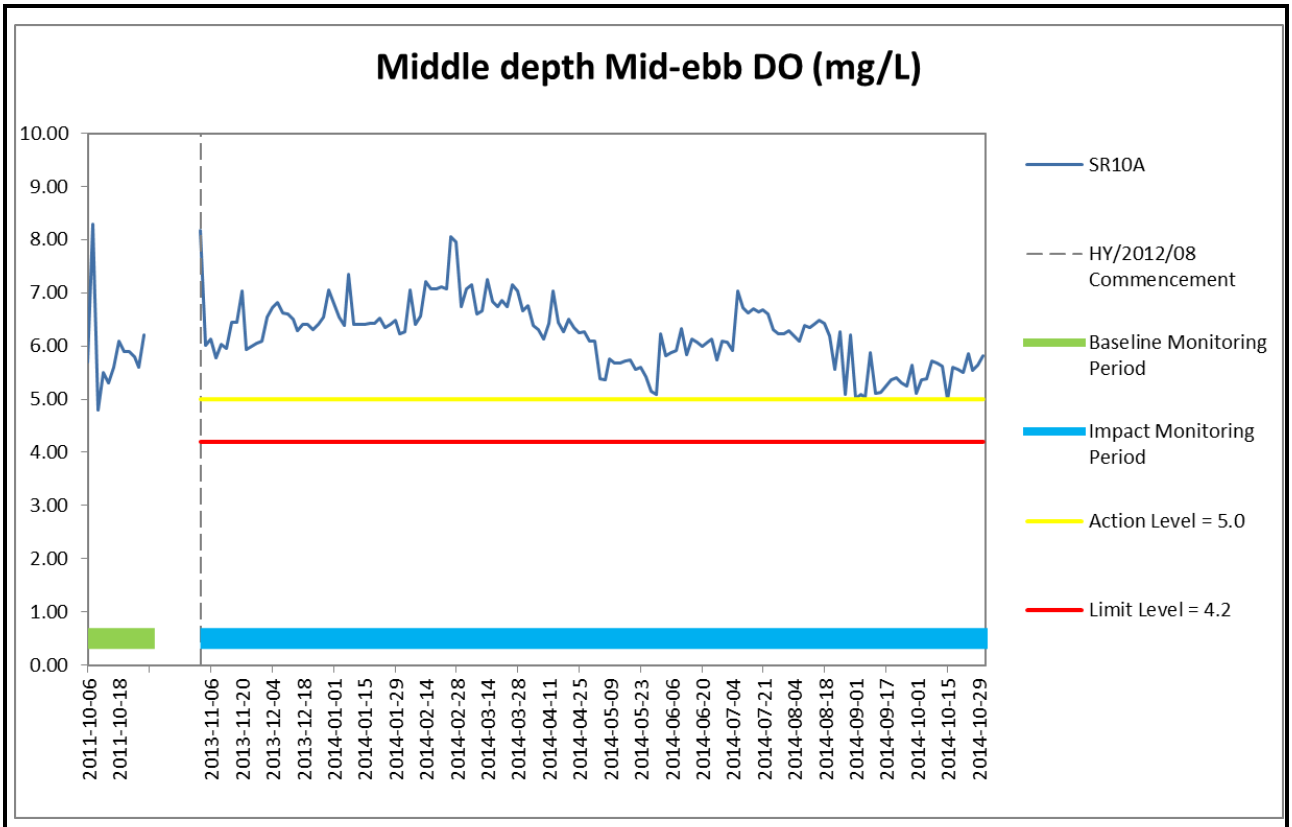


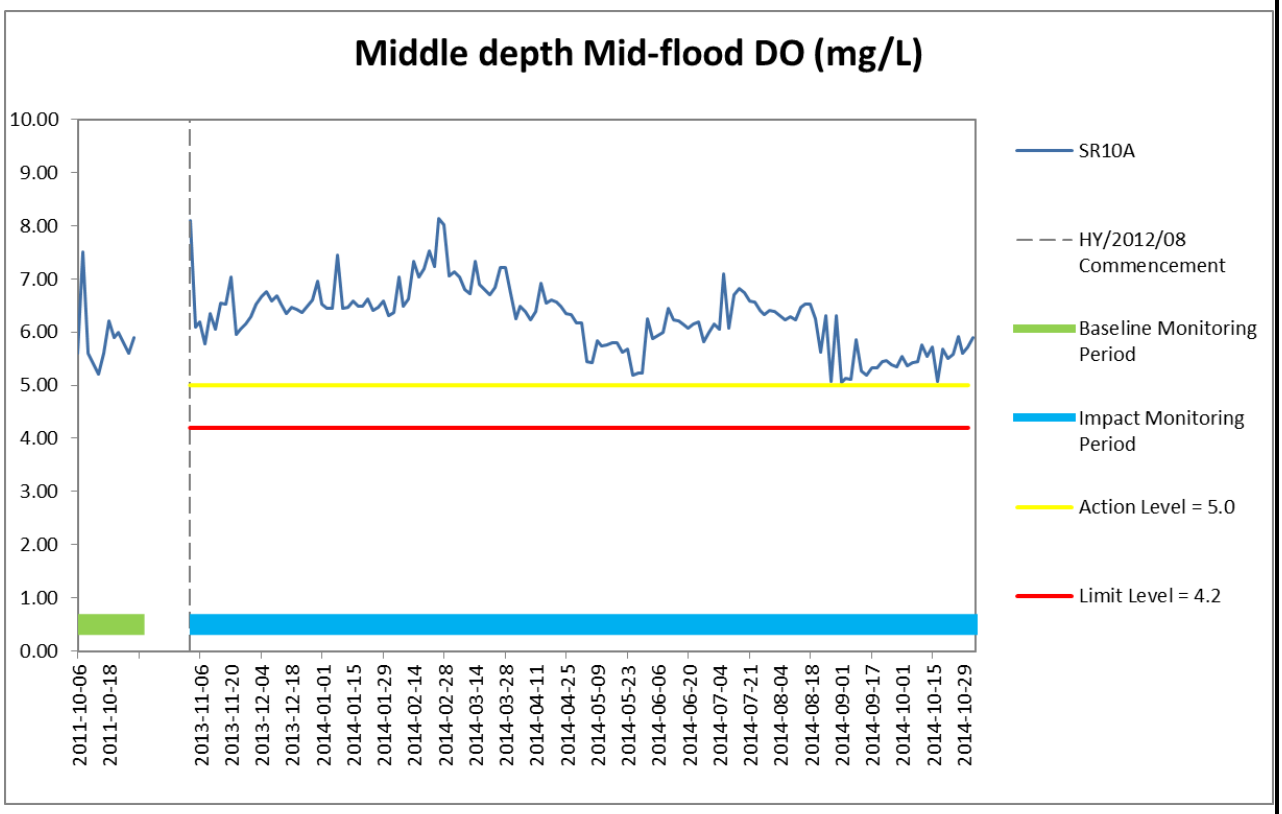


*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E15 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM

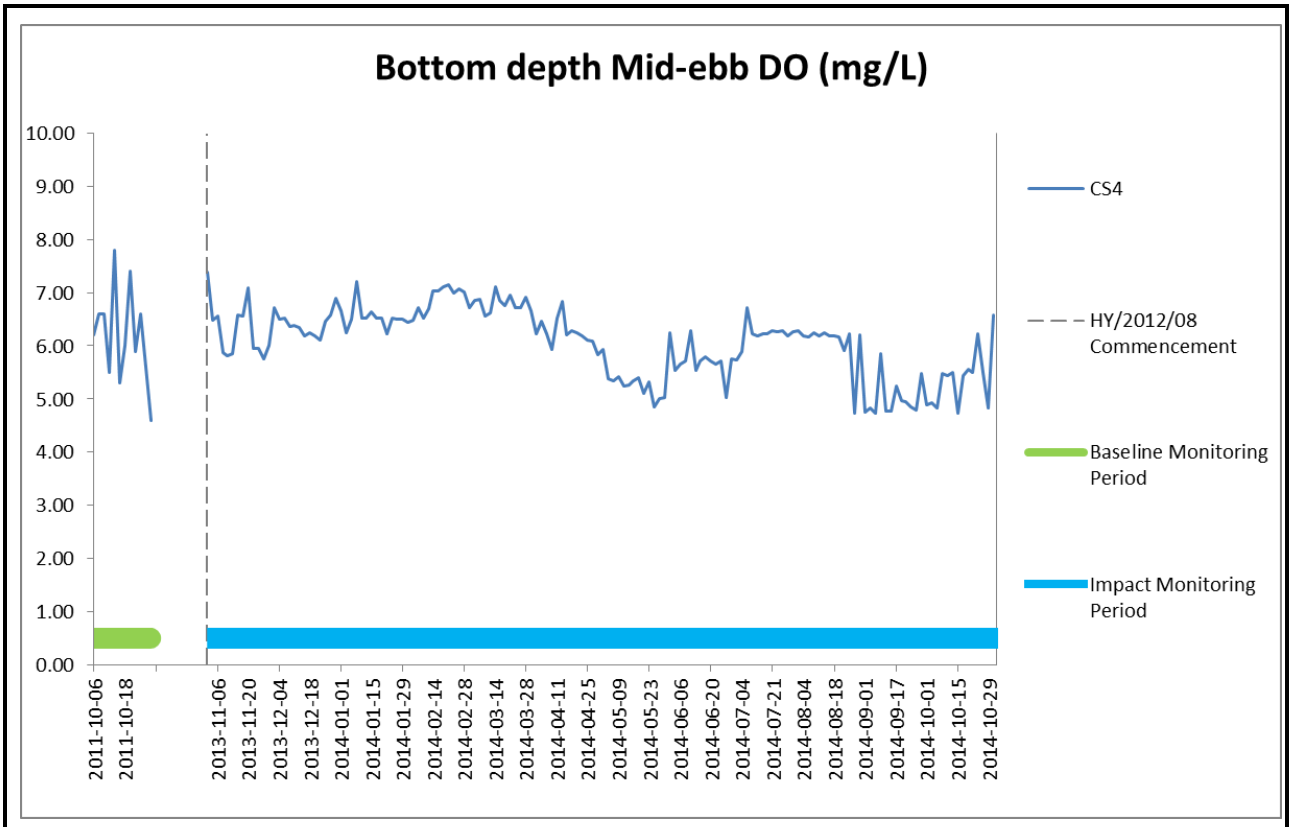




*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E16 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM



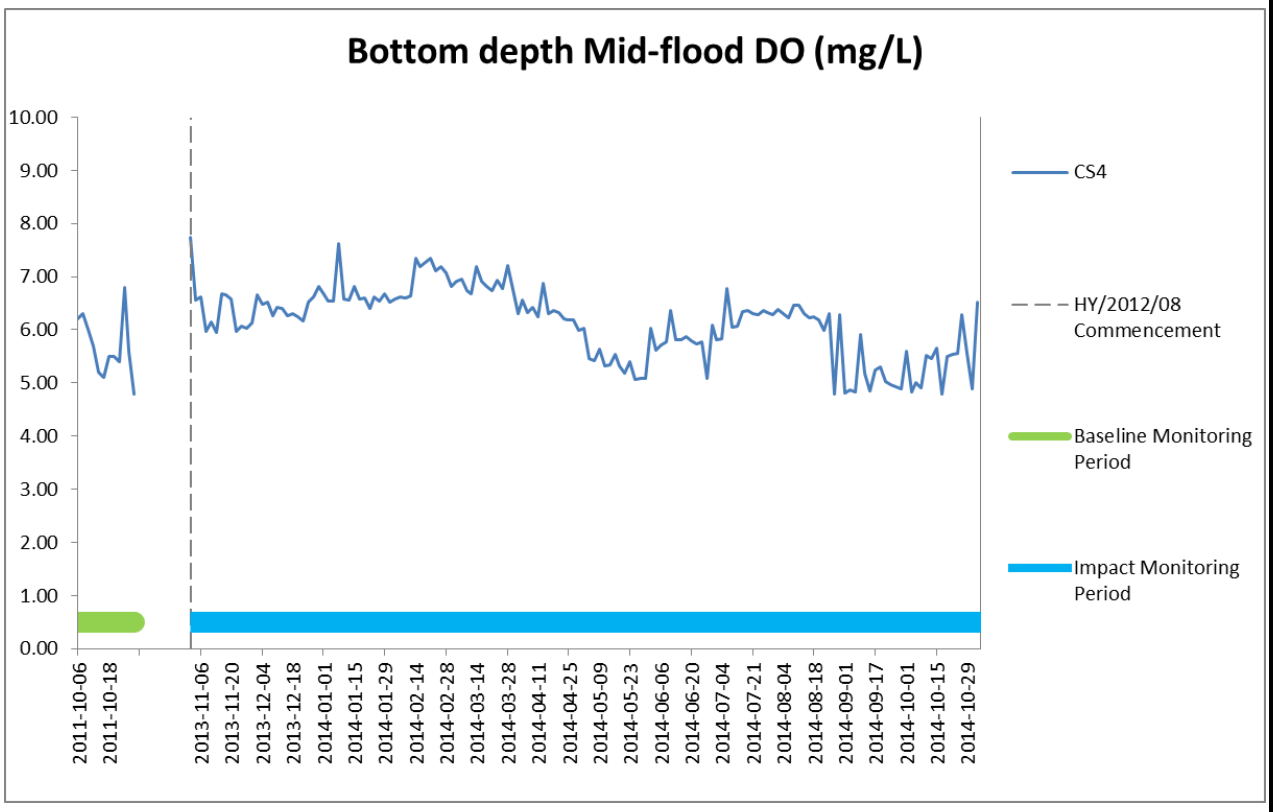
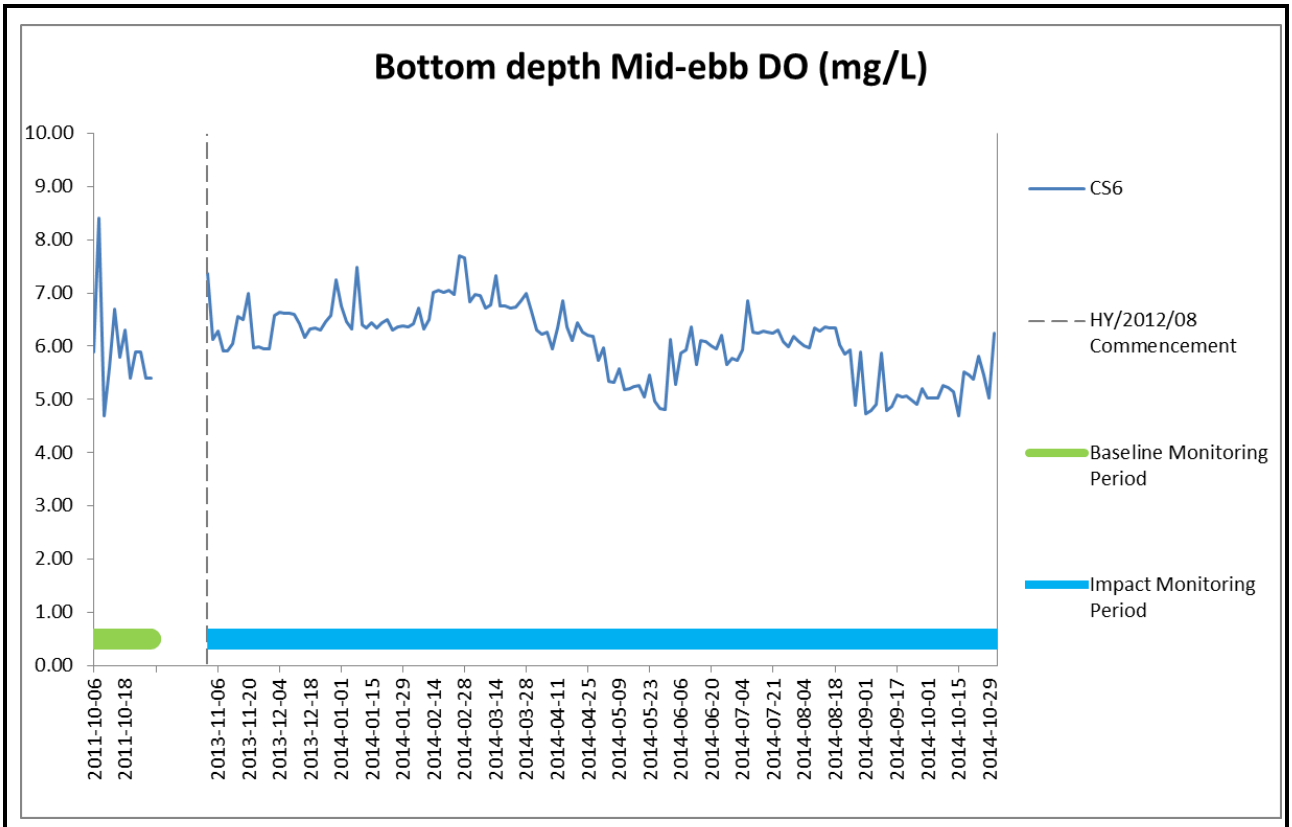


Figure E17 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



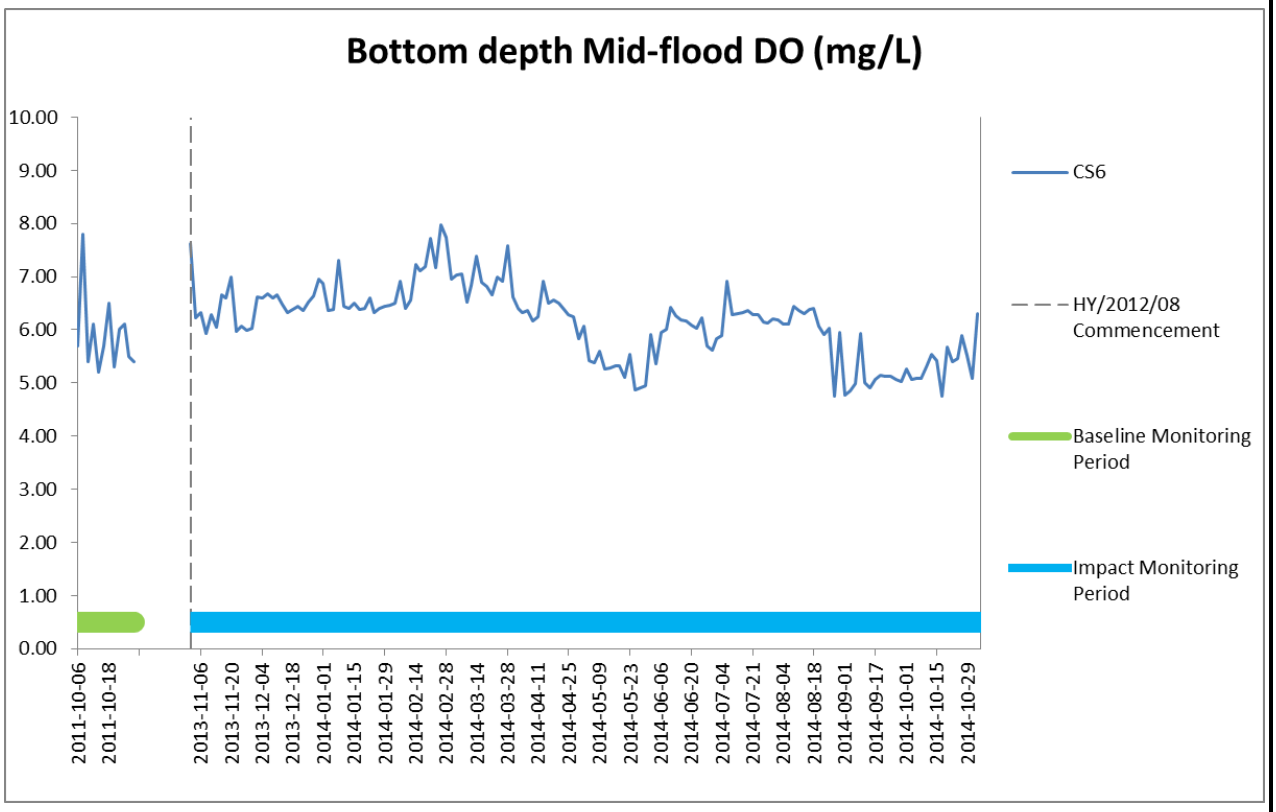
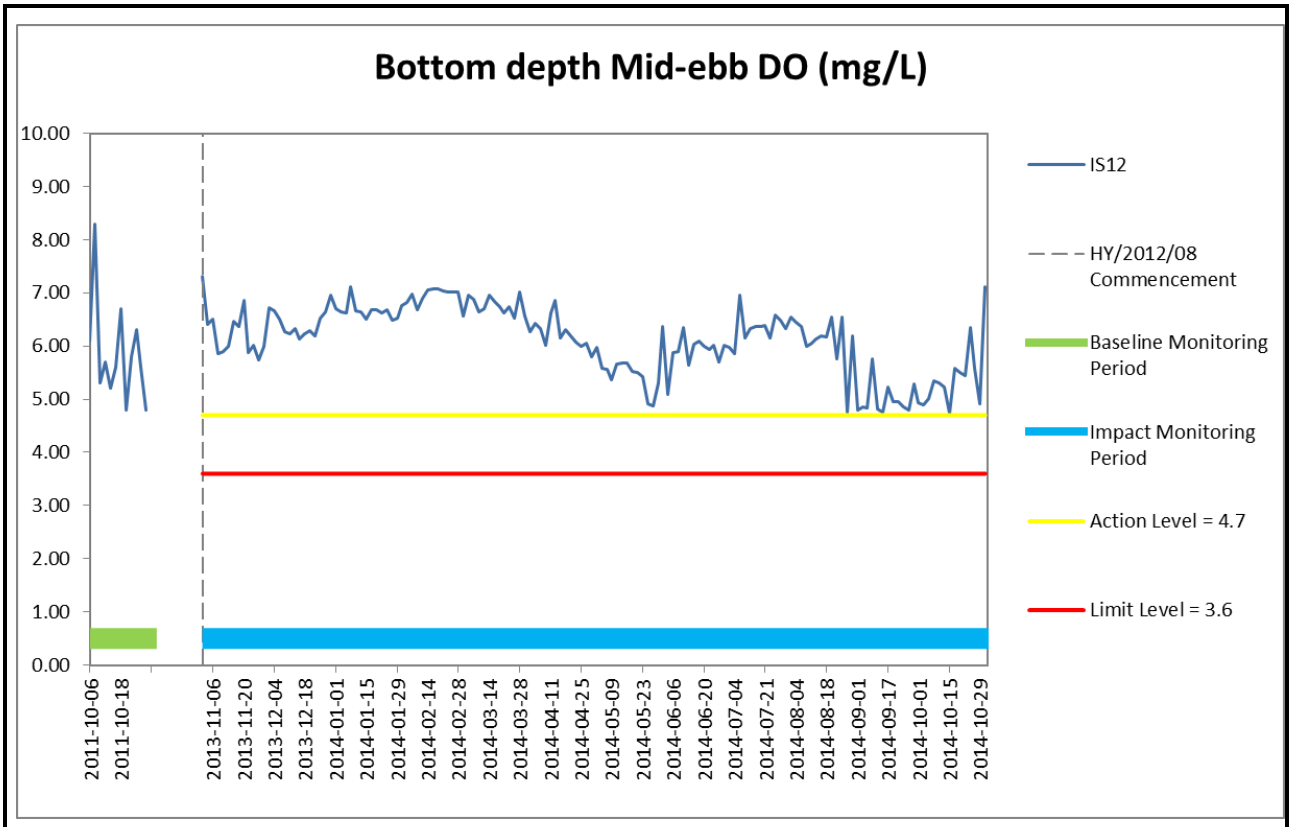


Figure E18 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



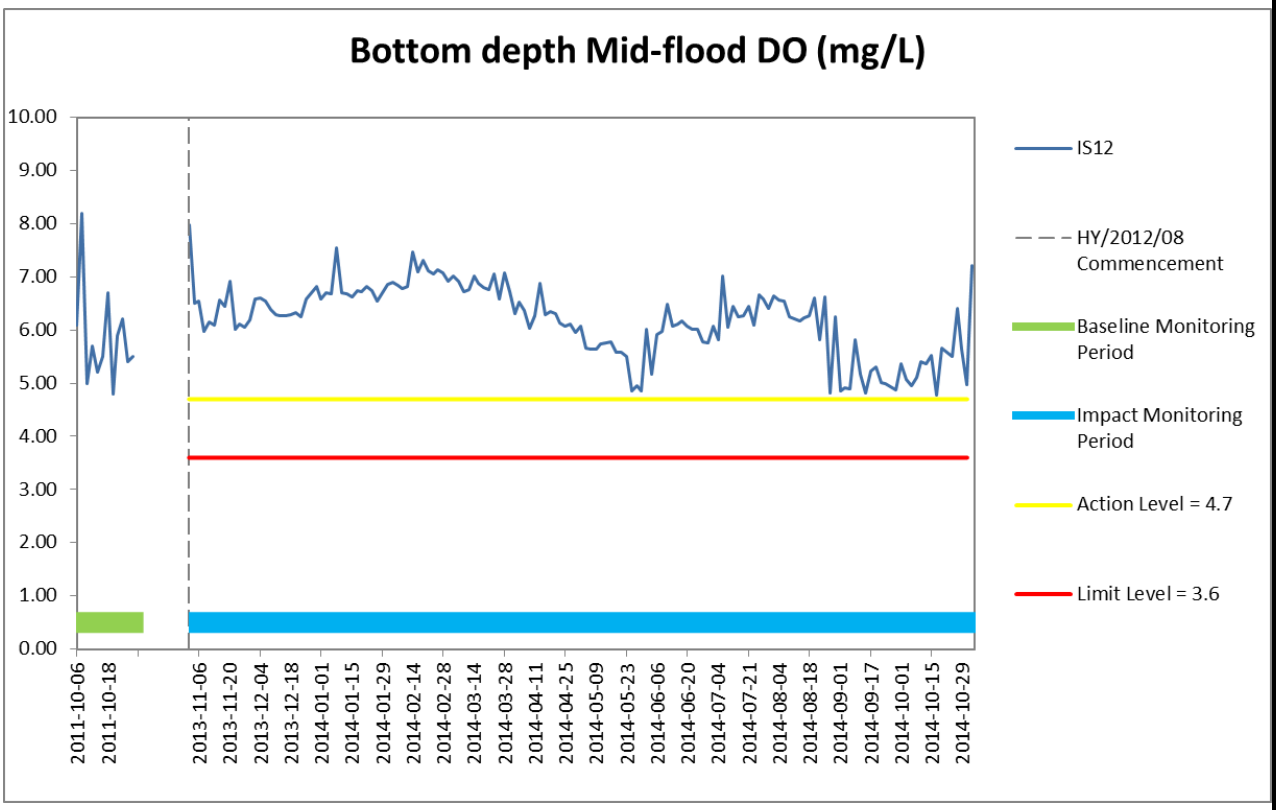
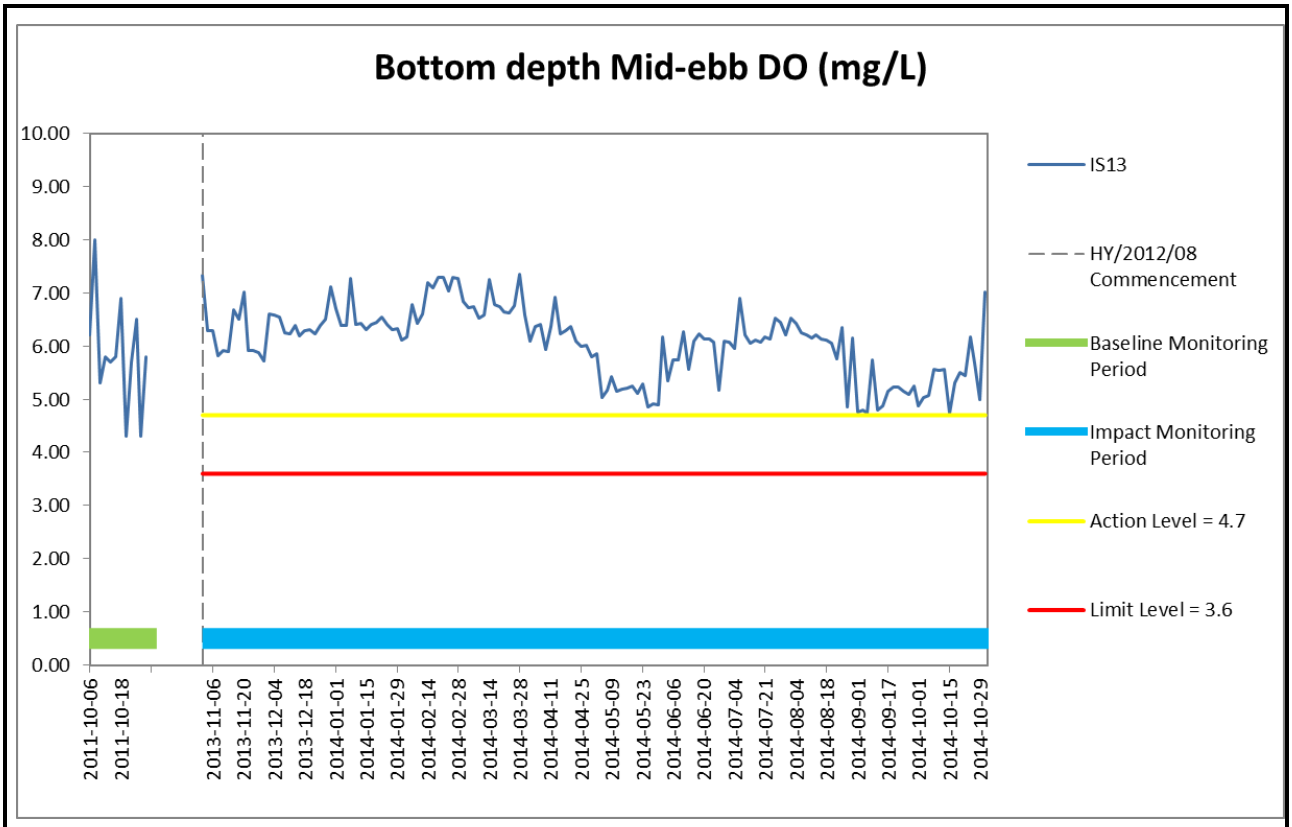


Figure E19 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



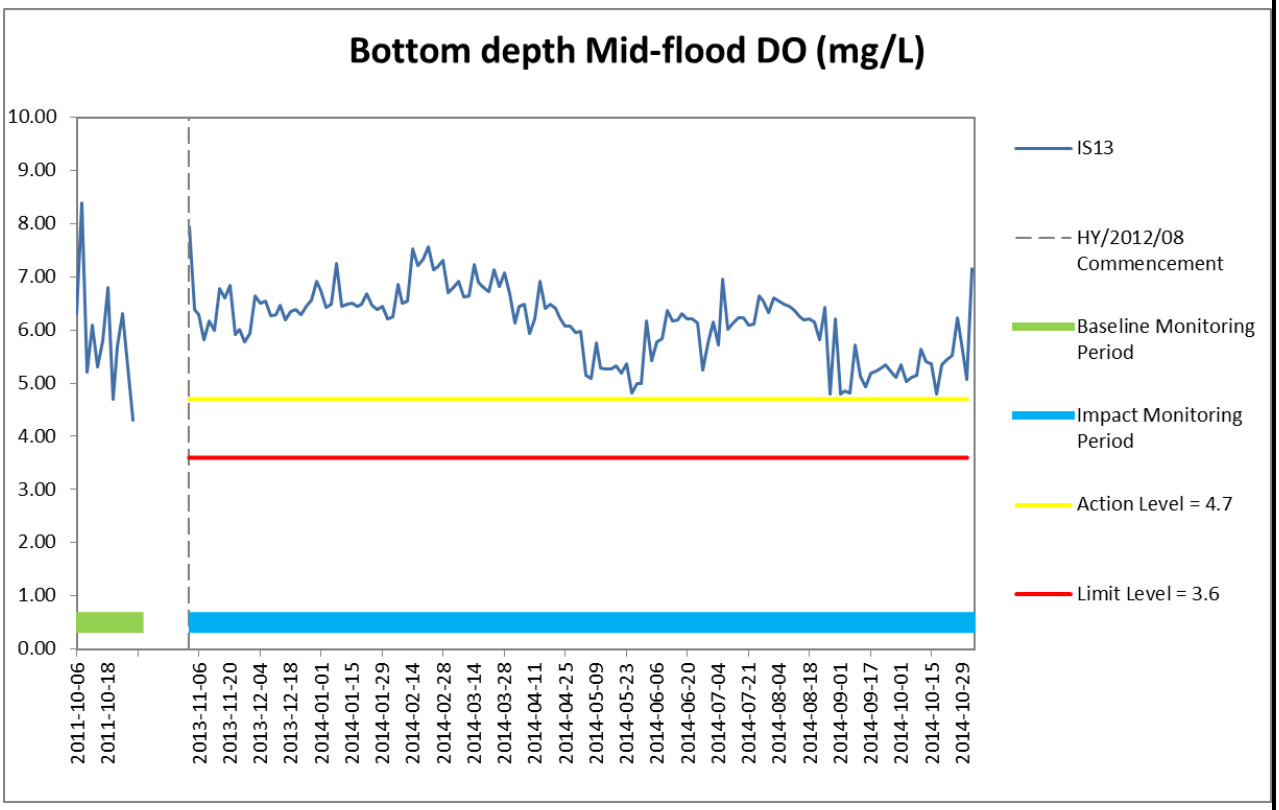
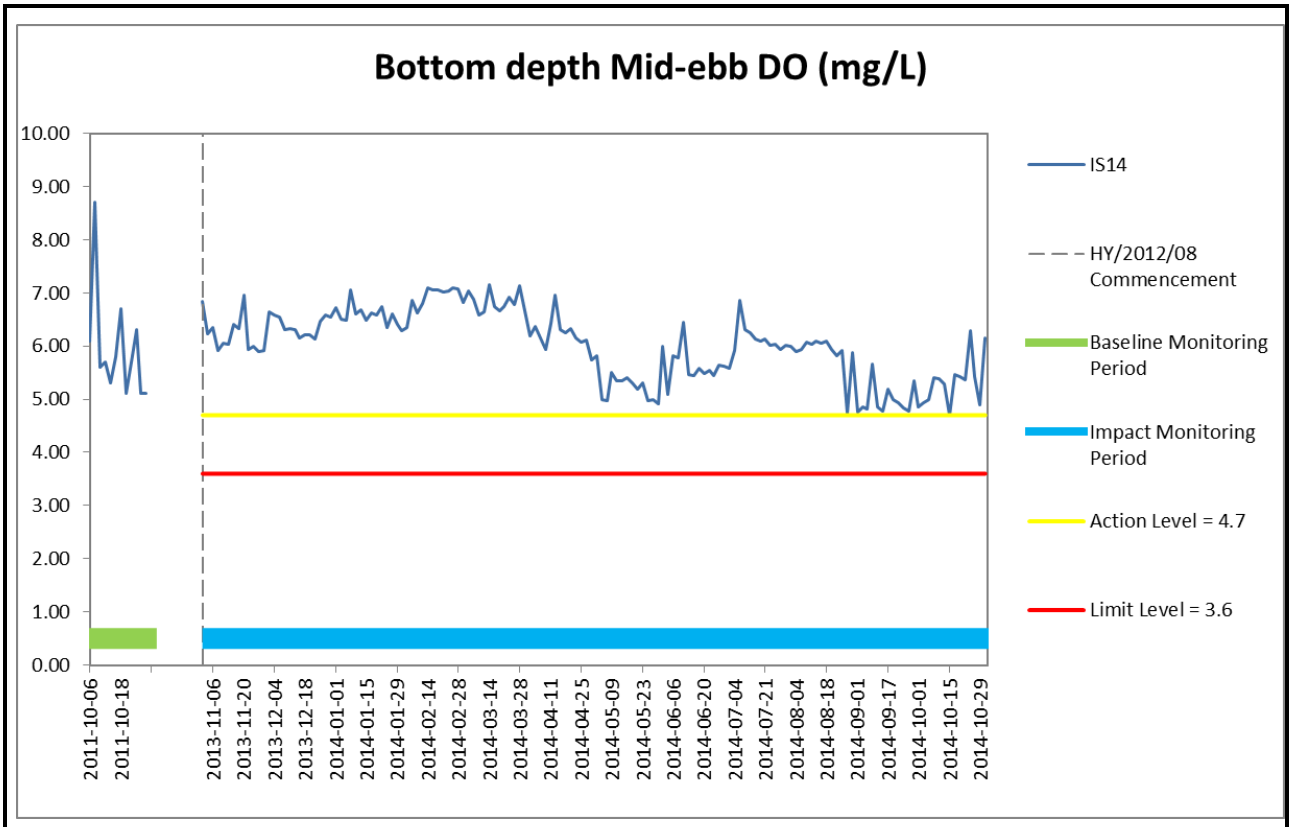


Figure E20 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



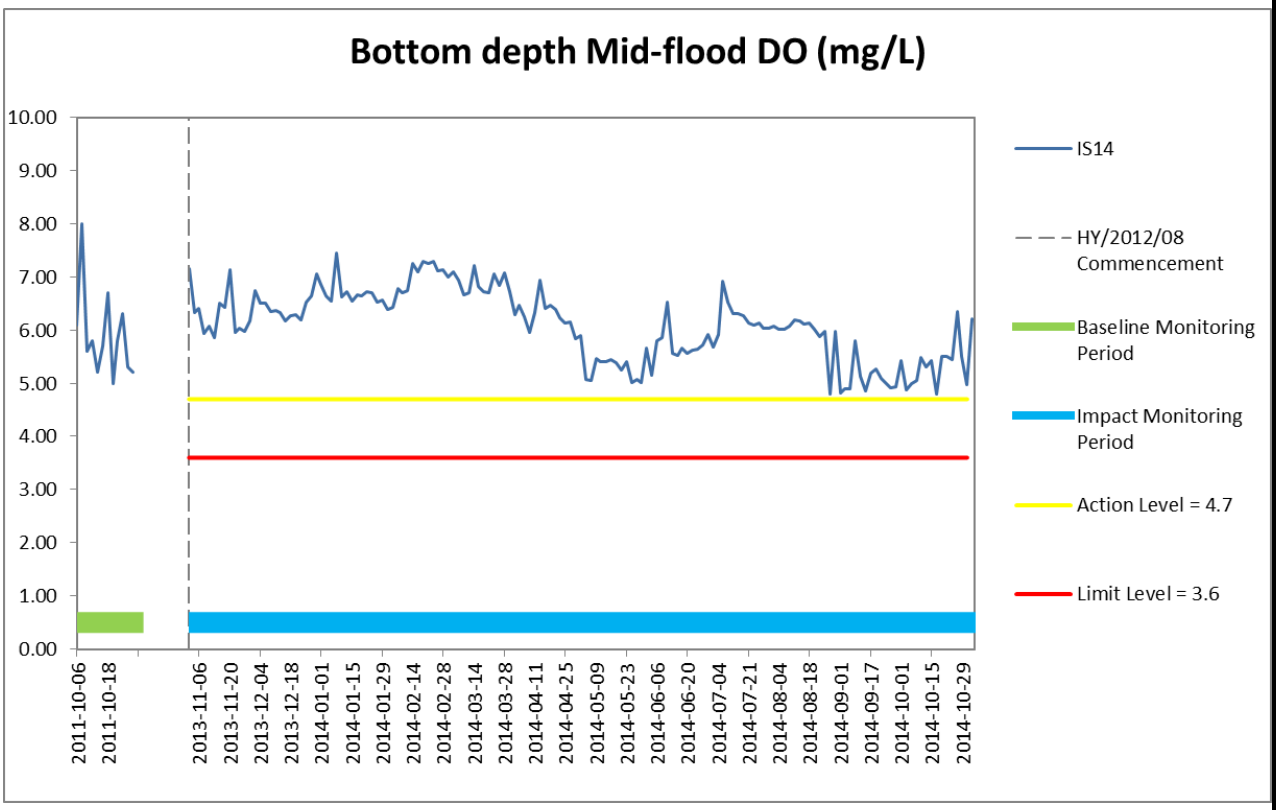
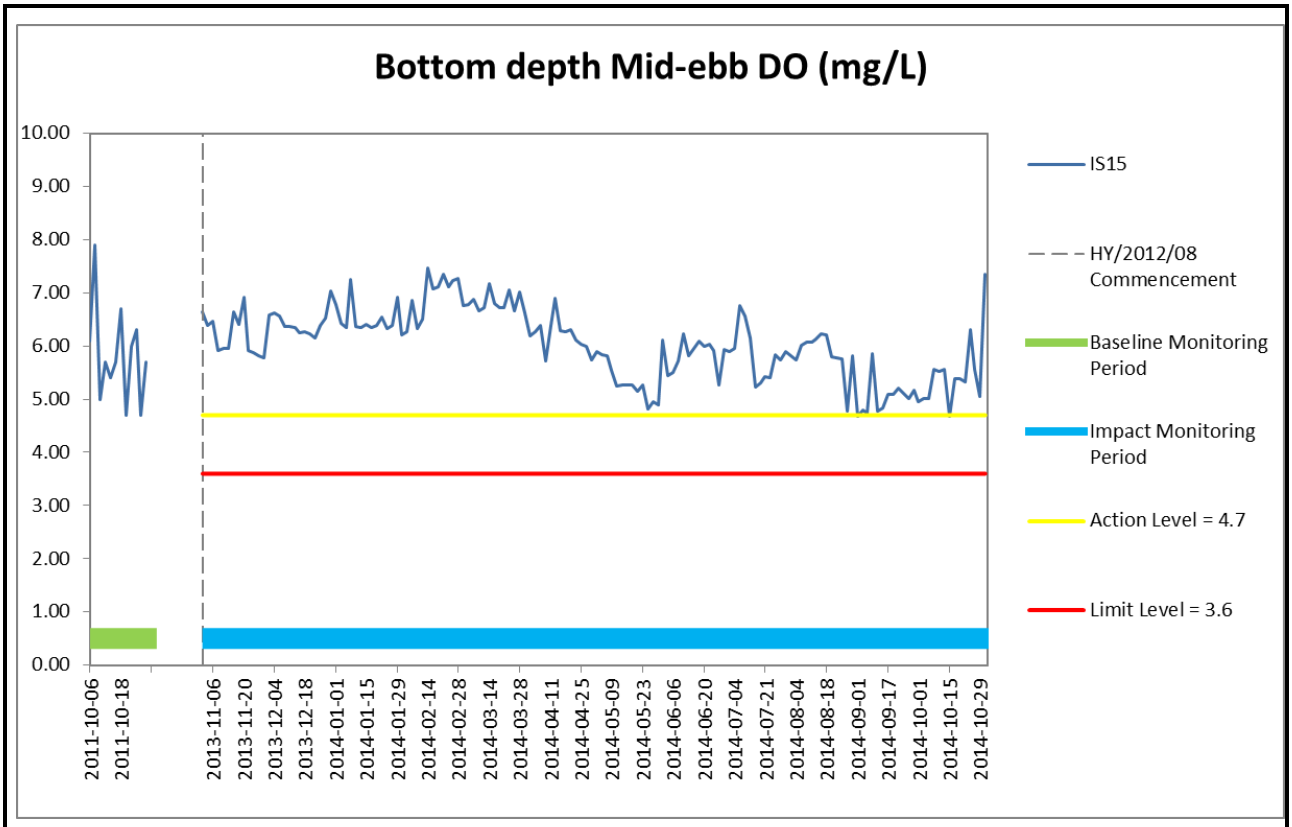


Figure E21 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



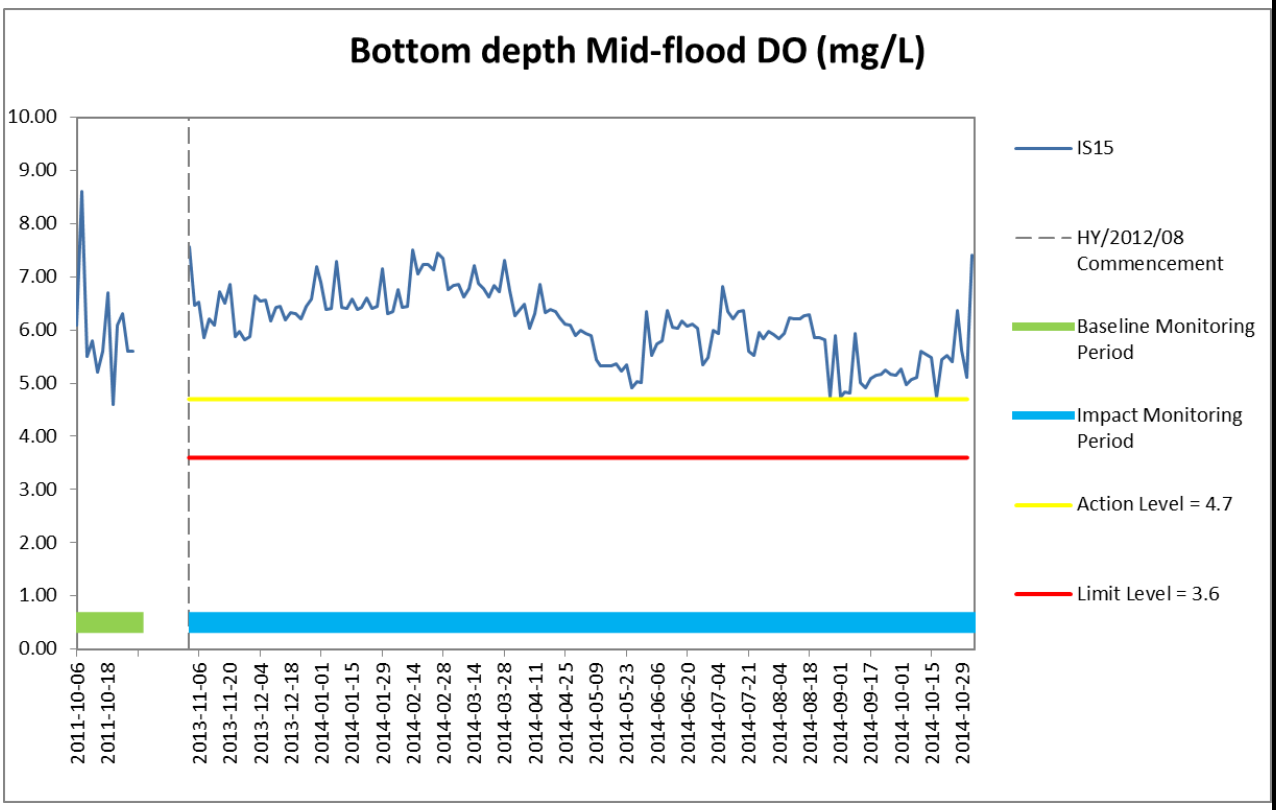
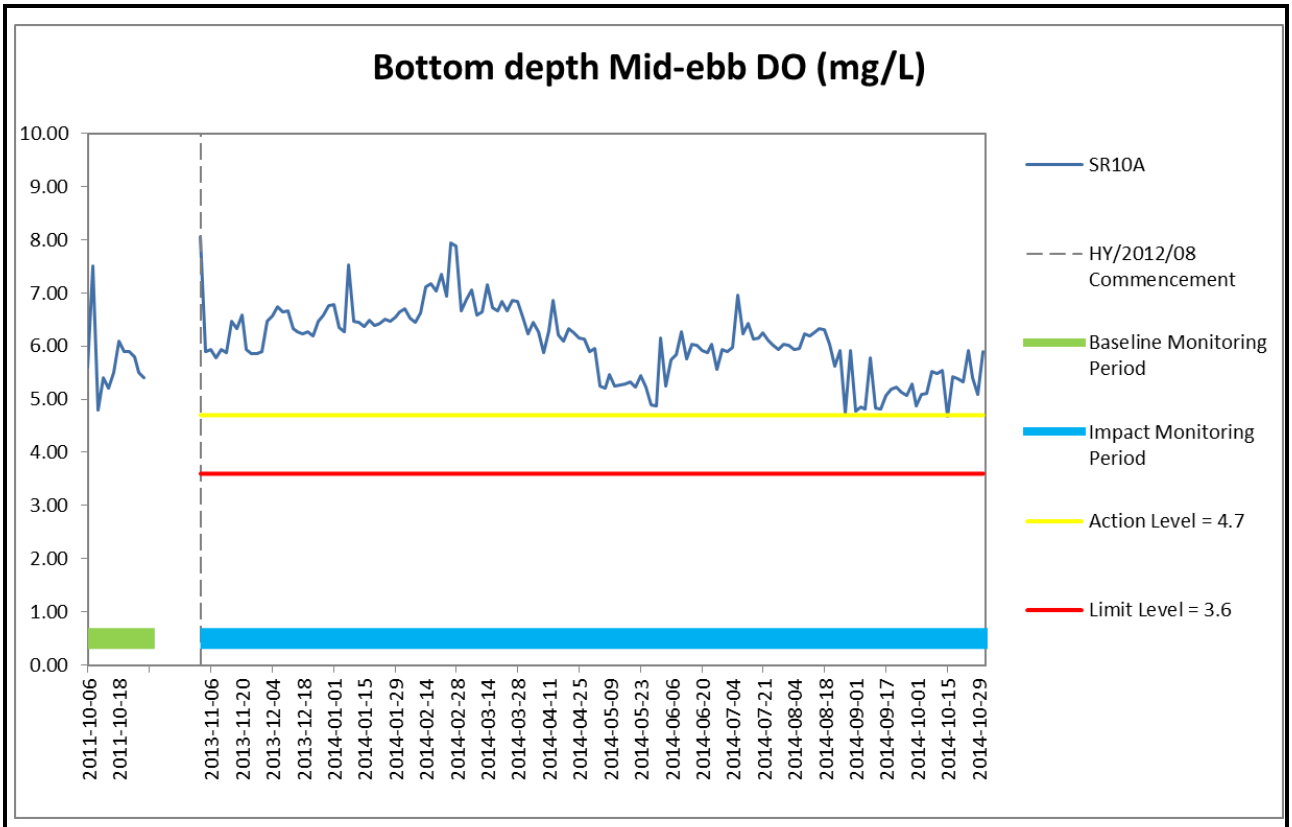


Figure E22 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



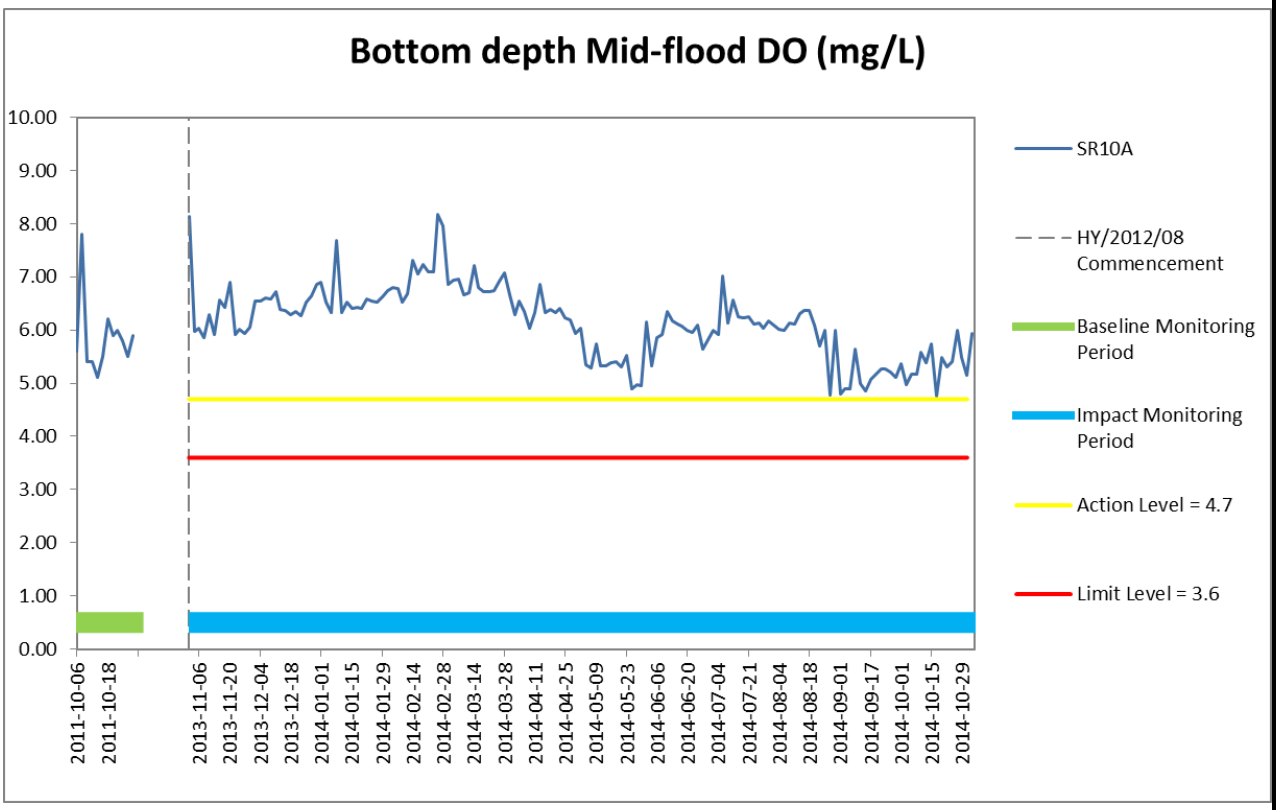
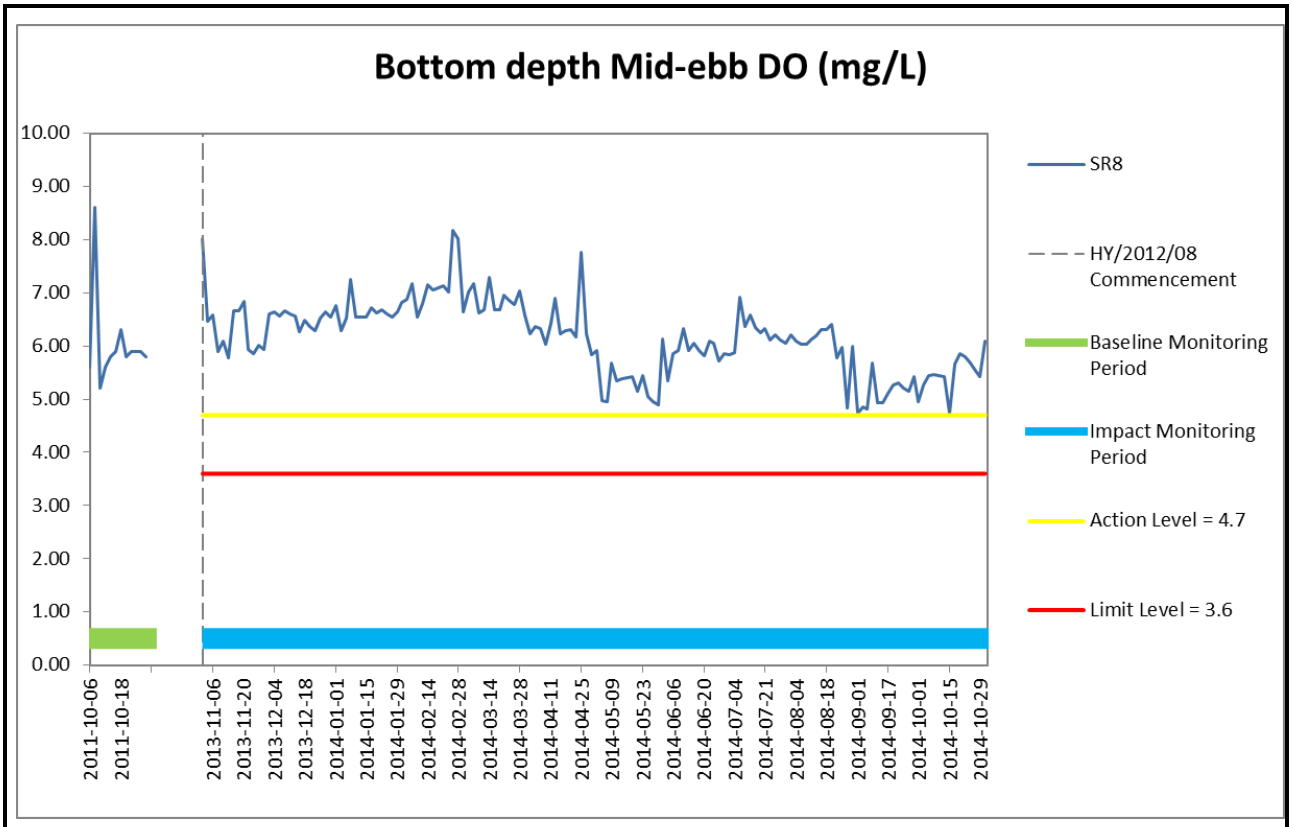


Figure E23 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



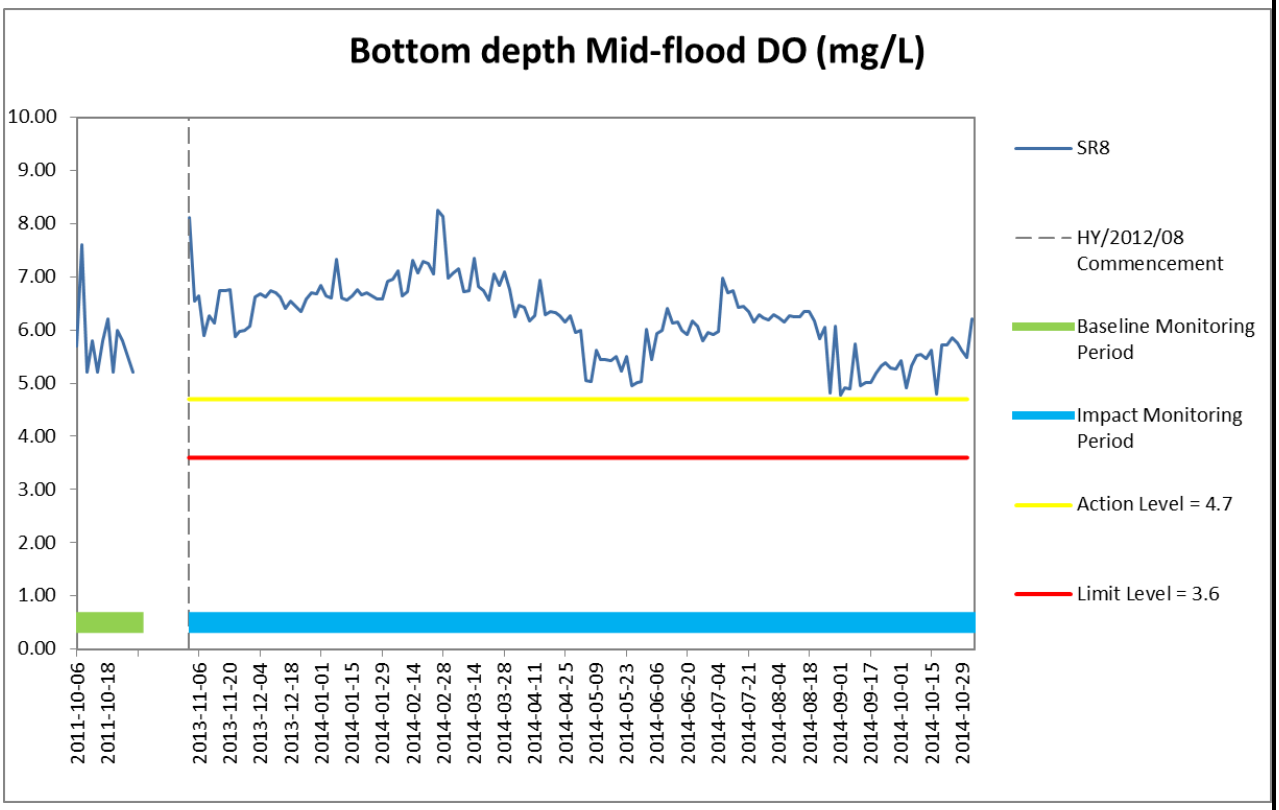
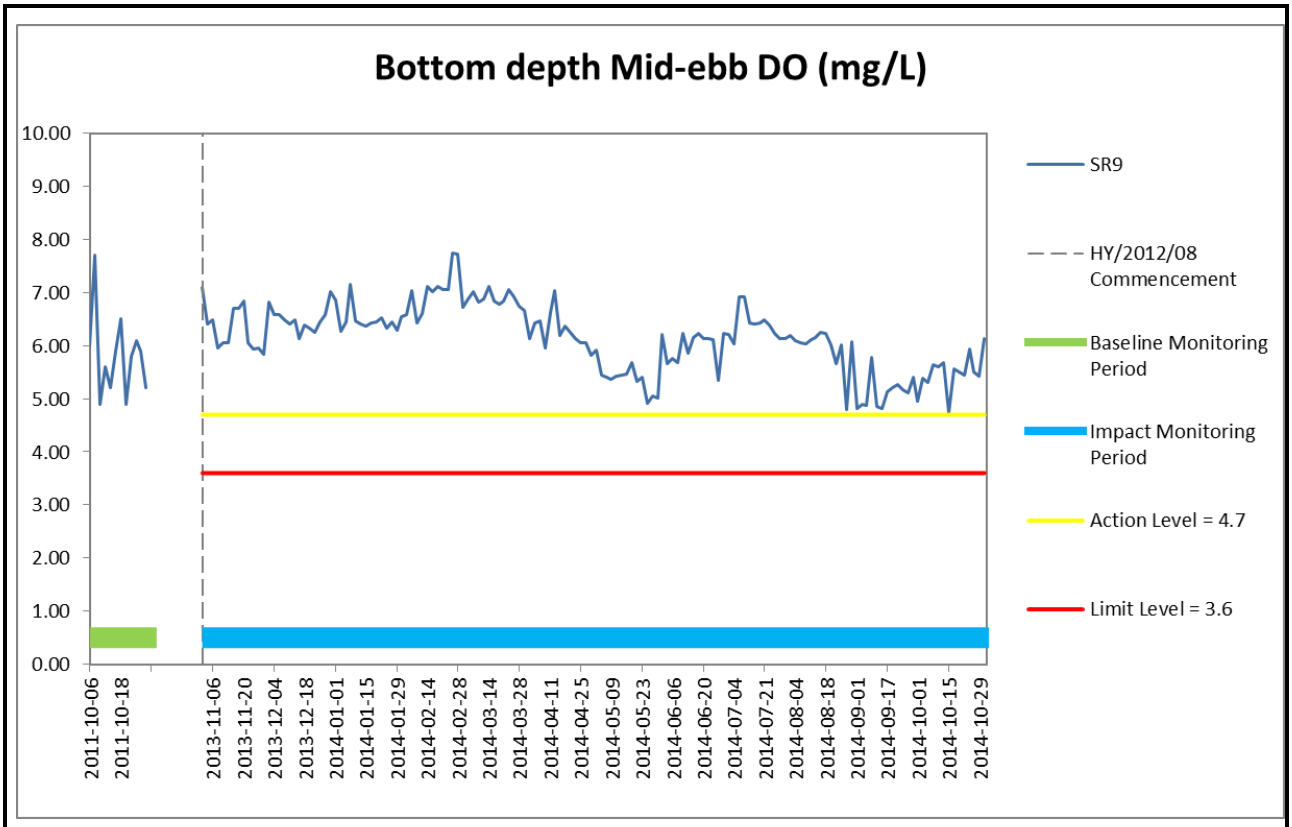


Figure E24 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



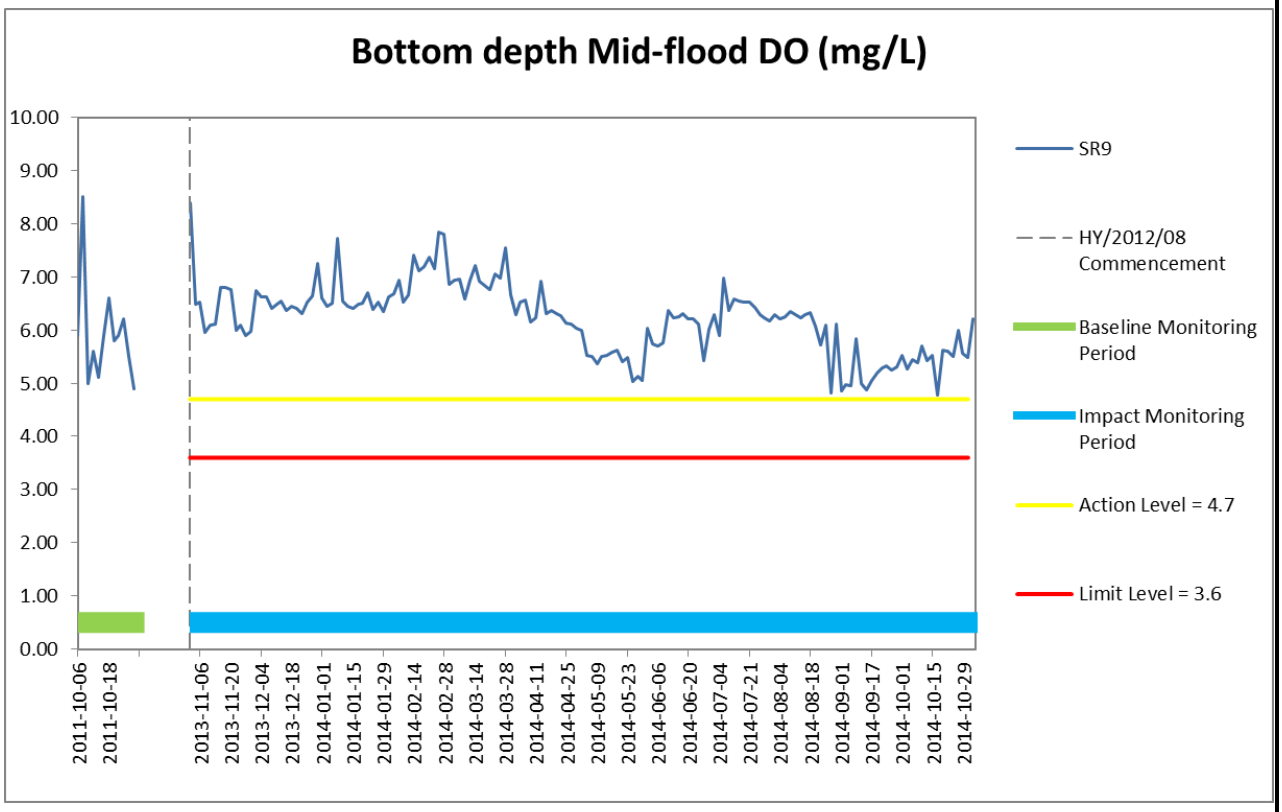
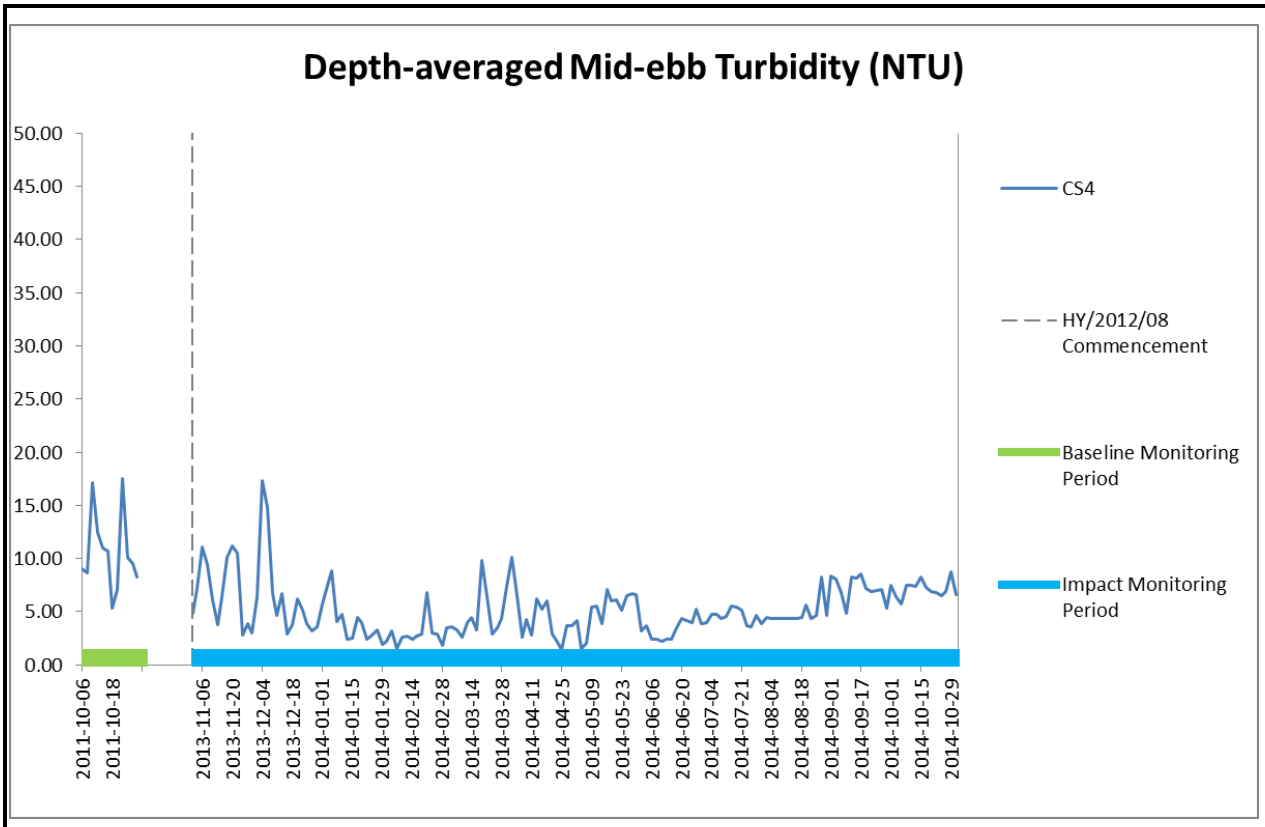


Figure E25 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



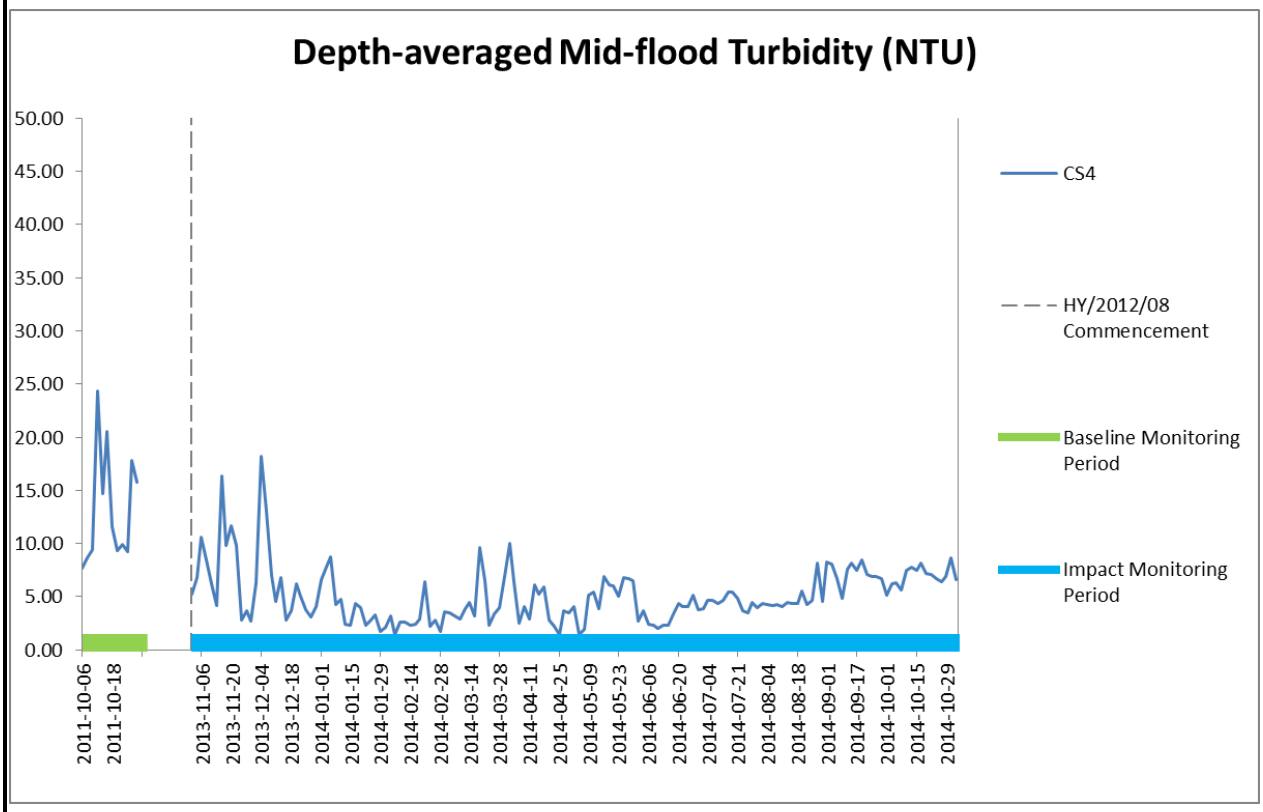
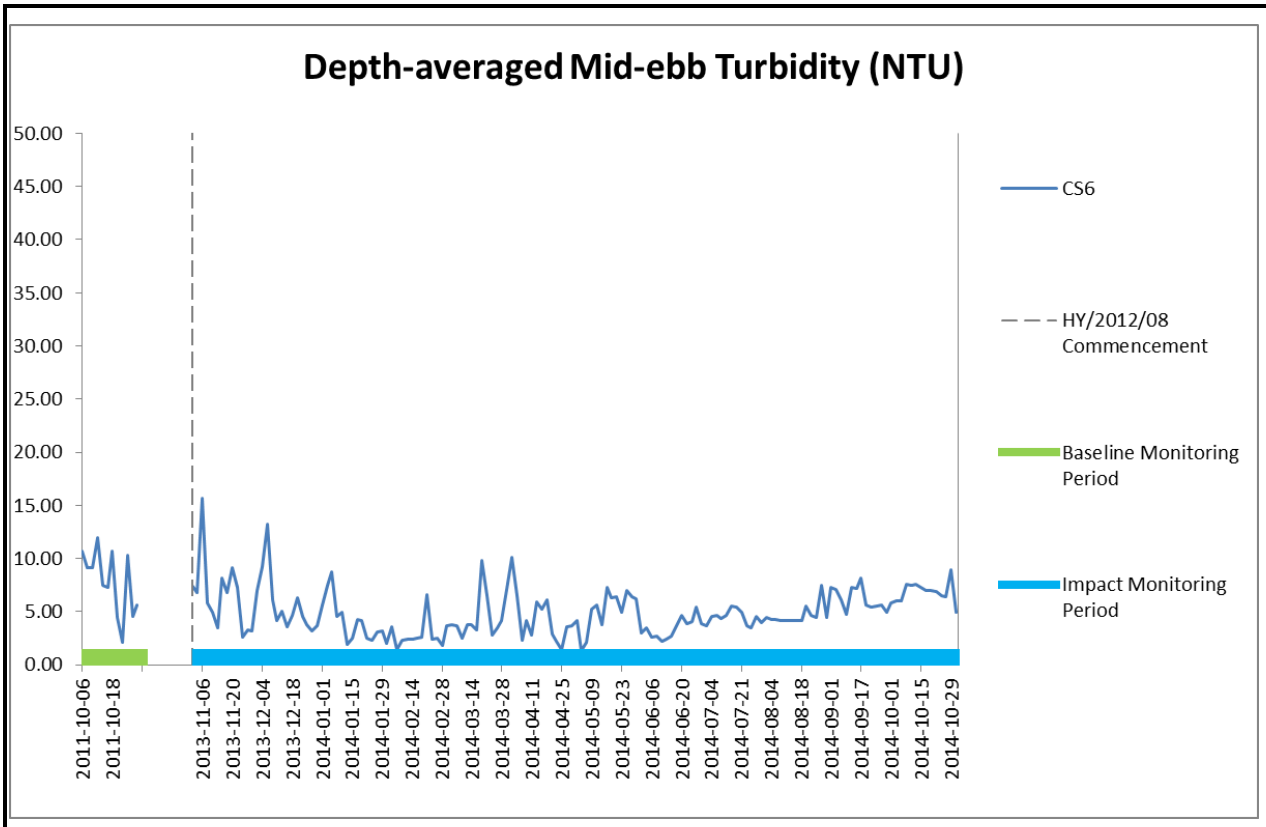


Figure E26 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



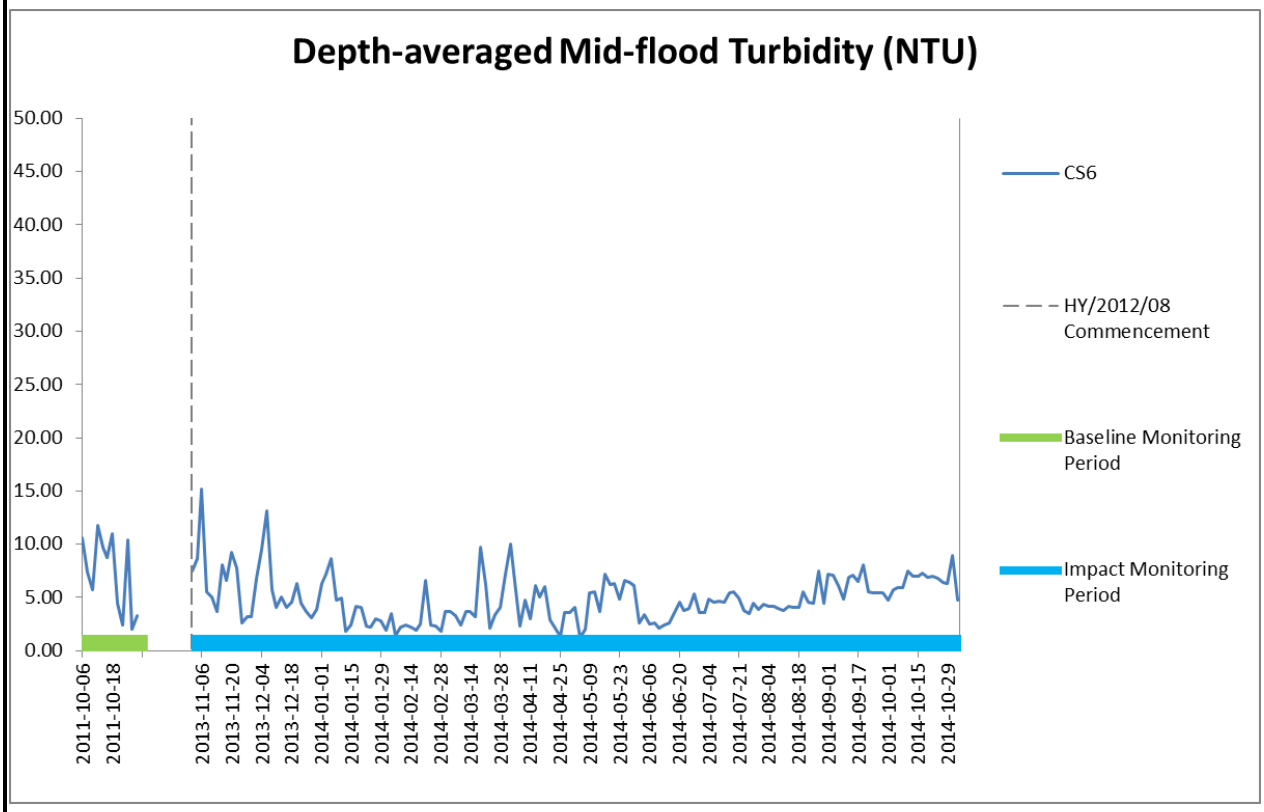
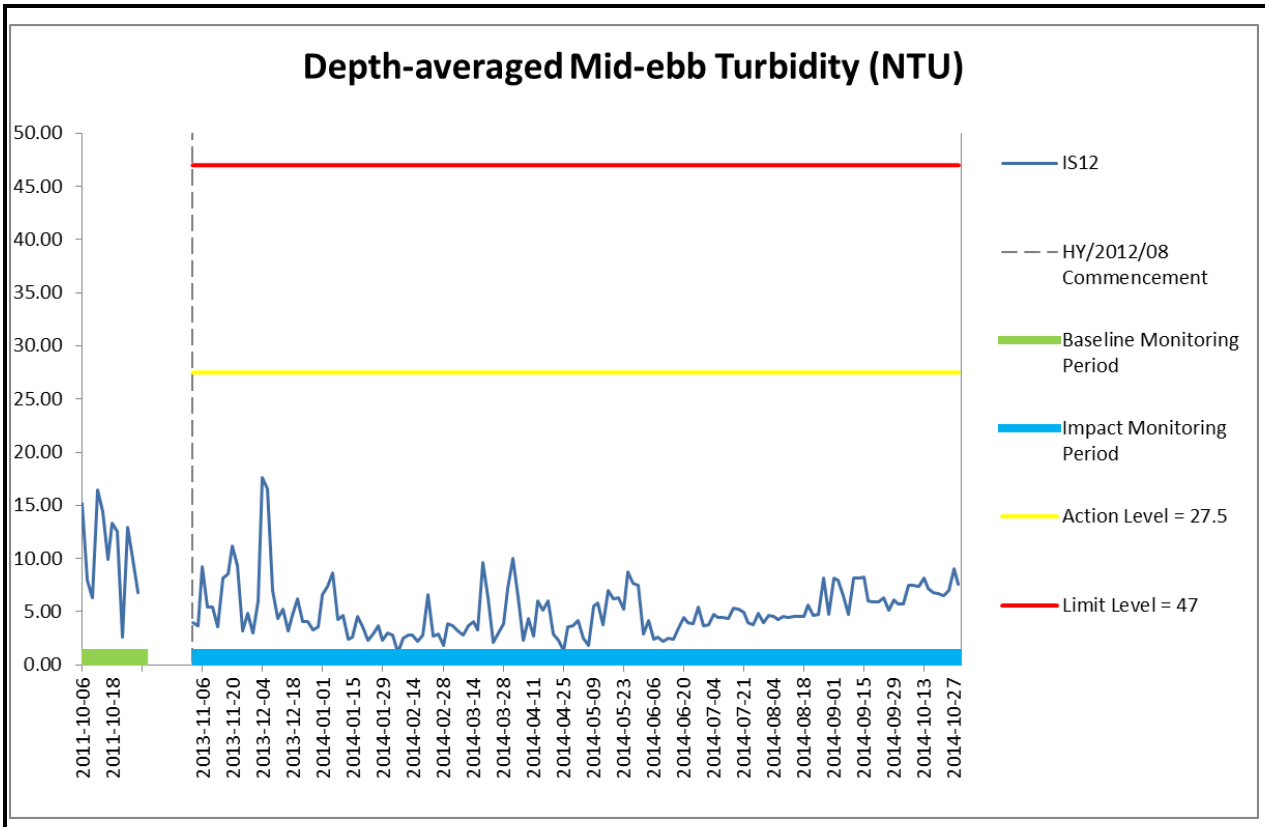


Figure E27 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



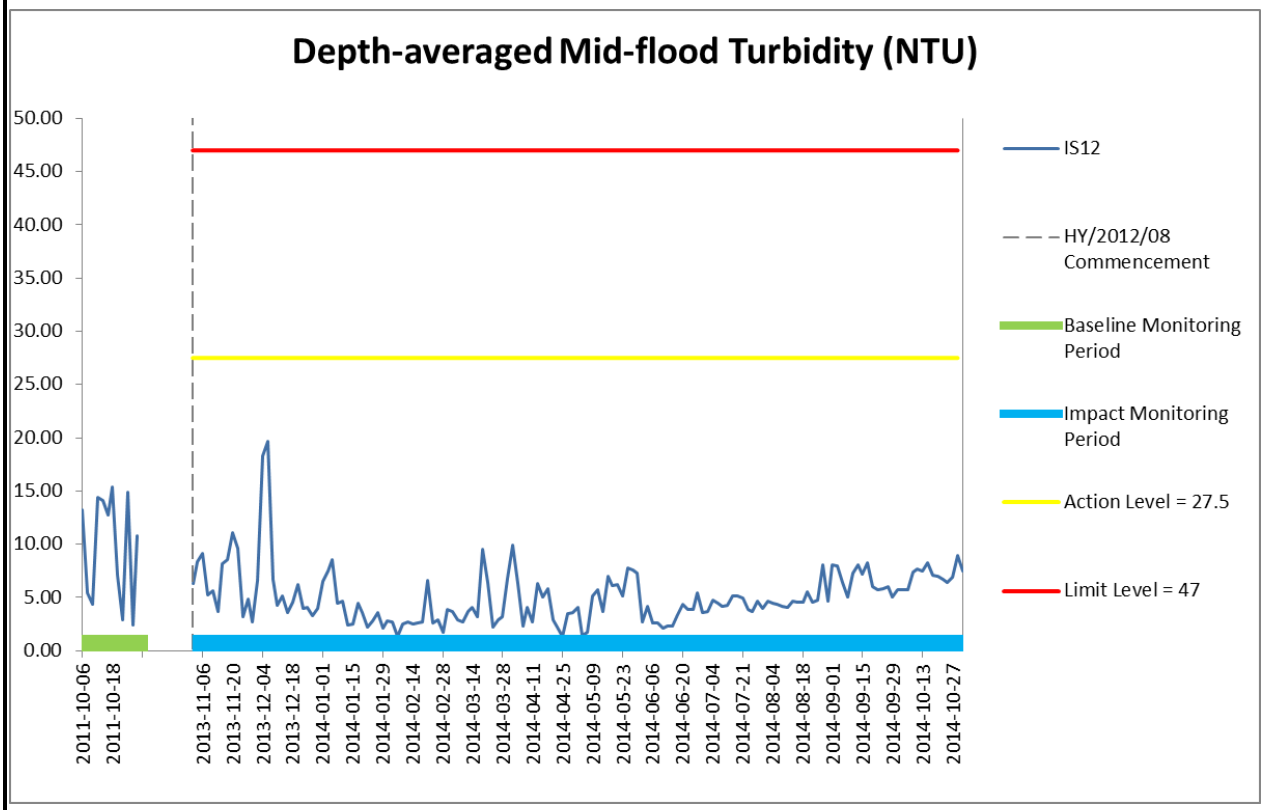


Figure E28 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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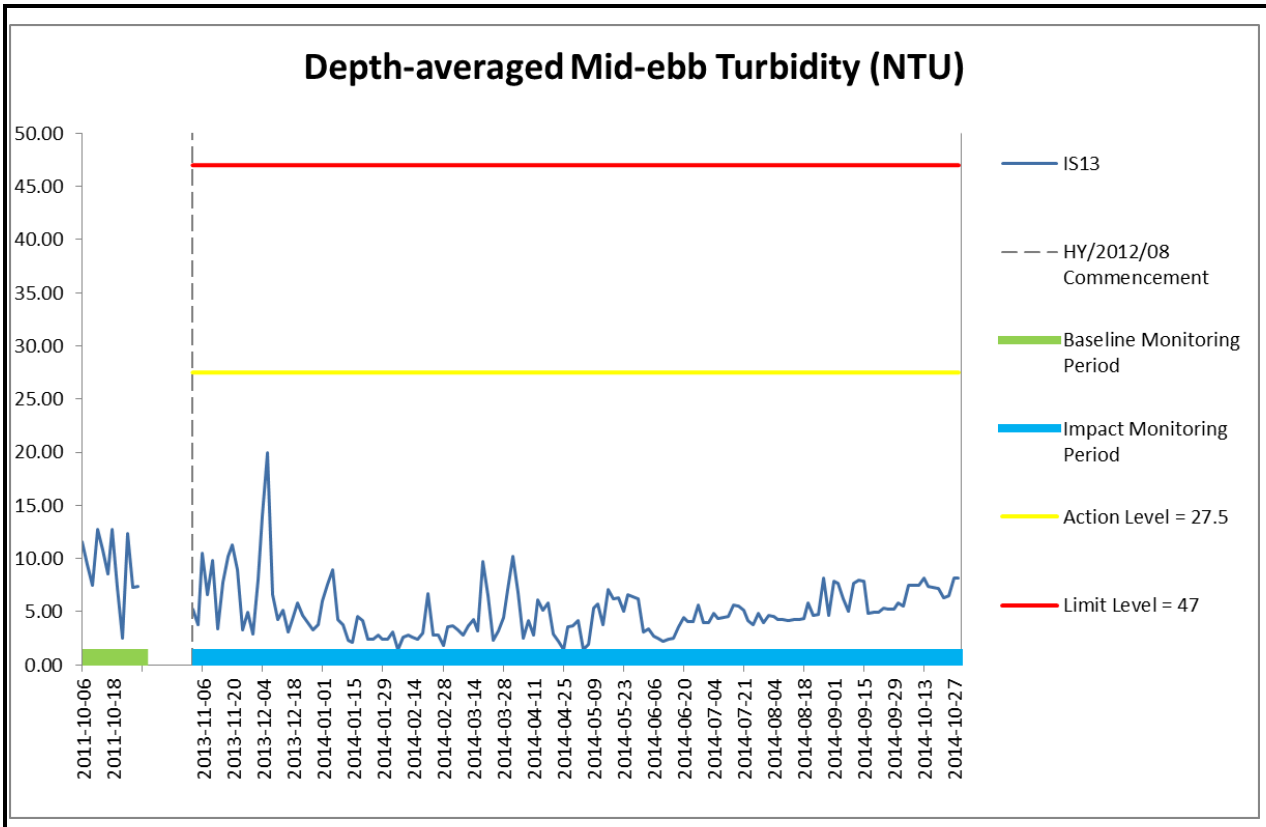


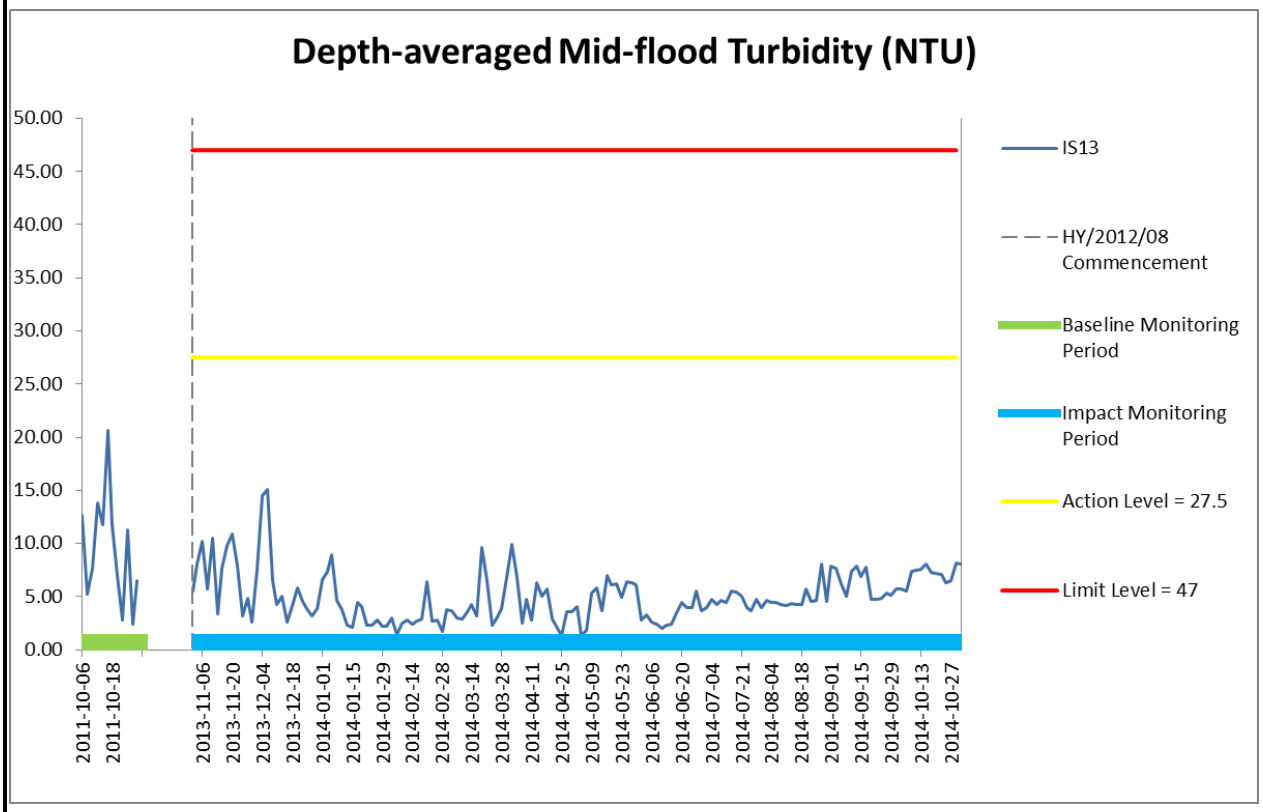
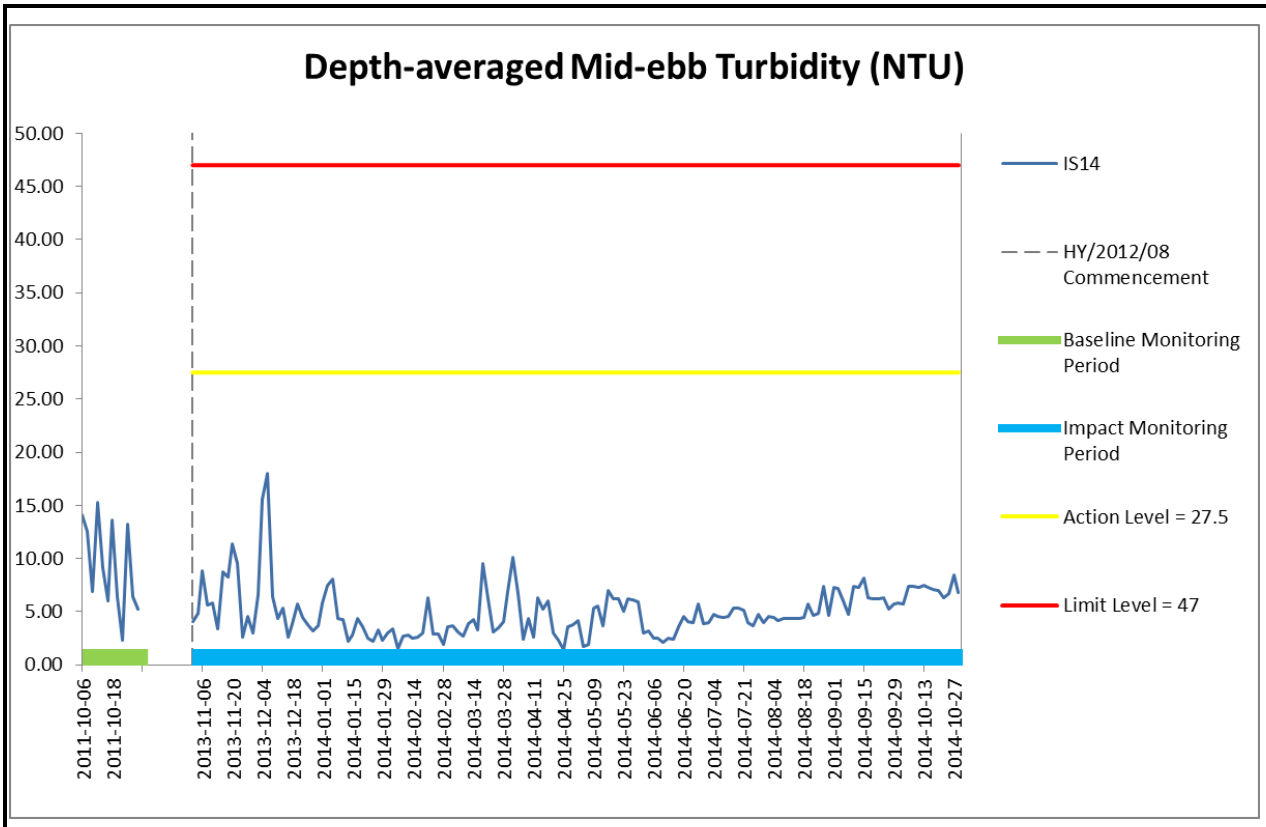


Figure E29 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



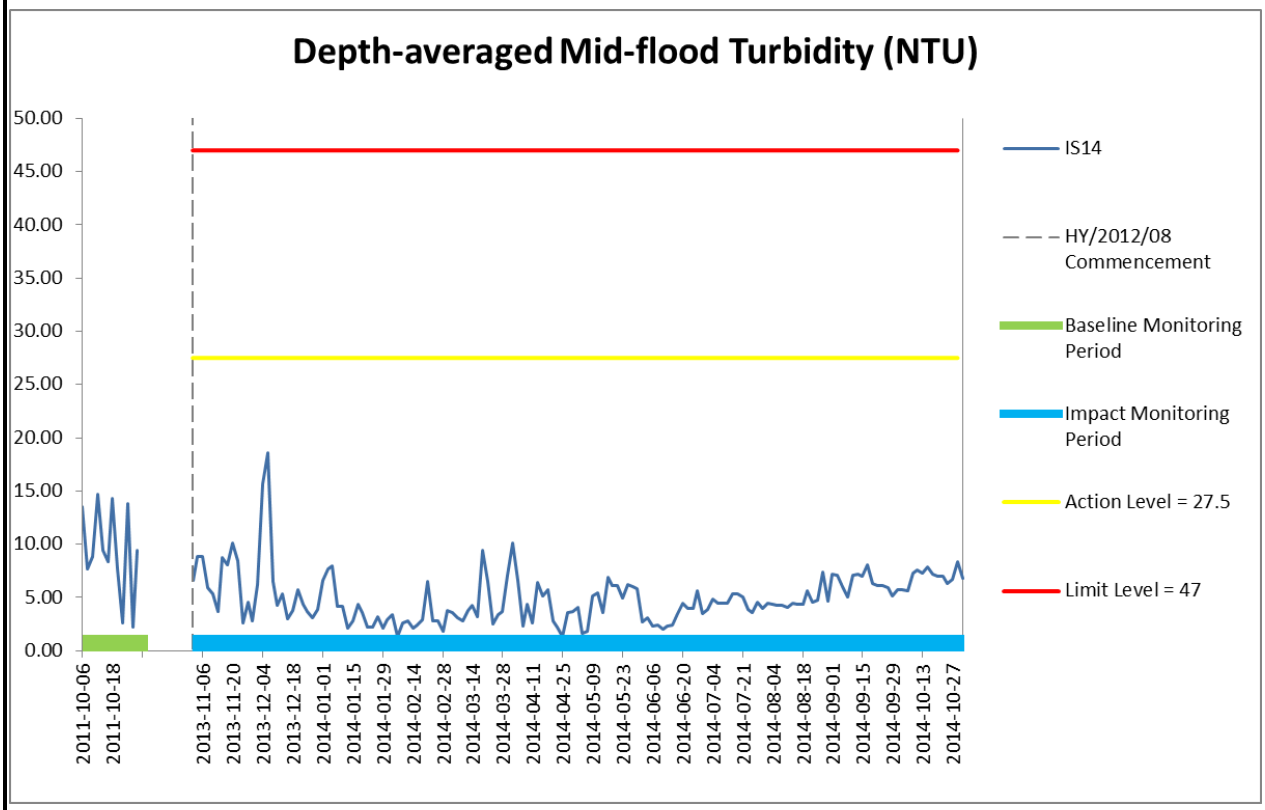


Figure E30 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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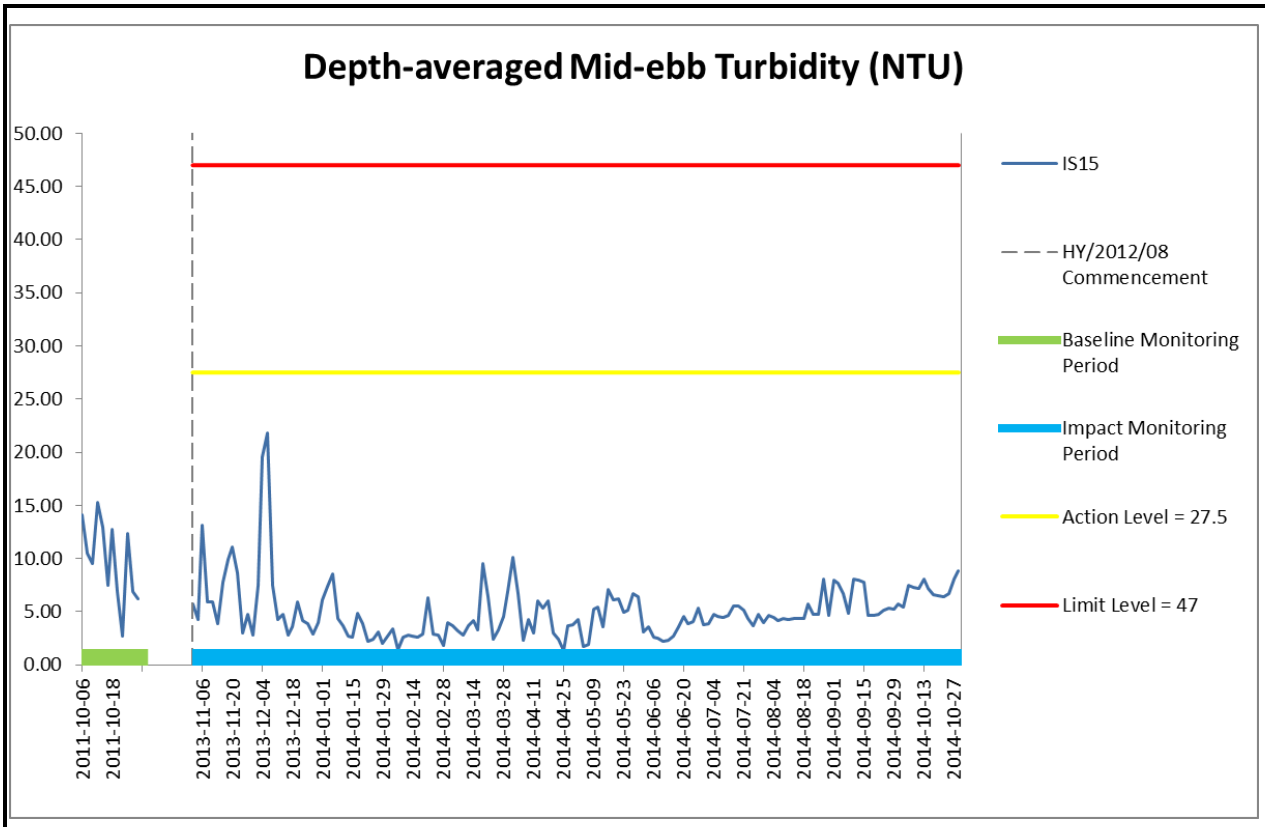


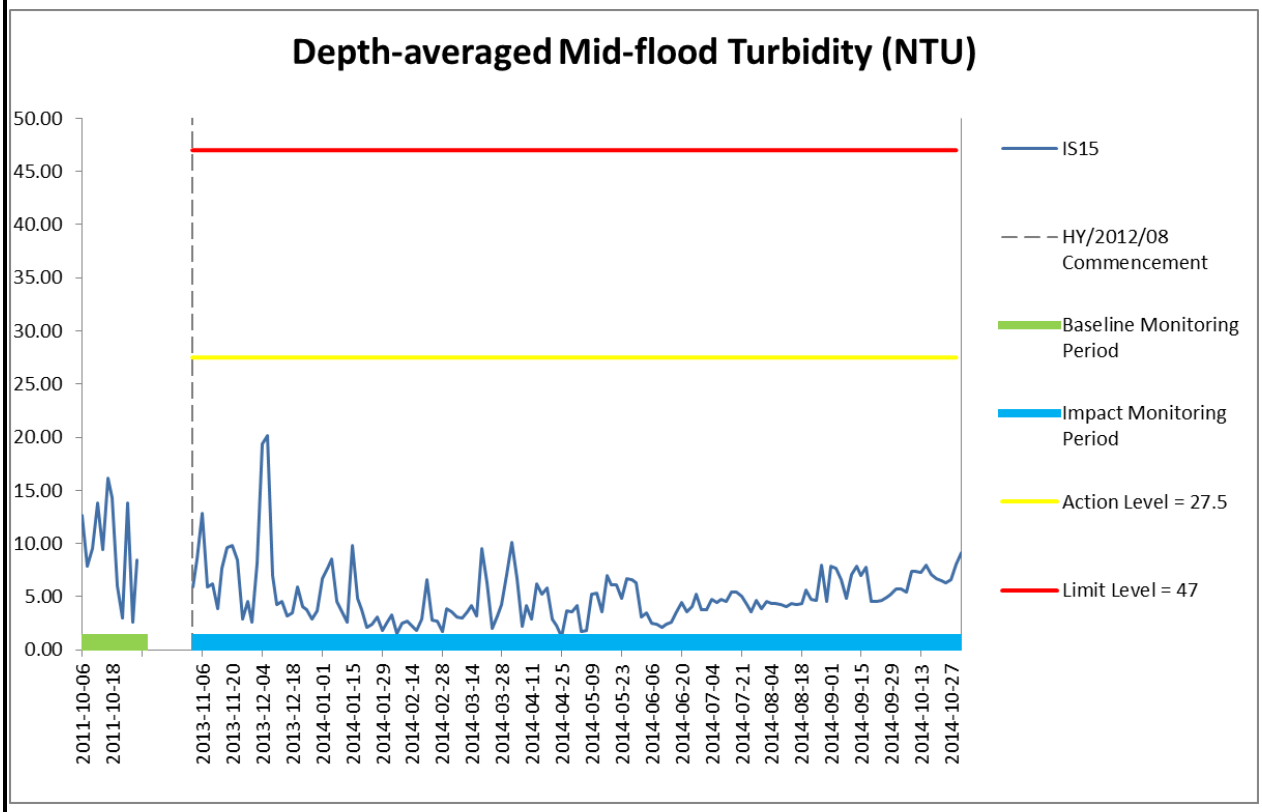
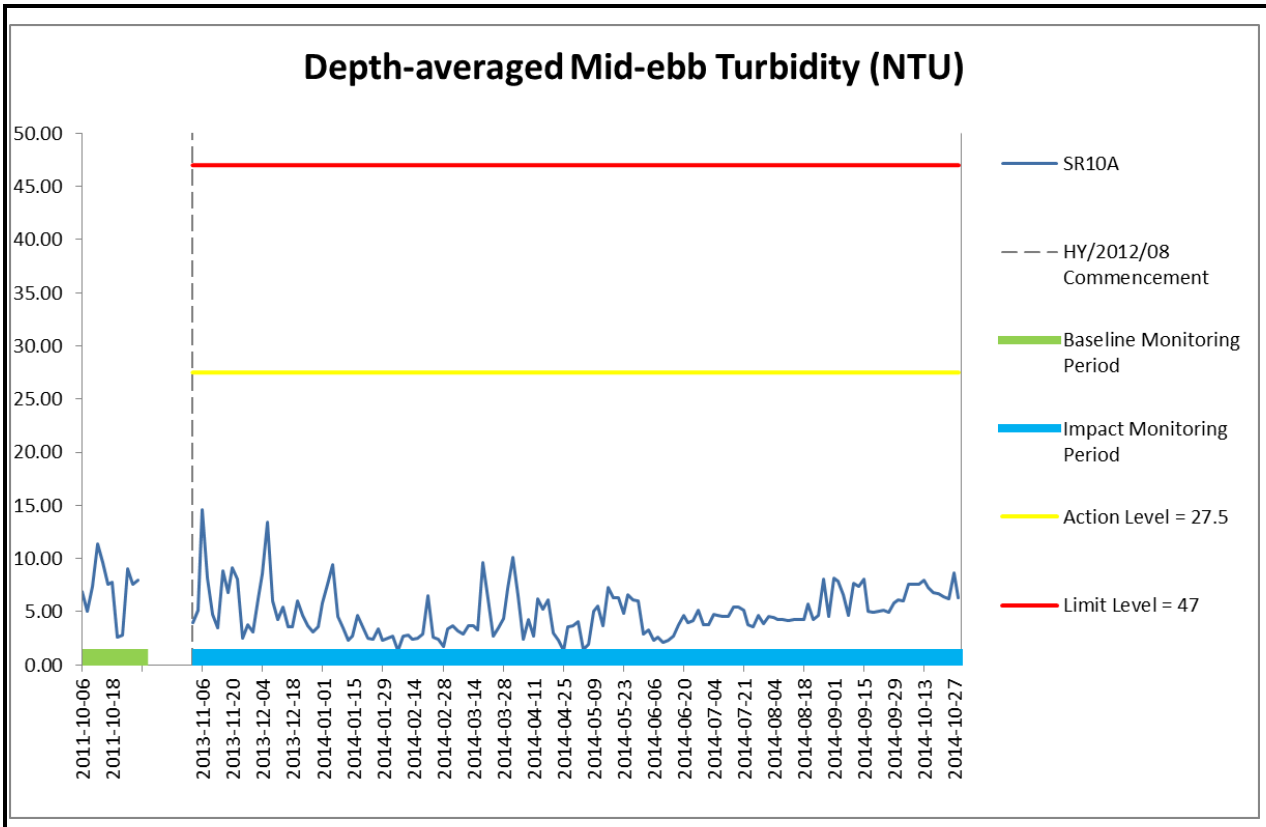


Figure E31 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



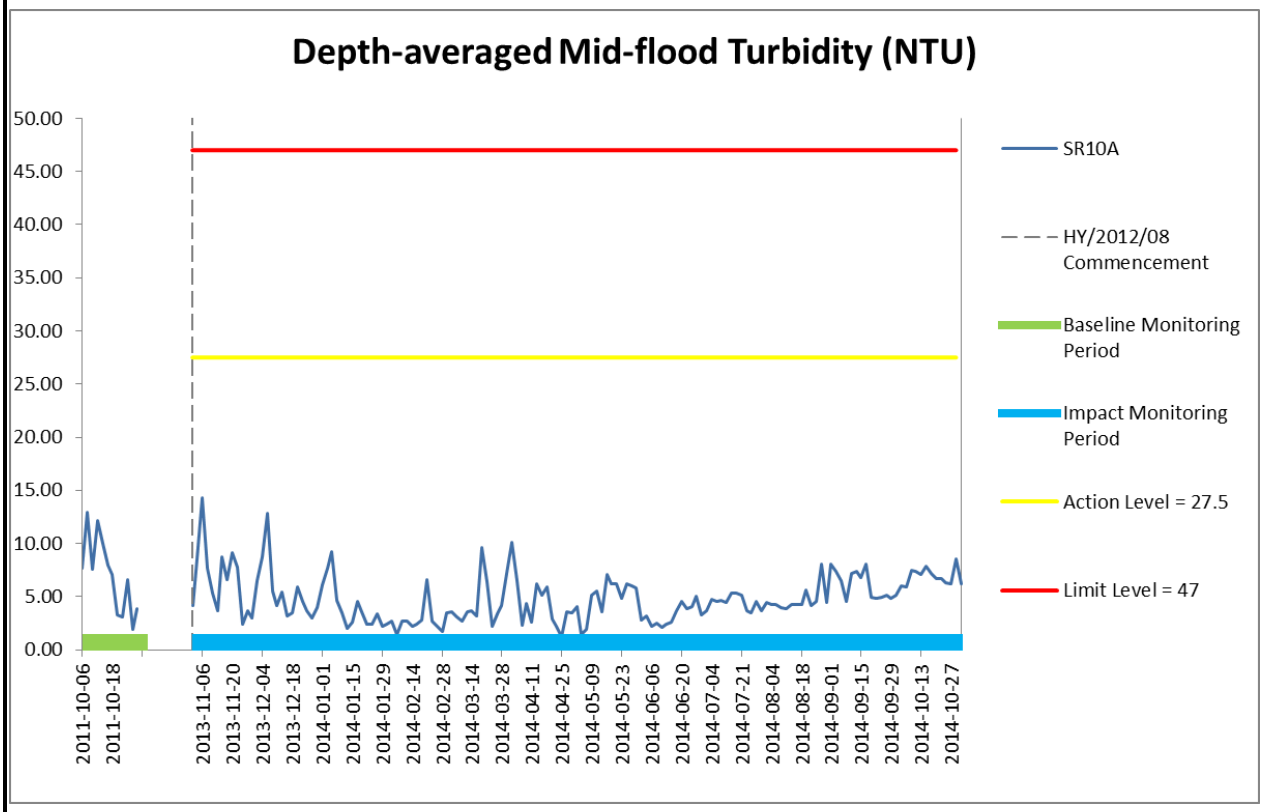
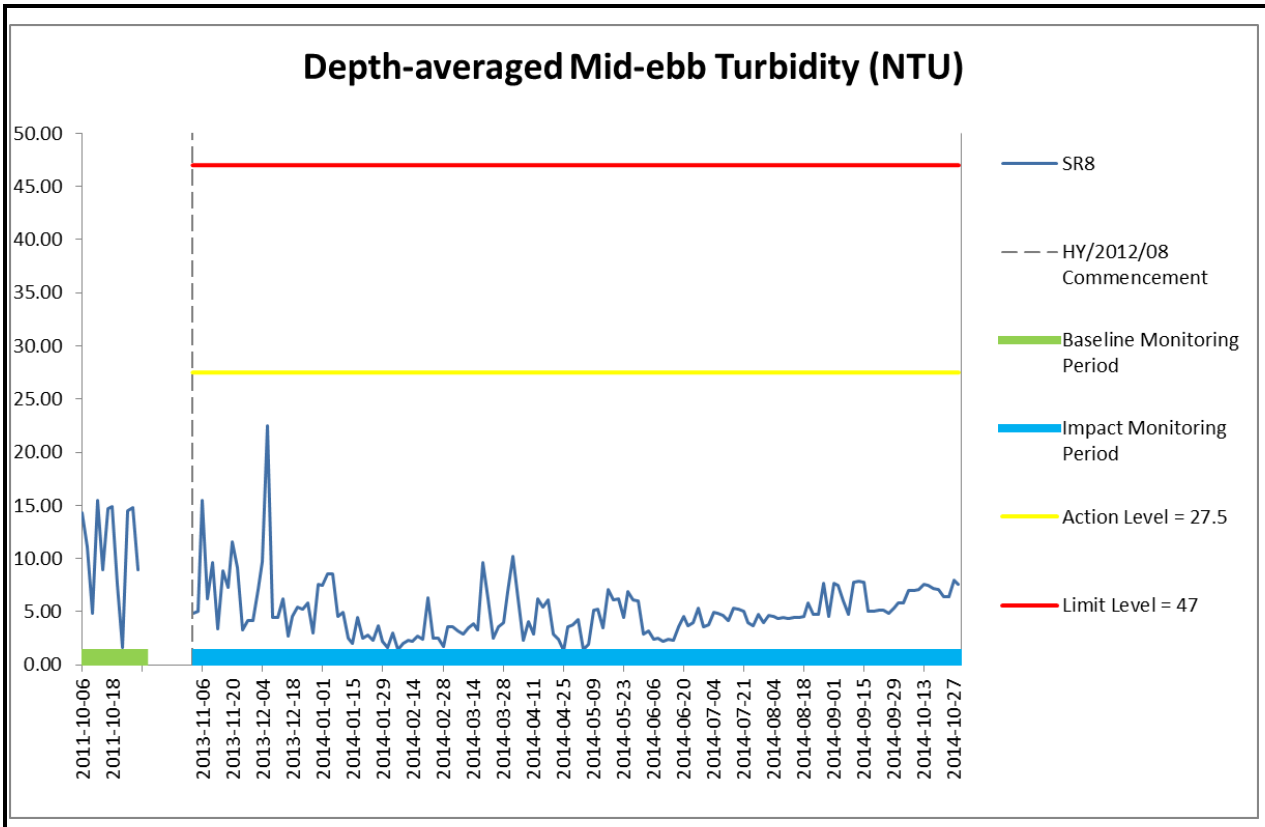


Figure E32 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



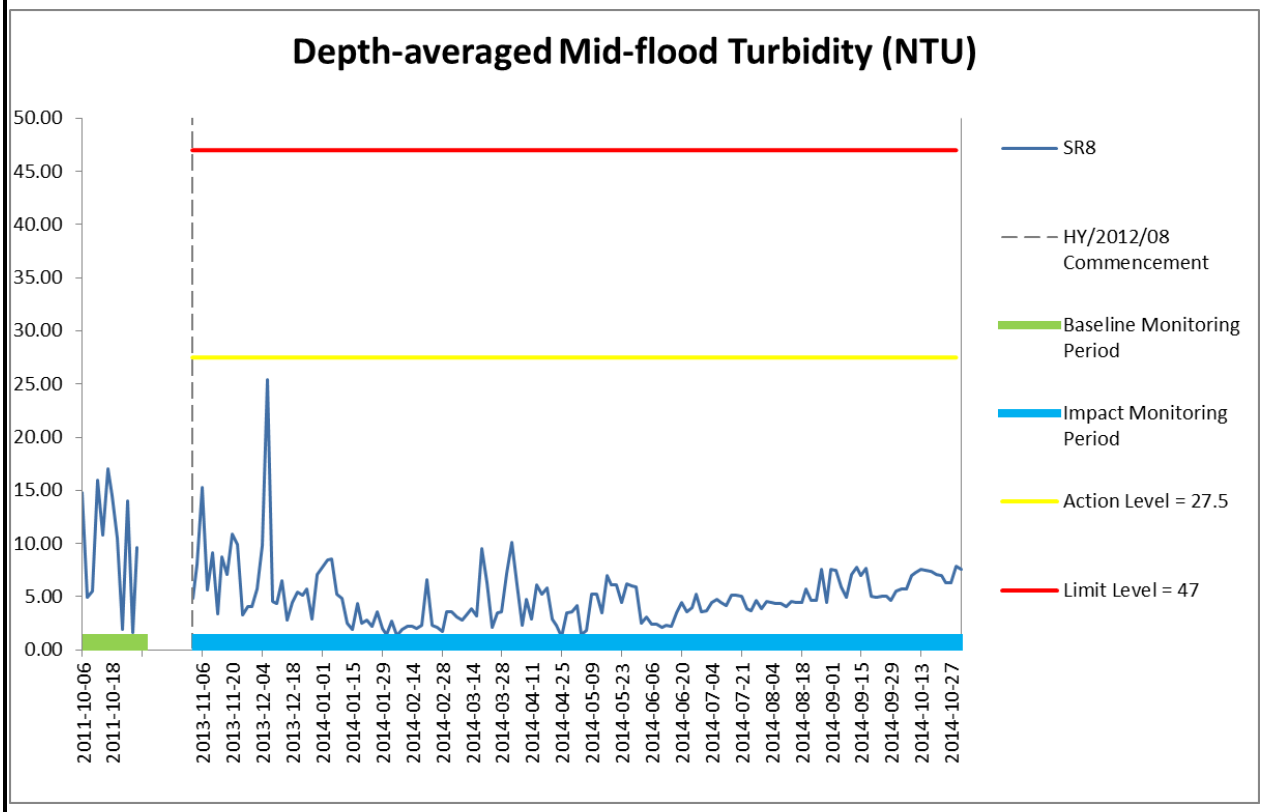


Figure E33 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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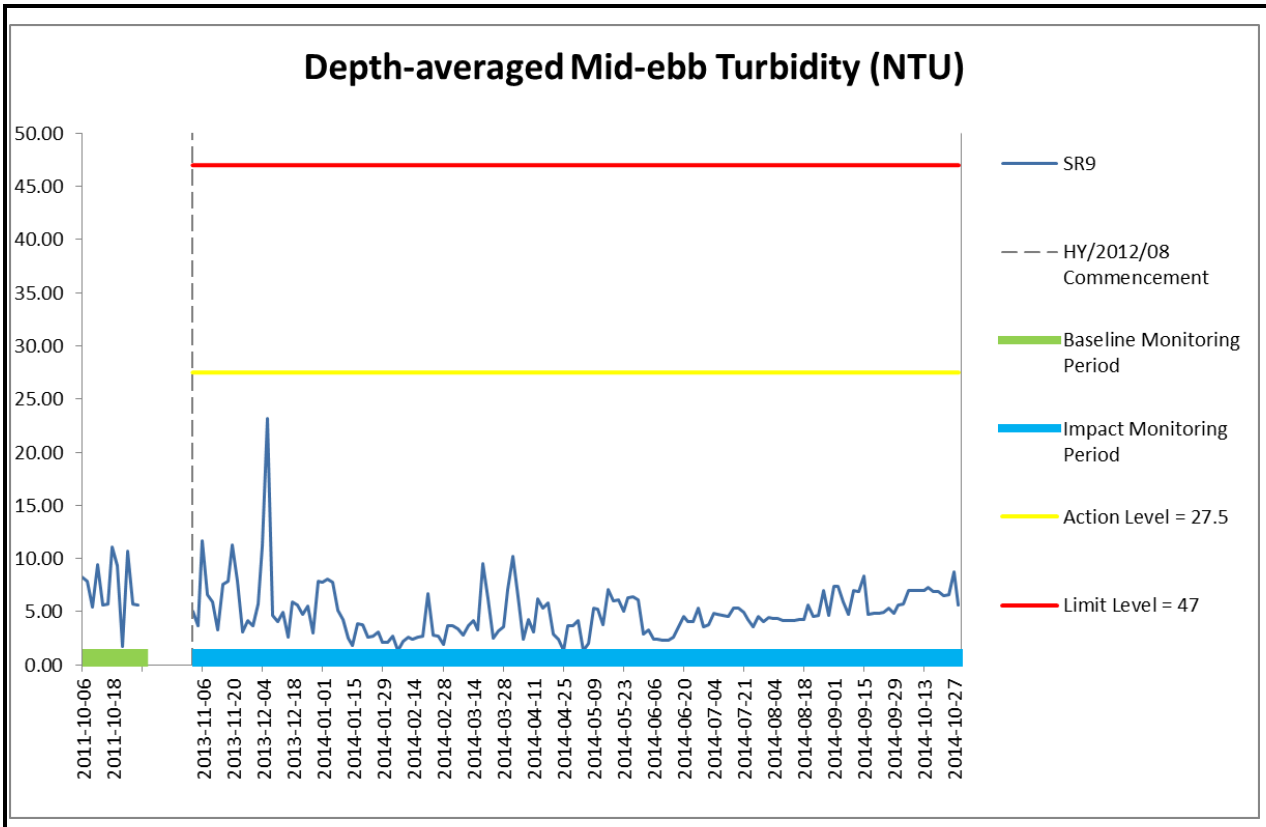

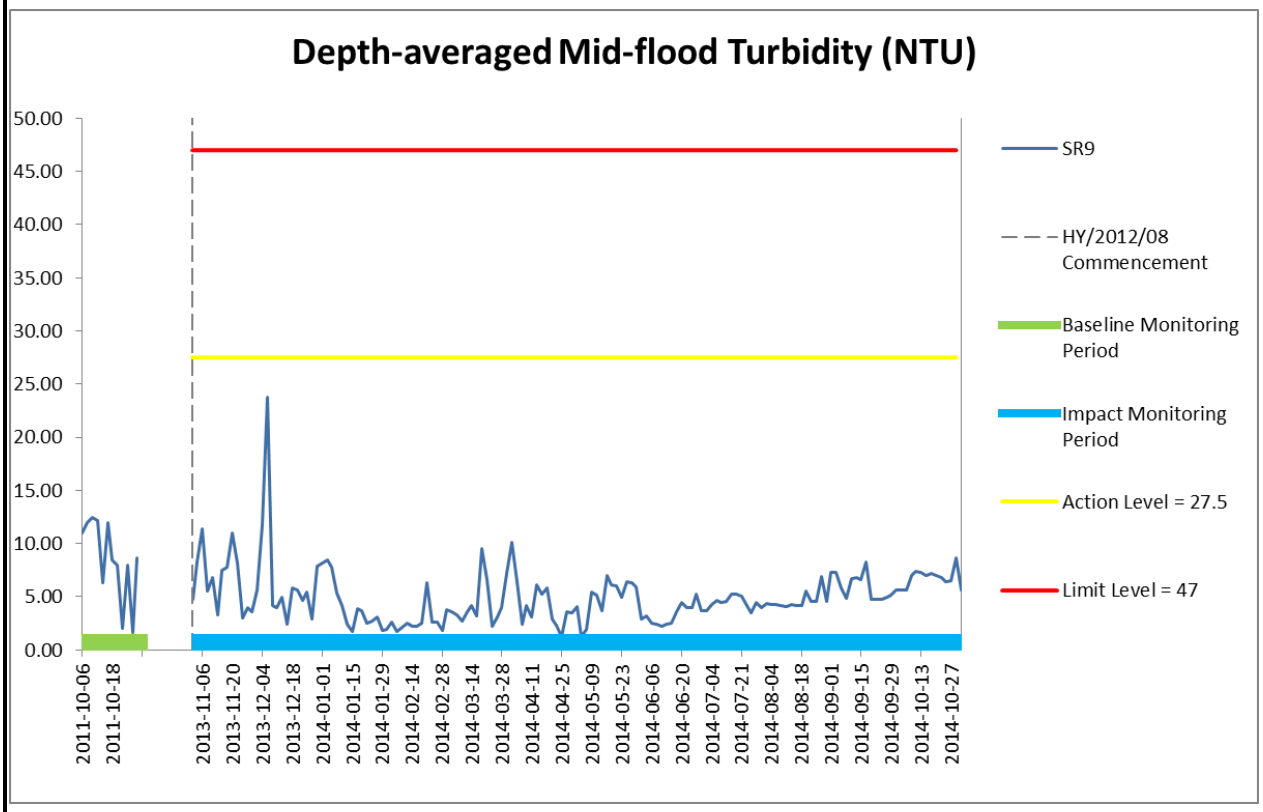

Figure E34 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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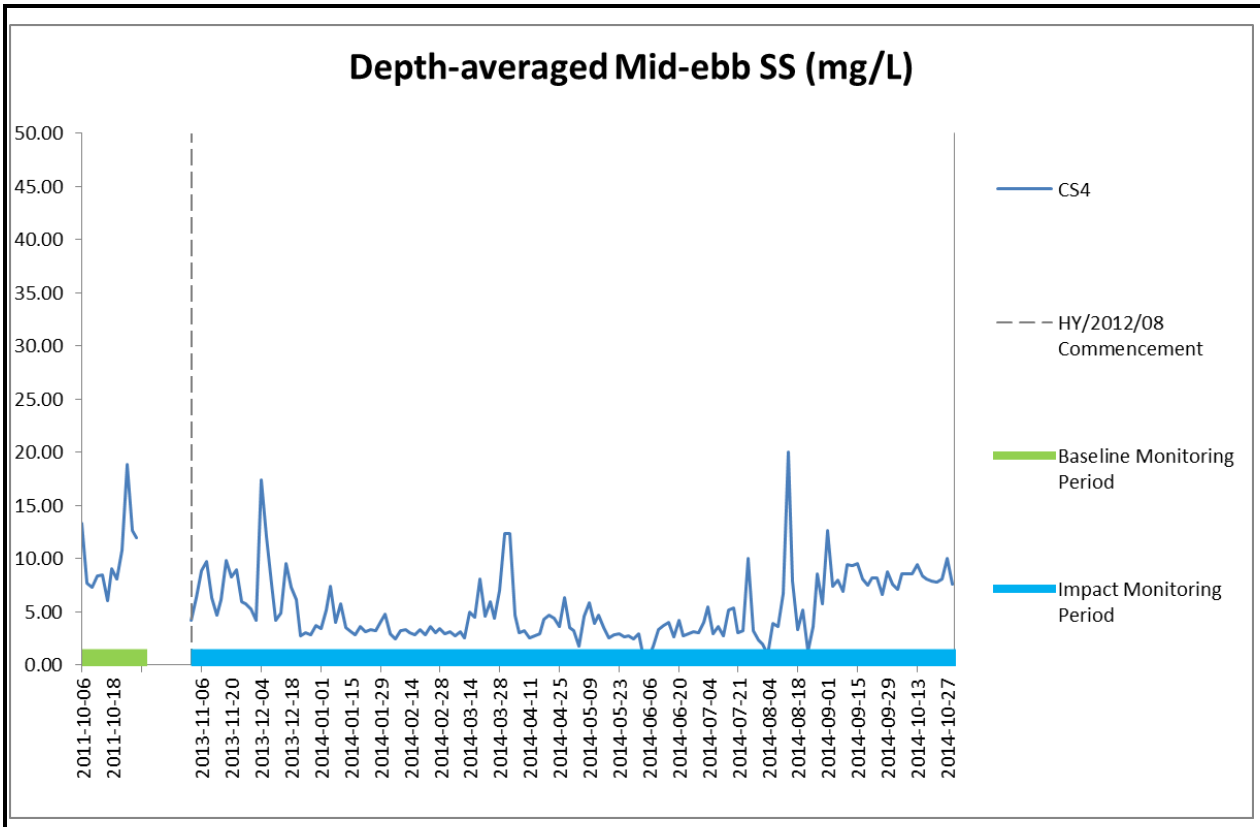

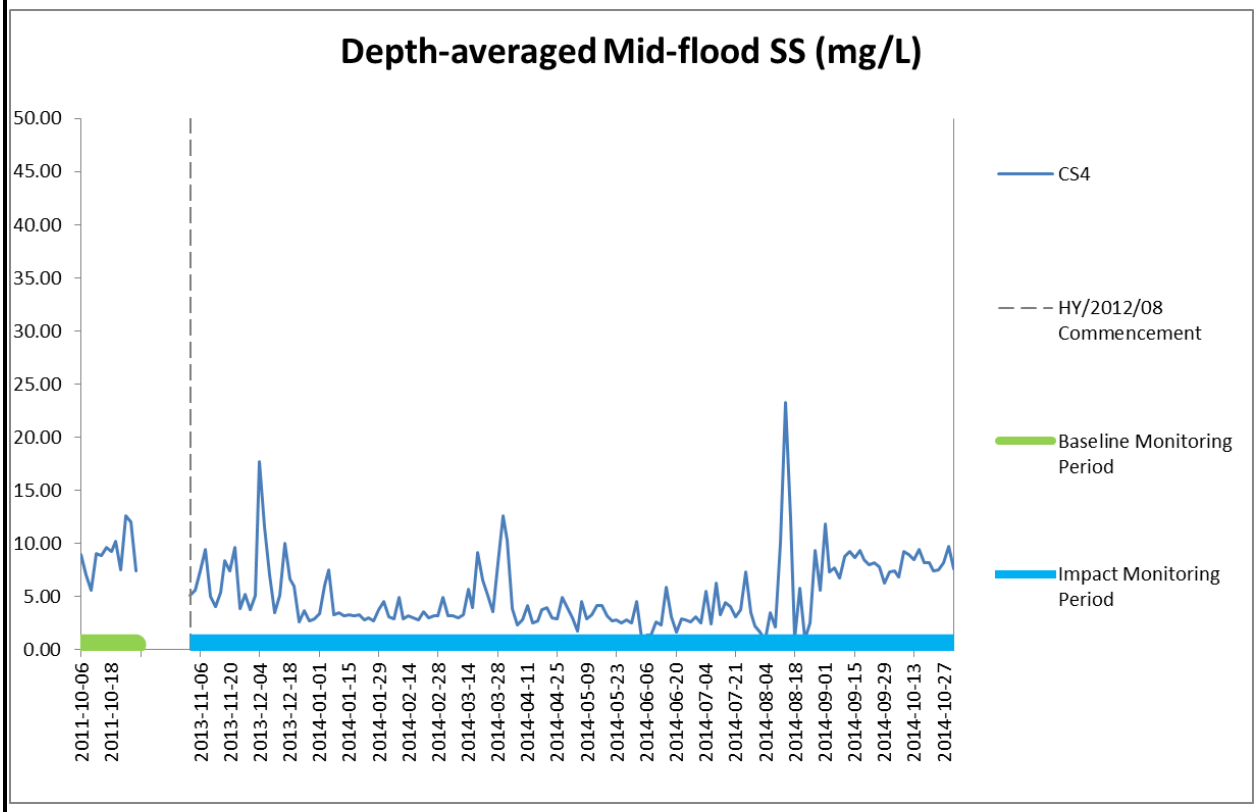

Figure E35 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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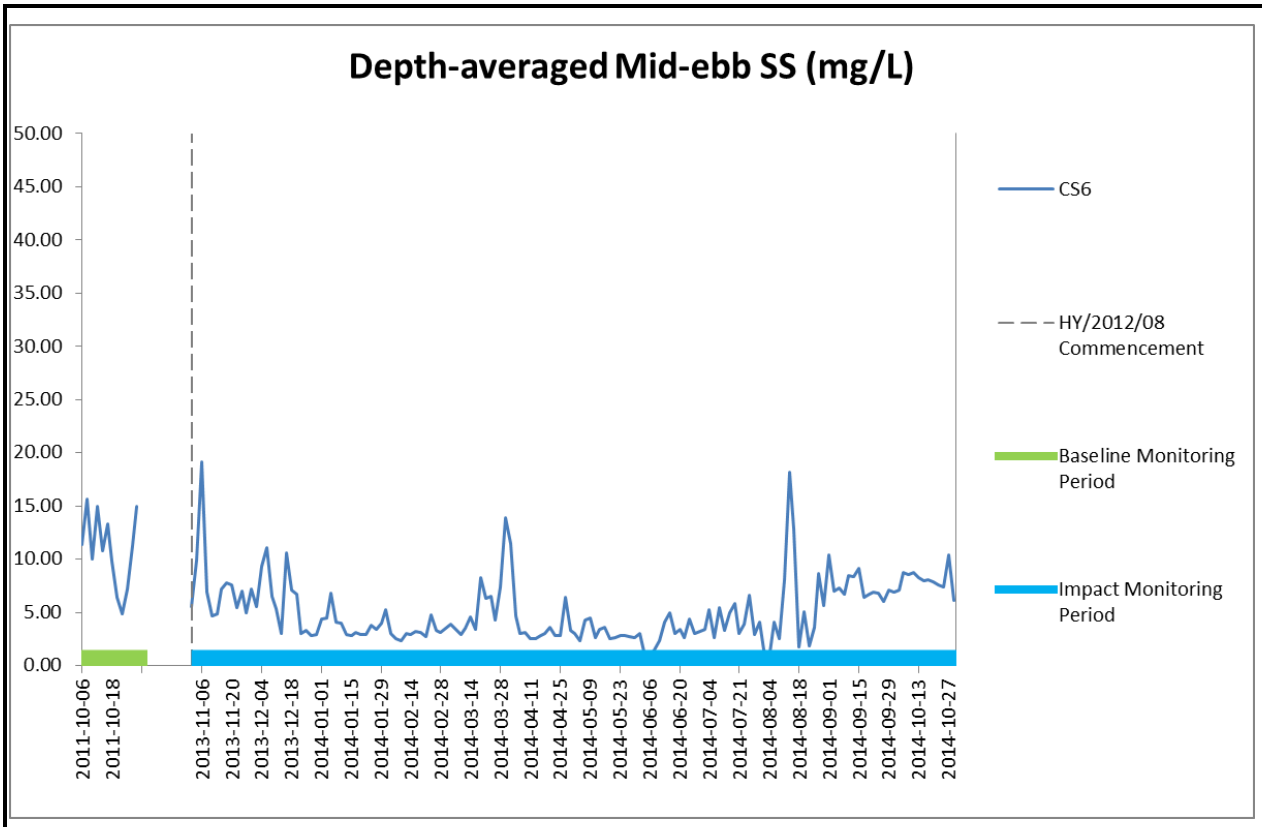

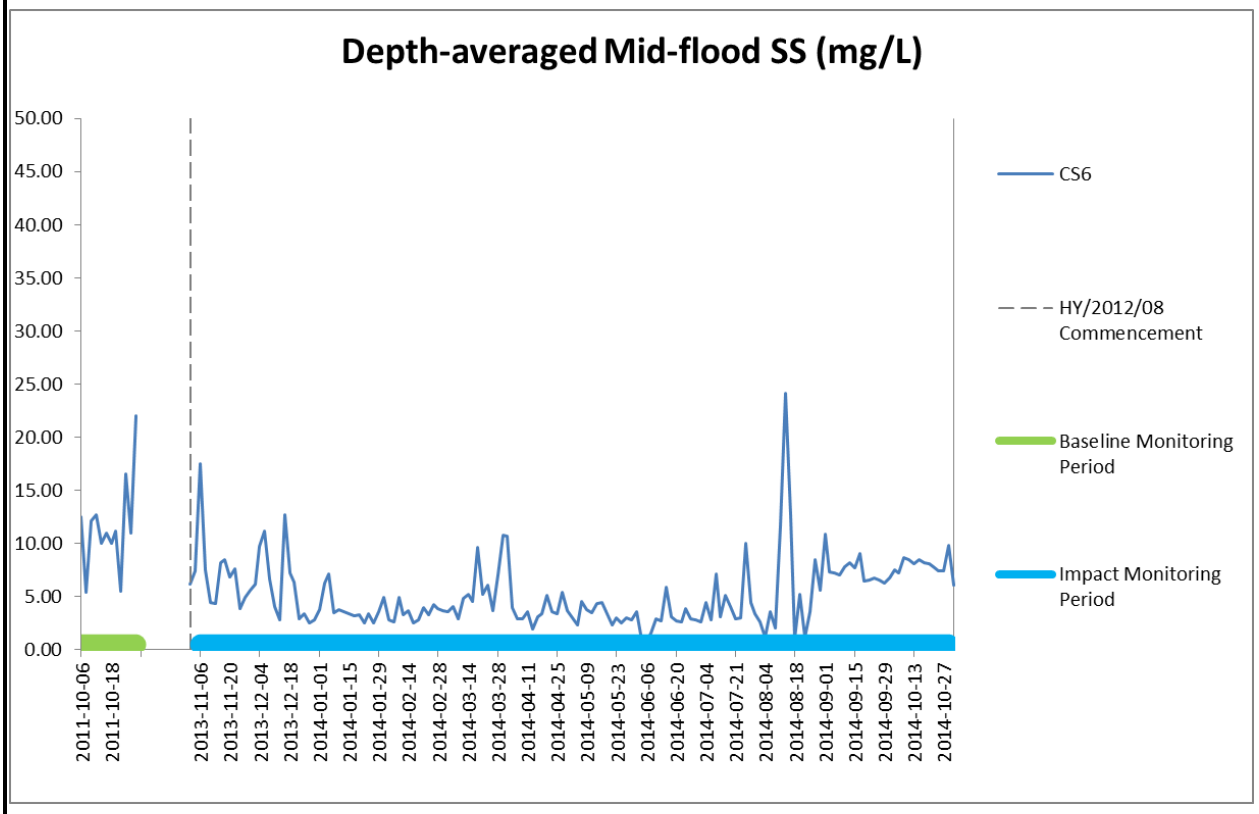

Figure E36 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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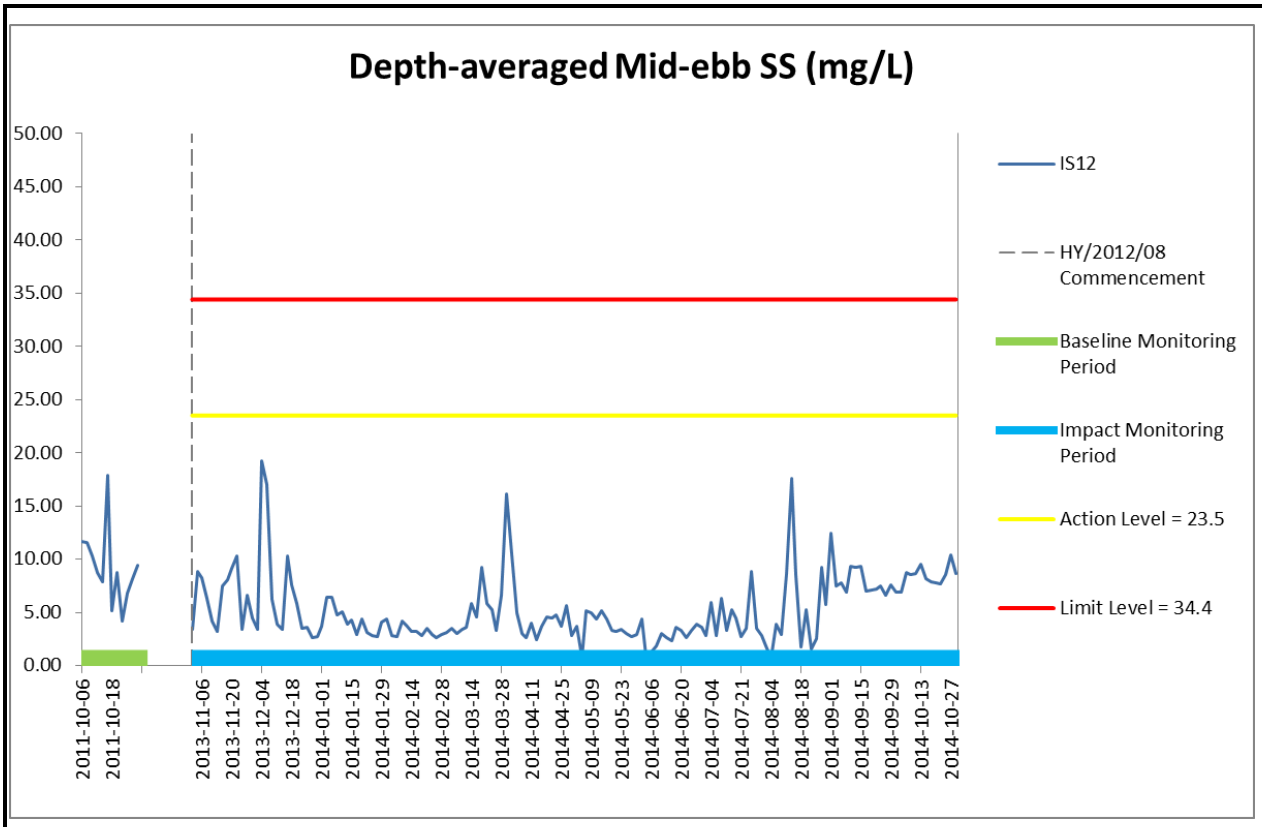

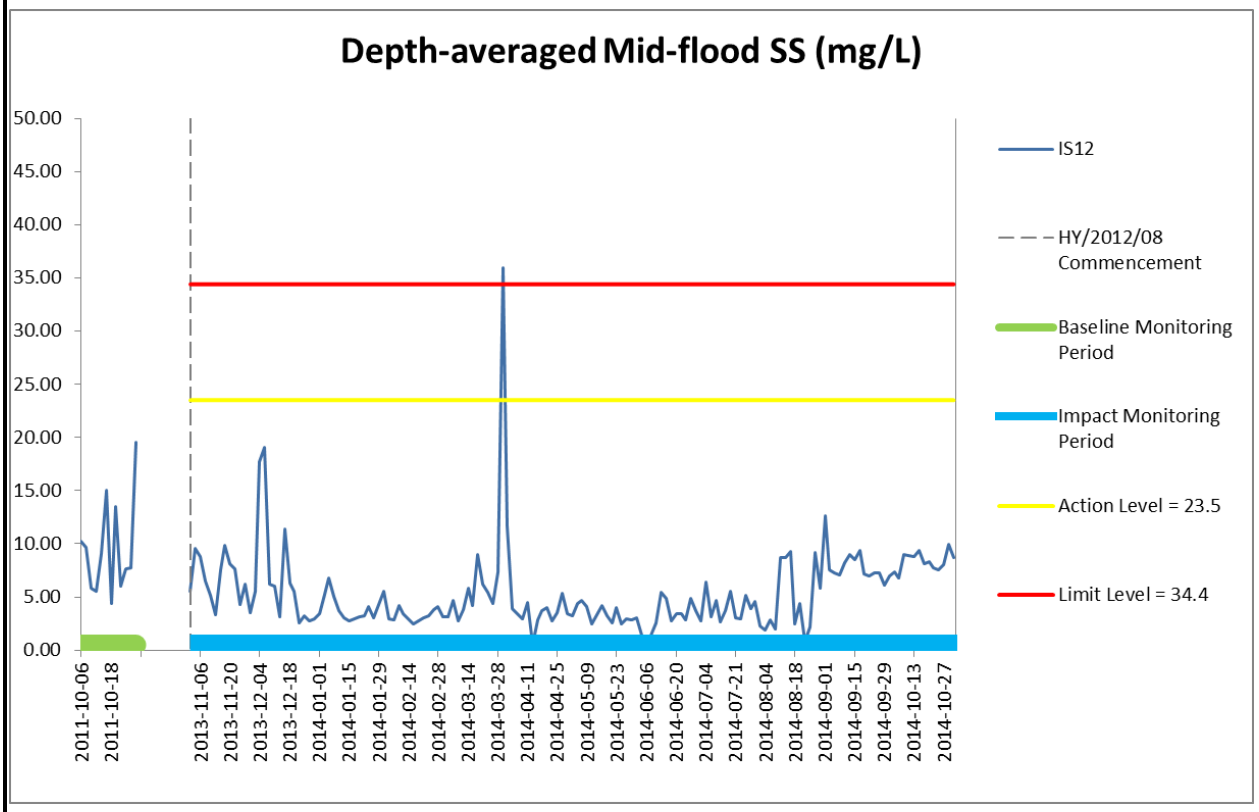

Figure E37 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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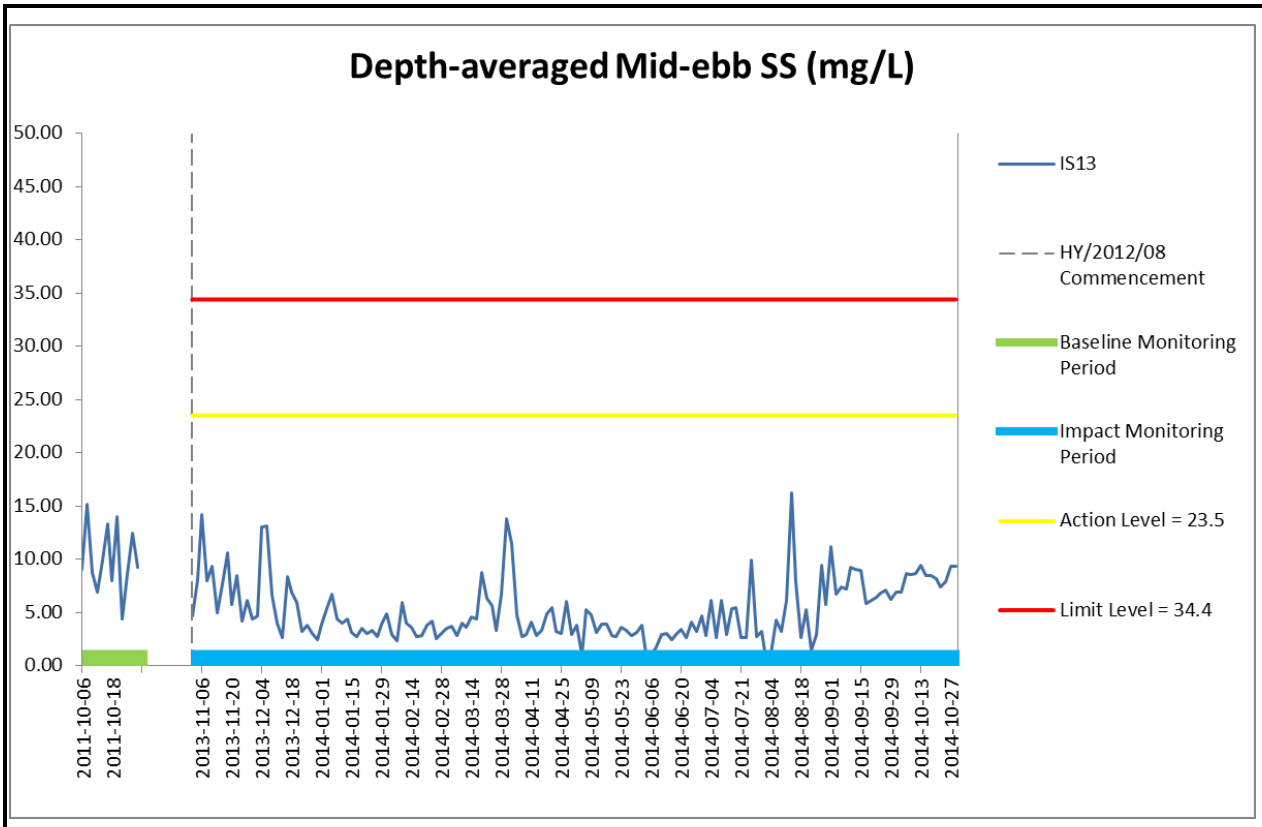

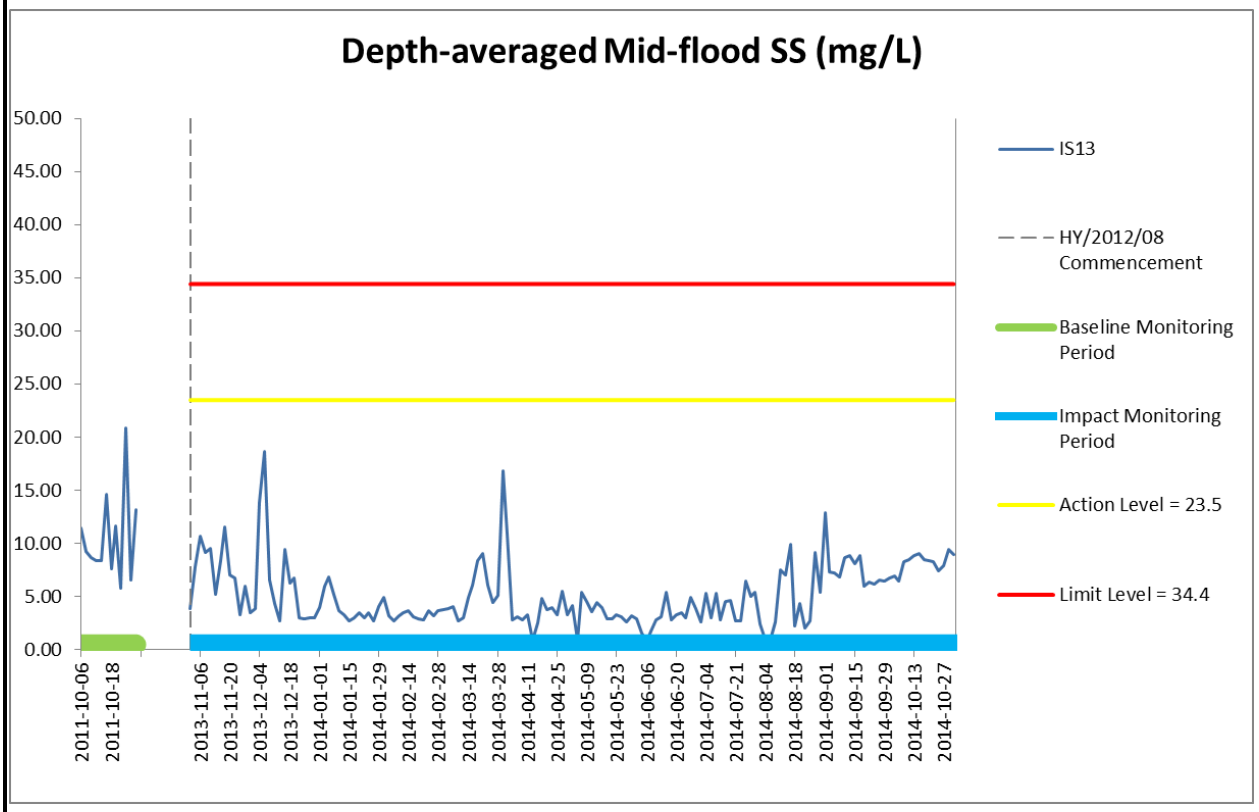

Figure E38 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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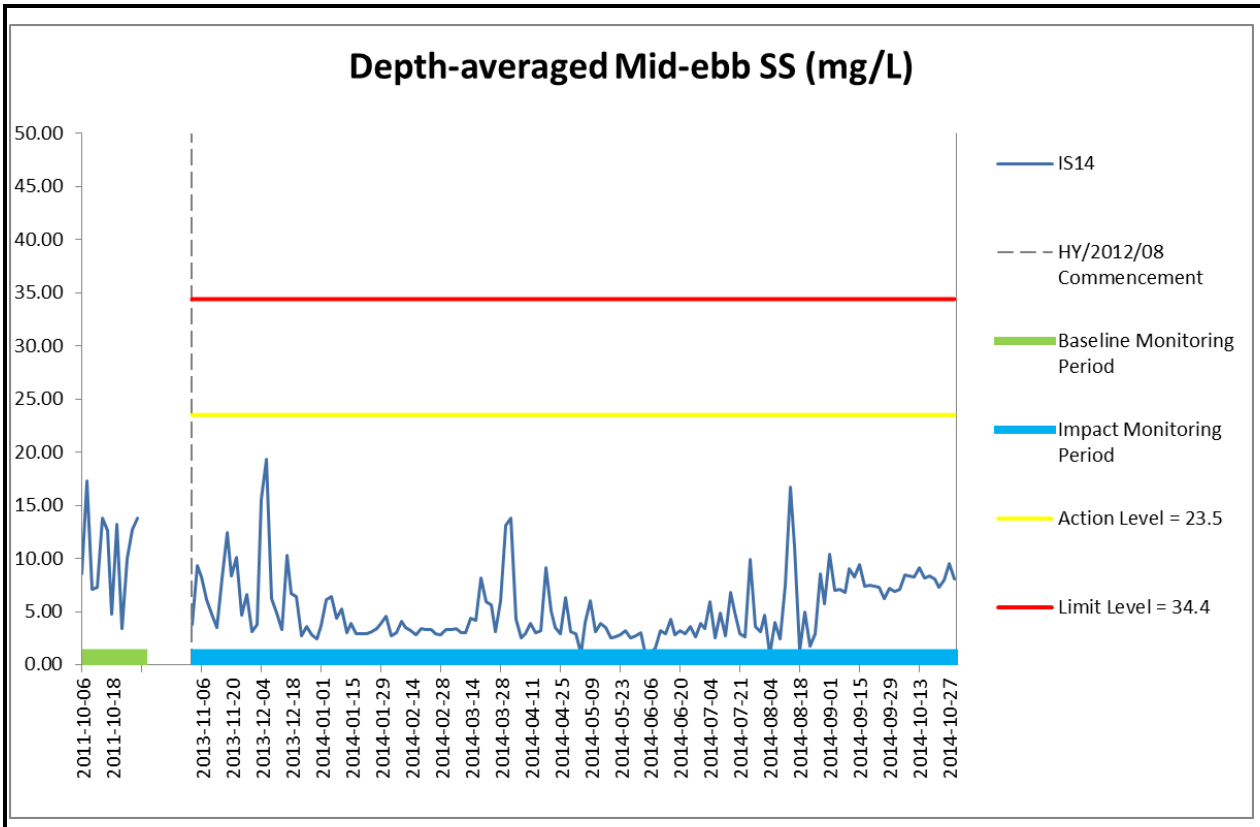

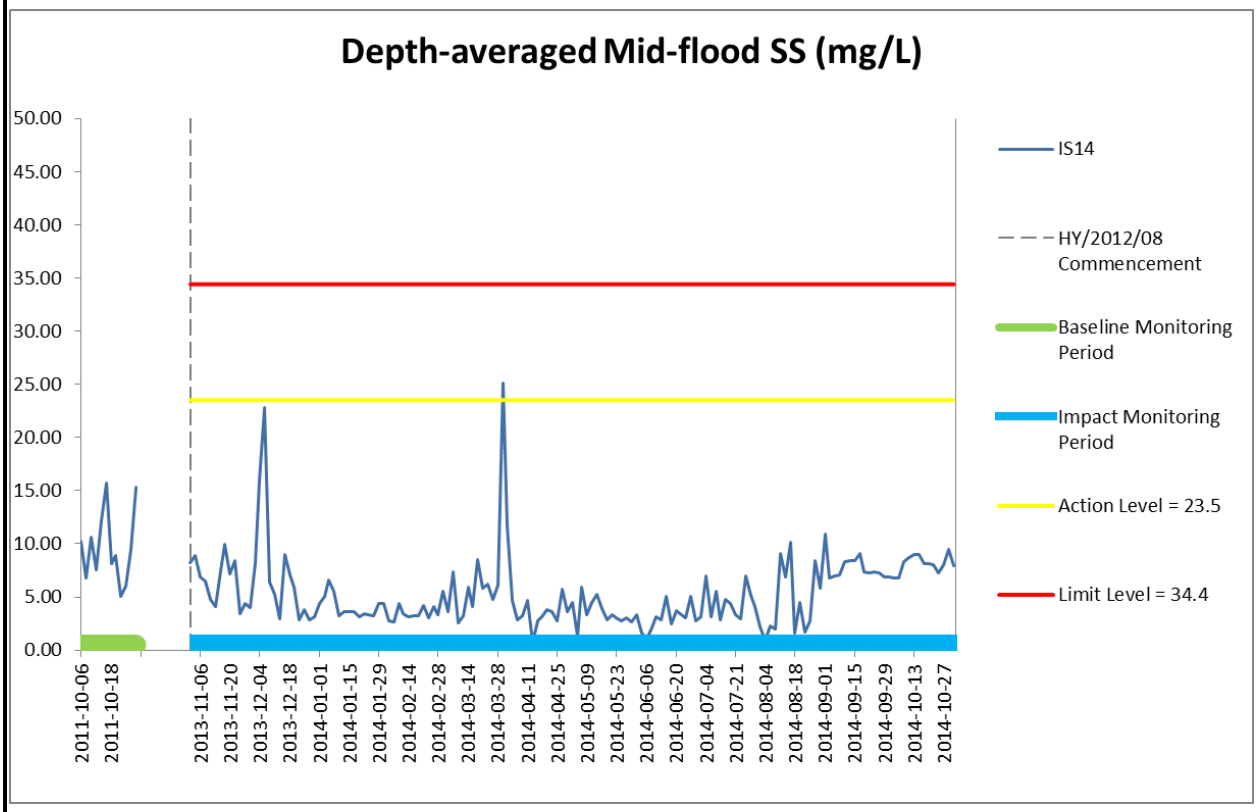

Figure E39 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

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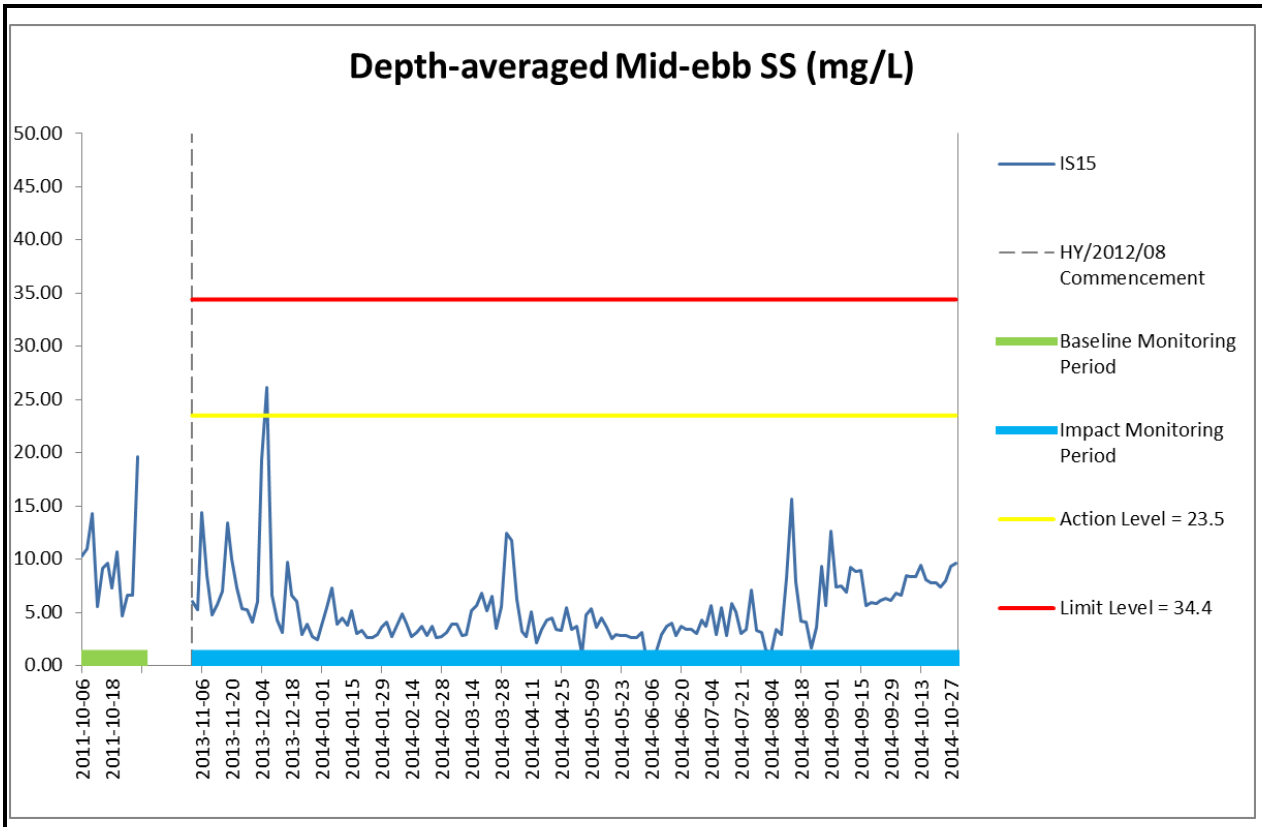


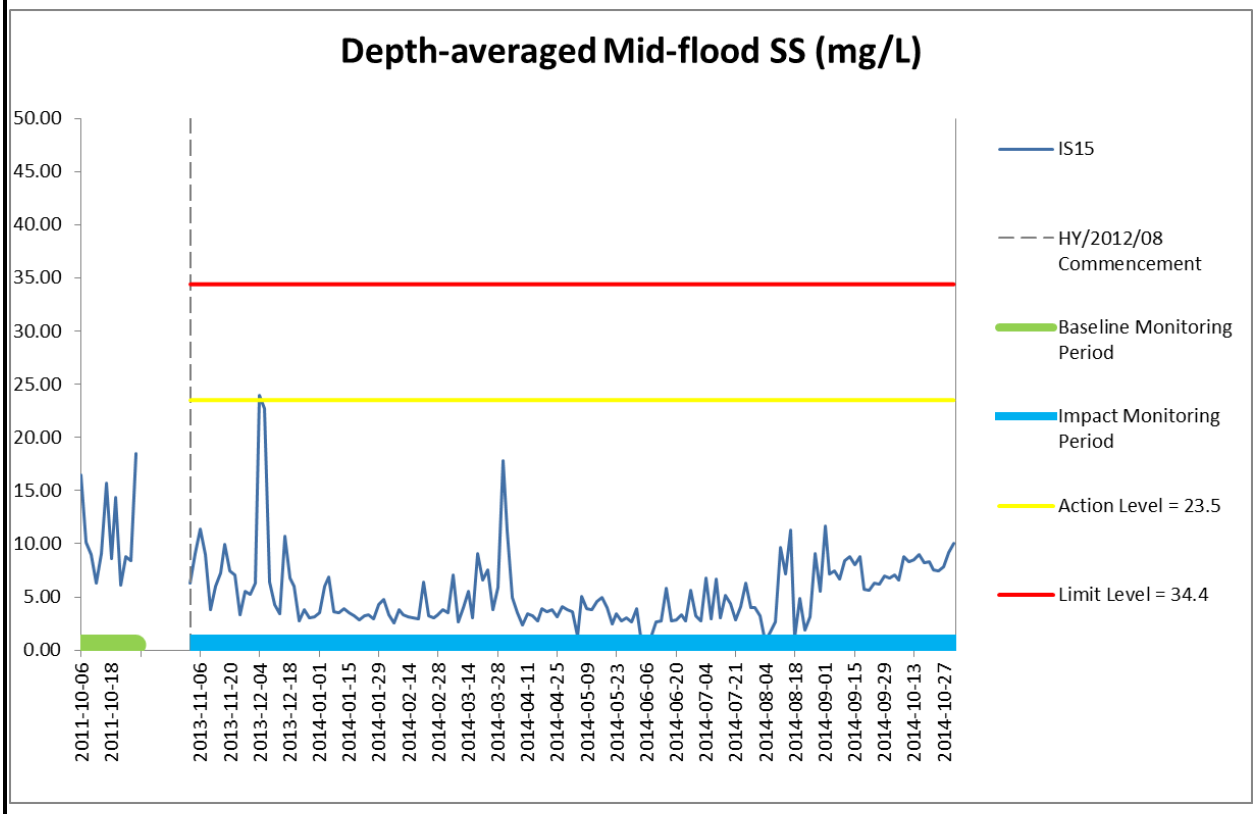
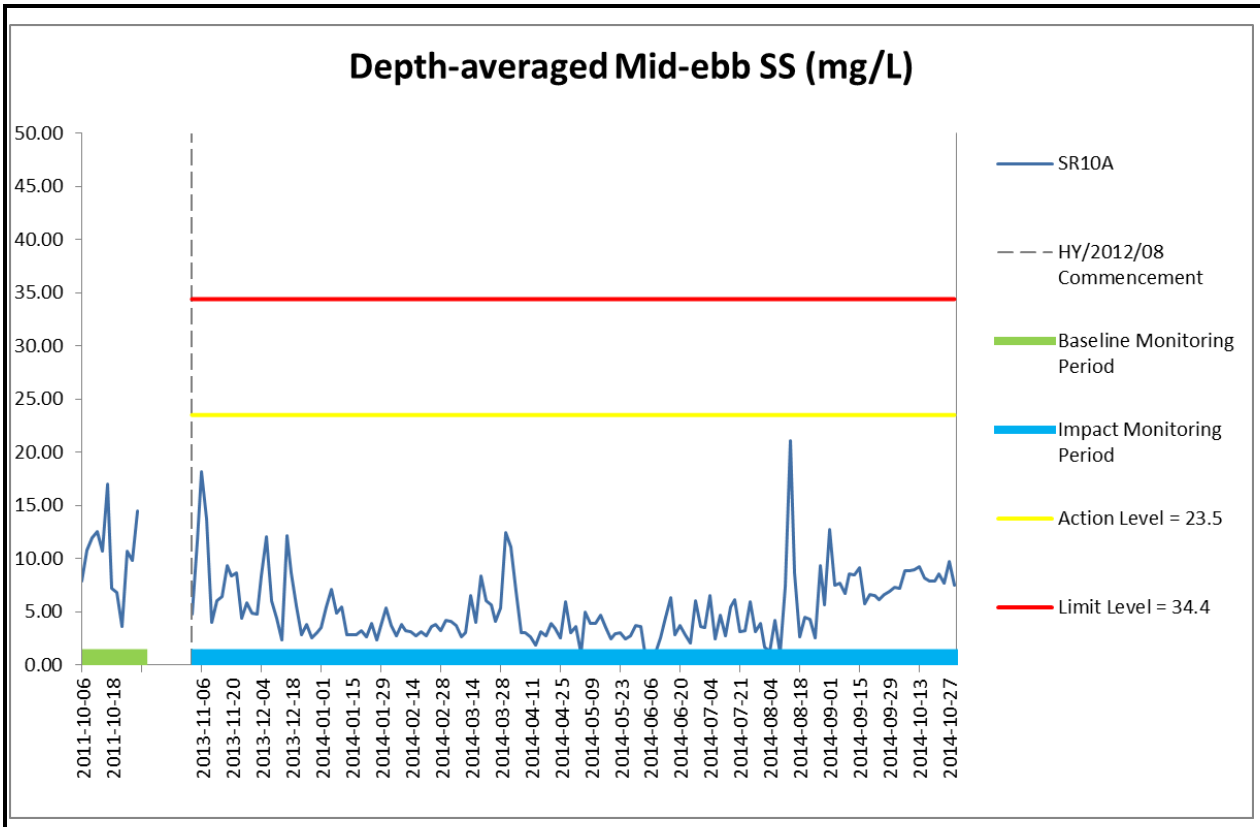


Figure E40 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM



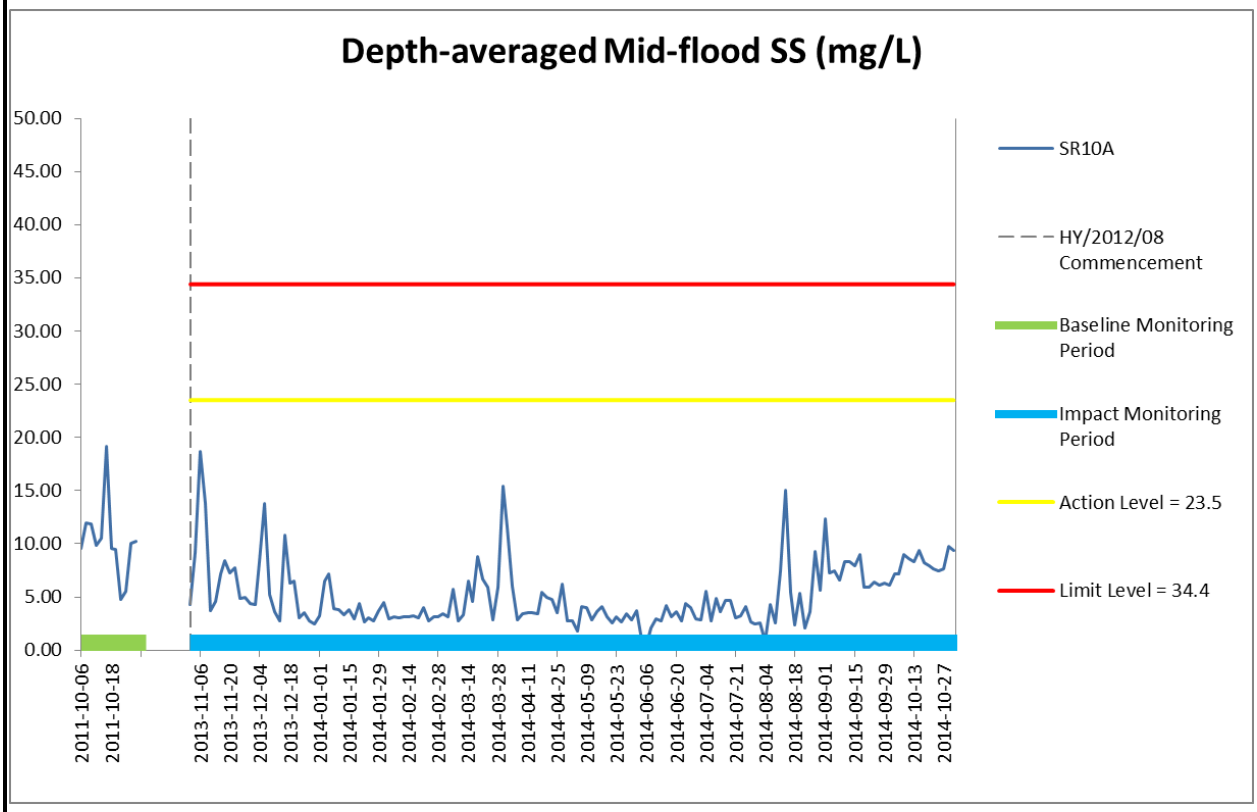
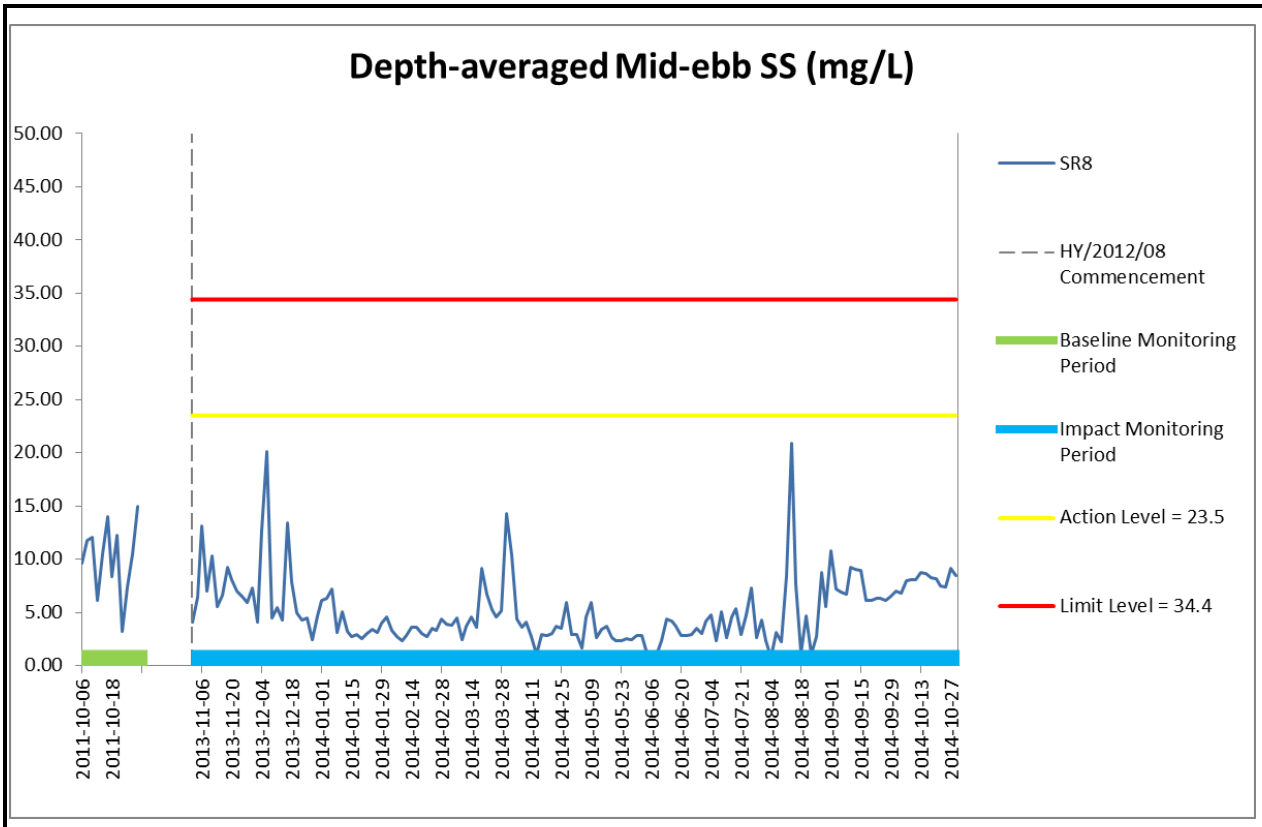


Figure E41 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*



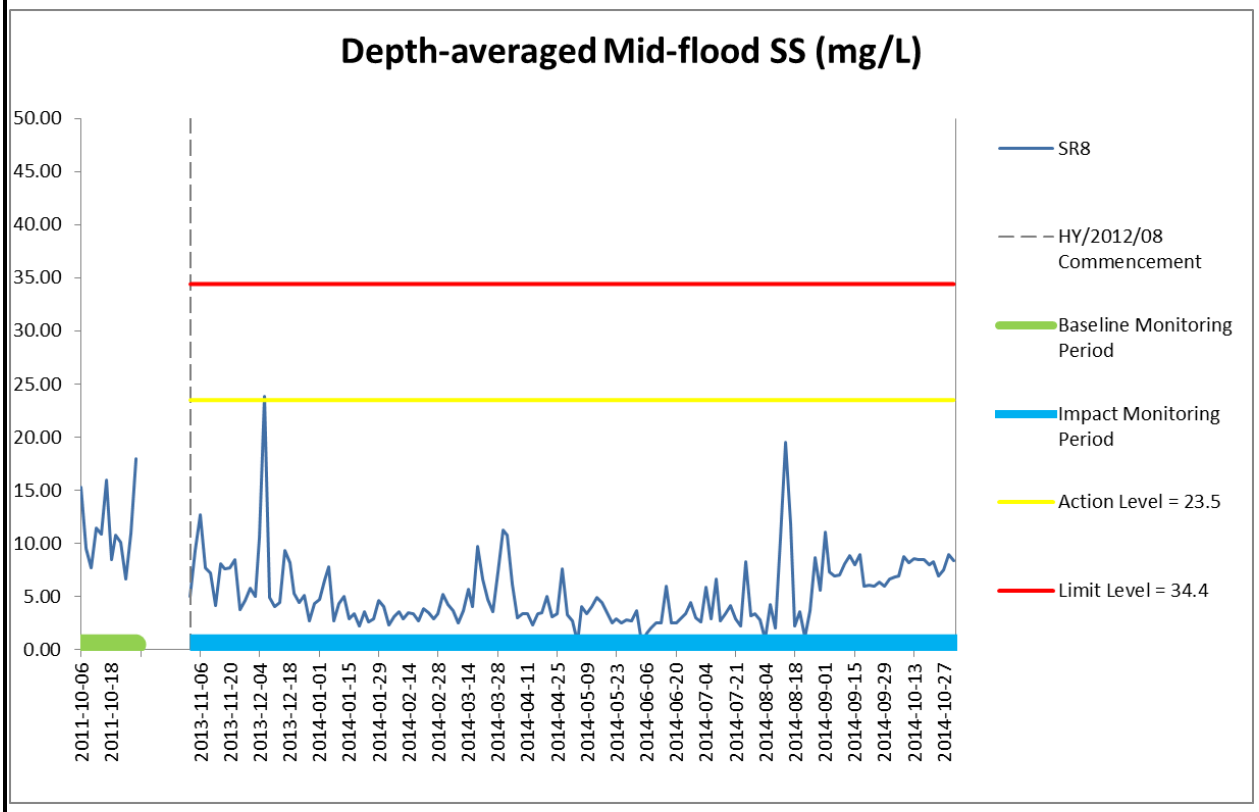
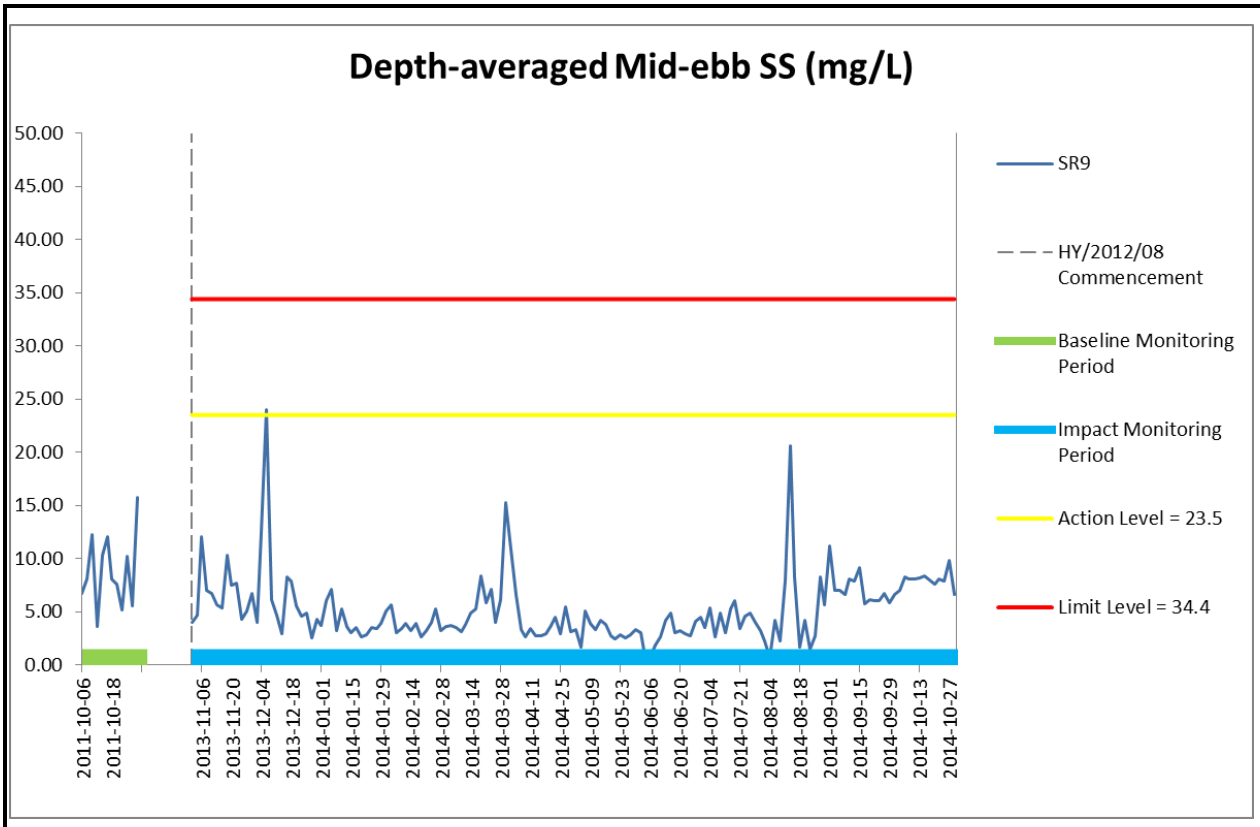


Figure E42 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

ERM



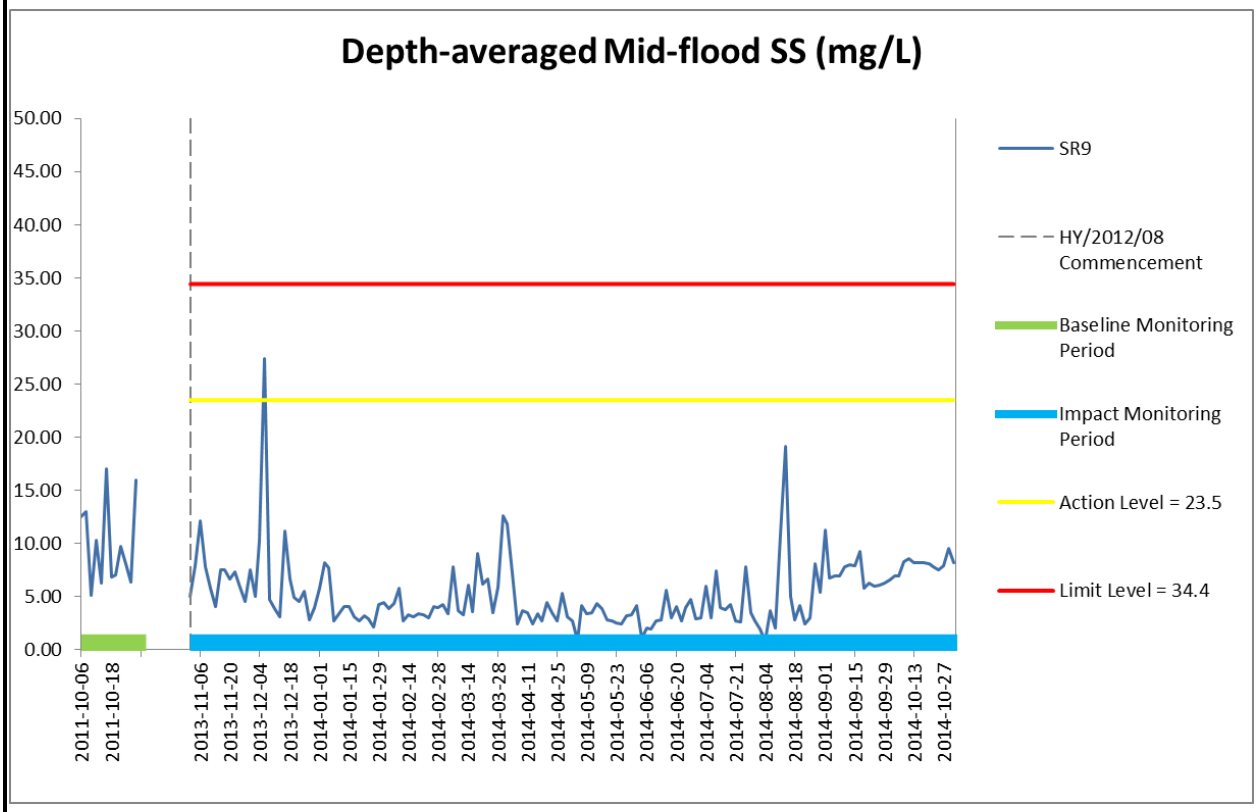


Figure E43 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2013 to 31/10/2014 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Dredging; Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Please note WQM Mid-Ebb on 15-Sep was cancelled due to adverse weather. *Ref: 0212330_Impact-WQM_1st annual.xlsx*

Appendix F

Impact Dolphin Monitoring Survey

CONTRACT NO. HY/2012/08
Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link (Northern Connection Sub-sea Tunnel Section) Chinese White Dolphin Monitoring

First Annual Progress Report (November 2013 - October 2014)
submitted to Dragages – Bouygues Joint Venture & ERM Hong Kong Ltd.

Submitted by
Samuel K.Y. Hung, Ph.D., Hong Kong Cetacean Research Project

24 January 2015

1. Introduction

1.1. As part of the Hong Kong-Zhuhai-Macao Bridge, the Tuen Mun-Chek Lap Kok Link (TM-CLKL) Northern Connection Sub-sea Tunnel Section (Contract no. HY/2012/08) comprises the sub-sea TBM tunnels (two tubes with cross passages) across the Urmston Road to connect Tuen Area 40 and Hong Kong Boundary Crossing Facilities (HKBCF) of approximately 4 km in length with dual 2-lane carriageway, the tunnels at both the southern landfall and the northern landfall for construction of approach roads to the sub-sea TBM tunnels of approximately 1.5 km in length, as well as the northern landfall reclamation of approximately 16.5 hectares and about 20.km long seawalls. Dragages – Bouygues Joint Venture (hereinafter called the "Contractor") was awarded as the main contractor for the Northern Connection Sub-sea Tunnel Section, and ERM Hong Kong Limited would serve as the Environmental Team to implement the Environmental Monitoring and Audit (EM&A) programme.

1.2. According to the updated EM&A Manual (for TM-CLKL), monthly line-transect vessel surveys for Chinese White Dolphin should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas as in AFCD annual marine mammal monitoring programme. However, as such surveys have been undertaken by the HKLR03 and HKBCF projects in the same areas (i.e. NWL and NEL), a combined monitoring approach is recommended by the Highways Department, that the TM-CLKL EM&A project can utilize the monitoring data collected by HKLR03 or HKBCF project to avoid any redundancy in monitoring effort. Such exemption for the dolphin monitoring will end upon the completion of the dolphin monitoring carried out by HKLR03 contract.

1.3. In November 2013, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by ERM Hong Kong Limited as the dolphin specialist for the TM-CLKL Northern Connection Sub-sea Tunnel Section EM&A project. He is responsible for the dolphin monitoring study, including the data collection on Chinese White

Dolphins during the construction phase (i.e. impact period) of the TM-CLKL project in Northwest Lantau (NWL) and Northeast Lantau (NEL) survey areas.

1.4. During the construction period of HKLR, the dolphin specialist would be in charge of reviewing and collating information collected by HKLR03 dolphin monitoring programme to examine any potential impacts of TM-CLKL construction works on the dolphins.

1.5. From the monitoring results, any changes in dolphin occurrence within the study area will be examined for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.

1.6. This report is the first annual progress report under the TM-CLKL construction phase dolphin monitoring programme submitted to the Contractor, summarizing the results of the surveys findings during the period of November 2013 to October 2014, utilizing the survey data collected by HKLR03 project.

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

2.1.1. According to the requirement of the updated EM&A manual, dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire construction period. The co-ordinates of all transect lines conducted during the HKLR03 dolphin monitoring surveys are shown in Table 1.

Table 1 Co-ordinates of transect lines conducted by HKLR03 project

Line No.		Easting	Northing		Line No.		Easting	Northing
1	Start Point	804671	814577		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805475	815457		14	Start Point	817537	820220
2	End Point	805477	826654		14	End Point	817537	824613
3	Start Point	806464	819435		15	Start Point	818568	820735
3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	819771		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	820220		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671
6	Start Point	809490	820466		18	Start Point	821504	822371
6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	820690		19	Start Point	822513	823268
7	End Point	810499	824613		19	End Point	822513	824321

8	Start Point	811508	820847		20	Start Point	823477	823402
8	End Point	811508	824254		20	End Point	823477	824613
9	Start Point	812516	820892		21	Start Point	805476	827081
9	End Point	812516	824254		21	End Point	805476	830562
10	Start Point	813525	820872		22	Start Point	806464	824033
10	End Point	813525	824657		22	End Point	806464	829598
11	Start Point	814556	818449		23	Start Point	814559	821739
11	End Point	814556	820992		23	End Point	814559	824768
12	Start Point	815542	818807					
12	End Point	815542	824882					

2.1.2. The HKLR03 survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 16 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2013, 2014). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^{o} and 90^{o} (in relation to the bow, which is defined as 0^{o}). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

2.1.4. During on-effort survey periods, the survey team recorded effort data including time, positions (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).

2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.

2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

2.1.7. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as "primary" survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as "secondary" survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese white dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

2.2. Photo-identification Work

2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the HKLR03 survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.

2.2.2. A professional digital camera (*Canon* EOS 7D or 60D model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.

2.2.4. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000).

2.2.5. All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

2.3. Data Analysis

2.3.1. The following analyses were performed utilizing the HKLR03 dolphin monitoring data collected under the present impact phase (the first year of TMCLKL construction; i.e. November 2013 to October 2014). In addition, these analyses were also conducted for the one-year baseline phase (one year before any HZMB construction works have commenced; i.e. February 2011 to January 2012), as well as the one-year transitional phase (one year after the HZMB construction works (HKBCF and HKLR works) have commenced, but before the commencement of TMCLKL construction works; i.e.

November 2012 to October 2013).

2.3.2. Along with the analyzed results from the baseline and transitional phases, results from the impact phase can then be interpreted from the examination of any temporal changes before and during the construction activities of TMCLKL on dolphin usage in North Lantau waters. For the baseline phase, both baseline monitoring data collected under HZMB contract as well as the AFCD long-term dolphin monitoring data were included to increase the sample size in order to match the similar amount of survey effort in transitional and impact phases, both of which only HKLR03 monitoring data were included for the various analyses.

Distribution analysis

2.3.3. The line-transect survey data was integrated with the Geographic Information System (GIS) in order to visualize and interpret different spatial and temporal patterns of dolphin distribution using sighting positions. Location data of dolphin groups were plotted on map layers of Hong Kong using a desktop GIS (ArcView© 3.1) to examine their distribution patterns in details. The dataset was also stratified into different subsets to examine distribution patterns of dolphin groups with different categories of group sizes, young calves and activities.

Encounter rate analysis

2.3.4. Encounter rate analysis – Encounter rates of Chinese white dolphins (number of on-effort sightings per 100 km of survey effort, and total number of dolphins sighted on-effort per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for the encounter rate analyses. Dolphin encounter rates during the impact phase were calculated in two ways for comparisons with the HZMB baseline and transitional period monitoring results as well as to the AFCD long-term marine mammal monitoring results.

2.3.5. Firstly, for the comparison with the HZMB monitoring results, the encounter rates were calculated using primary survey effort alone. The average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) were deduced based on the encounter rates from the 24 six events during the present 12-month study period (i.e. 24 sets of line-transect surveys in North Lantau), which was also compared with the one deduced from the events during the transitional period and baseline period.

2.3.6. Secondly, the encounter rates were also calculated using both primary and secondary survey effort as in AFCD long-term monitoring study. The encounter rate of sightings and dolphins were deduced by diving the total number of on-effort sightings (STG) and total number of dolphins (ANI) by the amount of survey effort for the present 12-month study period.

Quantitative grid analysis on habitat use

2.3.7. To conduct quantitative grid analysis of habitat use, positions of on-effort sightings of Chinese White Dolphins collected during the quarterly impact phase monitoring period were plotted onto 1-km^2 grids among NWL and NEL survey areas on GIS. Sighting

densities (number of on-effort sightings per km^2) and dolphin densities (total number of dolphins from on-effort sightings per km^2) were then calculated for each 1 km by 1 km grid with the aid of GIS.

2.3.8. Sighting density grids and dolphin density grids were then further normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent on each grid was calculated by examining the survey coverage on each line-transect survey to determine how many times the grid was surveyed during the study period. For example, when the survey boat traversed through a specific grid 50 times, 50 units of survey effort were counted for that grid. With the amount of survey effort calculated for each grid, the sighting density and dolphin density of each grid were then normalized (i.e. divided by the unit of survey effort).

2.3.9. The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort **s**ightings **p**er 100 units of **s**urvey **e**ffort. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of **d**olphins **p**er 100 units of **s**urvey **e**ffort. Among the 1-km^2 grids that were partially covered by land, the percentage of sea area was calculated using GIS tools, and their SPSE and DPSE values were adjusted accordingly. The following formulae were used to estimate SPSE and DPSE in each 1-km^2 grid within the study area:

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

where S = total number of on-effort sightings
D = total number of dolphins from on-effort sightings
E = total number of units of survey effort
SA% = percentage of sea area

Behavioural analysis

2.3.10. When dolphins were sighted during vessel surveys, their behaviour was observed. Different activities were categorized (i.e. feeding, socializing, traveling, and milling/resting) and recorded on sighting datasheets. This data was then input into a separate database with sighting information, which can be used to determine the distribution of behavioural data with a desktop GIS. Sighting distribution of dolphins engaged in different activities and behaviours would then be plotted on GIS and carefully examined to identify important areas for different activities of the dolphins.

Ranging pattern analysis

2.3.11. Location data of individual dolphins that occurred during the 12-month impact phase monitoring period were obtained from the dolphin sighting database and photo-identification catalogue. To deduce home ranges for individual dolphins using the fixed kernel methods, the program Animal Movement Analyst Extension, was loaded as an extension with ArcView© 3.1 along with another extension Spatial Analyst 2.0. Using the fixed kernel method, the program calculated kernel density estimates based on all sighting positions, and provided an active interface to display kernel density plots. The kernel estimator then calculated and displayed the overall ranging area at 95% UD level.

3. Monitoring Results

3.1. Summary of survey effort and dolphin sightings

3.1.1. During the first year of TMCLKL impact phase monitoring (November 2013 to October 2014), a total of 24 sets of systematic line-transect vessel surveys were conducted under the HKLR03 monitoring works to cover all transect lines in NWL and NEL survey areas twice per month.

3.1.2. From these HKLR03 surveys, a total of 3,520.41 km of survey effort was collected, with 93.2% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility). Among the two areas, 1,353.42 km and 2,166.99 km of survey effort were conducted in NEL and NWL survey areas respectively.

3.1.3. The total survey effort conducted on primary lines was 2,569.49 km, while the effort on secondary lines was 950.92 km. Both survey effort conducted on primary and secondary lines were considered as on-effort survey data. Summary table of the survey effort is shown in Appendix I.

3.1.4. During the 24 sets of HKLR03 monitoring surveys from November 2013 to October 2014, a total of 136 groups of 512 Chinese White Dolphins were sighted. All except eight dolphin sightings were made during on-effort search. Among the 128 on-effort sightings, 110 of them were made on primary lines, while the other 18 sightings were made on secondary lines. In this 12-month period, 97% of the dolphin sightings were made in NWL, while only four groups of 20 dolphins were sighted in NEL. A summary table of the dolphin sightings is shown in Appendix II.

3.2. Distribution

3.2.1. Distribution of dolphin sightings made during the HKLR03 monitoring surveys in November 2013 to October 2014 is shown in Figure 1.

3.2.2. The majority of dolphin sightings made in the 12-month period were concentrated in the northwestern end of the North Lantau region, with higher concentration all around Lung Kwu Chau, to the west of Sha Chau, near Black Point as well as between Lung Kwu Chau and Pillar Point (Figure 1). Other dolphin sightings were scattered to the northeast and west of the airport. The few sightings made in NEL were located near Siu Ho Wan, Shum Shui Kok, Yam O and Tuen Mun (Figure 1).

3.2.3. Notably, none of the dolphin groups were sighted in the vicinity of TMCLKL southern viaduct, as well as the HKLR03 and HKBCF reclamation sites. One sighting was made near the TMCLKL northern landfall, and a few sightings were made in the vicinity of the HKLR09 alignment. Generally speaking, dolphin appeared to have avoided the five construction areas of HZMB works during the present impact phase monitoring period.

3.2.4. Dolphin sighting distribution of the present impact phase monitoring period (November 2013 to October 2014) was compared to the ones during the baseline phase (February 2011 to January 2012) and transitional phase (November 2012 to October 2013). In the present impact phase period, dolphins have nearly vacated from the NEL region, which was in stark contrast to their very frequent occurrence around the Brothers Islands, Shum Shui Kok, and the vicinity of HZMB-associated work sites during the baseline period (Figure 2). Even in the transitional phase, dolphins still utilized NEL waters in a moderate extent, while they mostly avoided this area during the impact phase.

3.2.5. On the contrary, dolphin occurrence was similar across the three phases in NWL survey area, with the high concentration of dolphin sightings around Sha Chau and Lung Kwu Chau as well as near Black Point (Figure 2). However, there were two subtle differences observed among the three phases in NWL waters. Dolphins appeared to occur in much lower extent to the west of the airport platform and less frequently between Pillar Point and the airport platform during the impact phase when compared to the baseline and transitional phases (Figure 2).

3.3. Encounter rate

3.3.1. During the present 12-month impact phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline and transitional phases (Table 2).

Table 2. Comparison of average daily dolphin encounter rates from impact phase (November 2013 – October 2014), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012) (Note: encounter rates deduced from the three periods were calculated based on survey and on-effort sighting data made along the primary transect lines under favourable conditions; ± denotes the standard deviation of the average encounter rates)

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		**Encounter rate (ANI)** (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Northeast Lantau	**Northwest Lantau**	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2013-14)	0.22 ± 0.74	6.93 ± 4.08	0.76 ± 2.59	26.31 ± 17.56
Transitional Phase (2012-13)	1.70 ± 2.26	7.68 ± 4.36	4.75 ± 7.61	27.51 ± 18.06
Baseline Phase (2011-12)	6.05 ± 5.04	7.75 ± 5.69	19.91 ± 21.30	29.57 ± 26.96

3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the present 12-month study period using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 6.24 sightings and 22.93 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were 0.23 sightings and 1.23 dolphins per 100 km of survey effort respectively.

3.3.3. In NEL, the dolphin encounter rates (both STG and ANI) in the present 12-month impact monitoring period were exceptionally low, which was only a small fraction of the averages during the baseline phase (Table 2). In fact, such decline already existed in this area during the transitional phase (i.e. well before the TMCLKL construction works commenced), with the averages in the transitional phase being much lower than the ones in the baseline phase (reductions of 71.9% for STG and 76.1% respectively). Since then, dolphin occurrence has further diminished to a very low level after the construction works of TMCLKL have commenced.

3.3.4. In NWL, the average dolphin encounter rates (STG and ANI) during the present impact phase monitoring period were also slightly lower (reductions of 10.6% and 11.0% respectively) than the ones recorded in the baseline period, indicating a slight decline in dolphin usage of this survey area during the present impact phase monitoring period (Table 2). Such decline was persistent since the commencement of HZMB construction in 2012, with a slight decline in transitional phase followed by a further decline in the impact phase (Table 2).

3.3.5. A two-way ANOVA with repeated measures and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the three monitoring periods (i.e. baseline, transitional and impact). The two variables that were examined included the two periods and the two locations (i.e. NEL and NWL).

3.3.6. For the comparison between the three periods, the p-value for the differences in average dolphin encounter rates of STG and ANI were 0.0043 and 0.0426 respectively. If the alpha value is set at 0.05, significant differences were detected among the three periods in both dolphin encounter rates of STG and ANI.

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from one to 13 individuals per group in North Lantau region during November 2013 – October 2014. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline and transitional phases, as shown in Table 3.

3.4.2. The average dolphin group sizes in the entire North Lantau region as well as in NWL waters during the present impact phase monitoring period were slightly higher than the ones recorded during the baseline and transitional phases (Table 3). Among the 136 dolphin groups sighted during the impact phase, 93 of them were composed of 1-4 individuals only, while there were only four dolphin groups with more than 10 individuals.

Table 3. Comparison of average dolphin group sizes from impact phase (November 2013 – October 2014), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012) (± denotes the standard deviation of the average encounter rates)

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2013-14)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

3.4.3. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present quarter is shown in Figure 3, with comparison to the ones in transitional phase and baseline phase. During the TMCLKL impact phase in 2013-14, distribution of the larger dolphin groups were mainly concentrated around Lung Kwu Chau, Sha Chau and near Black Point (Figure 3). This distribution pattern was similar to the one during the transitional phase, but was very different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many also sighted in NEL waters (Figure 3). Moreover, fewer large dolphin groups with more than 10 animals were sighted during the impact phase when compared with the transitional and baseline phases.

3.5. Habitat use

3.5.1. During the impact phase monitoring period in 2013-14, the most heavily utilized habitats by Chinese White Dolphins mainly concentrated around Lung Kwu Chau (Figures 4a and 4b). For the rest of North Lantau region, only a few grids in NEL as well as the eastern and southwestern sections of NWL recorded the presence of dolphins in very low density. Moreover, all grids near TMCLKL and HKLR09 alignments as well as the HKLR03/HKBCF reclamation sites rarely recorded the presence of dolphins in the present 12-month impact monitoring period (Figures 4a and 4b).

3.5.2. When compared with the habitat use patterns during the baseline phase, dolphin usage in NEL was dramatically different from the present impact monitoring period (Figure 5). During the baseline period, a number of grids between Siu Mo To and Shum Shui Kok recorded moderately high to high dolphin densities, which was in stark contrast to the rare dolphin usage during the present impact phase period (Figure 5).

3.5.3. On the other hand, the density patterns in NWL were similar between the baseline and impact phase monitoring periods, with the exception that dolphin rarely utilized the waters to the west of airport during the impact phase, while their densities were relatively much higher during the baseline phase in the same area.

3.5.4. Notably, the habitat use patterns between the present impact phase in 2013-14 and transitional phase in 2012-13 were largely similar, indicating that the declining usage by the dolphins in NEL have already persisted before the commencement of TMCLKL

construction works. Nevertheless, the declining usage of NEL waters and the central portion of NL waters have further worsened during the present impact monitoring period with the on-going TMCLK construction works in addition to other HZMB-related construction activities.

3.6. Mother-calf pairs

3.6.1. During the present 12-month impact phase monitoring period, a total of two unspotted calves and 27 unspotted juveniles (UJ) were sighted in North Lantau waters. These young calves comprised of 5.7% of all animals sighted, which was slightly higher than the percentage recorded during the baseline period (4.5%) but slightly lower than the one during the transitional phase (6.7%).

3.6.2. In NWL, the young calves were mainly sighted within and in the vicinity of Lung Kwu Chau during the impact phase monitoring period, which was drastically different from the distribution patterns during the baseline and transitional phases when young calves were sighted throughout NWL waters (Figure 6). Moreover, only one young calf was sighted near Siu Ho Wan in NEL during the impact phase, but they were regularly sighted in this area during baseline and transitional phases (Figure 6).

3.6.3. Notably, none of the young calves were sighted in the vicinity of the TMCLKL/HKLR09 alignments and HKBCF/HKLR03 reclamation sites during the present impact phase monitoring period (Figure 6).

3.7. Activities and associations with fishing boats

3.7.1. Eight dolphin sightings of each were associated with feeding and socializing activities respectively during the 12-month impact phase monitoring period. The percentage of sightings associated with feeding activities during the present impact phase (5.9%) was much lower than the ones recorded during the baseline period (12.8%) as well as transitional phase (8.6%) On the contrary, the percentage of socializing activities during the present impact phase monitoring period (5.9%) was higher than the one recorded during the baseline period (3.8%), but slightly lower than the one during the transitional period (6.4%). Notably, four other groups were also engaged in traveling activity during the present impact phase monitoring period.

3.7.2. Distribution of dolphins engaged in feeding, socializing and traveling activities during the present impact phase monitoring period is shown in Figure 7. The sightings associated with feeding activities occurred near Lung Kwu Chau, Sha Chau, Pillar Point and Siu Ho Wan, while the ones associated with socializing activities could be found along the Urmston Road between Pillar Point and the marine park as well as near Lung Kwu Chau and Sha Chau (Figure 7). On the contrary, feeding activities were frequently sighted along the Urmston Road, within the marine park, to the west of airport platform and around the Brothers Islands during the baseline phase, while the socializing activities were more scattered throughout the North Lantau region in the same period as well as in the transitional phase (Figure 7).

3.7.3. Dolphin sightings associated with traveling activities were concentrated to the north and east of Lung Kwu Chau during the impact phase monitoring period (Figure 7). This was

very different from the pattern observed in baseline phase when traveling activities were primarily found near Pillar Point and to the west of the airport platform (Figure 7).

3.7.4. During the impact phase monitoring period in 2013-14, only one of the 136 dolphin groups were found to be associated with an operating fishing vessel (a hang trawler) in North Lantau waters. The extremely rare event of fishing boat association in the impact phase as well as the transitional phase (3 of 186 groups associated with fishing boats) was quite different from the baseline period with 14 of 288 dolphin groups associated with fishing boats. This was likely related to the trawl ban being implemented in December 2012 in Hong Kong waters.

3.8. Summary of photo-identification works

3.8.1. During the 12-month impact phase monitoring period, a total of 77 individuals sighted 291 times altogether were identified (see Appendix III). Only 17 of the 291 re-sightings (from 11 individuals) were made in NEL, while the rest were made in NWL.

3.8.2. About half of the 77 identified individuals were sighted only once or twice, while many individuals were also sighted frequently during the 12-month period. For example, 17 individuals were sighted more than five times, while five individuals (NL24, NL48, NL136, NL261 and NL272) were sighted ten times or more. Their frequent occurrences indicated strong reliance of North Lantau waters as their home ranges during the impact phase monitoring period, which should be continuously monitored for the rest of the impact phase monitoring period.

3.8.3. Notably, fifteen recognized females (i.e. NL33, NL46, NL80, NL93, NL98, NL104, NL123, NL145, NL182, NL202, NL221, NL233, NL256, WL124 and WL172) were accompanied with their calves during their re-sightings.

3.9. Individual range use

3.9.1. Ranging patterns of the 77 individuals identified during the 12-month impact phase monitoring period in 2013-14 were determined by fixed kernel method, and are shown in Appendix IV.

3.9.2. All identified dolphins sighted in this 12-month period were utilizing their ranges primarily in NWL, while some have extended their range use to West Lantau waters (e.g. CH34, NL33, NL150, WL15, WL124) based on the HKLR09 monitoring data collected during the same period (Appendix IV). The majority of identified dolphins have avoided the NEL waters, the area where many of them have utilized as their core areas of activities in the past.

3.9.3. An examination on temporal changes in range use of individual dolphins across the baseline, transitional and impact phases revealed that a number of dolphins have gradually shifted their range use away from their previously important habitat in NEL (especially around the Brothers) (see examples in Appendix V). Several individuals have expanded their range use into West Lantau waters (e.g. CH34, EL01, NL33, NL37, NL49, NL98, NL136, NL188, NL259, NL272, NL296, WL05) during the impact phase,

while others have either increased their utilization of NWL (e.g. NL48, NL123, NL165, NL284) or possibly moved away from Hong Kong waters more often with only a few sightings despite their frequent occurrence here in the past (e.g. NL191, NL244, WL11).

3.9.4. Such range shifts of identified individual dolphins were also documented in Hung (2014), and could be related to the disturbance of construction activities and other existing threats in the NEL region. This should be continuously monitored for the rest of the TMCLKL impact phase monitoring period, as the waters around the Brothers Islands is scheduled to be established as a marine park in 2016 as an important compensation measure for the dolphins.

4. Conclusion

4.1. During the first year of TMCLKL impact phase monitoring of Chinese white dolphins, no adverse impact from the activities of the TMCLKL construction project on the dolphins was noticeable from general observations.

4.2. Although the dolphins infrequently occurred along the alignment of TMCLKL northern connection sub-sea tunnel section in the past and during the baseline monitoring period, it is apparent that dolphin usage has been significantly reduced in NEL, and many individuals have shifted away from the important habitat around the Brothers Islands.

4.3. It is critical to monitor the dolphin usage in North Lantau region for the rest of the impact phase monitoring period, to determine whether the dolphins are continuously affected by the various construction activities in relation to the HZMB-related works, and whether suitable mitigation measure can be applied to revert the situation.

5. References

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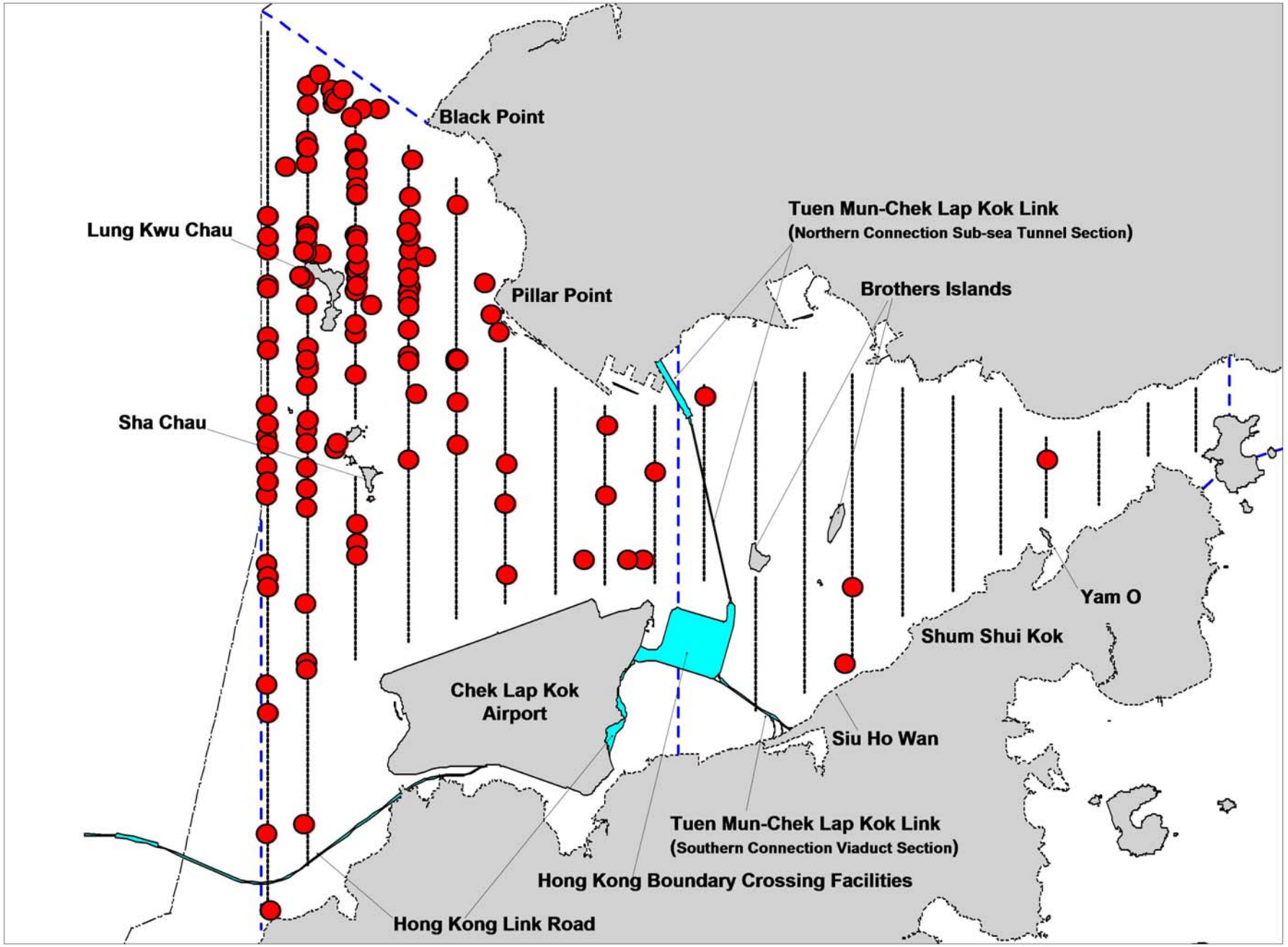


Figure 1. Distribution of Chinese white dolphin sightings in North Lantau region during the first year of TMCLKL construction works (November 2013 to October 2014), utilizing the HKLR03 monitoring data

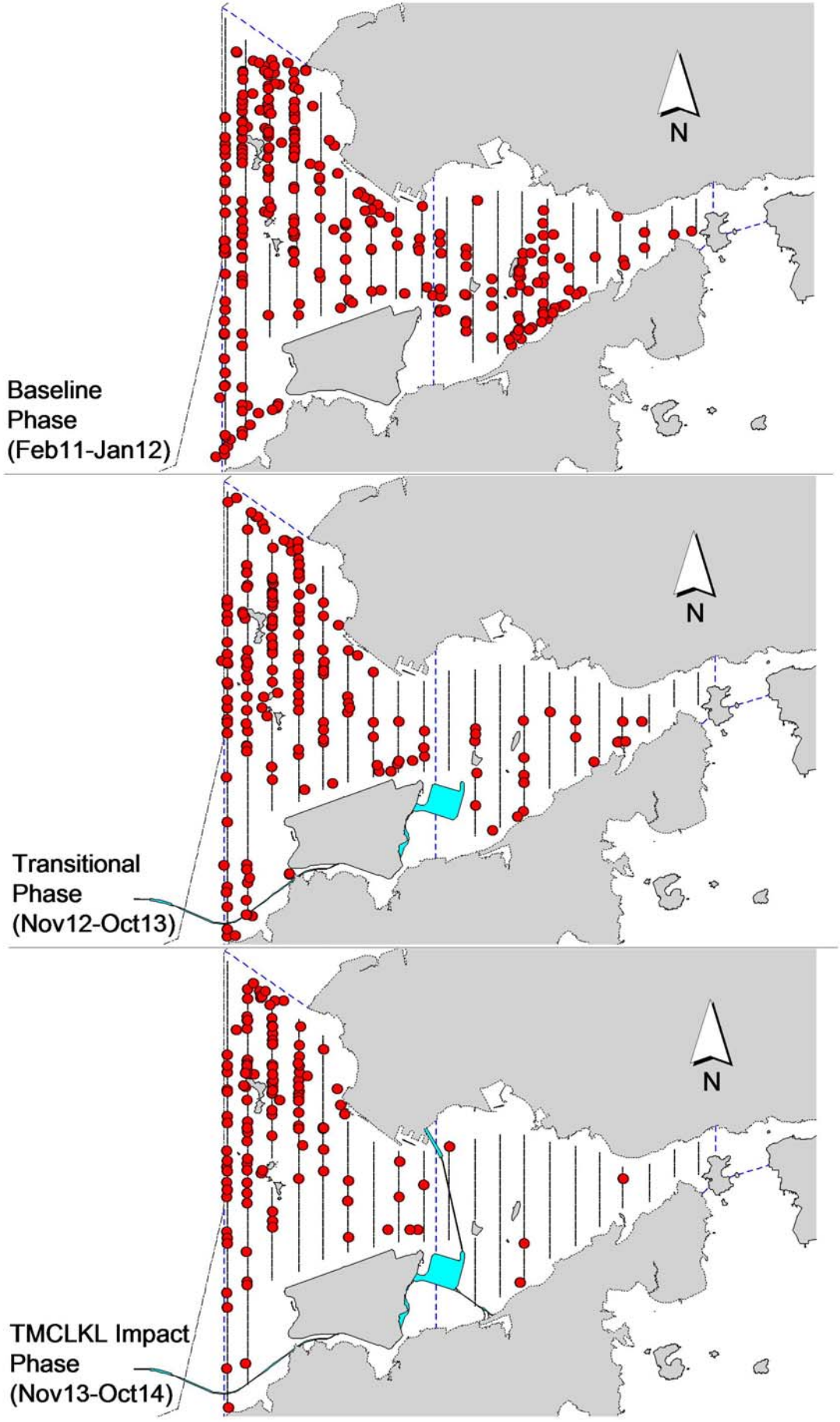


Figure 2. A comparison on distribution of Chinese white dolphin sightings in North Lantau region during the baseline, transitional and impact phases of TMCLKL construction works

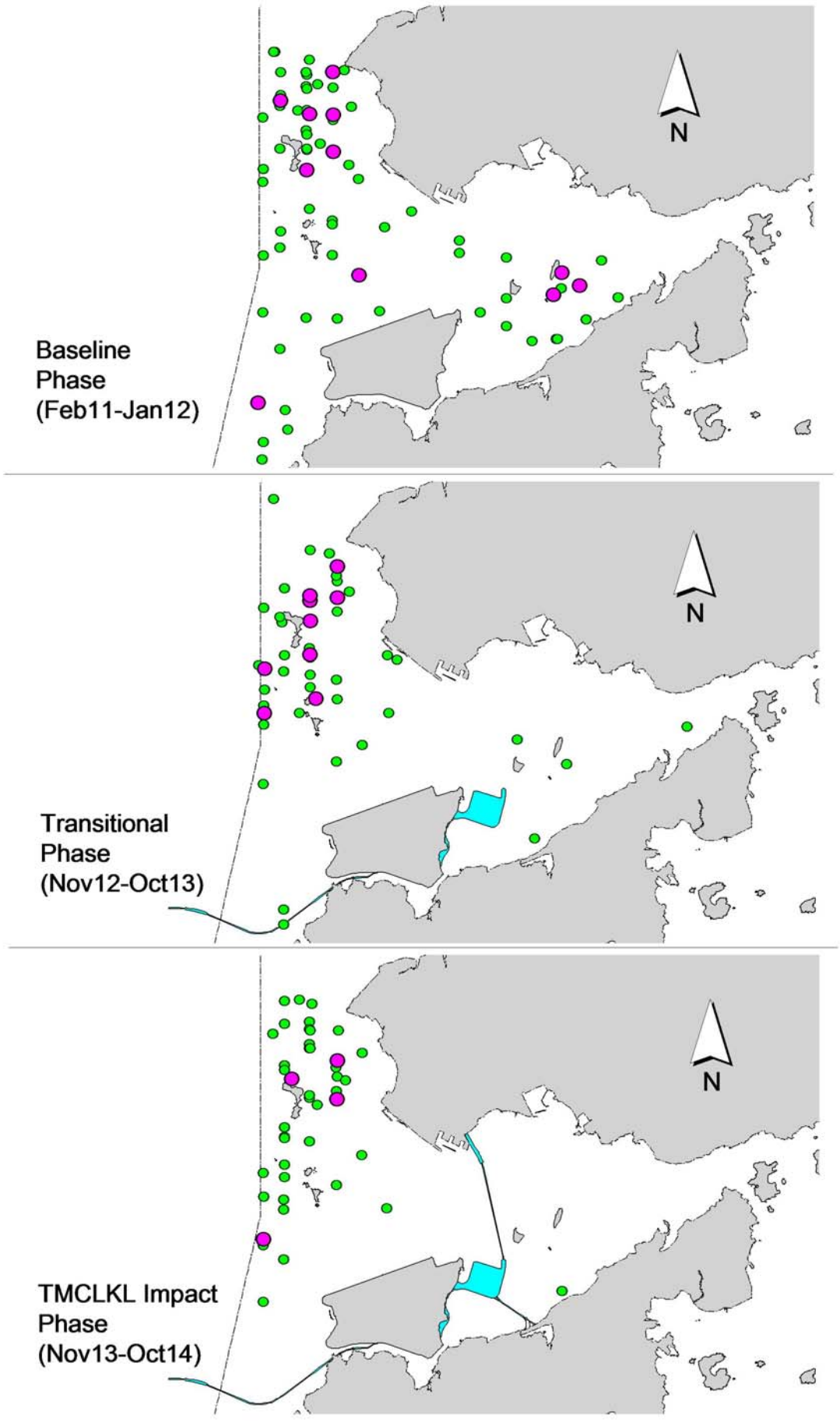


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

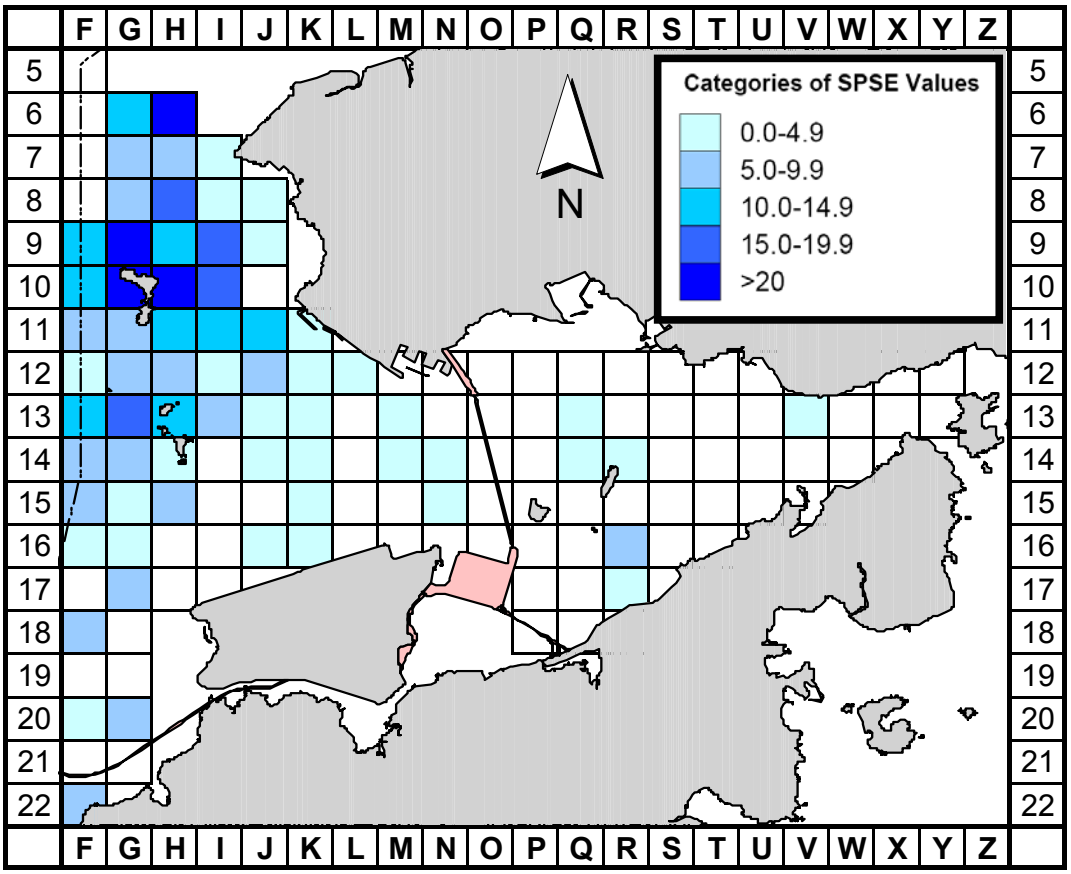


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Nov13 - Oct14) (SPSE = no. of on-effort sightings per 100 units of survey effort)

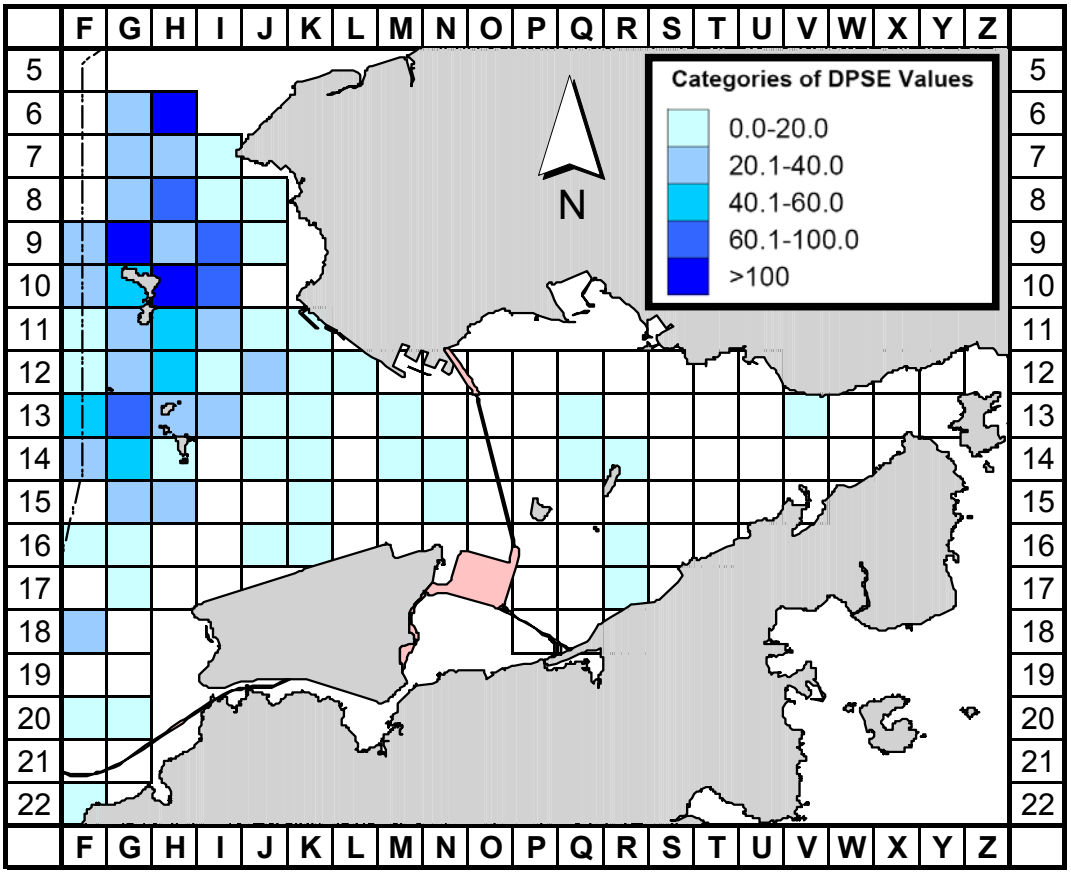


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Nov13 -Oct14) (DPSE = no. of dolphins per 100 units of survey effort)

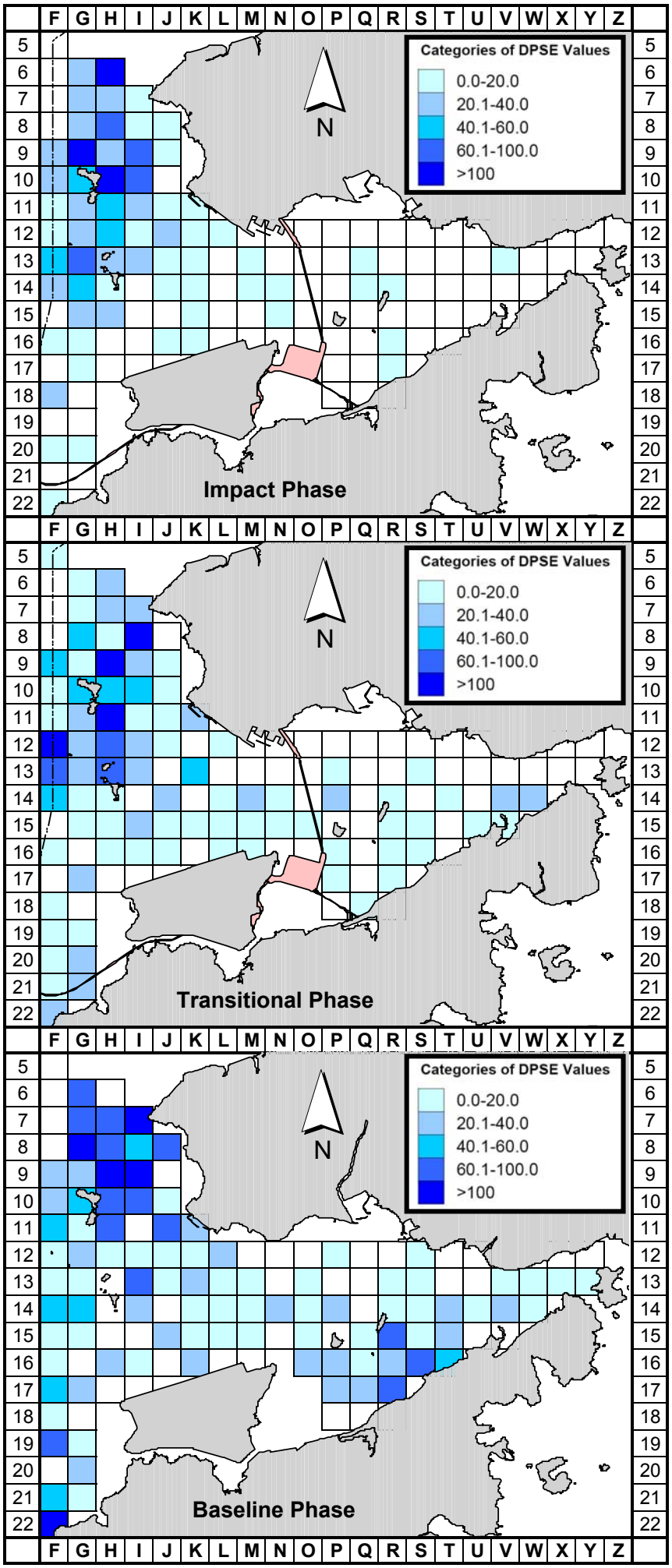


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km^2 in NWL and NEL survey areas between the impact phase (Nov13-Oct14), transitional phase (Nov12-Oct13) and baseline phase (Feb11-Jan12) monitoring periods (DPSE = no. of dolphins per 100 units of survey effort)

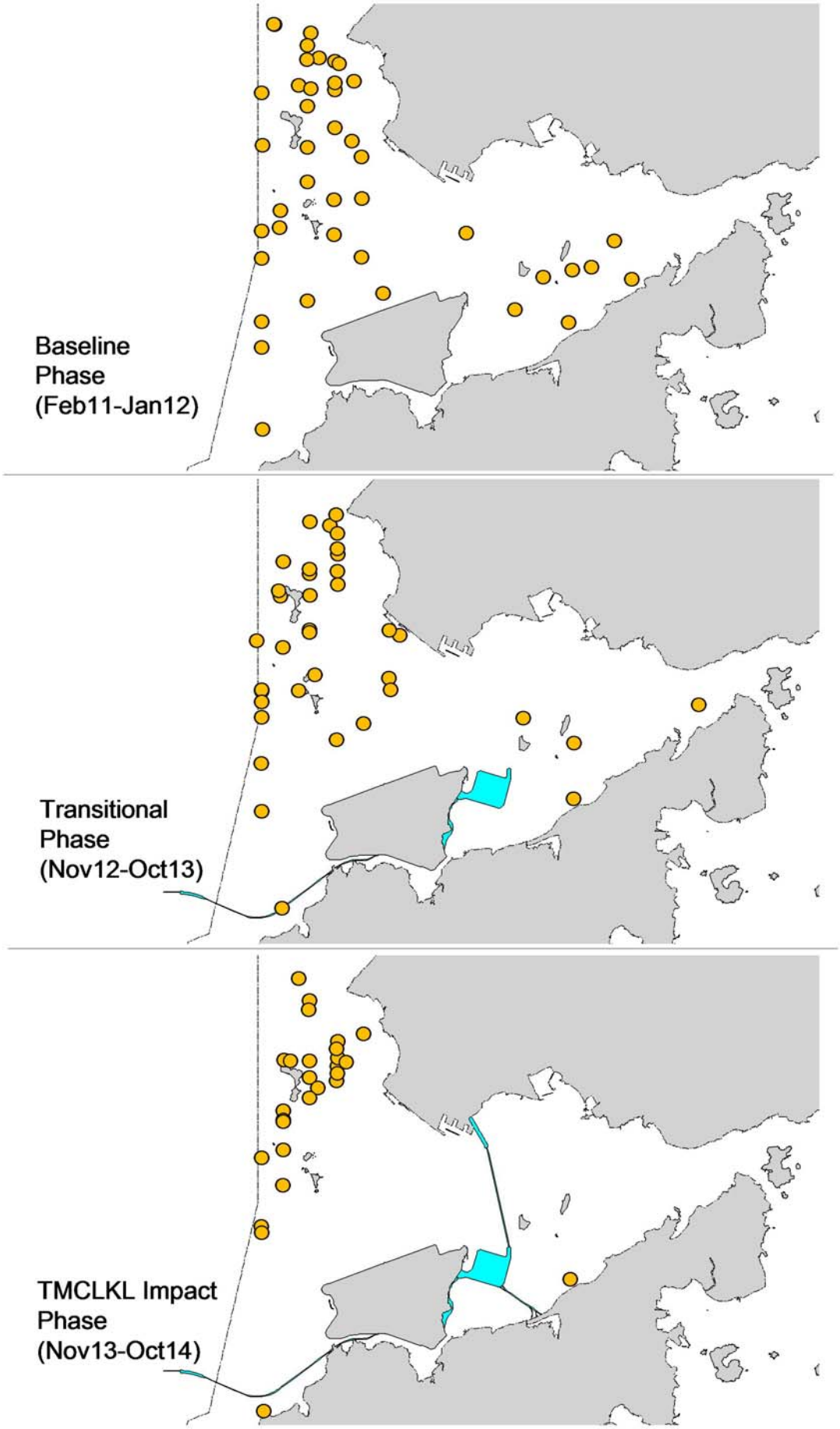


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works

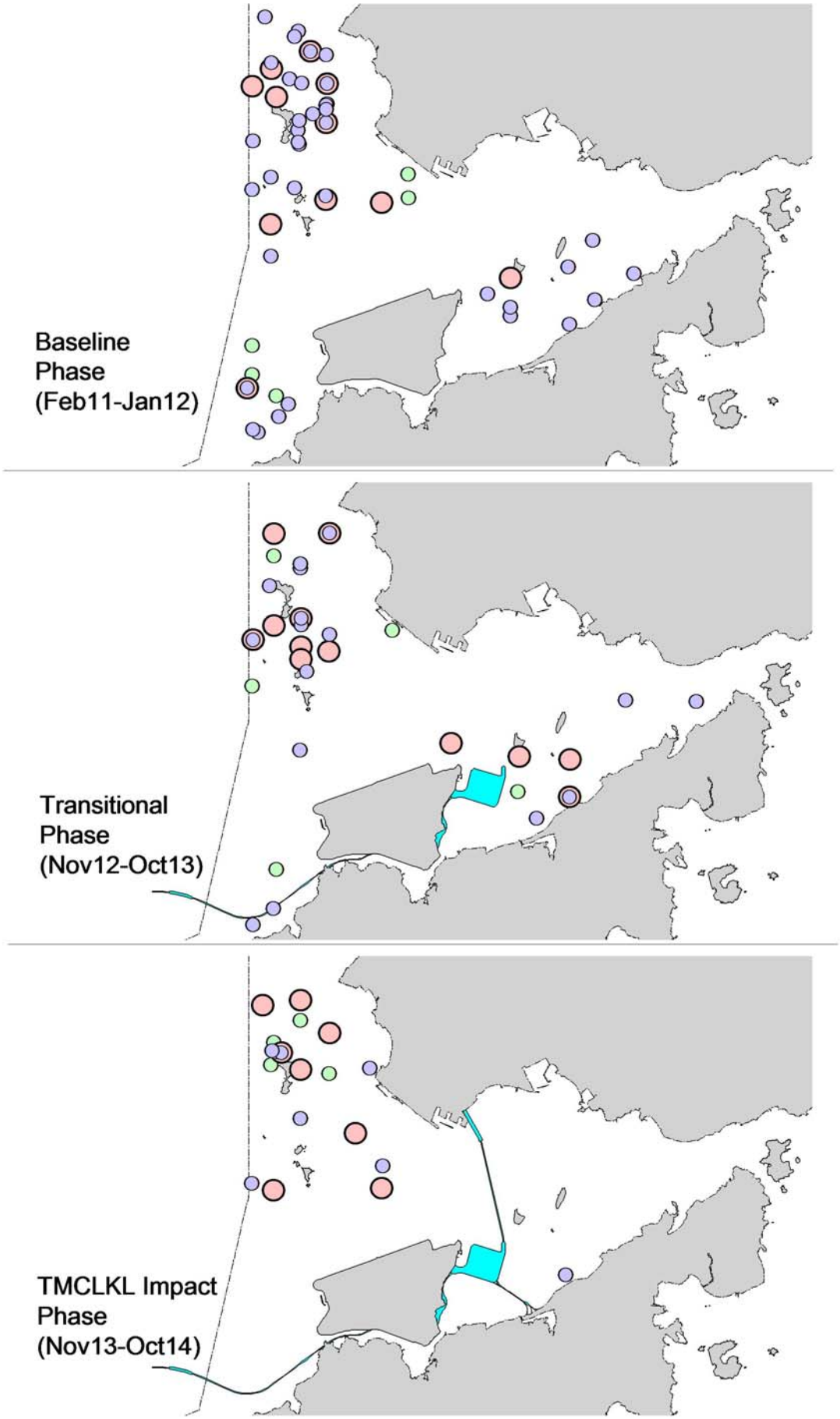


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works

Appendix I. HKLR03 Survey Effort Database (November 2013 - October 201

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
1-Nov-13	NW LANTAU	1	6.43	AUTUMN	STANDARD31516	HKLR	P
1-Nov-13	NW LANTAU	2	28.32	AUTUMN	STANDARD31516	HKLR	P
1-Nov-13	NW LANTAU	3	19.23	AUTUMN	STANDARD31516	HKLR	P
1-Nov-13	NW LANTAU	1	2.25	AUTUMN	STANDARD31516	HKLR	S
1-Nov-13	NW LANTAU	2	5.73	AUTUMN	STANDARD31516	HKLR	S
1-Nov-13	NW LANTAU	3	4.87	AUTUMN	STANDARD31516	HKLR	S
1-Nov-13	NE LANTAU	2	3.67	AUTUMN	STANDARD31516	HKLR	P
5-Nov-13	NE LANTAU	2	34.75	AUTUMN	STANDARD31516	HKLR	P
5-Nov-13	NE LANTAU	2	10.65	AUTUMN	STANDARD31516	HKLR	S
5-Nov-13	NW LANTAU	2	13.99	AUTUMN	STANDARD31516	HKLR	P
5-Nov-13	NW LANTAU	2	6.61	AUTUMN	STANDARD31516	HKLR	S
8-Nov-13	NW LANTAU	0	1.73	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	1	10.57	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	2	39.88	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	3	1.50	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	1	1.29	AUTUMN	STANDARD31516	HKLR	S
8-Nov-13	NW LANTAU	2	5.53	AUTUMN	STANDARD31516	HKLR	S
8-Nov-13	NW LANTAU	3	2.36	AUTUMN	STANDARD31516	HKLR	S
13-Nov-13	NE LANTAU	1	5.70	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NE LANTAU	2	21.79	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NE LANTAU	3	9.60	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NE LANTAU	2	11.71	AUTUMN	STANDARD31516	HKLR	S
13-Nov-13	NE LANTAU	3	1.10	AUTUMN	STANDARD31516	HKLR	S
13-Nov-13	NW LANTAU	1	1.93	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NW LANTAU	2	5.89	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NW LANTAU	3	6.87	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NW LANTAU	2	4.22	AUTUMN	STANDARD31516	HKLR	S
5-Dec-13	NE LANTAU	1	21.06	WINTER	STANDARD31516	HKLR	P
5-Dec-13	NE LANTAU	2	16.22	WINTER	STANDARD31516	HKLR	P
5-Dec-13	NE LANTAU	1	6.64	WINTER	STANDARD31516	HKLR	S
5-Dec-13	NE LANTAU	2	5.18	WINTER	STANDARD31516	HKLR	S
5-Dec-13	NW LANTAU	2	11.53	WINTER	STANDARD31516	HKLR	P
5-Dec-13	NW LANTAU	3	3.89	WINTER	STANDARD31516	HKLR	P
5-Dec-13	NW LANTAU	2	3.87	WINTER	STANDARD31516	HKLR	S
5-Dec-13	NW LANTAU	3	2.51	WINTER	STANDARD31516	HKLR	S
9-Dec-13	NW LANTAU	2	19.03	WINTER	STANDARD31516	HKLR	P
9-Dec-13	NW LANTAU	3	37.52	WINTER	STANDARD31516	HKLR	P
9-Dec-13	NW LANTAU	2	5.22	WINTER	STANDARD31516	HKLR	S
9-Dec-13	NW LANTAU	3	6.78	WINTER	STANDARD31516	HKLR	S
13-Dec-13	NE LANTAU	1	4.50	WINTER	STANDARD31516	HKLR	P
13-Dec-13	NE LANTAU	2	31.16	WINTER	STANDARD31516	HKLR	P
13-Dec-13	NE LANTAU	1	3.90	WINTER	STANDARD31516	HKLR	S
13-Dec-13	NE LANTAU	2	9.44	WINTER	STANDARD31516	HKLR	S
13-Dec-13	NW LANTAU	2	8.88	WINTER	STANDARD31516	HKLR	P
13-Dec-13	NW LANTAU	3	6.40	WINTER	STANDARD31516	HKLR	P
13-Dec-13	NW LANTAU	2	4.12	WINTER	STANDARD31516	HKLR	S
19-Dec-13	NW LANTAU	3	14.06	WINTER	STANDARD31516	HKLR	P
19-Dec-13	NW LANTAU	4	36.79	WINTER	STANDARD31516	HKLR	P
19-Dec-13	NW LANTAU	5	6.10	WINTER	STANDARD31516	HKLR	P
19-Dec-13	NW LANTAU	3	8.79	WINTER	STANDARD31516	HKLR	S
19-Dec-13	NW LANTAU	4	2.91	WINTER	STANDARD31516	HKLR	S
19-Dec-13	NW LANTAU	5	0.90	WINTER	STANDARD31516	HKLR	S

Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
7-Jan-14	NE LANTAU	2	1.09	WINTER	STANDARD31516	HKLR	P
7-Jan-14	NE LANTAU	3	14.05	WINTER	STANDARD31516	HKLR	P
7-Jan-14	NE LANTAU	4	1.01	WINTER	STANDARD31516	HKLR	P
7-Jan-14	NE LANTAU	2	3.39	WINTER	STANDARD31516	HKLR	**S**
7-Jan-14	NE LANTAU	3	7.60	WINTER	STANDARD31516	HKLR	S
7-Jan-14	NW LANTAU	2	9.81	WINTER	STANDARD31516	HKLR	P
7-Jan-14	NW LANTAU	3	28.88	WINTER	STANDARD31516	HKLR	P
7-Jan-14	NW LANTAU	2	8.13	WINTER	STANDARD31516	HKLR	S
7-Jan-14	NW LANTAU	3	3.43	WINTER	STANDARD31516	HKLR	S
9-Jan-14	NE LANTAU	1	4.79	WINTER	STANDARD31516	HKLR	P
9-Jan-14	NE LANTAU	2	14.76	WINTER	STANDARD31516	HKLR	P
9-Jan-14	NE LANTAU	1	2.30	WINTER	STANDARD31516	HKLR	S
9-Jan-14	NE LANTAU	2	8.28	WINTER	STANDARD31516	HKLR	S
9-Jan-14	NW LANTAU	2	10.13	WINTER	STANDARD31516	HKLR	P
9-Jan-14	NW LANTAU	3	21.20	WINTER	STANDARD31516	HKLR	P
9-Jan-14	NW LANTAU	2	5.02	WINTER	STANDARD31516	HKLR	S
9-Jan-14	NW LANTAU	3	2.06	WINTER	STANDARD31516	HKLR	S
21-Jan-14	NE LANTAU	2	4.00	WINTER	STANDARD 31516	HKLR	P
21-Jan-14	NE LANTAU	3	15.27	WINTER	STANDARD 31516	HKLR	P
21-Jan-14	NE LANTAU	4	1.50	WINTER	STANDARD 31516	HKLR	P
21-Jan-14	NE LANTAU	3	10.76	WINTER	STANDARD 31516	HKLR	S
21-Jan-14	NE LANTAU	4	0.40	WINTER	STANDARD 31516	HKLR	S
21-Jan-14	NW LANTAU	2	13.76	WINTER	STANDARD 31516	HKLR	P
21-Jan-14	NW LANTAU	3	14.44	WINTER	STANDARD 31516	HKLR	P
21-Jan-14	NW LANTAU	4	1.29	WINTER	STANDARD 31516	HKLR	P
21-Jan-14	NW LANTAU	2	4.95	WINTER	STANDARD 31516	HKLR	S
21-Jan-14	NW LANTAU	3	3.95	WINTER	STANDARD 31516	HKLR	S
23-Jan-14	NW LANTAU	1	4.93	WINTER	STANDARD31516	HKLR	P
23-Jan-14	NW LANTAU	2	29.22	WINTER	STANDARD31516	HKLR	P
23-Jan-14	NW LANTAU	3	5.21	WINTER	STANDARD31516	HKLR	P
23-Jan-14	NW LANTAU	1	2.20	WINTER	STANDARD31516	HKLR	S
23-Jan-14	NW LANTAU	2	10.18	WINTER	STANDARD31516	HKLR	S
23-Jan-14	NE LANTAU	1	1.41	WINTER	STANDARD31516	HKLR	P
23-Jan-14	NE LANTAU	2	12.52	WINTER	STANDARD31516	HKLR	P
23-Jan-14	NE LANTAU	3	2.59	WINTER	STANDARD31516	HKLR	P
23-Jan-14	NE LANTAU	1	0.47	WINTER	STANDARD31516	HKLR	S
23-Jan-14	NE LANTAU	2	9.53	WINTER	STANDARD31516	HKLR	S
6-Feb-14	NW LANTAU	1	1.68	WINTER	STANDARD 31516	HKLR	P
6-Feb-14	NW LANTAU	2	35.03	WINTER	STANDARD 31516	HKLR	P
6-Feb-14	NW LANTAU	3	2.90	WINTER	STANDARD 31516	HKLR	P
6-Feb-14	NW LANTAU	2	11.99	WINTER	STANDARD 31516	HKLR	S
6-Feb-14	NW LANTAU	3	1.20	WINTER	STANDARD 31516	HKLR	S
6-Feb-14	NE LANTAU	1	5.59	WINTER	STANDARD 31516	HKLR	P
6-Feb-14	NE LANTAU	2	8.66	WINTER	STANDARD 31516	HKLR	P
6-Feb-14	NE LANTAU	3	2.60	WINTER	STANDARD 31516	HKLR	P
6-Feb-14	NE LANTAU	1	4.45	WINTER	STANDARD 31516	HKLR	S
6-Feb-14	NE LANTAU	2	6.50	WINTER	STANDARD 31516	HKLR	S
12-Feb-14	NE LANTAU	2	13.78	WINTER	STANDARD 31516	HKLR	P
12-Feb-14	NE LANTAU	3	5.91	WINTER	STANDARD 31516	HKLR	P
12-Feb-14	NE LANTAU	1	2.02	WINTER	STANDARD 31516	HKLR	S
12-Feb-14	NE LANTAU	2	5.36	WINTER	STANDARD 31516	HKLR	S
12-Feb-14	NE LANTAU	3	3.53	WINTER	STANDARD 31516	HKLR	S
12-Feb-14	NW LANTAU	2	11.72	WINTER	STANDARD 31516	HKLR	P
12-Feb-14	NW LANTAU	3	15.87	WINTER	STANDARD 31516	HKLR	P

Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
12-Feb-14	NW LANTAU	2	3.67	WINTER	STANDARD 31516	HKLR	S
12-Feb-14	NW LANTAU	3	7.72	WINTER	STANDARD 31516	HKLR	S
14-Feb-14	NE LANTAU	2	11.72	WINTER	STANDARD 31516	HKLR	P
14-Feb-14	NE LANTAU	3	5.58	WINTER	STANDARD 31516	HKLR	P
14-Feb-14	NE LANTAU	2	7.68	WINTER	STANDARD 31516	HKLR	S
14-Feb-14	NE LANTAU	3	2.72	WINTER	STANDARD 31516	HKLR	S
14-Feb-14	NW LANTAU	2	17.02	WINTER	STANDARD 31516	HKLR	P
14-Feb-14	NW LANTAU	3	24.77	WINTER	STANDARD 31516	HKLR	P
14-Feb-14	NW LANTAU	2	9.82	WINTER	STANDARD 31516	HKLR	S
14-Feb-14	NW LANTAU	3	2.18	WINTER	STANDARD 31516	HKLR	S
20-Feb-14	NW LANTAU	3	22.68	WINTER	STANDARD 31516	HKLR	P
20-Feb-14	NW LANTAU	4	6.16	WINTER	STANDARD 31516	HKLR	P
20-Feb-14	NW LANTAU	3	7.31	WINTER	STANDARD 31516	HKLR	S
20-Feb-14	NE LANTAU	2	17.92	WINTER	STANDARD 31516	HKLR	P
20-Feb-14	NE LANTAU	3	2.19	WINTER	STANDARD 31516	HKLR	P
20-Feb-14	NE LANTAU	1	0.97	WINTER	STANDARD 31516	HKLR	S
20-Feb-14	NE LANTAU	2	8.94	WINTER	STANDARD 31516	HKLR	S
5-Mar-14	NW LANTAU	1	3.88	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NW LANTAU	2	20.76	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NW LANTAU	3	5.93	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NW LANTAU	2	5.25	SPRING	STANDARD31516	HKLR	S
5-Mar-14	NW LANTAU	3	1.96	SPRING	STANDARD31516	HKLR	S
5-Mar-14	NE LANTAU	2	17.99	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NE LANTAU	3	1.69	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NE LANTAU	2	11.02	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NE LANTAU	2	1.40	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NE LANTAU	3	11.82	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NE LANTAU	4	2.90	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NE LANTAU	2	6.16	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NE LANTAU	3	4.12	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NE LANTAU	4	1.40	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NW LANTAU	1	1.70	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	2	5.31	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	3	9.08	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	4	18.01	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	5	6.14	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	2	6.91	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NW LANTAU	3	1.40	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NW LANTAU	4	4.25	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NW LANTAU	0	4.79	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NW LANTAU	1	25.40	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NW LANTAU	2	8.51	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NW LANTAU	0	2.51	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NW LANTAU	1	7.24	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NW LANTAU	2	3.21	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NE LANTAU	1	14.20	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NE LANTAU	2	2.36	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NE LANTAU	1	9.07	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NE LANTAU	2	2.17	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NE LANTAU	1	13.41	SPRING	STANDARD31516	HKLR	P
25-Mar-14	NE LANTAU	2	6.67	SPRING	STANDARD31516	HKLR	P
25-Mar-14	NE LANTAU	1	6.73	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NE LANTAU	2	4.19	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NW LANTAU	1	7.45	SPRING	STANDARD31516	HKLR	P

Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
25-Mar-14	NW LANTAU	2	22.31	SPRING	STANDARD31516	HKLR	P
25-Mar-14	NW LANTAU	1	0.96	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NW LANTAU	2	6.58	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NW LANTAU	1	1.41	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	2	8.57	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	3	14.93	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	4	3.00	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	2	3.16	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NW LANTAU	3	3.00	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NW LANTAU	4	1.00	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NE LANTAU	2	0.80	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NE LANTAU	3	15.53	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NE LANTAU	4	4.16	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NE LANTAU	2	2.20	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NE LANTAU	3	8.51	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NE LANTAU	2	0.90	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NE LANTAU	3	9.61	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NE LANTAU	4	6.20	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NE LANTAU	2	1.80	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NE LANTAU	3	6.39	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NE LANTAU	4	2.90	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NW LANTAU	2	1.40	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NW LANTAU	3	14.62	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NW LANTAU	4	23.91	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NW LANTAU	2	2.10	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NW LANTAU	3	7.86	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NW LANTAU	4	2.99	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NW LANTAU	2	4.27	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NW LANTAU	3	24.56	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NW LANTAU	4	2.91	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NW LANTAU	2	2.45	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NW LANTAU	3	4.20	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NE LANTAU	2	3.94	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NE LANTAU	3	15.37	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NE LANTAU	4	1.10	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NE LANTAU	2	1.20	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NE LANTAU	3	9.49	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NW LANTAU	2	1.91	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NW LANTAU	3	29.94	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NW LANTAU	4	8.44	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NW LANTAU	2	0.80	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NW LANTAU	3	9.72	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NW LANTAU	4	2.20	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NE LANTAU	2	5.03	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NE LANTAU	3	10.14	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NE LANTAU	4	1.31	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NE LANTAU	2	7.37	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NE LANTAU	3	3.65	SPRING	STANDARD31516	HKLR	S
2-May-14	NW LANTAU	1	8.33	SPRING	STANDARD31516	HKLR	P
2-May-14	NW LANTAU	2	20.71	SPRING	STANDARD31516	HKLR	P
2-May-14	NW LANTAU	3	11.20	SPRING	STANDARD31516	HKLR	P
2-May-14	NW LANTAU	1	8.11	SPRING	STANDARD31516	HKLR	S
2-May-14	NW LANTAU	2	2.77	SPRING	STANDARD31516	HKLR	S
2-May-14	NW LANTAU	3	1.30	SPRING	STANDARD31516	HKLR	S

Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
2-May-14	NE LANTAU	2	8.93	SPRING	STANDARD31516	HKLR	P
2-May-14	NE LANTAU	3	8.38	SPRING	STANDARD31516	HKLR	P
2-May-14	NE LANTAU	2	7.68	SPRING	STANDARD31516	HKLR	S
2-May-14	NE LANTAU	3	2.51	SPRING	STANDARD31516	HKLR	S
19-May-14	NE LANTAU	1	2.45	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	2	13.17	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	3	2.63	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	4	1.40	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	1	1.44	SPRING	STANDARD31516	HKLR	S
19-May-14	NE LANTAU	2	4.97	SPRING	STANDARD31516	HKLR	S
19-May-14	NE LANTAU	3	3.94	SPRING	STANDARD31516	HKLR	S
19-May-14	NW LANTAU	3	14.57	SPRING	STANDARD31516	HKLR	P
19-May-14	NW LANTAU	4	16.43	SPRING	STANDARD31516	HKLR	P
19-May-14	NW LANTAU	3	4.87	SPRING	STANDARD31516	HKLR	S
19-May-14	NW LANTAU	4	2.01	SPRING	STANDARD31516	HKLR	S
21-May-14	NW LANTAU	1	1.40	SPRING	STANDARD31516	HKLR	P
21-May-14	NW LANTAU	2	13.43	SPRING	STANDARD31516	HKLR	P
21-May-14	NW LANTAU	3	16.59	SPRING	STANDARD31516	HKLR	P
21-May-14	NW LANTAU	1	0.60	SPRING	STANDARD31516	HKLR	S
21-May-14	NW LANTAU	2	4.20	SPRING	STANDARD31516	HKLR	S
21-May-14	NW LANTAU	3	2.50	SPRING	STANDARD31516	HKLR	S
21-May-14	NE LANTAU	2	13.25	SPRING	STANDARD31516	HKLR	P
21-May-14	NE LANTAU	3	6.78	SPRING	STANDARD31516	HKLR	P
21-May-14	NE LANTAU	2	9.07	SPRING	STANDARD31516	HKLR	S
21-May-14	NE LANTAU	3	1.50	SPRING	STANDARD31516	HKLR	S
26-May-14	NW LANTAU	2	21.21	SPRING	STANDARD31516	HKLR	P
26-May-14	NW LANTAU	3	19.14	SPRING	STANDARD31516	HKLR	P
26-May-14	NW LANTAU	2	3.70	SPRING	STANDARD31516	HKLR	S
26-May-14	NW LANTAU	3	9.05	SPRING	STANDARD31516	HKLR	S
26-May-14	NE LANTAU	1	3.10	SPRING	STANDARD31516	HKLR	P
26-May-14	NE LANTAU	2	13.43	SPRING	STANDARD31516	HKLR	P
26-May-14	NE LANTAU	2	10.87	SPRING	STANDARD31516	HKLR	S
3-Jun-14	NE LANTAU	2	14.31	SUMMER	STANDARD31516	HKLR	P
3-Jun-14	NE LANTAU	3	2.60	SUMMER	STANDARD31516	HKLR	P
3-Jun-14	NE LANTAU	2	10.89	SUMMER	STANDARD31516	HKLR	S
3-Jun-14	NW LANTAU	2	6.52	SUMMER	STANDARD31516	HKLR	P
3-Jun-14	NW LANTAU	3	23.00	SUMMER	STANDARD31516	HKLR	P
3-Jun-14	NW LANTAU	4	10.70	SUMMER	STANDARD31516	HKLR	P
3-Jun-14	NW LANTAU	2	3.78	SUMMER	STANDARD31516	HKLR	S
3-Jun-14	NW LANTAU	3	9.70	SUMMER	STANDARD31516	HKLR	S
5-Jun-14	NE LANTAU	1	5.65	SUMMER	STANDARD31516	HKLR	P
5-Jun-14	NE LANTAU	2	10.52	SUMMER	STANDARD31516	HKLR	P
5-Jun-14	NE LANTAU	3	4.20	SUMMER	STANDARD31516	HKLR	P
5-Jun-14	NE LANTAU	1	2.20	SUMMER	STANDARD31516	HKLR	S
5-Jun-14	NE LANTAU	2	6.23	SUMMER	STANDARD31516	HKLR	S
5-Jun-14	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	S
5-Jun-14	NW LANTAU	2	13.90	SUMMER	STANDARD31516	HKLR	P
5-Jun-14	NW LANTAU	3	16.56	SUMMER	STANDARD31516	HKLR	P
5-Jun-14	NW LANTAU	2	3.70	SUMMER	STANDARD31516	HKLR	S
5-Jun-14	NW LANTAU	3	3.61	SUMMER	STANDARD31516	HKLR	S
10-Jun-14	NW LANTAU	2	6.21	SUMMER	STANDARD31516	HKLR	P
10-Jun-14	NW LANTAU	3	31.70	SUMMER	STANDARD31516	HKLR	P
10-Jun-14	NW LANTAU	4	2.50	SUMMER	STANDARD31516	HKLR	P
10-Jun-14	NW LANTAU	2	9.29	SUMMER	STANDARD31516	HKLR	S

Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
10-Jun-14	NW LANTAU	3	4.10	SUMMER	STANDARD31516	HKLR	S
10-Jun-14	NE LANTAU	2	12.34	SUMMER	STANDARD31516	HKLR	P
10-Jun-14	NE LANTAU	3	3.50	SUMMER	STANDARD31516	HKLR	P
10-Jun-14	NE LANTAU	2	10.53	SUMMER	STANDARD31516	HKLR	S
10-Jun-14	NE LANTAU	3	0.73	SUMMER	STANDARD31516	HKLR	S
16-Jun-14	NW LANTAU	2	3.11	SUMMER	STANDARD31516	HKLR	P
16-Jun-14	NW LANTAU	3	13.98	SUMMER	STANDARD31516	HKLR	P
16-Jun-14	NW LANTAU	4	14.31	SUMMER	STANDARD31516	HKLR	P
16-Jun-14	NW LANTAU	3	4.28	SUMMER	STANDARD31516	HKLR	S
16-Jun-14	NW LANTAU	4	3.43	SUMMER	STANDARD31516	HKLR	S
16-Jun-14	NE LANTAU	1	1.40	SUMMER	STANDARD31516	HKLR	P
16-Jun-14	NE LANTAU	2	18.35	SUMMER	STANDARD31516	HKLR	P
16-Jun-14	NE LANTAU	1	0.30	SUMMER	STANDARD31516	HKLR	S
16-Jun-14	NE LANTAU	2	10.55	SUMMER	STANDARD31516	HKLR	S
3-Jul-14	NE LANTAU	2	1.89	SUMMER	STANDARD31516	HKLR	P
3-Jul-14	NE LANTAU	2	2.14	SUMMER	STANDARD31516	HKLR	S
3-Jul-14	NW LANTAU	2	7.87	SUMMER	STANDARD31516	HKLR	P
3-Jul-14	NW LANTAU	3	23.09	SUMMER	STANDARD31516	HKLR	P
3-Jul-14	NW LANTAU	4	5.90	SUMMER	STANDARD31516	HKLR	P
3-Jul-14	NW LANTAU	2	2.90	SUMMER	STANDARD31516	HKLR	S
3-Jul-14	NW LANTAU	3	7.84	SUMMER	STANDARD31516	HKLR	S
3-Jul-14	NW LANTAU	4	0.60	SUMMER	STANDARD31516	HKLR	S
9-Jul-14	NW LANTAU	1	1.80	SUMMER	STANDARD31516	HKLR	P
9-Jul-14	NW LANTAU	2	9.28	SUMMER	STANDARD31516	HKLR	P
9-Jul-14	NW LANTAU	2	3.22	SUMMER	STANDARD31516	HKLR	S
10-Jul-14	NW LANTAU	1	8.81	SUMMER	STANDARD31516	HKLR	P
10-Jul-14	NW LANTAU	2	12.85	SUMMER	STANDARD31516	HKLR	P
10-Jul-14	NW LANTAU	3	2.29	SUMMER	STANDARD31516	HKLR	P
10-Jul-14	NW LANTAU	1	0.73	SUMMER	STANDARD31516	HKLR	S
10-Jul-14	NW LANTAU	2	6.69	SUMMER	STANDARD31516	HKLR	S
10-Jul-14	NE LANTAU	1	14.94	SUMMER	STANDARD31516	HKLR	P
10-Jul-14	NE LANTAU	2	16.33	SUMMER	STANDARD31516	HKLR	P
10-Jul-14	NE LANTAU	3	6.20	SUMMER	STANDARD31516	HKLR	P
10-Jul-14	NE LANTAU	1	3.93	SUMMER	STANDARD31516	HKLR	S
10-Jul-14	NE LANTAU	2	6.90	SUMMER	STANDARD31516	HKLR	S
10-Jul-14	NE LANTAU	3	0.80	SUMMER	STANDARD31516	HKLR	S
14-Jul-14	NW LANTAU	2	19.59	SUMMER	STANDARD31516	HKLR	P
14-Jul-14	NW LANTAU	3	11.09	SUMMER	STANDARD31516	HKLR	P
14-Jul-14	NW LANTAU	2	2.05	SUMMER	STANDARD31516	HKLR	S
14-Jul-14	NW LANTAU	3	3.80	SUMMER	STANDARD31516	HKLR	S
14-Jul-14	NW LANTAU	4	0.93	SUMMER	STANDARD31516	HKLR	S
14-Jul-14	NE LANTAU	1	2.00	SUMMER	STANDARD31516	HKLR	P
14-Jul-14	NE LANTAU	2	14.57	SUMMER	STANDARD31516	HKLR	P
14-Jul-14	NE LANTAU	3	2.40	SUMMER	STANDARD31516	HKLR	P
14-Jul-14	NE LANTAU	4	1.20	SUMMER	STANDARD31516	HKLR	P
14-Jul-14	NE LANTAU	2	10.51	SUMMER	STANDARD31516	HKLR	S
14-Jul-14	NE LANTAU	3	0.30	SUMMER	STANDARD31516	HKLR	S
21-Jul-14	NW LANTAU	1	5.90	SUMMER	STANDARD31516	HKLR	P
21-Jul-14	NW LANTAU	2	31.10	SUMMER	STANDARD31516	HKLR	P
21-Jul-14	NW LANTAU	3	3.70	SUMMER	STANDARD31516	HKLR	P
21-Jul-14	NW LANTAU	2	7.90	SUMMER	STANDARD31516	HKLR	S
21-Jul-14	NW LANTAU	3	4.90	SUMMER	STANDARD31516	HKLR	S
21-Jul-14	NE LANTAU	1	2.80	SUMMER	STANDARD31516	HKLR	P
21-Jul-14	NE LANTAU	2	13.70	SUMMER	STANDARD31516	HKLR	P

Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
21-Jul-14	NE LANTAU	2	10.70	SUMMER	STANDARD31516	HKLR	S
5-Aug-14	NE LANTAU	1	8.40	SUMMER	STANDARD31516	HKLR	P
5-Aug-14	NE LANTAU	2	5.80	SUMMER	STANDARD31516	HKLR	P
5-Aug-14	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	P
5-Aug-14	NE LANTAU	1	6.20	SUMMER	STANDARD31516	HKLR	S
5-Aug-14	NE LANTAU	2	4.80	SUMMER	STANDARD31516	HKLR	S
5-Aug-14	NW LANTAU	1	8.00	SUMMER	STANDARD31516	HKLR	P
5-Aug-14	NW LANTAU	2	30.30	SUMMER	STANDARD31516	HKLR	P
5-Aug-14	NW LANTAU	3	1.70	SUMMER	STANDARD31516	HKLR	P
5-Aug-14	NW LANTAU	1	1.50	SUMMER	STANDARD31516	HKLR	S
5-Aug-14	NW LANTAU	2	9.90	SUMMER	STANDARD31516	HKLR	S
6-Aug-14	NW LANTAU	1	4.30	SUMMER	STANDARD31516	HKLR	P
6-Aug-14	NW LANTAU	2	21.55	SUMMER	STANDARD31516	HKLR	P
6-Aug-14	NW LANTAU	3	5.21	SUMMER	STANDARD31516	HKLR	P
6-Aug-14	NW LANTAU	1	2.30	SUMMER	STANDARD31516	HKLR	S
6-Aug-14	NW LANTAU	2	4.05	SUMMER	STANDARD31516	HKLR	S
6-Aug-14	NW LANTAU	3	0.30	SUMMER	STANDARD31516	HKLR	S
6-Aug-14	NE LANTAU	1	17.62	SUMMER	STANDARD31516	HKLR	P
6-Aug-14	NE LANTAU	2	2.26	SUMMER	STANDARD31516	HKLR	P
6-Aug-14	NE LANTAU	1	10.52	SUMMER	STANDARD31516	HKLR	S
15-Aug-14	NW LANTAU	2	7.71	SUMMER	STANDARD31516	HKLR	P
15-Aug-14	NW LANTAU	3	29.93	SUMMER	STANDARD31516	HKLR	P
15-Aug-14	NW LANTAU	3	9.92	SUMMER	STANDARD31516	HKLR	S
15-Aug-14	NW LANTAU	4	2.64	SUMMER	STANDARD31516	HKLR	S
15-Aug-14	NE LANTAU	2	17.22	SUMMER	STANDARD31516	HKLR	P
15-Aug-14	NE LANTAU	3	0.58	SUMMER	STANDARD31516	HKLR	P
15-Aug-14	NE LANTAU	2	8.54	SUMMER	STANDARD31516	HKLR	S
15-Aug-14	NE LANTAU	3	1.26	SUMMER	STANDARD31516	HKLR	S
19-Aug-14	NE LANTAU	1	1.46	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NE LANTAU	2	11.20	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NE LANTAU	3	5.91	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NE LANTAU	4	0.80	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NE LANTAU	2	4.35	SUMMER	STANDARD31516	HKLR	S
19-Aug-14	NE LANTAU	3	6.48	SUMMER	STANDARD31516	HKLR	S
19-Aug-14	NW LANTAU	2	1.16	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NW LANTAU	3	23.08	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NW LANTAU	4	3.24	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NW LANTAU	5	3.69	SUMMER	STANDARD31516	HKLR	P
19-Aug-14	NW LANTAU	3	4.32	SUMMER	STANDARD31516	HKLR	S
19-Aug-14	NW LANTAU	4	7.12	SUMMER	STANDARD31516	HKLR	S
2-Sep-14	NW LANTAU	1	7.96	AUTUMN	STANDARD31516	HKLR	P
2-Sep-14	NW LANTAU	2	14.28	AUTUMN	STANDARD31516	HKLR	P
2-Sep-14	NW LANTAU	3	16.44	AUTUMN	STANDARD31516	HKLR	P
2-Sep-14	NW LANTAU	2	7.13	AUTUMN	STANDARD31516	HKLR	S
2-Sep-14	NW LANTAU	3	5.72	AUTUMN	STANDARD31516	HKLR	S
2-Sep-14	NE LANTAU	2	15.63	AUTUMN	STANDARD31516	HKLR	P
2-Sep-14	NE LANTAU	3	2.18	AUTUMN	STANDARD31516	HKLR	P
2-Sep-14	NE LANTAU	2	8.31	AUTUMN	STANDARD31516	HKLR	S
2-Sep-14	NE LANTAU	3	1.28	AUTUMN	STANDARD31516	HKLR	S
11-Sep-14	NW LANTAU	1	4.75	AUTUMN	STANDARD31516	HKLR	P
11-Sep-14	NW LANTAU	2	23.23	AUTUMN	STANDARD31516	HKLR	P
11-Sep-14	NW LANTAU	3	3.33	AUTUMN	STANDARD31516	HKLR	P
11-Sep-14	NW LANTAU	1	0.70	AUTUMN	STANDARD31516	HKLR	S
11-Sep-14	NW LANTAU	2	5.11	AUTUMN	STANDARD31516	HKLR	S

Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
11-Sep-14	NW LANTAU	3	1.50	AUTUMN	STANDARD31516	HKLR	S
11-Sep-14	NE LANTAU	1	1.64	AUTUMN	STANDARD31516	HKLR	P
11-Sep-14	NE LANTAU	2	18.53	AUTUMN	STANDARD31516	HKLR	P
11-Sep-14	NE LANTAU	2	10.73	AUTUMN	STANDARD31516	HKLR	S
19-Sep-14	NW LANTAU	2	30.50	AUTUMN	STANDARD31516	HKLR	P
19-Sep-14	NW LANTAU	3	0.60	AUTUMN	STANDARD31516	HKLR	P
19-Sep-14	NW LANTAU	2	8.90	AUTUMN	STANDARD31516	HKLR	S
19-Sep-14	NW LANTAU	3	0.80	AUTUMN	STANDARD31516	HKLR	S
19-Sep-14	NE LANTAU	2	18.62	AUTUMN	STANDARD31516	HKLR	P
19-Sep-14	NE LANTAU	3	1.43	AUTUMN	STANDARD31516	HKLR	P
19-Sep-14	NE LANTAU	2	10.55	AUTUMN	STANDARD31516	HKLR	S
22-Sep-14	NE LANTAU	2	14.44	AUTUMN	STANDARD31516	HKLR	P
22-Sep-14	NE LANTAU	3	2.95	AUTUMN	STANDARD31516	HKLR	P
22-Sep-14	NE LANTAU	2	10.11	AUTUMN	STANDARD31516	HKLR	S
22-Sep-14	NW LANTAU	1	1.20	AUTUMN	STANDARD31516	HKLR	P
22-Sep-14	NW LANTAU	2	36.86	AUTUMN	STANDARD31516	HKLR	P
22-Sep-14	NW LANTAU	2	12.01	AUTUMN	STANDARD31516	HKLR	S
22-Sep-14	NW LANTAU	3	1.10	AUTUMN	STANDARD31516	HKLR	S
7-Oct-14	NE LANTAU	2	11.15	AUTUMN	STANDARD 31516	HKLR	P
7-Oct-14	NE LANTAU	3	6.75	AUTUMN	STANDARD 31516	HKLR	P
7-Oct-14	NE LANTAU	2	8.44	AUTUMN	STANDARD 31516	HKLR	S
7-Oct-14	NE LANTAU	3	1.46	AUTUMN	STANDARD 31516	HKLR	S
7-Oct-14	NW LANTAU	1	1.90	AUTUMN	STANDARD 31516	HKLR	P
7-Oct-14	NW LANTAU	2	25.80	AUTUMN	STANDARD 31516	HKLR	P
7-Oct-14	NW LANTAU	3	11.94	AUTUMN	STANDARD 31516	HKLR	P
7-Oct-14	NW LANTAU	2	9.13	AUTUMN	STANDARD 31516	HKLR	S
7-Oct-14	NW LANTAU	3	3.26	AUTUMN	STANDARD 31516	HKLR	S
13-Oct-14	NE LANTAU	2	10.59	AUTUMN	STANDARD 31516	HKLR	P
13-Oct-14	NE LANTAU	3	8.72	AUTUMN	STANDARD 31516	HKLR	P
13-Oct-14	NE LANTAU	2	7.91	AUTUMN	STANDARD 31516	HKLR	S
13-Oct-14	NE LANTAU	3	2.38	AUTUMN	STANDARD 31516	HKLR	S
13-Oct-14	NW LANTAU	2	4.96	AUTUMN	STANDARD 31516	HKLR	P
13-Oct-14	NW LANTAU	3	16.34	AUTUMN	STANDARD 31516	HKLR	P
13-Oct-14	NW LANTAU	4	4.95	AUTUMN	STANDARD 31516	HKLR	P
13-Oct-14	NW LANTAU	2	3.81	AUTUMN	STANDARD 31516	HKLR	S
13-Oct-14	NW LANTAU	3	7.23	AUTUMN	STANDARD 31516	HKLR	S
13-Oct-14	NW LANTAU	4	1.20	AUTUMN	STANDARD 31516	HKLR	S
16-Oct-14	NE LANTAU	2	12.51	AUTUMN	STANDARD 31516	HKLR	P
16-Oct-14	NE LANTAU	3	6.72	AUTUMN	STANDARD 31516	HKLR	P
16-Oct-14	NE LANTAU	2	8.04	AUTUMN	STANDARD 31516	HKLR	S
16-Oct-14	NE LANTAU	3	2.53	AUTUMN	STANDARD 31516	HKLR	S
16-Oct-14	NW LANTAU	2	3.81	AUTUMN	STANDARD 31516	HKLR	P
16-Oct-14	NW LANTAU	3	21.23	AUTUMN	STANDARD 31516	HKLR	P
16-Oct-14	NW LANTAU	4	6.50	AUTUMN	STANDARD 31516	HKLR	P
16-Oct-14	NW LANTAU	2	4.30	AUTUMN	STANDARD 31516	HKLR	S
16-Oct-14	NW LANTAU	3	3.56	AUTUMN	STANDARD 31516	HKLR	S
23-Oct-14	NE LANTAU	2	15.42	AUTUMN	STANDARD 31516	HKLR	P
23-Oct-14	NE LANTAU	3	1.90	AUTUMN	STANDARD 31516	HKLR	P
23-Oct-14	NE LANTAU	2	9.28	AUTUMN	STANDARD 31516	HKLR	S
23-Oct-14	NE LANTAU	3	0.70	AUTUMN	STANDARD 31516	HKLR	S
23-Oct-14	NW LANTAU	2	30.11	AUTUMN	STANDARD 31516	HKLR	P
23-Oct-14	NW LANTAU	3	10.91	AUTUMN	STANDARD 31516	HKLR	P
23-Oct-14	NW LANTAU	1	1.60	AUTUMN	STANDARD 31516	HKLR	S
23-Oct-14	NW LANTAU	2	9.19	AUTUMN	STANDARD 31516	HKLR	S
23-Oct-14	NW LANTAU	3	1.99	AUTUMN	STANDARD 31516	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (November 2013 - October 2014)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
1-Nov-13	1	1049	4	NW LANTAU	2	74	ON	HKLR	823145	809509	AUTUMN	NONE	P
1-Nov-13	2	1152	3	NW LANTAU	3	214	ON	HKLR	826947	807517	AUTUMN	NONE	P
1-Nov-13	3	1203	7	NW LANTAU	3	159	ON	HKLR	827235	807539	AUTUMN	NONE	P
1-Nov-13	4	1225	1	NW LANTAU	2	137	ON	HKLR	827490	807539	AUTUMN	NONE	P
1-Nov-13	5	1236	3	NW LANTAU	2	358	ON	HKLR	828232	807530	AUTUMN	NONE	P
1-Nov-13	6	1252	7	NW LANTAU	2	ND	OFF	HKLR	828941	807583	AUTUMN	NONE	
1-Nov-13	7	1312	4	NW LANTAU	2	72	ON	HKLR	830018	805999	AUTUMN	NONE	S
1-Nov-13	8	1458	11	NW LANTAU	3	60	ON	HKLR	821228	804642	AUTUMN	NONE	P
5-Nov-13	1	1421	5	NW LANTAU	2	378	ON	HKLR	828097	808508	AUTUMN	NONE	P
8-Nov-13	1	1041	4	NW LANTAU	1	302	ON	HKLR	824489	807678	AUTUMN	NONE	P
8-Nov-13	2	1103	8	NW LANTAU	2	694	ON	HKLR	827091	807858	AUTUMN	NONE	P
8-Nov-13	3	1152	7	NW LANTAU	3	299	ON	HKLR	827660	805459	AUTUMN	NONE	P
8-Nov-13	4	1215	9	NW LANTAU	2	756	ON	HKLR	825357	805465	AUTUMN	NONE	P
8-Nov-13	5	1232	5	NW LANTAU	2	ND	OFF	HKLR	825025	805464	AUTUMN	NONE	
8-Nov-13	6	1249	4	NW LANTAU	2	7	ON	HKLR	823806	805462	AUTUMN	NONE	P
8-Nov-13	7	1400	2	NW LANTAU	2	155	ON	HKLR	818382	804657	AUTUMN	NONE	P
8-Nov-13	8	1426	8	NW LANTAU	2	149	ON	HKLR	823675	804648	AUTUMN	NONE	P
8-Nov-13	9	1526	1	NW LANTAU	2	45	ON	HKLR	826872	806446	AUTUMN	NONE	P
8-Nov-13	10	1536	4	NW LANTAU	1	225	ON	HKLR	825643	806454	AUTUMN	NONE	P
8-Nov-13	11	1606	4	NW LANTAU	2	223	ON	HKLR	821988	806457	AUTUMN	NONE	P
13-Nov-13	1	1451	1	NW LANTAU	3	343	ON	HKLR	825118	808482	AUTUMN	NONE	P
5-Dec-13	1	1127	3	NE LANTAU	1	275	ON	HKLR	820787	816500	WINTER	NONE	P
9-Dec-13	1	1119	1	NW LANTAU	3	77	ON	HKLR	822544	811516	WINTER	NONE	P
9-Dec-13	2	1238	4	NW LANTAU	2	132	ON	HKLR	826515	807547	WINTER	NONE	P
9-Dec-13	3	1256	12	NW LANTAU	2	103	ON	HKLR	827833	807540	WINTER	NONE	P
9-Dec-13	4	1518	4	NW LANTAU	3	177	ON	HKLR	823088	804646	WINTER	NONE	P
9-Dec-13	5	1539	1	NW LANTAU	2	866	ON	HKLR	826577	804664	WINTER	NONE	P
19-Dec-13	1	1203	2	NW LANTAU	3	73	ON	HKLR	824648	805453	WINTER	NONE	P
19-Dec-13	2	1216	6	NW LANTAU	3	150	ON	HKLR	823972	805483	WINTER	NONE	P
7-Jan-14	1	1258	2	NW LANTAU	3	87	ON	HKLR	825659	809348	WINTER	NONE	S
7-Jan-14	2	1337	1	NW LANTAU	3	125	ON	HKLR	825152	808472	WINTER	NONE	P
7-Jan-14	3	1452	3	NW LANTAU	2	1171	ON	HKLR	826673	806456	WINTER	NONE	P

Appendix II. (cont'd)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
7-Jan-14	4	1515	6	NW LANTAU	2	5	ON	HKLR	829275	806451	WINTER	NONE	P
9-Jan-14	1	1336	6	NW LANTAU	3	24	ON	HKLR	823238	807510	WINTER	NONE	P
9-Jan-14	2	1407	10	NW LANTAU	2	62	ON	HKLR	826405	807506	WINTER	NONE	P
9-Jan-14	3	1435	1	NW LANTAU	3	56	ON	HKLR	826272	807526	WINTER	NONE	P
9-Jan-14	4	1534	3	NW LANTAU	2	131	ON	HKLR	826675	805395	WINTER	NONE	S
9-Jan-14	5	1546	1	NW LANTAU	2	113	ON	HKLR	826176	805446	WINTER	NONE	P
21-Jan-14	1	1407	2	NW LANTAU	2	99	ON	HKLR	829916	806916	WINTER	NONE	S
21-Jan-14	2	1426	7	NW LANTAU	2	260	ON	HKLR	830008	805474	WINTER	NONE	P
21-Jan-14	3	1444	2	NW LANTAU	2	84	ON	HKLR	829188	805452	WINTER	NONE	P
21-Jan-14	4	1521	9	NW LANTAU	2	434	ON	HKLR	824969	805464	WINTER	NONE	P
23-Jan-14	1	1015	2	NW LANTAU	2	977	ON	HKLR	816090	804642	WINTER	NONE	P
23-Jan-14	2	1101	4	NW LANTAU	2	329	ON	HKLR	826576	804674	WINTER	NONE	P
23-Jan-14	3	1133	3	NW LANTAU	1	957	ON	HKLR	830195	806061	WINTER	NONE	P
23-Jan-14	4	1202	5	NW LANTAU	1	199	ON	HKLR	828976	806450	WINTER	NONE	P
23-Jan-14	5	1250	2	NW LANTAU	2	372	ON	HKLR	821623	806467	WINTER	NONE	P
23-Jan-14	6	1538	9	NE LANTAU	2	365	ON	HKLR	819337	816344	WINTER	NONE	S
6-Feb-14	1	1040	2	NW LANTAU	2	895	ON	HKLR	822535	804645	WINTER	HANG	P
6-Feb-14	2	1049	4	NW LANTAU	2	515	ON	HKLR	823908	804658	WINTER	NONE	P
6-Feb-14	3	1109	2	NW LANTAU	2	422	ON	HKLR	825591	804672	WINTER	NONE	P
6-Feb-14	4	1204	3	NW LANTAU	1	888	ON	HKLR	826473	806445	WINTER	NONE	P
6-Feb-14	5	1428	4	NE LANTAU	2	ND	OFF	HKLR	824423	813528	WINTER	NONE	
12-Feb-14	1	1449	1	NW LANTAU	2	290	ON	HKLR	828878	805462	WINTER	NONE	P
14-Feb-14	1	1237	1	NW LANTAU	2	ND	OFF	HKLR	826601	809051	WINTER	NONE	
14-Feb-14	2	1348	4	NW LANTAU	3	133	ON	HKLR	821401	806466	WINTER	NONE	P
14-Feb-14	3	1525	1	NW LANTAU	3	112	ON	HKLR	824262	804649	WINTER	NONE	P
20-Feb-14	1	1046	7	NW LANTAU	3	72	ON	HKLR	822688	805449	WINTER	NONE	P
20-Feb-14	2	1135	7	NW LANTAU	3	648	ON	HKLR	828813	805029	WINTER	NONE	P
5-Mar-14	1	1053	3	NW LANTAU	2	64	ON	HKLR	827173	805499	SPRING	NONE	P
5-Mar-14	2	1126	13	NW LANTAU	2	ND	OFF	HKLR	827150	805736	SPRING	NONE	
5-Mar-14	3	1323	6	NW LANTAU	2	28	ON	HKLR	827568	807488	SPRING	NONE	P
11-Mar-14	1	1518	2	NW LANTAU	3	86	ON	HKLR	827525	806437	SPRING	NONE	P
17-Mar-14	1	1159	2	NW LANTAU	2	151	ON	HKLR	822985	812516	SPRING	NONE	P

Appendix II. (cont'd)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
17-Mar-14	2	1411	5	NW LANTAU	1	277	ON	HKLR	824834	806452	SPRING	NONE	P
17-Mar-14	3	1439	1	NW LANTAU	1	36	ON	HKLR	826839	806456	SPRING	NONE	P
17-Mar-14	4	1509	2	NW LANTAU	2	72	ON	HKLR	830273	805938	SPRING	NONE	S
17-Mar-14	5	1541	1	NW LANTAU	1	194	ON	HKLR	827219	804675	SPRING	NONE	P
17-Mar-14	6	1551	1	NW LANTAU	1	125	ON	HKLR	825325	804672	SPRING	NONE	P
25-Mar-14	1	1249	1	NW LANTAU	2	131	ON	HKLR	821041	809495	SPRING	NONE	P
25-Mar-14	2	1452	2	NW LANTAU	2	72	ON	HKLR	826927	806498	SPRING	NONE	P
25-Mar-14	3	1535	3	NW LANTAU	2	299	ON	HKLR	829321	805462	SPRING	NONE	P
25-Mar-14	4	1549	1	NW LANTAU	2	349	ON	HKLR	827693	805469	SPRING	NONE	P
4-Apr-14	1	1021	3	NW LANTAU	3	43	ON	HKLR	819355	805442	SPRING	NONE	P
14-Apr-14	1	1438	8	NW LANTAU	3	94	ON	HKLR	826451	806445	SPRING	NONE	P
14-Apr-14	2	1517	2	NW LANTAU	4	273	ON	HKLR	830117	806010	SPRING	NONE	S
16-Apr-14	1	1048	4	NW LANTAU	2	541	ON	HKLR	825124	805454	SPRING	NONE	P
16-Apr-14	2	1113	1	NW LANTAU	2	385	ON	HKLR	827306	805458	SPRING	NONE	P
16-Apr-14	3	1137	2	NW LANTAU	2	17	ON	HKLR	830362	805465	SPRING	NONE	P
16-Apr-14	4	1150	9	NW LANTAU	2	49	ON	HKLR	830073	806051	SPRING	NONE	S
24-Apr-14	1	1328	1	NW LANTAU	3	123	ON	HKLR	825992	809184	SPRING	NONE	S
2-May-14	1	1128	3	NW LANTAU	3	22	ON	HKLR	830572	805712	SPRING	NONE	S
2-May-14	2	1154	2	NW LANTAU	2	27	ON	HKLR	828677	806460	SPRING	NONE	P
2-May-14	3	1213	7	NW LANTAU	2	522	ON	HKLR	826540	806456	SPRING	NONE	P
2-May-14	4	1333	1	NW LANTAU	1	1233	ON	HKLR	825129	808503	SPRING	NONE	P
19-May-14	1	1405	5	NW LANTAU	4	177	ON	HKLR	829177	805472	SPRING	NONE	P
19-May-14	2	1451	5	NW LANTAU	4	28	ON	HKLR	823530	805461	SPRING	NONE	P
21-May-14	1	1257	1	NW LANTAU	2	242	ON	HKLR	823873	811529	SPRING	NONE	P
26-May-14	1	1209	5	NW LANTAU	3	362	ON	HKLR	828433	806460	SPRING	NONE	P
26-May-14	2	1232	1	NW LANTAU	3	1066	ON	HKLR	827514	806458	SPRING	NONE	P
5-Jun-14	1	1400	3	NW LANTAU	3	184	ON	HKLR	827350	805448	SUMMER	NONE	P
5-Jun-14	2	1413	3	NW LANTAU	3	20	ON	HKLR	826719	805344	SUMMER	NONE	S
16-Jun-14	1	1408	1	NW LANTAU	3	ND	OFF	HKLR	827538	805459	SUMMER	NONE	
3-Jul-14	1	958	4	NE LANTAU	2	317	ON	HKLR	823230	820459	SUMMER	NONE	P
3-Jul-14	2	1302	4	NW LANTAU	3	ND	OFF	HKLR	821327	811071	SUMMER	NONE	
3-Jul-14	3	1642	2	NW LANTAU	3	161	ON	HKLR	814628	804722	SUMMER	NONE	P

Appendix II. (cont'd)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
10-Jul-14	1	1110	5	NW LANTAU	2	588	ON	HKLR	827483	805459	SUMMER	NONE	P
10-Jul-14	2	1150	5	NW LANTAU	2	0	ON	HKLR	829928	806565	SUMMER	NONE	S
14-Jul-14	1	1022	3	NW LANTAU	2	572	ON	HKLR	816276	805395	SUMMER	NONE	P
14-Jul-14	2	1036	1	NW LANTAU	2	866	ON	HKLR	819222	805442	SUMMER	NONE	P
14-Jul-14	3	1044	5	NW LANTAU	2	118	ON	HKLR	820484	805434	SUMMER	NONE	P
14-Jul-14	4	1105	7	NW LANTAU	2	471	ON	HKLR	822311	805448	SUMMER	NONE	P
14-Jul-14	5	1144	2	NW LANTAU	2	819	ON	HKLR	827173	805448	SUMMER	NONE	P
21-Jul-14	1	1113	1	NW LANTAU	2	694	ON	HKLR	823509	804668	SUMMER	NONE	P
21-Jul-14	2	1436	2	NW LANTAU	2	325	ON	HKLR	821325	812267	SUMMER	NONE	S
5-Aug-14	1	1413	8	NW LANTAU	2	428	ON	HKLR	826185	806764	SUMMER	NONE	P
5-Aug-14	2	1435	4	NW LANTAU	2	0	ON	HKLR	827426	806458	SUMMER	NONE	P
5-Aug-14	3	1444	2	NW LANTAU	2	990	ON	HKLR	828943	806461	SUMMER	NONE	P
5-Aug-14	4	1515	2	NW LANTAU	2	452	ON	HKLR	827872	804667	SUMMER	NONE	P
6-Aug-14	1	1110	3	NW LANTAU	3	10	ON	HKLR	826730	805323	SUMMER	NONE	S
6-Aug-14	2	1151	1	NW LANTAU	2	17	ON	HKLR	829773	806359	SUMMER	NONE	S
15-Aug-14	1	1029	5	NW LANTAU	3	393	ON	HKLR	818936	804648	SUMMER	NONE	P
15-Aug-14	2	1041	7	NW LANTAU	3	15	ON	HKLR	821006	804652	SUMMER	NONE	P
15-Aug-14	3	1218	3	NW LANTAU	3	0	ON	HKLR	823429	806027	SUMMER	NONE	S
15-Aug-14	4	1305	2	NW LANTAU	2	749	ON	HKLR	823524	808510	SUMMER	NONE	P
15-Aug-14	5	1310	6	NW LANTAU	3	83	ON	HKLR	824321	808501	SUMMER	NONE	P
19-Aug-14	1	1338	2	NW LANTAU	3	105	ON	HKLR	825220	807514	SUMMER	NONE	P
19-Aug-14	2	1536	3	NW LANTAU	2	113	ON	HKLR	823076	805450	SUMMER	NONE	P
2-Sep-14	1	1106	3	NW LANTAU	1	201	ON	HKLR	827206	805396	AUTUMN	NONE	P
2-Sep-14	2	1215	5	NW LANTAU	2	562	ON	HKLR	828278	806459	AUTUMN	NONE	P
11-Sep-14	1	1132	6	NW LANTAU	2	374	ON	HKLR	826693	807517	AUTUMN	NONE	P
11-Sep-14	2	1215	6	NW LANTAU	2	1742	ON	HKLR	822381	809476	AUTUMN	NONE	P
19-Sep-14	1	1336	1	NW LANTAU	2	ND	OFF	HKLR	821325	811947	AUTUMN	NONE	
22-Sep-14	1	1432	5	NW LANTAU	2	198	ON	HKLR	828289	806480	AUTUMN	NONE	P
22-Sep-14	2	1559	6	NW LANTAU	2	955	ON	HKLR	822811	804656	AUTUMN	NONE	P
22-Sep-14	3	1612	2	NW LANTAU	2	153	ON	HKLR	820785	804662	AUTUMN	NONE	P
7-Oct-14	1	1403	3	NW LANTAU	2	284	ON	HKLR	823528	806089	AUTUMN	NONE	S
7-Oct-14	2	1423	4	NW LANTAU	2	130	ON	HKLR	825820	806454	AUTUMN	NONE	P

Appendix II. (cont'd)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
7-Oct-14	3	1445	4	NW LANTAU	2	75	ON	HKLR	827149	806457	AUTUMN	NONE	P
7-Oct-14	4	1515	6	NW LANTAU	2	125	ON	HKLR	828943	806471	AUTUMN	NONE	P
7-Oct-14	5	1556	1	NW LANTAU	2	300	ON	HKLR	827474	804666	AUTUMN	NONE	P
7-Oct-14	6	1603	2	NW LANTAU	2	707	ON	HKLR	826499	804664	AUTUMN	NONE	P
13-Oct-14	1	1207	4	NW LANTAU	3	116	ON	HKLR	825098	807514	AUTUMN	NONE	P
13-Oct-14	2	1220	2	NW LANTAU	3	252	ON	HKLR	825707	807525	AUTUMN	NONE	P
13-Oct-14	3	1232	3	NW LANTAU	3	335	ON	HKLR	826161	807516	AUTUMN	NONE	P
13-Oct-14	4	1258	1	NW LANTAU	2	311	ON	HKLR	830272	806185	AUTUMN	NONE	S

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in November 2013-October 2014

ID#	DATE	STG#	AREA
CH34	05/11/13	1	NW LANTAU
	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
	09/12/13	3	NW LANTAU
	23/01/14	4	NW LANTAU
	20/02/14	1	NW LANTAU
	26/05/14	1	NW LANTAU
	10/07/14	1	NW LANTAU
	13/10/14	4	NW LANTAU
CH98	25/03/14	3	NW LANTAU
CH112	23/01/14	2	NW LANTAU
CH153	22/09/14	3	NW LANTAU
EL01	05/11/13	1	NW LANTAU
	05/12/13	1	NE LANTAU
	21/01/14	1	NW LANTAU
	23/01/14	6	NE LANTAU
	06/02/14	5	NE LANTAU
	17/03/14	1	NW LANTAU
	16/04/14	2	NW LANTAU
	21/05/14	1	NW LANTAU
NL11	23/01/14	3	NW LANTAU
NL24	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
	05/12/13	1	NE LANTAU
	09/12/13	4	NW LANTAU
	19/12/13	2	NW LANTAU
	09/01/14	2	NW LANTAU
	23/01/14	6	NE LANTAU
	20/02/14	1	NW LANTAU
	05/03/14	3	NW LANTAU
	14/04/14	1	NW LANTAU
NL33	05/11/13	1	NW LANTAU
	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
	08/11/13	11	NW LANTAU
	09/01/14	2	NW LANTAU
	23/01/14	6	NE LANTAU
	02/05/14	3	NW LANTAU
NL37	08/11/13	2	NW LANTAU

ID#	DATE	STG#	AREA
NL46	01/11/13	3	NW LANTAU
	23/01/14	4	NW LANTAU
	05/03/14	2	NW LANTAU
	19/05/14	1	NW LANTAU
	05/08/14	2	NW LANTAU
	11/09/14	1	NW LANTAU
NL48	08/11/13	9	NW LANTAU
	09/12/13	3	NW LANTAU
	07/01/14	4	NW LANTAU
	09/01/14	2	NW LANTAU
	09/01/14	3	NW LANTAU
	21/01/14	1	NW LANTAU
	23/01/14	3	NW LANTAU
	11/03/14	1	NW LANTAU
	25/03/14	4	NW LANTAU
	16/04/14	4	NW LANTAU
	02/05/14	1	NW LANTAU
	05/08/14	1	NW LANTAU
	19/08/14	1	NW LANTAU
	19/09/14	1	NW LANTAU
	13/10/14	1	NW LANTAU
NL49	08/11/13	2	NW LANTAU
	09/12/13	3	NW LANTAU
	05/03/14	2	NW LANTAU
NL80	01/11/13	3	NW LANTAU
	01/11/13	6	NW LANTAU
	08/11/13	6	NW LANTAU
	21/01/14	2	NW LANTAU
	14/07/14	4	NW LANTAU
	11/09/14	2	NW LANTAU
NL93	01/11/13	8	NW LANTAU
	20/02/14	2	NW LANTAU
	10/07/14	1	NW LANTAU
	05/08/14	1	NW LANTAU
NL98	01/11/13	2	NW LANTAU
	19/12/13	2	NW LANTAU
	09/01/14	2	NW LANTAU
	20/02/14	1	NW LANTAU
NL103	08/11/13	3	NW LANTAU
	07/01/14	4	NW LANTAU

Appendix III. (cont'd)

ID#	DATE	STG#	AREA
NL104	09/12/13	3	NW LANTAU
	23/01/14	4	NW LANTAU
	05/03/14	2	NW LANTAU
	05/03/14	3	NW LANTAU
	16/04/14	4	NW LANTAU
	05/08/14	1	NW LANTAU
	02/09/14	1	NW LANTAU
NL120	09/01/14	2	NW LANTAU
	23/01/14	6	NE LANTAU
	06/02/14	5	NE LANTAU
	14/04/14	1	NW LANTAU
NL123	08/11/13	11	NW LANTAU
	23/01/14	2	NW LANTAU
	23/01/14	5	NW LANTAU
	03/07/14	1	NE LANTAU
	15/08/14	5	NW LANTAU
NL136	01/11/13	8	NW LANTAU
	09/12/13	2	NW LANTAU
	07/01/14	1	NW LANTAU
	09/01/14	1	NW LANTAU
	20/02/14	2	NW LANTAU
	11/03/14	1	NW LANTAU
	17/03/14	2	NW LANTAU
	25/03/14	3	NW LANTAU
	05/06/14	2	NW LANTAU
	07/10/14	1	NW LANTAU
	13/10/14	1	NW LANTAU
NL139	01/11/13	8	NW LANTAU
	08/11/13	1	NW LANTAU
	09/12/13	2	NW LANTAU
	07/01/14	1	NW LANTAU
	09/01/14	1	NW LANTAU
	23/01/14	6	NE LANTAU
	20/02/14	1	NW LANTAU
	03/07/14	1	NE LANTAU
NL145	01/11/13	3	NW LANTAU
	16/04/14	1	NW LANTAU
	02/05/14	3	NW LANTAU
	14/07/14	3	NW LANTAU
NL150	08/11/13	3	NW LANTAU
	22/09/14	3	NW LANTAU

ID#	DATE	STG#	AREA
NL165	01/11/13	8	NW LANTAU
	08/11/13	1	NW LANTAU
	09/12/13	3	NW LANTAU
	20/02/14	1	NW LANTAU
	05/03/14	2	NW LANTAU
NL182	01/11/13	6	NW LANTAU
	24/04/14	1	NW LANTAU
	10/07/14	2	NW LANTAU
	11/09/14	1	NW LANTAU
	07/10/14	1	NW LANTAU
	13/10/14	2	NW LANTAU
NL188	08/11/13	8	NW LANTAU
NL191	25/03/14	1	NW LANTAU
NL202	06/02/14	3	NW LANTAU
	16/04/14	4	NW LANTAU
	19/08/14	1	NW LANTAU
	19/08/14	2	NW LANTAU
NL210	14/02/14	1	NW LANTAU
	02/05/14	2	NW LANTAU
	10/07/14	2	NW LANTAU
	11/09/14	2	NW LANTAU
NL212	08/11/13	3	NW LANTAU
NL213	25/03/14	3	NW LANTAU
	13/10/14	1	NW LANTAU
NL214	07/01/14	4	NW LANTAU
	21/01/14	4	NW LANTAU
	16/04/14	3	NW LANTAU
	02/05/14	1	NW LANTAU
	02/09/14	1	NW LANTAU
	07/10/14	3	NW LANTAU
	13/10/14	2	NW LANTAU
NL220	09/01/14	1	NW LANTAU
	05/03/14	3	NW LANTAU
NL221	07/01/14	4	NW LANTAU
	21/01/14	4	NW LANTAU
NL224	16/04/14	3	NW LANTAU
	02/05/14	1	NW LANTAU
	21/01/14	3	NW LANTAU
NL226	01/11/13	1	NW LANTAU
	05/12/13	1	NE LANTAU
	21/01/14	4	NW LANTAU
	04/04/14	1	NW LANTAU

Appendix III. (cont'd)

ID#	DATE	STG#	AREA
NL233	05/03/14	1	NW LANTAU
	11/09/14	1	NW LANTAU
	22/09/14	1	NW LANTAU
	07/10/14	2	NW LANTAU
NL236	01/11/13	7	NW LANTAU
	08/11/13	2	NW LANTAU
	21/01/14	3	NW LANTAU
	05/03/14	2	NW LANTAU
	22/09/14	3	NW LANTAU
NL242	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
	19/12/13	2	NW LANTAU
	09/01/14	2	NW LANTAU
	23/01/14	6	NE LANTAU
	05/08/14	1	NW LANTAU
NL244	09/12/13	1	NW LANTAU
NL247	14/07/14	4	NW LANTAU
	15/08/14	2	NW LANTAU
NL256	07/10/14	3	NW LANTAU
NL259	01/11/13	8	NW LANTAU
	23/01/14	4	NW LANTAU
	20/02/14	2	NW LANTAU
	04/04/14	1	NW LANTAU
	16/04/14	4	NW LANTAU
	13/10/14	1	NW LANTAU
NL260	20/02/14	2	NW LANTAU
	19/05/14	2	NW LANTAU
NL261	01/11/13	1	NW LANTAU
	08/11/13	1	NW LANTAU
	08/11/13	10	NW LANTAU
	09/12/13	3	NW LANTAU
	23/01/14	4	NW LANTAU
	06/02/14	5	NE LANTAU
	05/03/14	3	NW LANTAU
	17/03/14	1	NW LANTAU
	16/04/14	4	NW LANTAU
	02/05/14	3	NW LANTAU
	19/05/14	1	NW LANTAU
	03/07/14	1	NE LANTAU
	05/08/14	1	NW LANTAU

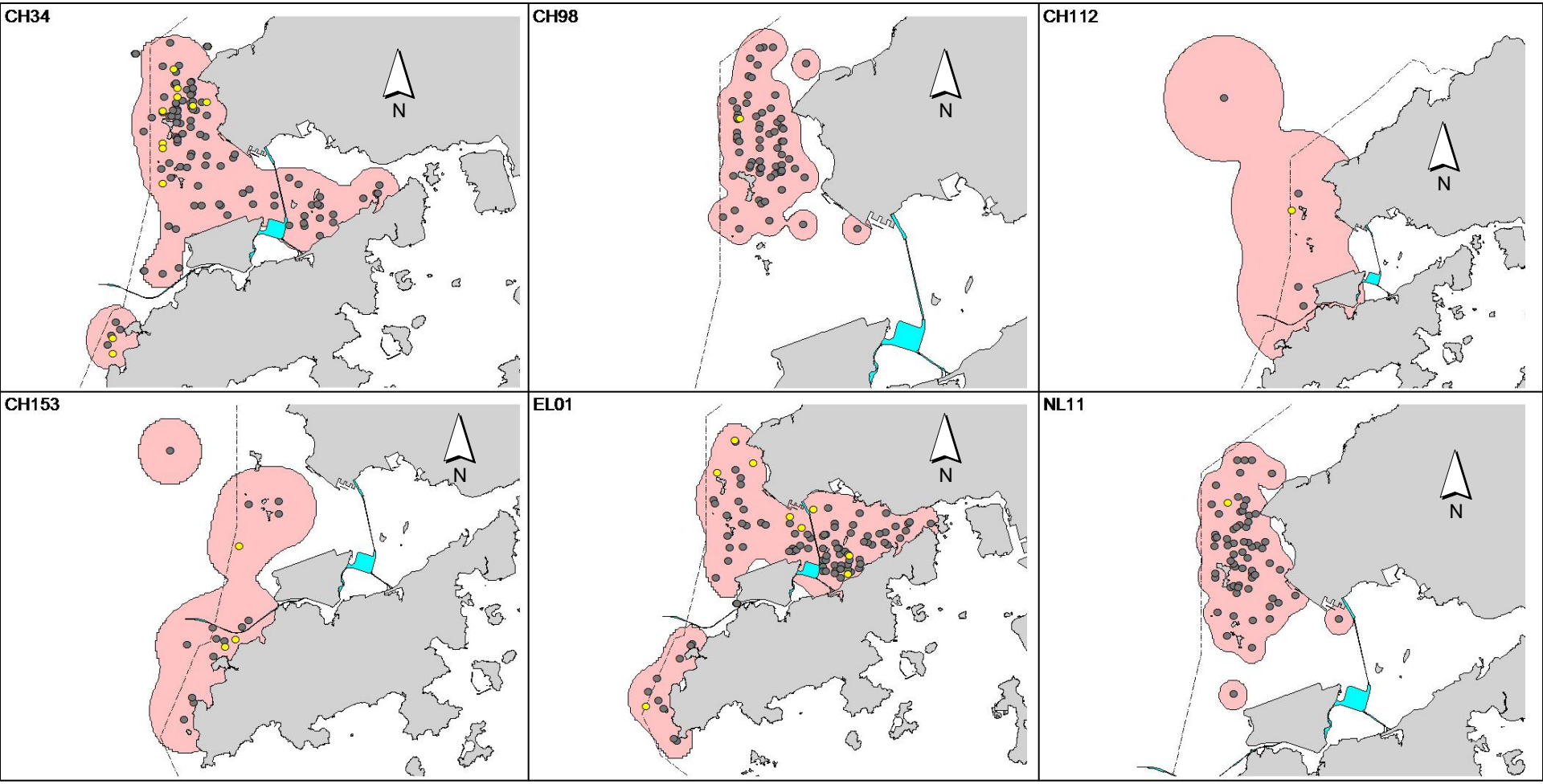
ID#	DATE	STG#	AREA
NL262	01/11/13	8	NW LANTAU
	09/12/13	3	NW LANTAU
	05/03/14	3	NW LANTAU
	16/04/14	4	NW LANTAU
	19/05/14	1	NW LANTAU
NL269	01/11/13	8	NW LANTAU
	19/05/14	2	NW LANTAU
NL272	01/11/13	1	NW LANTAU
	08/11/13	4	NW LANTAU
	09/01/14	1	NW LANTAU
	21/01/14	2	NW LANTAU
	23/01/14	6	NE LANTAU
	05/03/14	2	NW LANTAU
	02/05/14	3	NW LANTAU
	05/06/14	1	NW LANTAU
	05/06/14	2	NW LANTAU
	15/08/14	5	NW LANTAU
NL278	15/08/14	2	NW LANTAU
	07/10/14	2	NW LANTAU
NL284	01/11/13	1	NW LANTAU
	09/12/13	3	NW LANTAU
	21/01/14	4	NW LANTAU
	20/02/14	1	NW LANTAU
	17/03/14	2	NW LANTAU
	19/05/14	1	NW LANTAU
	15/08/14	5	NW LANTAU
NL285	08/11/13	11	NW LANTAU
	23/01/14	2	NW LANTAU
	03/07/14	1	NE LANTAU
	15/08/14	5	NW LANTAU
NL286	06/02/14	3	NW LANTAU
	16/04/14	4	NW LANTAU
	15/08/14	5	NW LANTAU
	19/08/14	2	NW LANTAU
NL287	16/04/14	1	NW LANTAU
	02/05/14	3	NW LANTAU
	14/07/14	3	NW LANTAU
	15/08/14	5	NW LANTAU
NL295	05/03/14	2	NW LANTAU
	19/05/14	2	NW LANTAU
	26/05/14	1	NW LANTAU
	07/10/14	1	NW LANTAU

Appendix III. (cont'd)

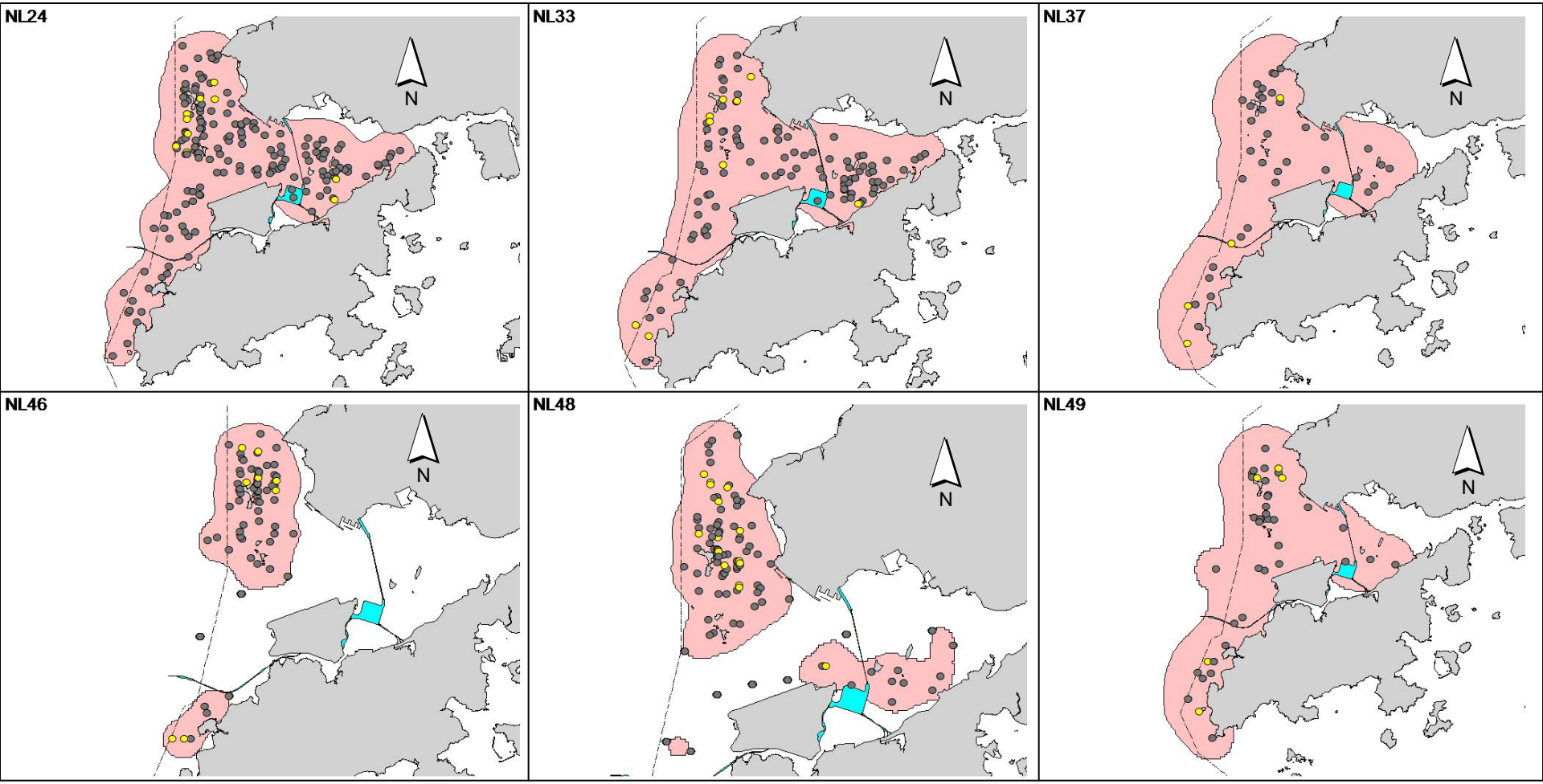
ID#	DATE	STG#	AREA
NL296	05/11/13	1	NW LANTAU
	20/02/14	2	NW LANTAU
	05/03/14	1	NW LANTAU
	05/03/14	2	NW LANTAU
	26/05/14	1	NW LANTAU
NL300	08/11/13	6	NW LANTAU
	26/05/14	1	NW LANTAU
	14/07/14	4	NW LANTAU
	07/10/14	5	NW LANTAU
NL301	01/11/13	4	NW LANTAU
	01/11/13	6	NW LANTAU
	14/07/14	4	NW LANTAU
	11/09/14	2	NW LANTAU
NL302	19/05/14	1	NW LANTAU
	11/09/14	2	NW LANTAU
NL303	19/05/14	1	NW LANTAU
NL306	16/04/14	1	NW LANTAU
NL307	17/03/14	2	NW LANTAU
	15/08/14	5	NW LANTAU
NL308	21/01/14	2	NW LANTAU
SL35	08/11/13	10	NW LANTAU
WL04	01/11/13	8	NW LANTAU
	09/12/13	2	NW LANTAU
	05/03/14	2	NW LANTAU
WL05	01/11/13	8	NW LANTAU
	09/12/13	3	NW LANTAU
	05/03/14	2	NW LANTAU
WL11	08/11/13	2	NW LANTAU
	05/03/14	2	NW LANTAU
WL15	08/11/13	10	NW LANTAU
WL28	15/08/14	2	NW LANTAU
WL30	10/07/14	1	NW LANTAU
WL46	09/12/13	3	NW LANTAU
	15/08/14	2	NW LANTAU
WL79	08/11/13	4	NW LANTAU
WL98	08/11/13	4	NW LANTAU
WL124	08/11/13	8	NW LANTAU
	03/07/14	3	NW LANTAU
	15/08/14	2	NW LANTAU
WL188	15/08/14	2	NW LANTAU

ID#	DATE	STG#	AREA
WL179	09/12/13	4	NW LANTAU
	17/03/14	2	NW LANTAU
	16/04/14	1	NW LANTAU
WL188	06/08/14	1	NW LANTAU
WL199	05/03/14	2	NW LANTAU
WL214	09/01/14	4	NW LANTAU
	15/08/14	2	NW LANTAU

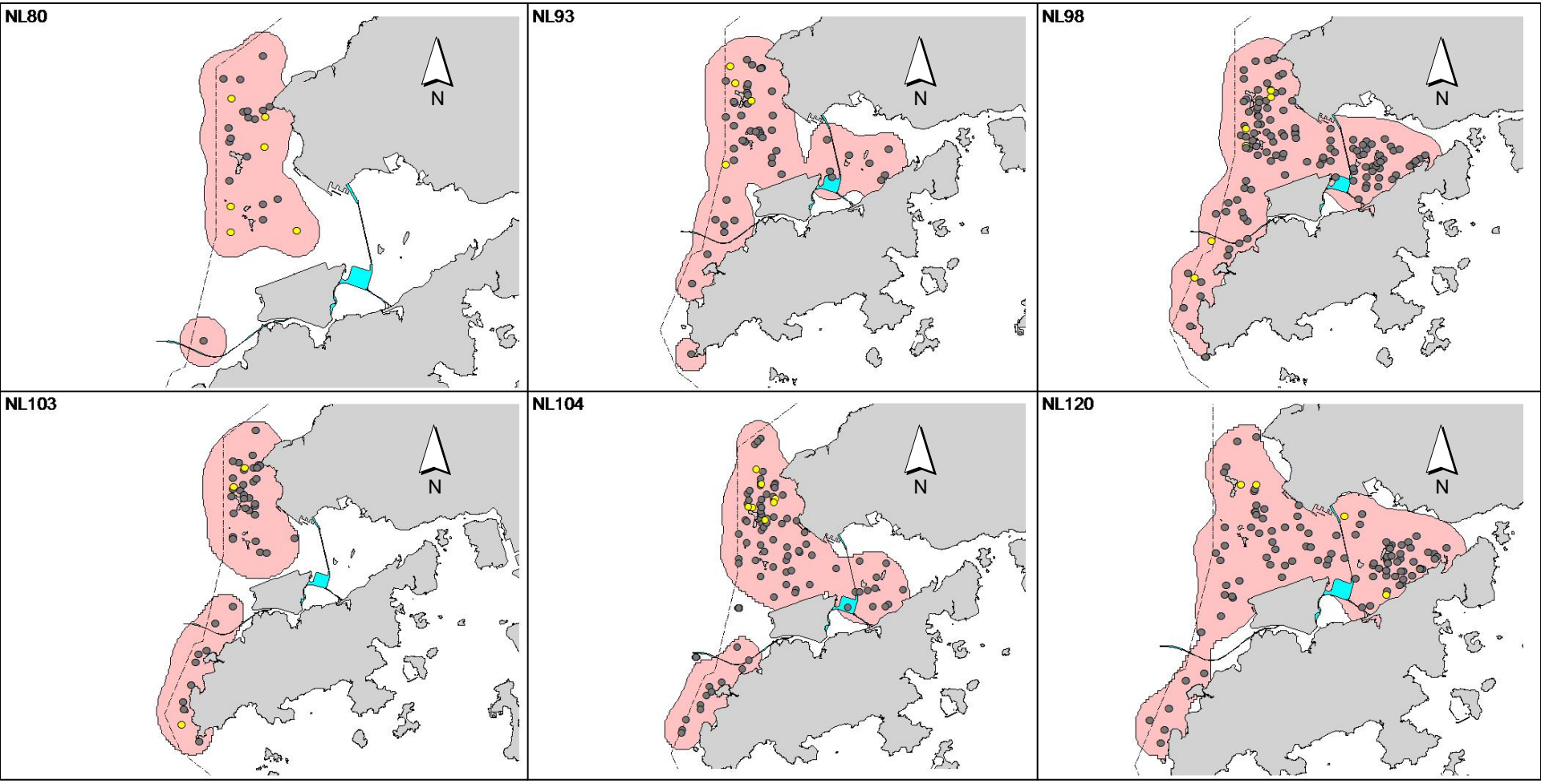
Appendix IV. Ranging patterns (95% kernel ranges) of 77 individual dolphins that were sighted during the first year of TMCLKL construction works, utilizing the HKLR03 monitoring data
(note: yellow dots indicates sightings made in November 2013 to October 2014)



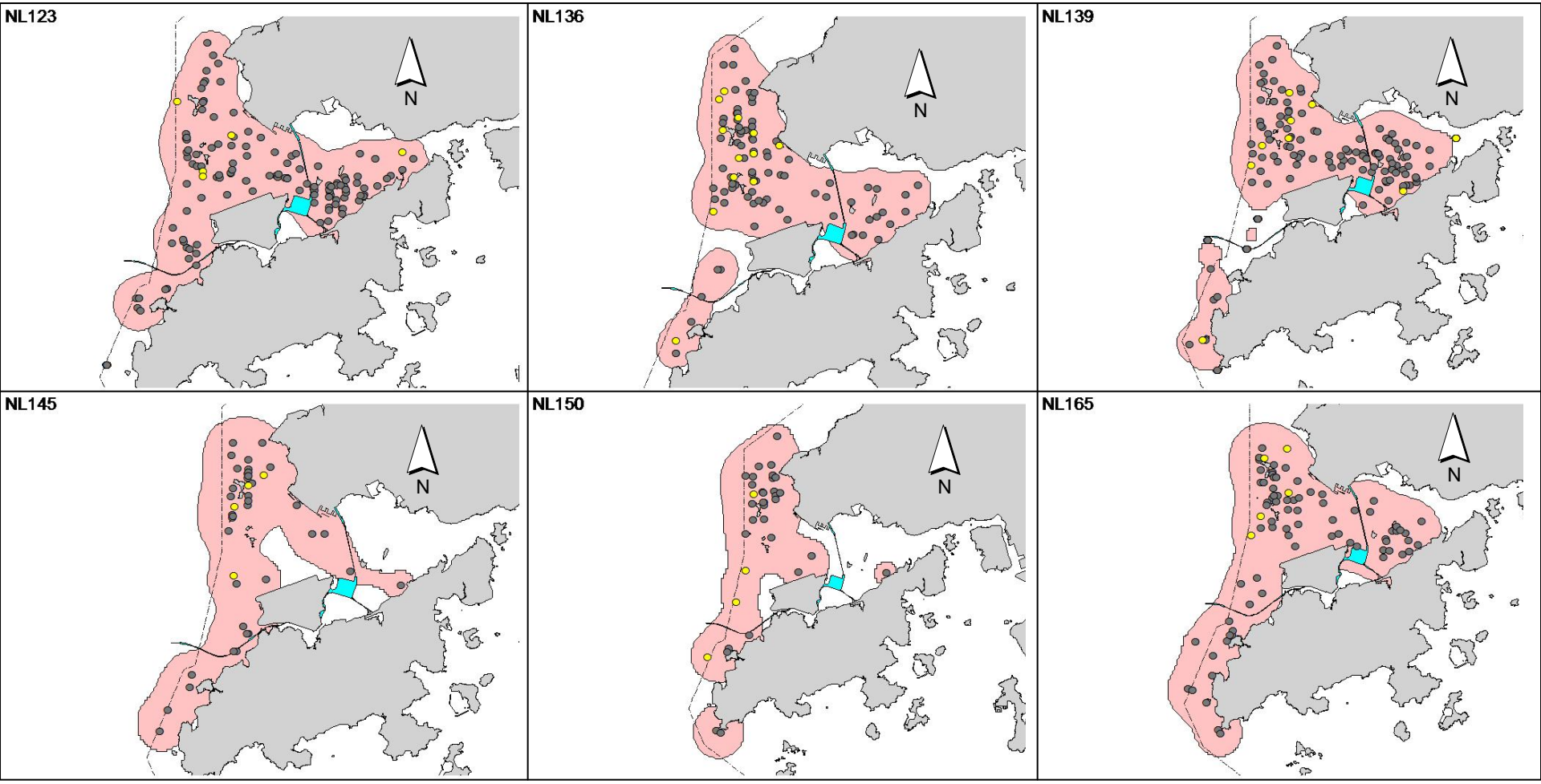
Appendix IV. (cont'd)



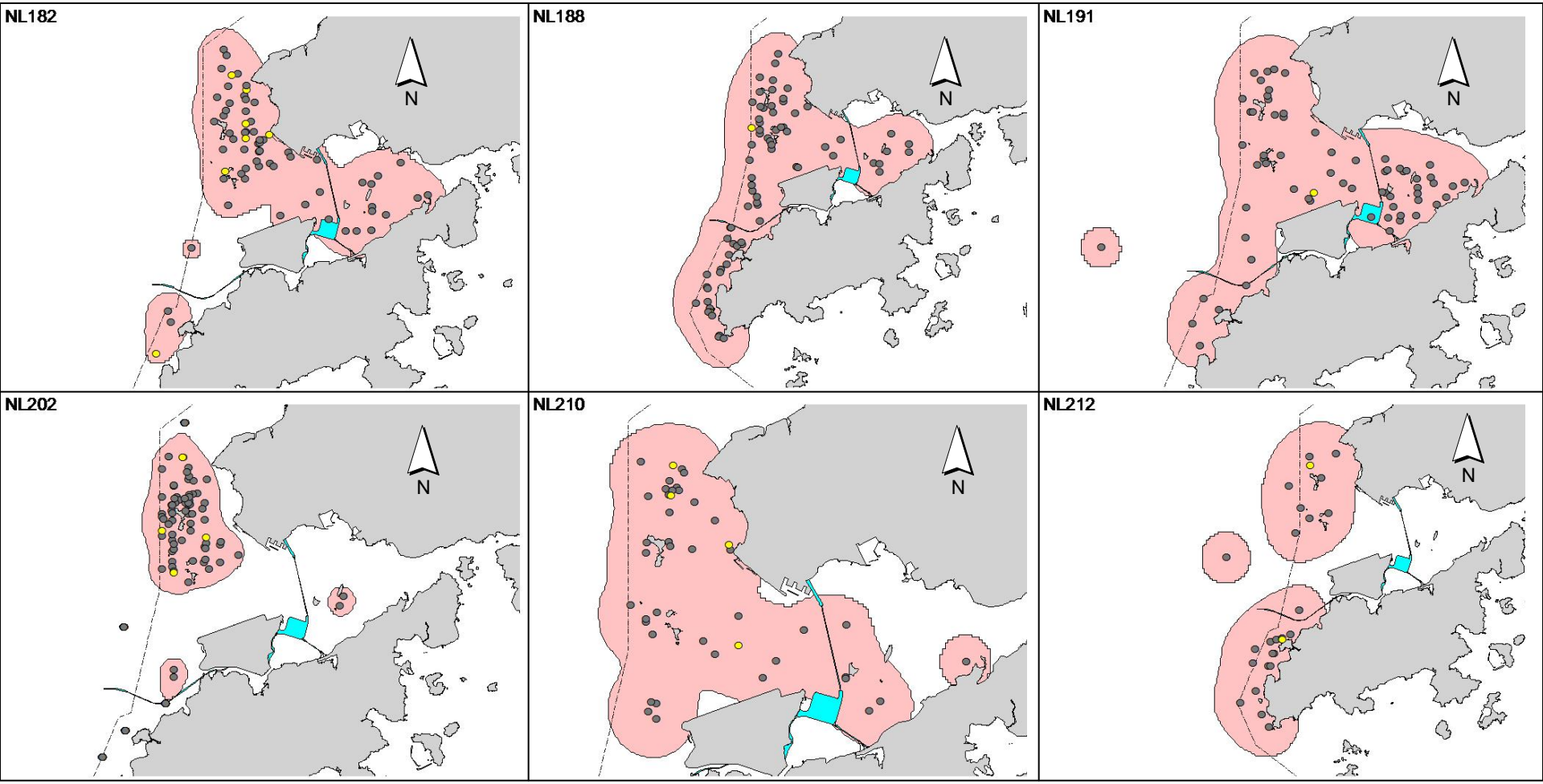
Appendix IV. (cont'd)



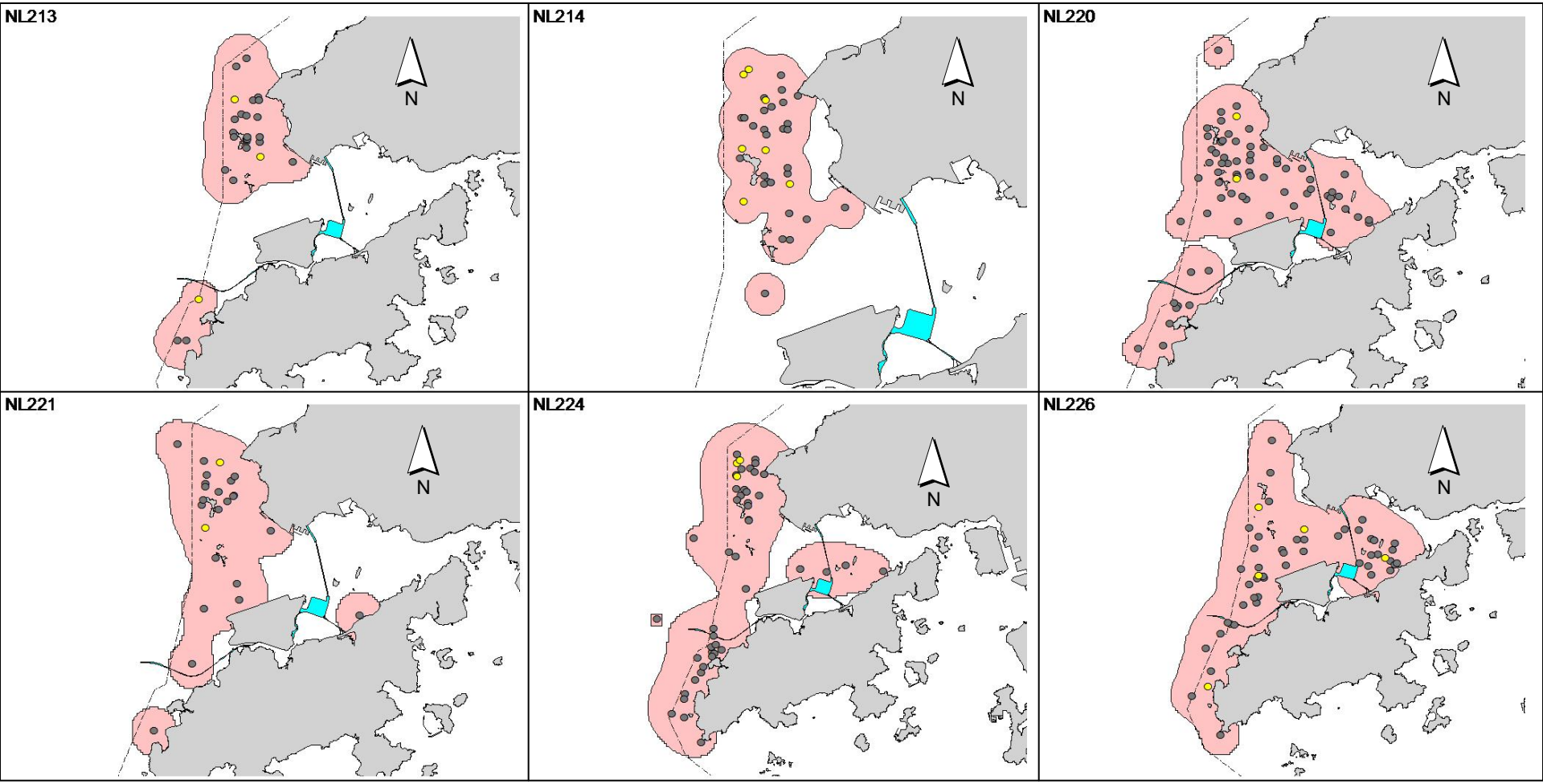
Appendix IV. (cont'd)



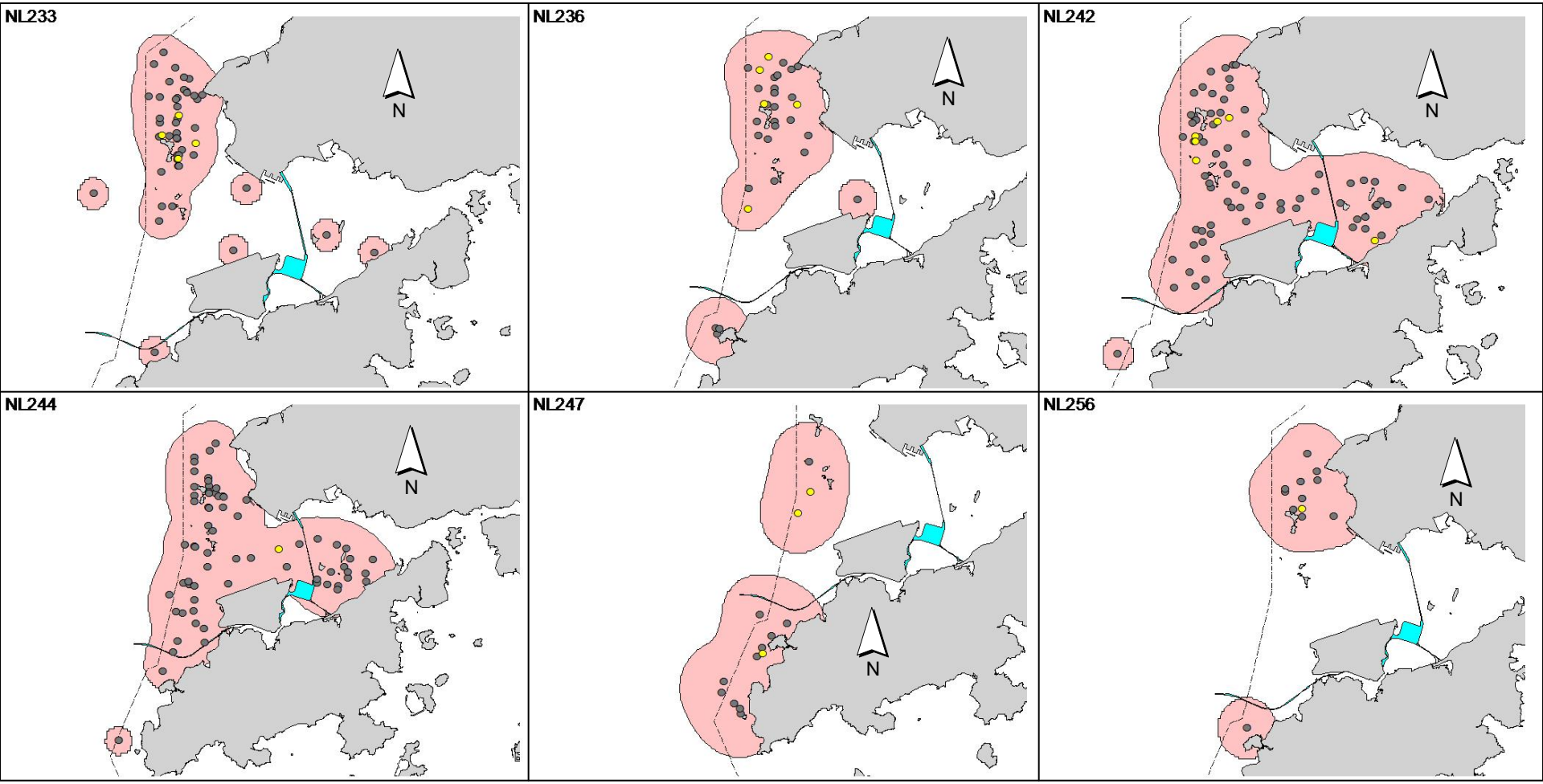
Appendix IV. (cont'd)



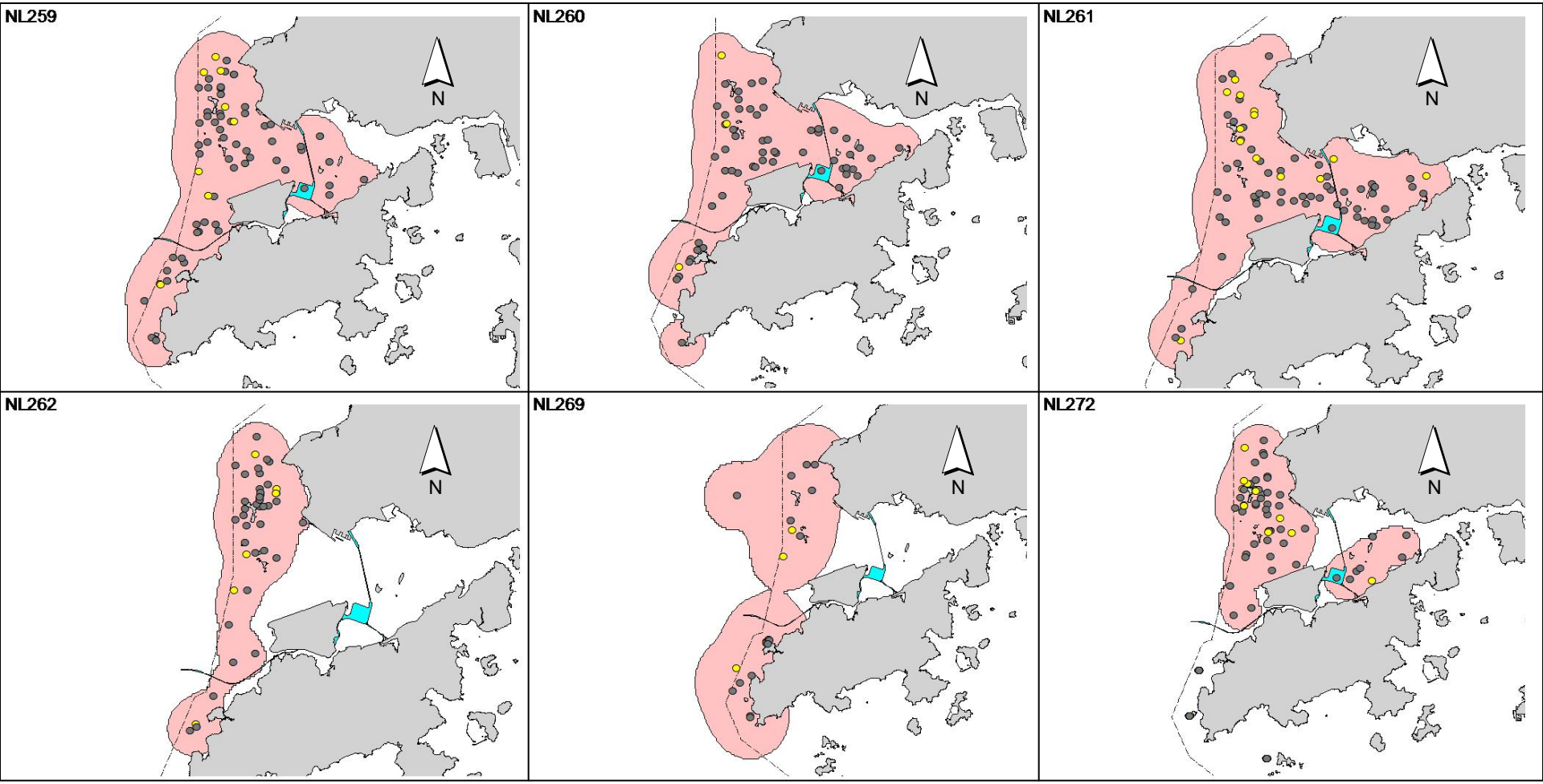
Appendix IV. (cont'd)



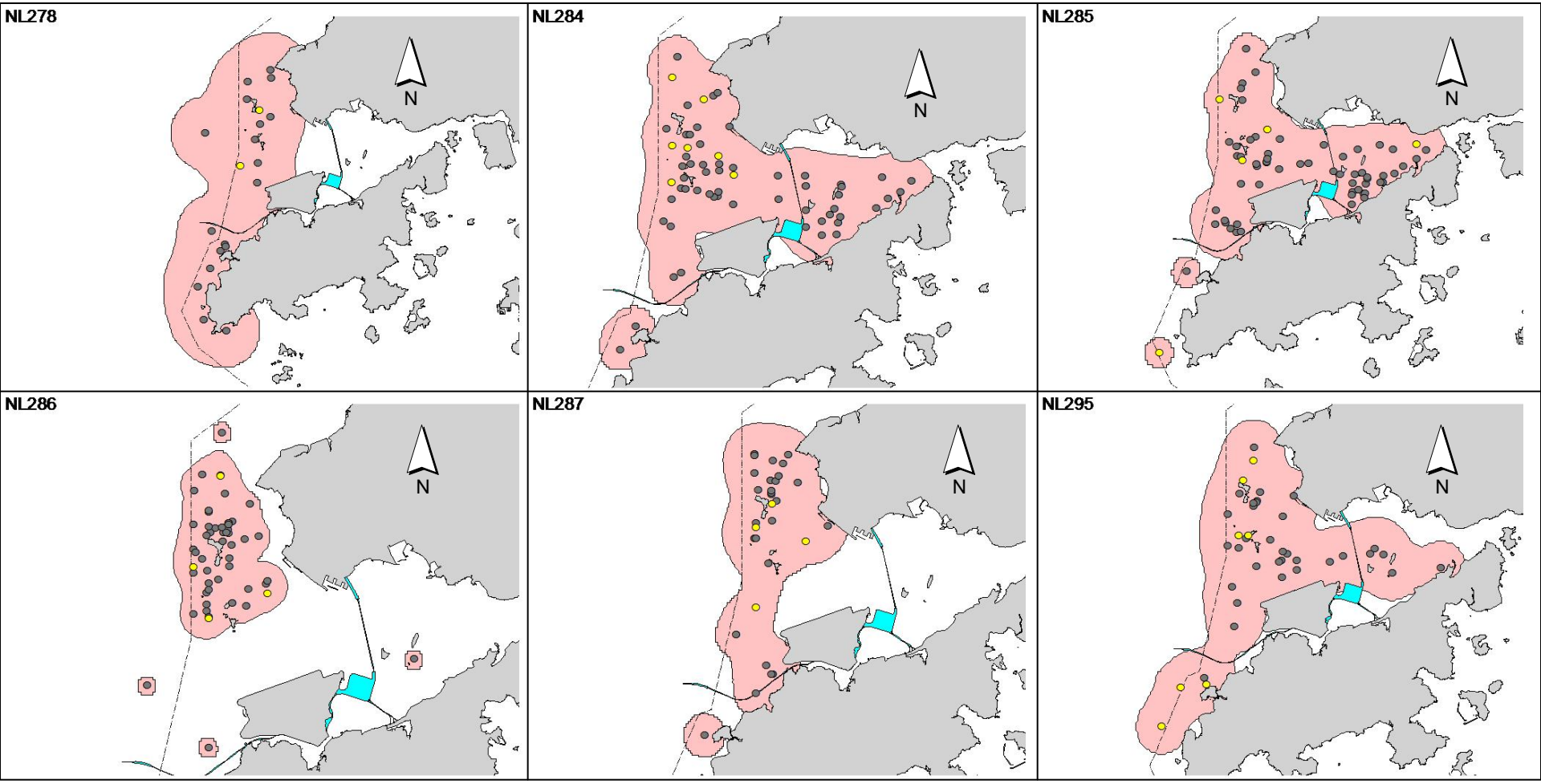
Appendix IV. (cont'd)



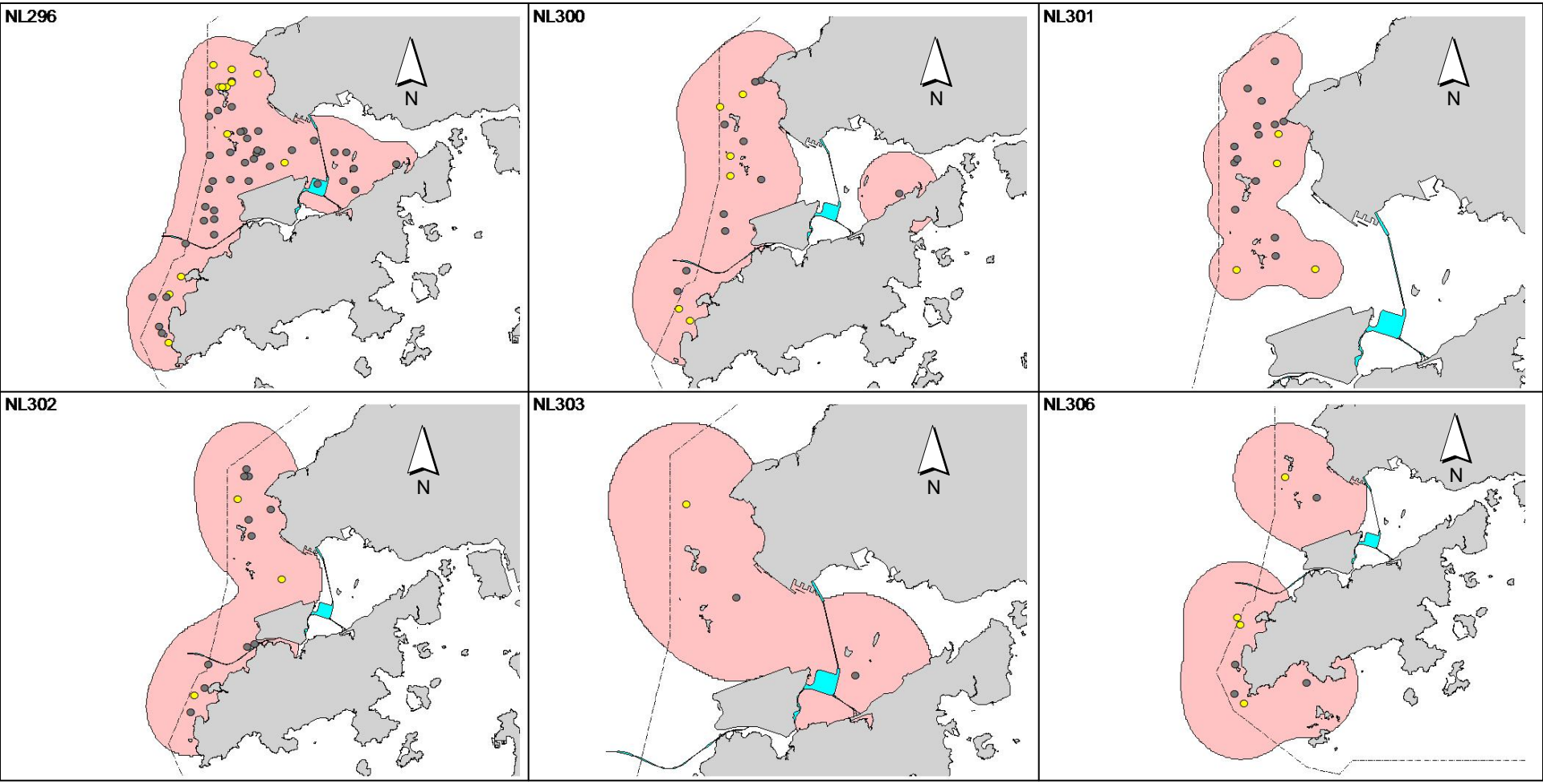
Appendix IV. (cont'd)



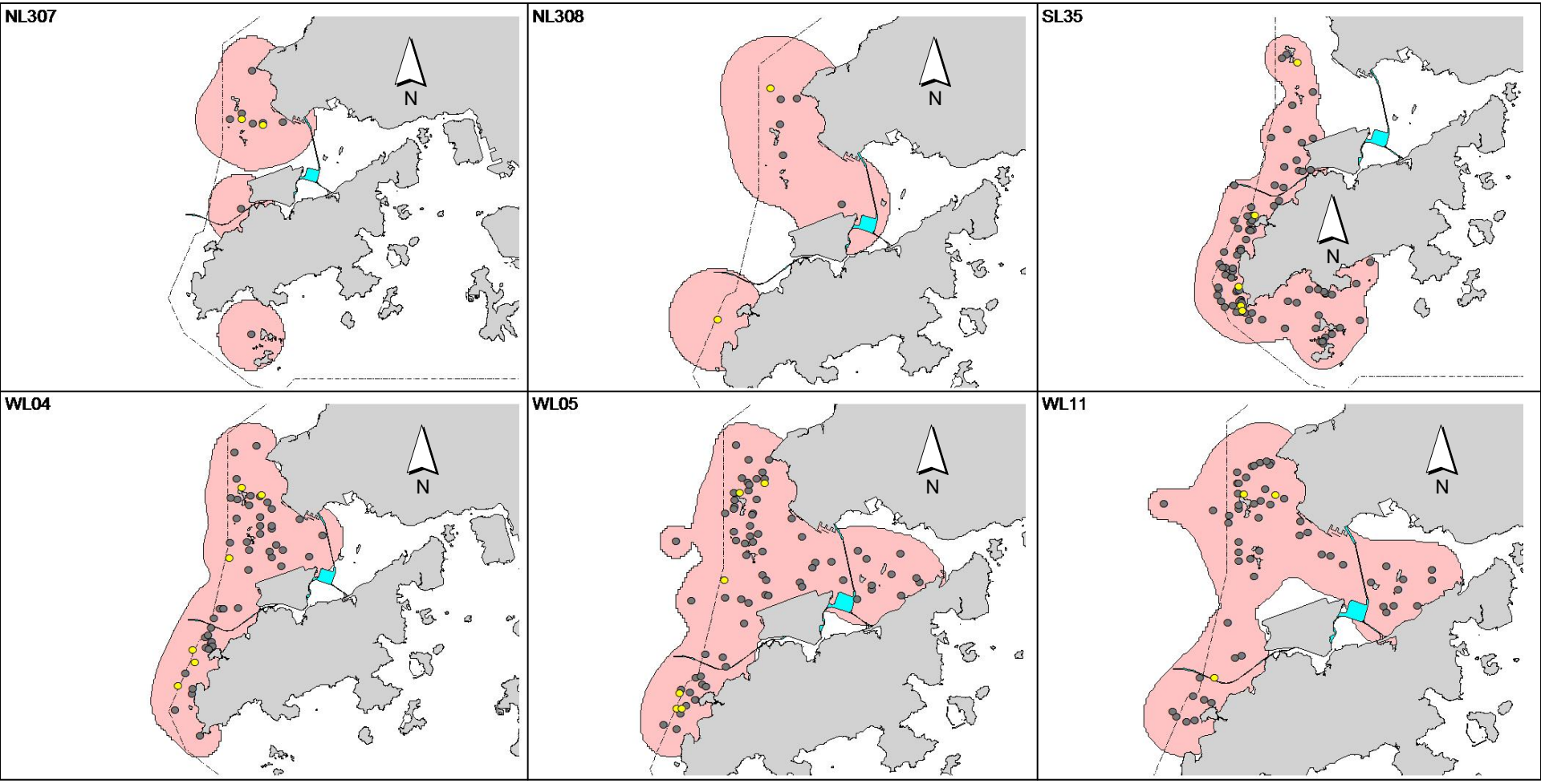
Appendix IV. (cont'd)



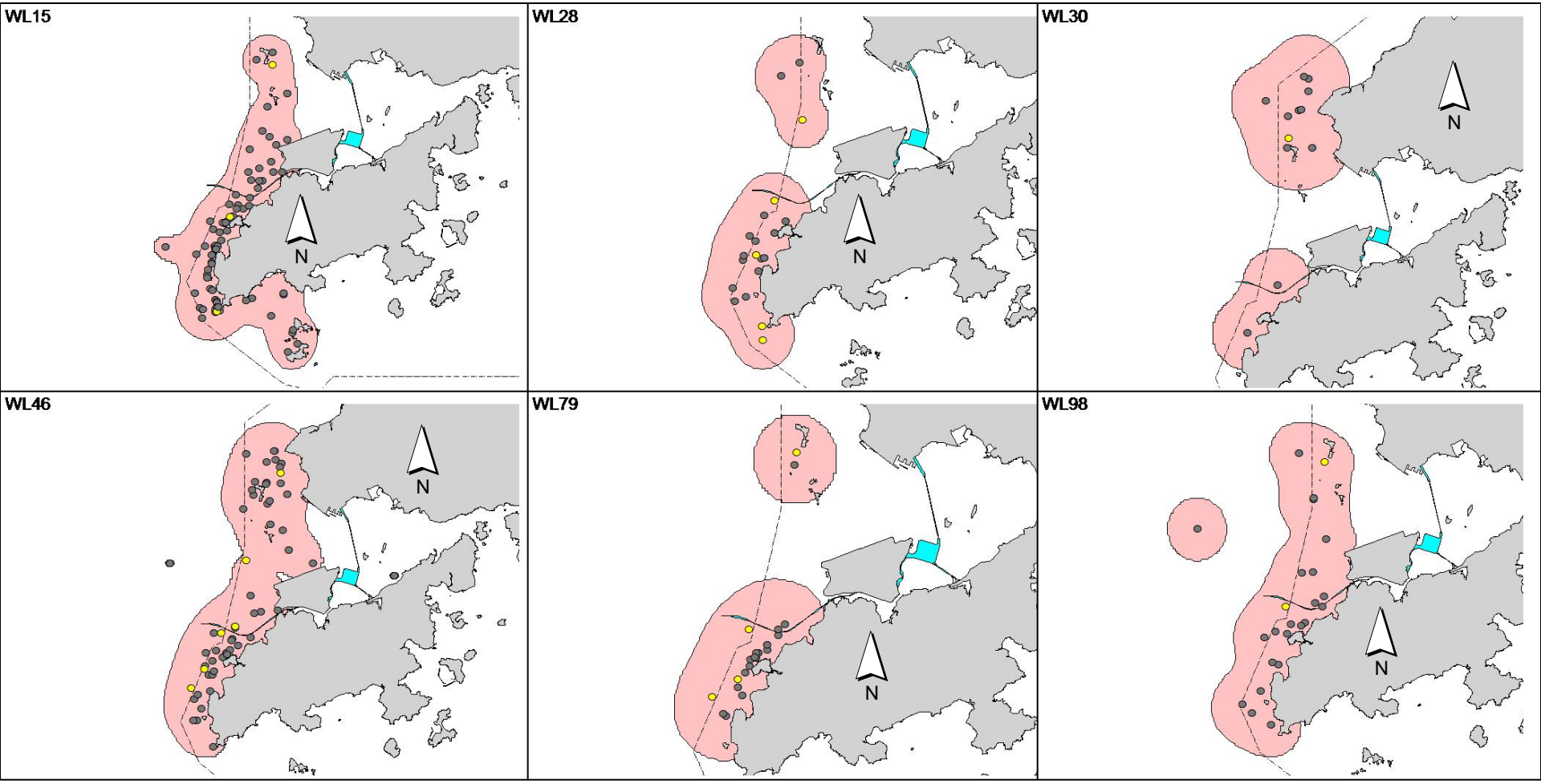
Appendix IV. (cont'd)



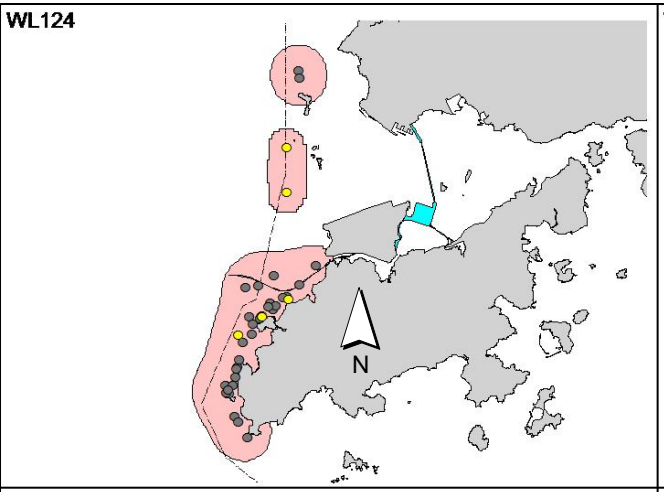
Appendix IV. (cont'd)

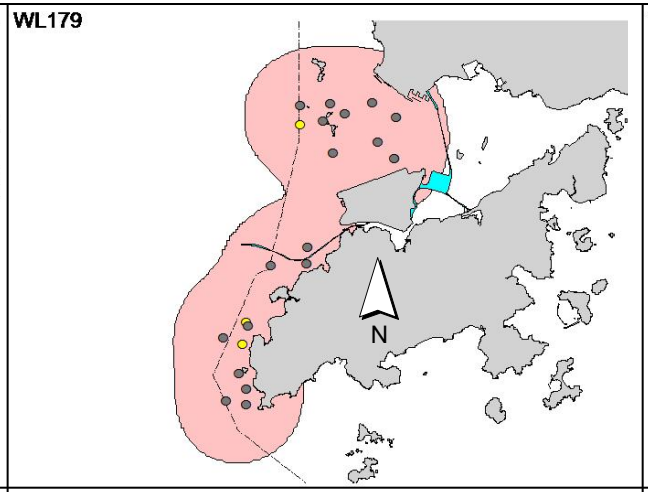


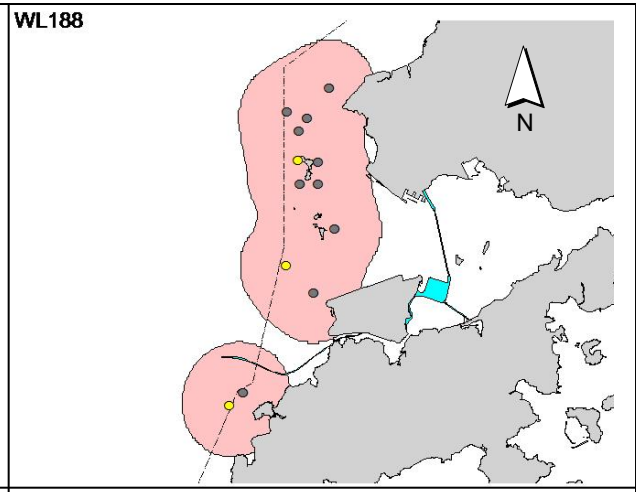
Appendix IV. (cont'd)

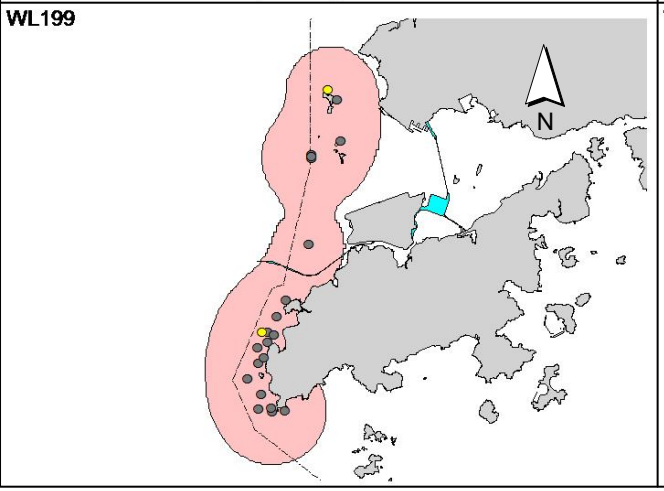


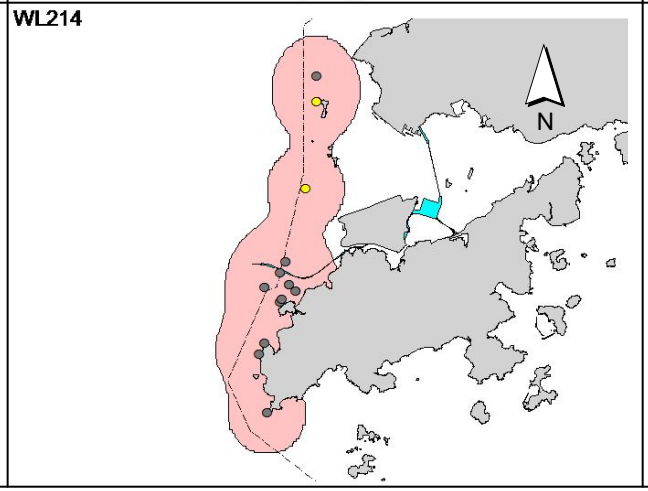
Appendix IV. (cont'd)

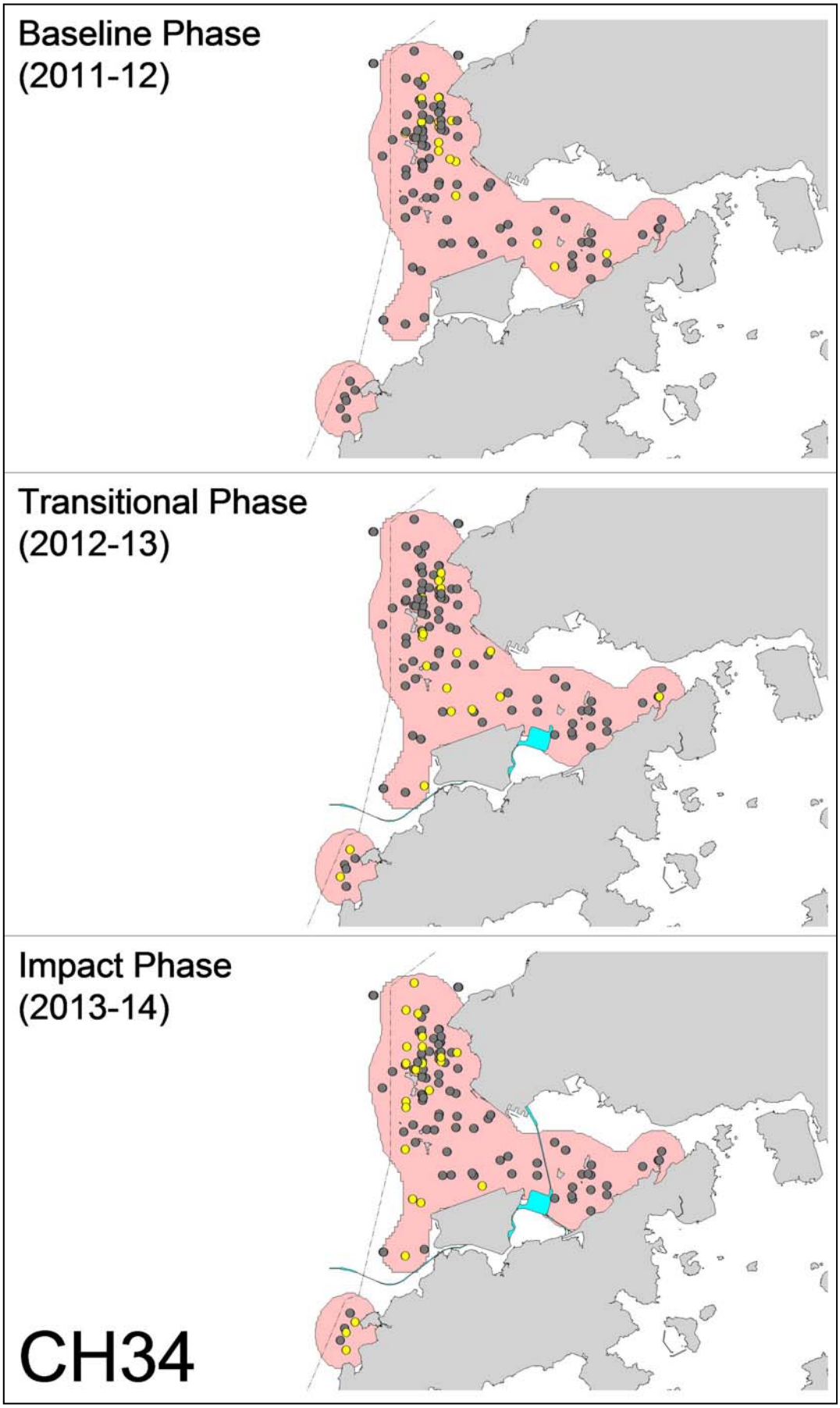




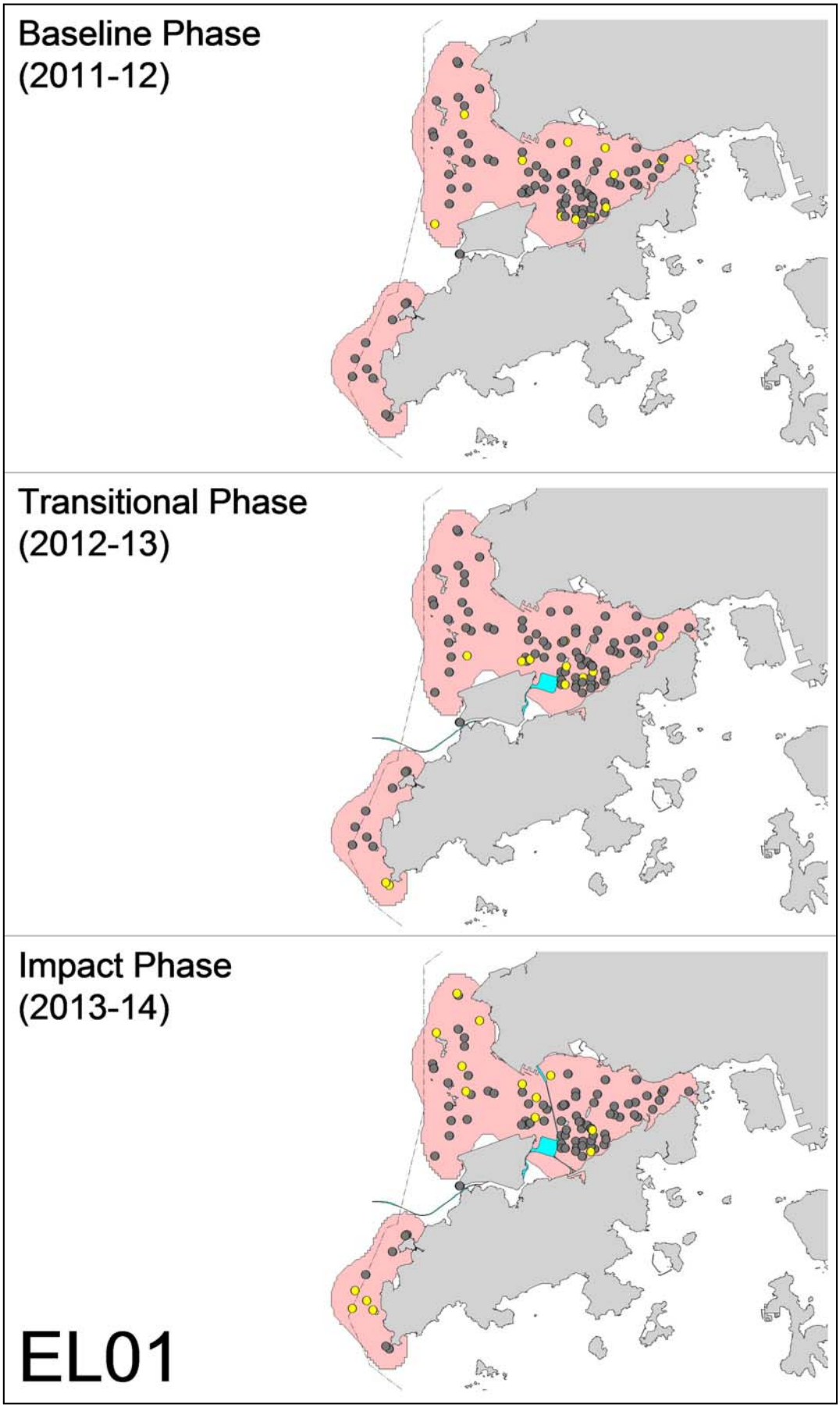




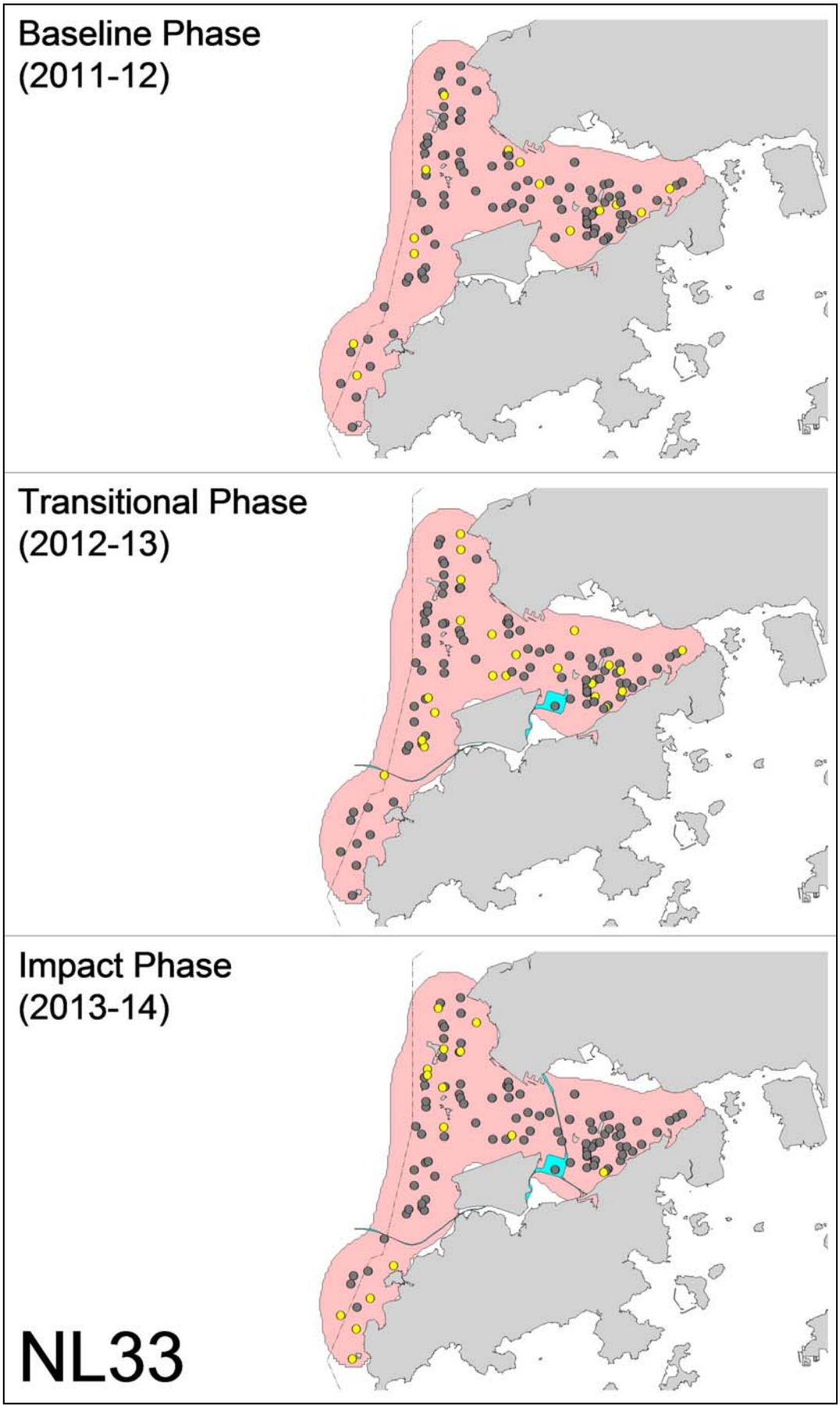




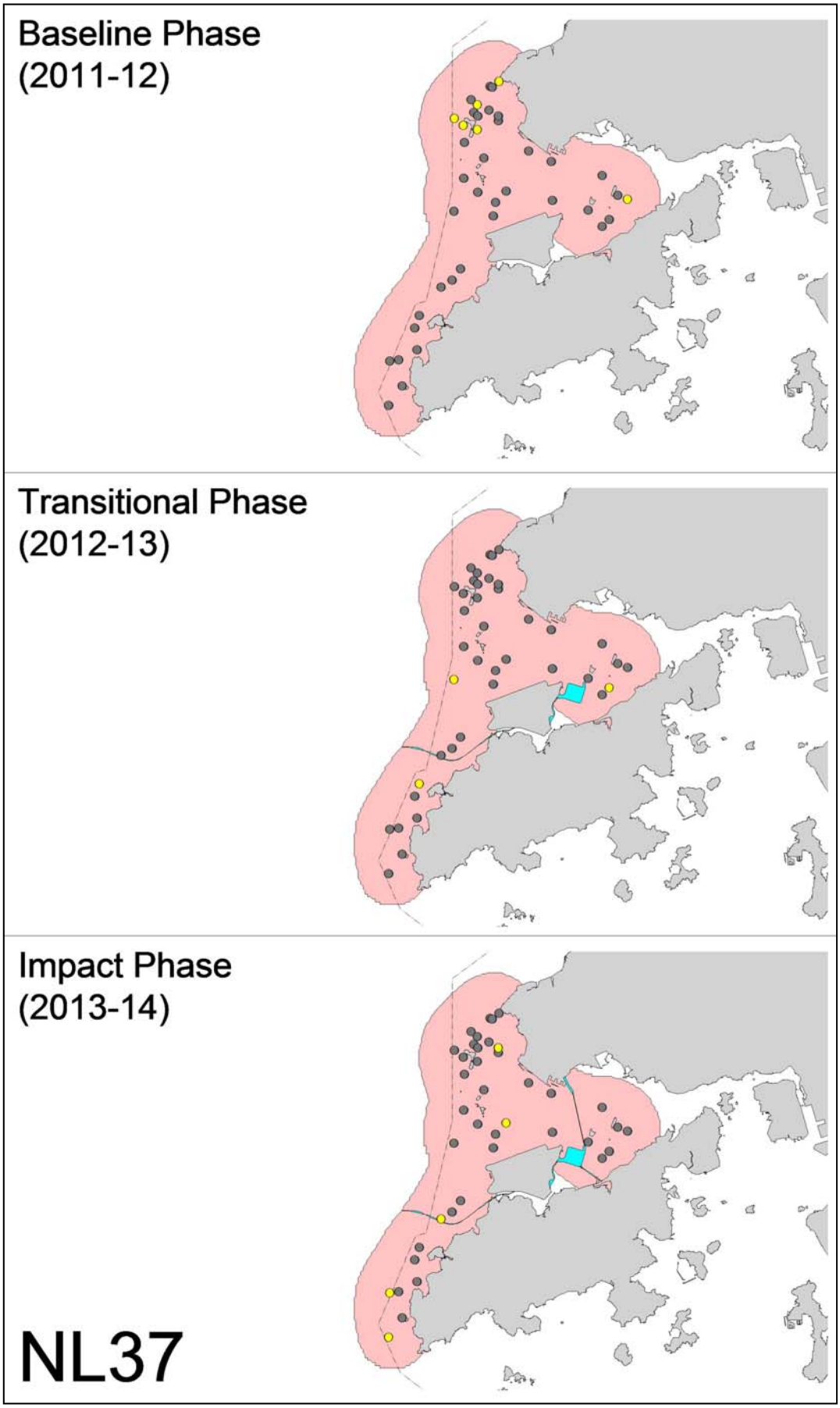
Appendix V. Temporal changes in range use of individual dolphins during baseline, transitional & impact phase of TMCLKL construction (note: yellow dots indicates sightings made in corresponding period)



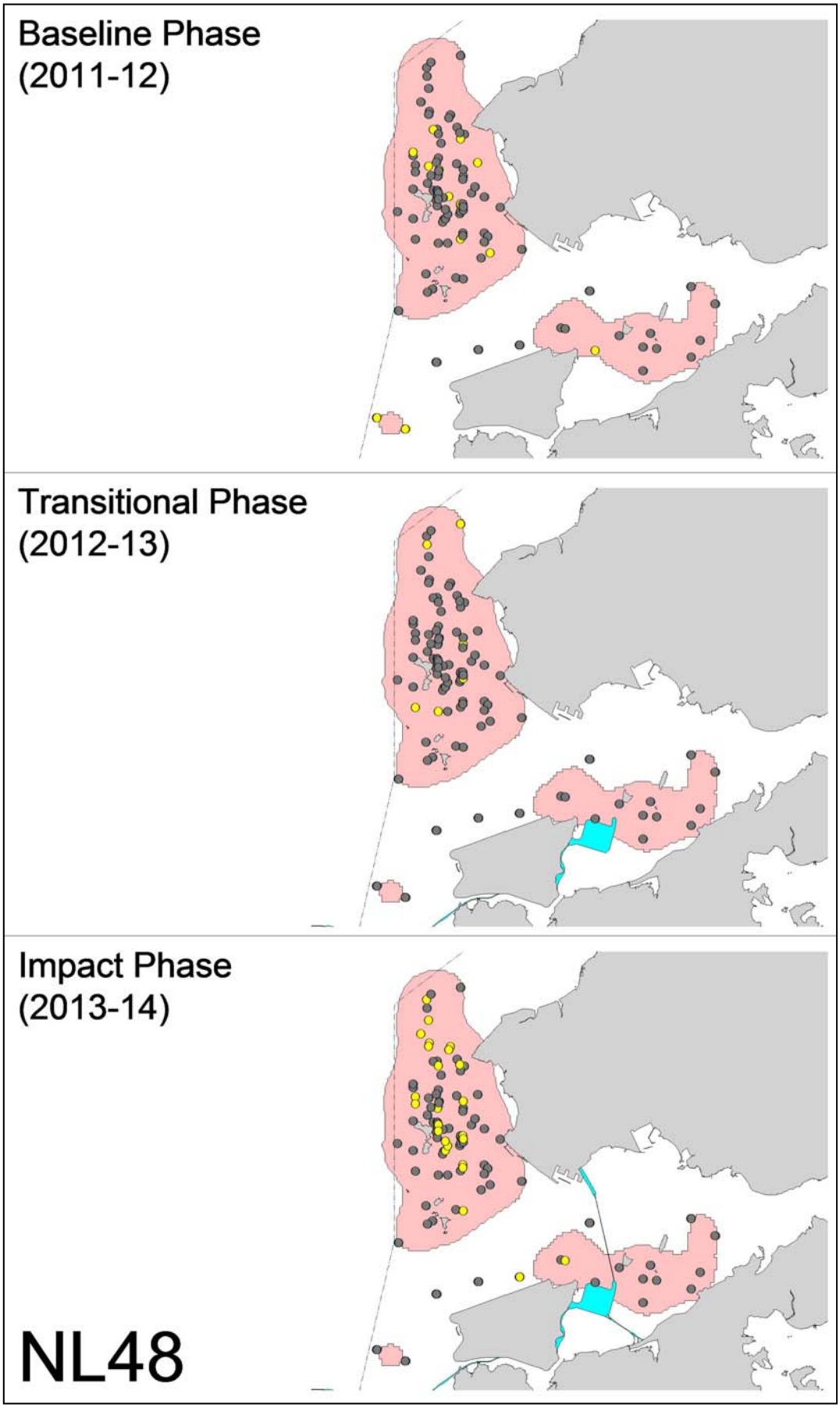
Appendix V. (cont'd)



Appendix V. (cont'd)



Appendix V. (cont'd)



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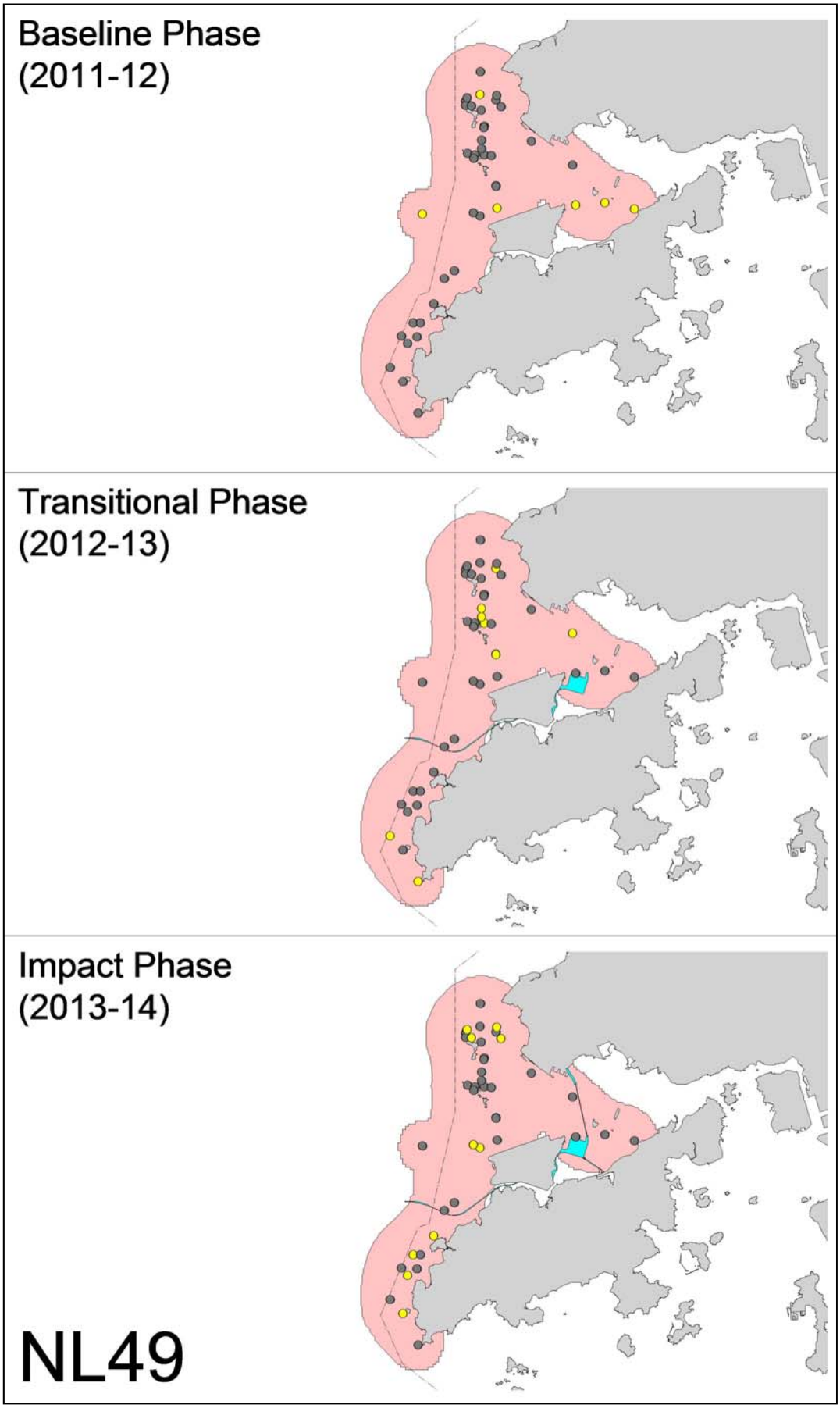

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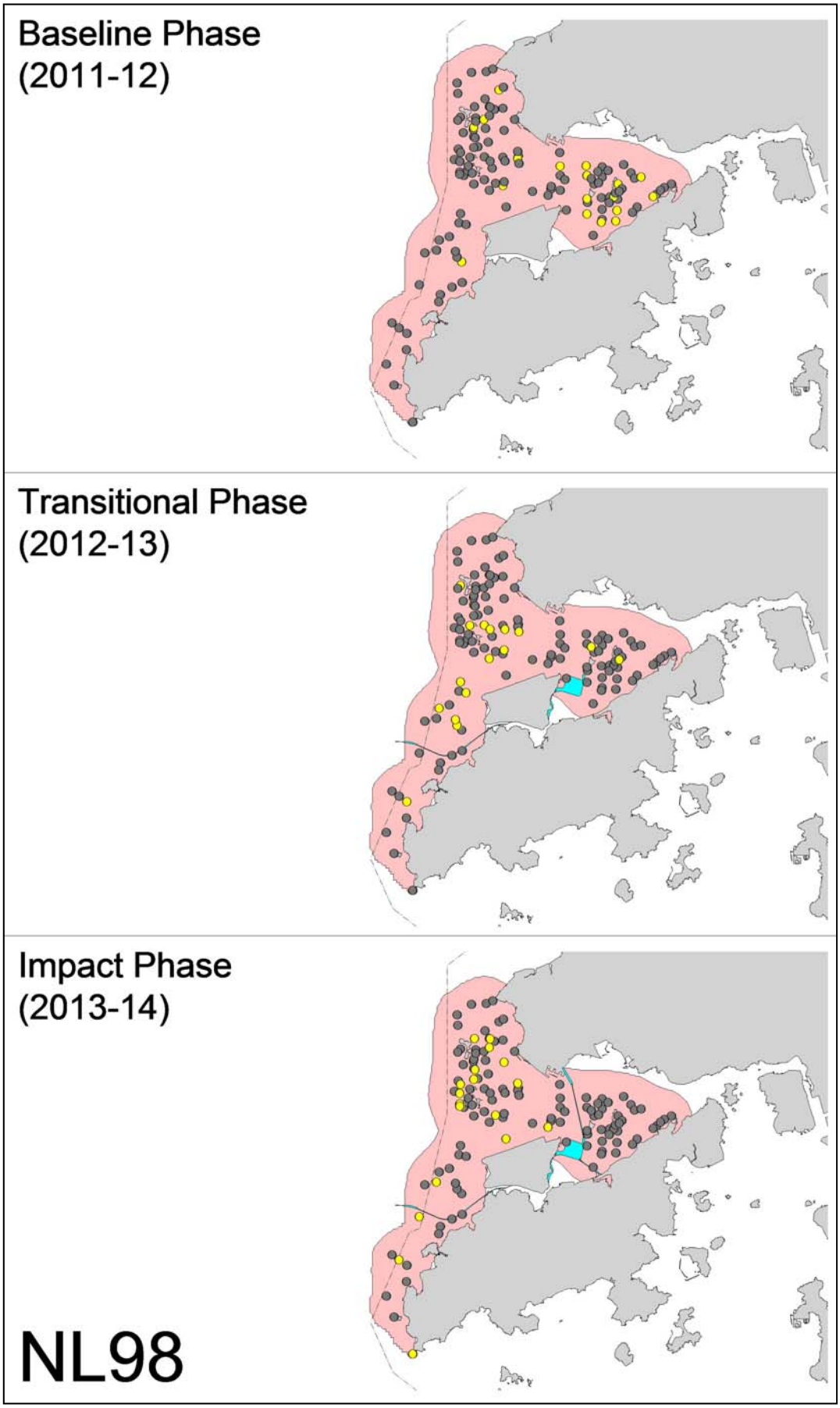

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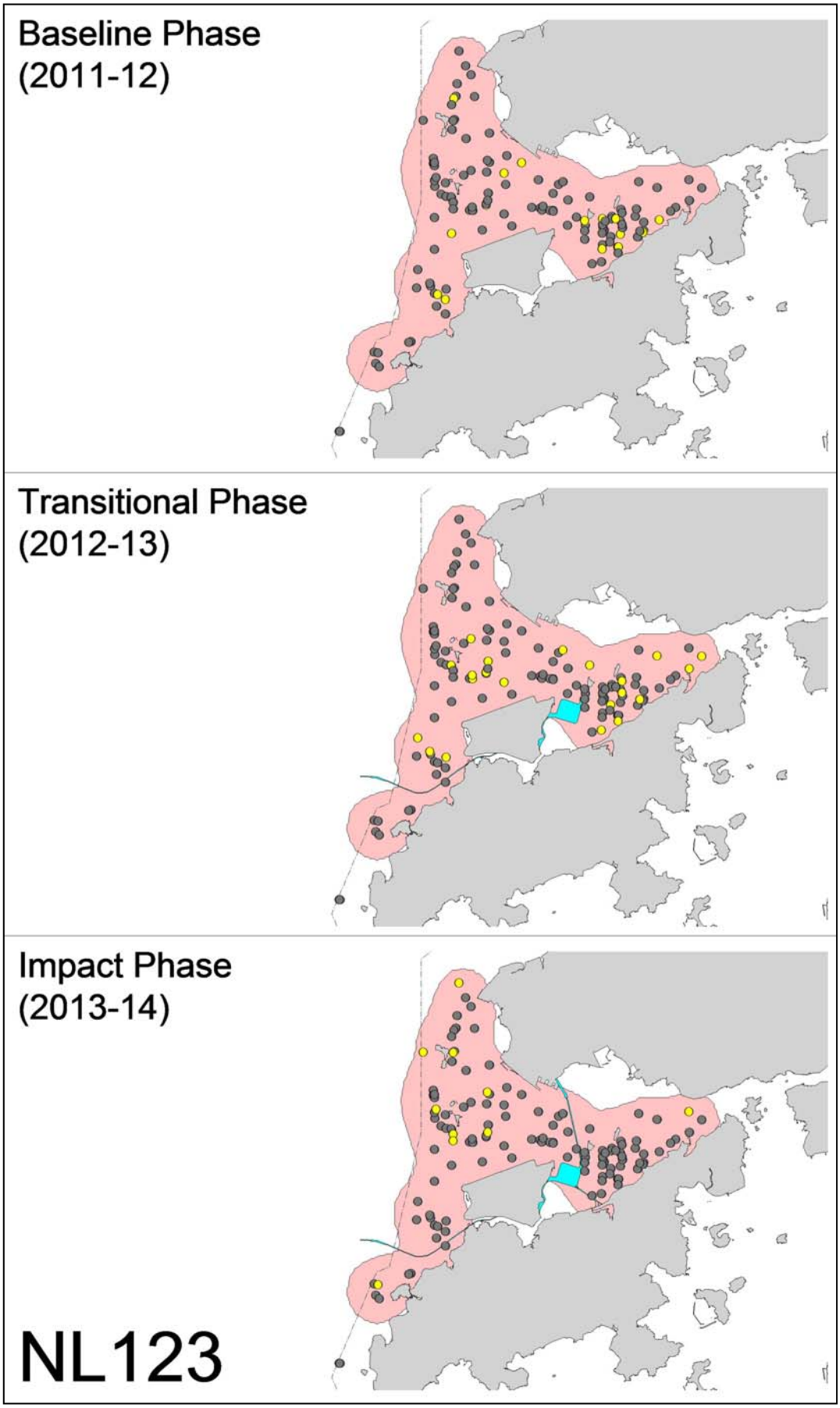

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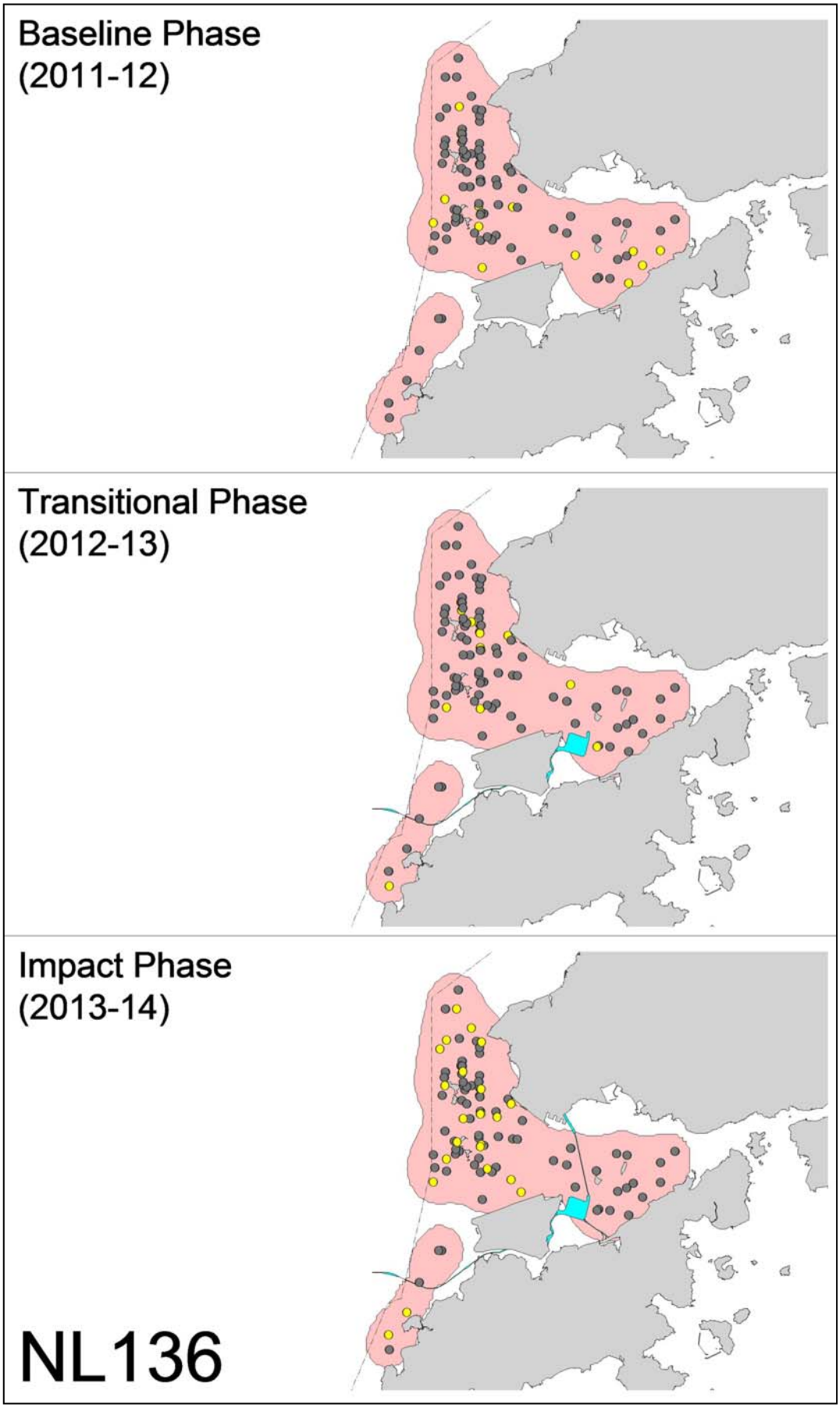

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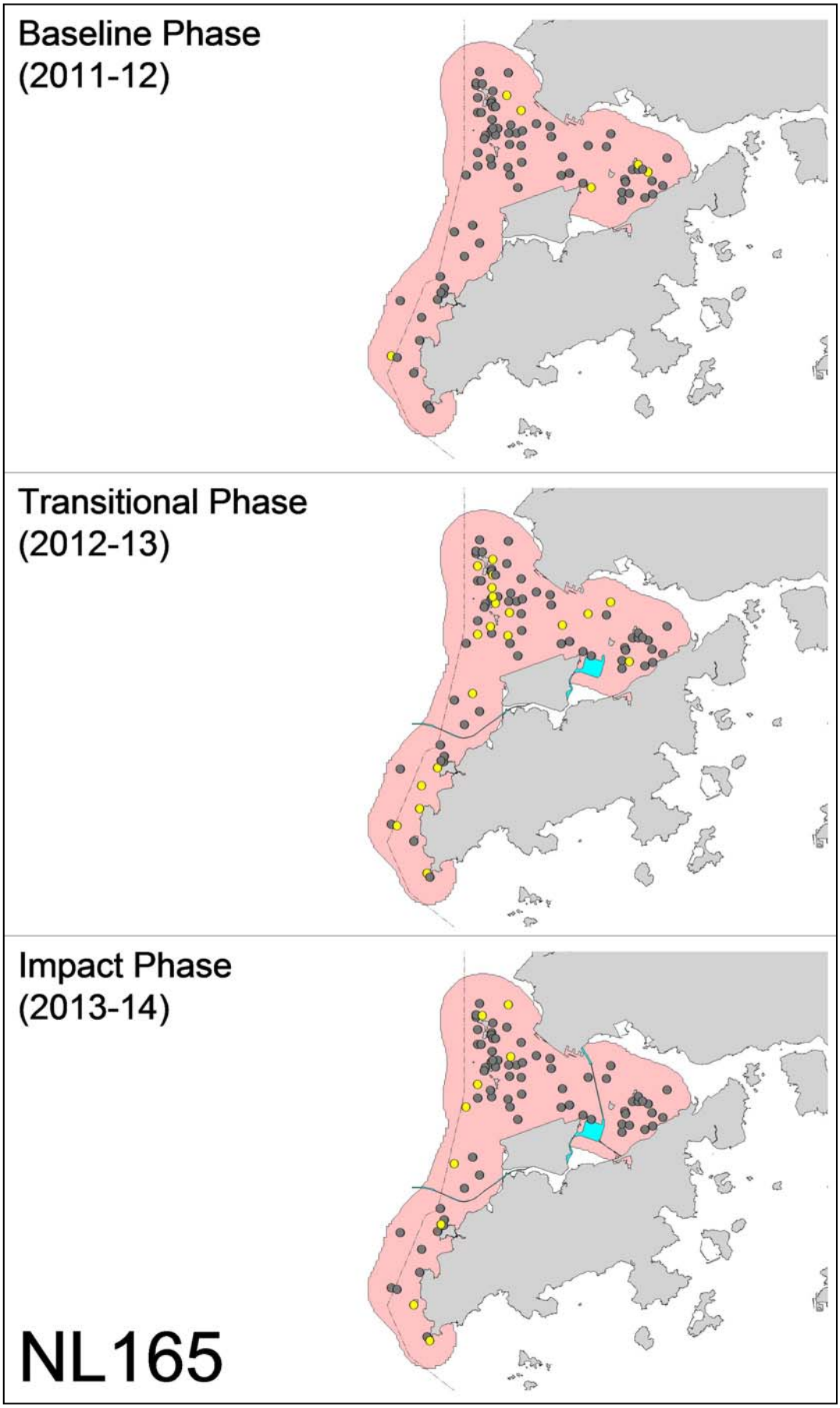

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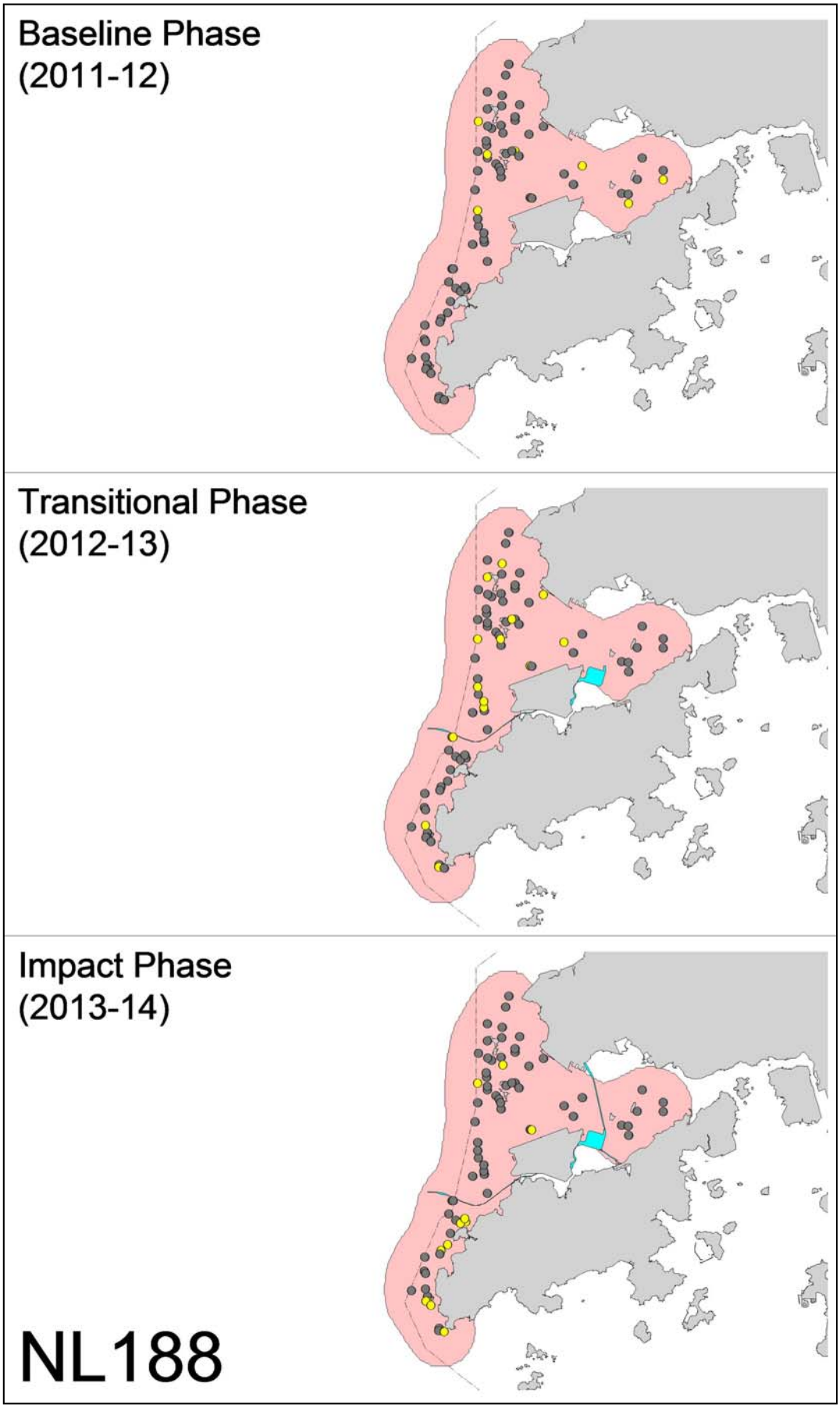

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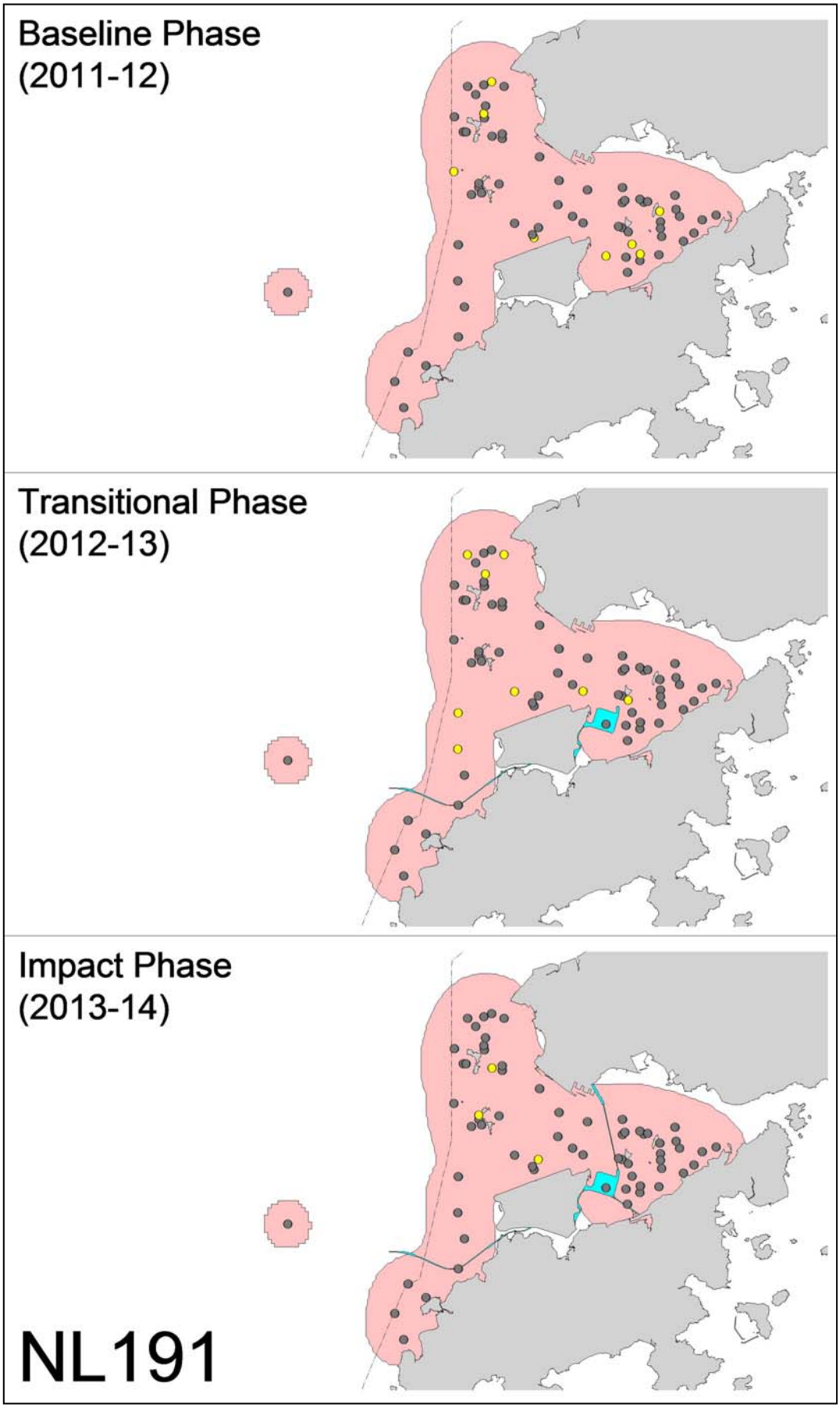

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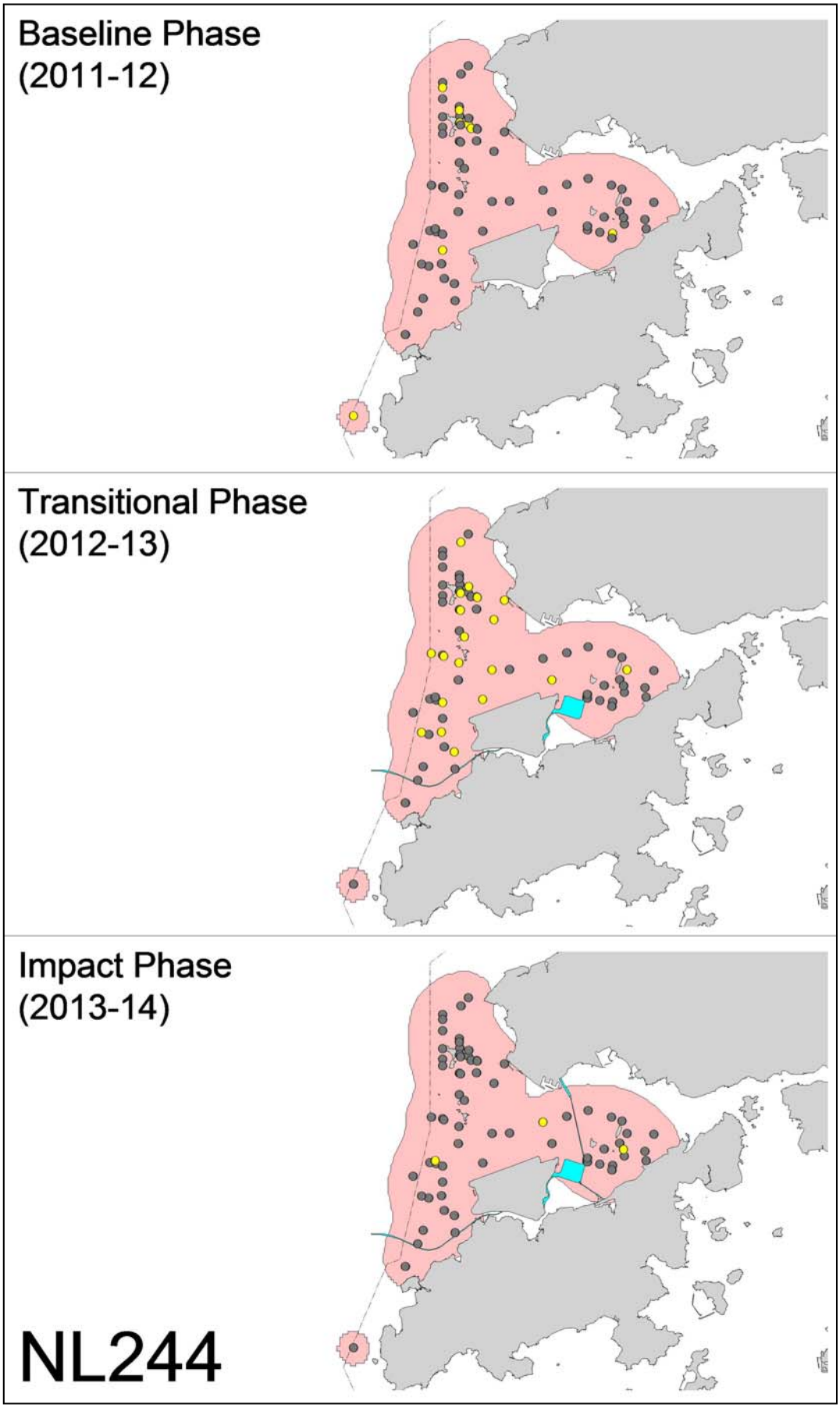

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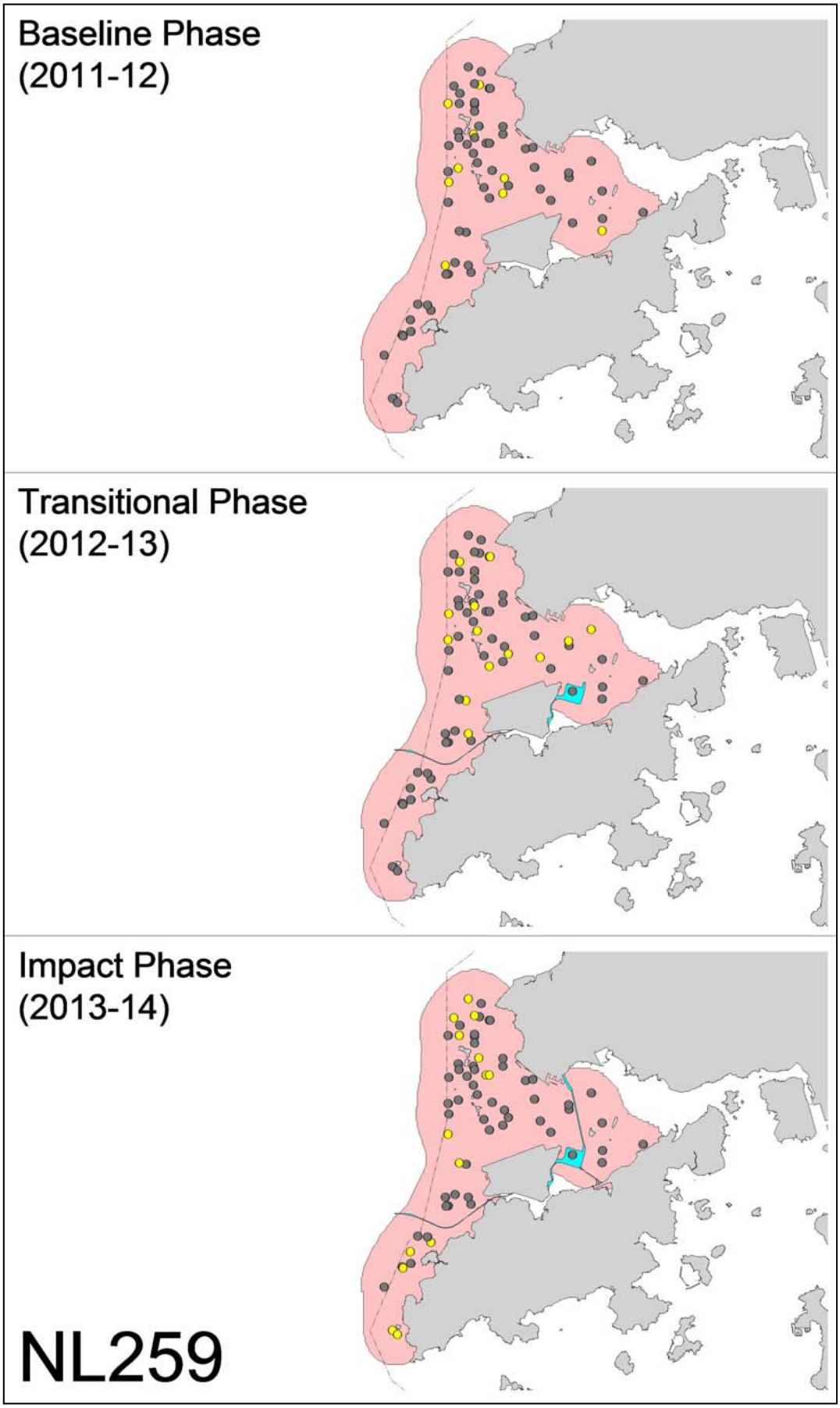

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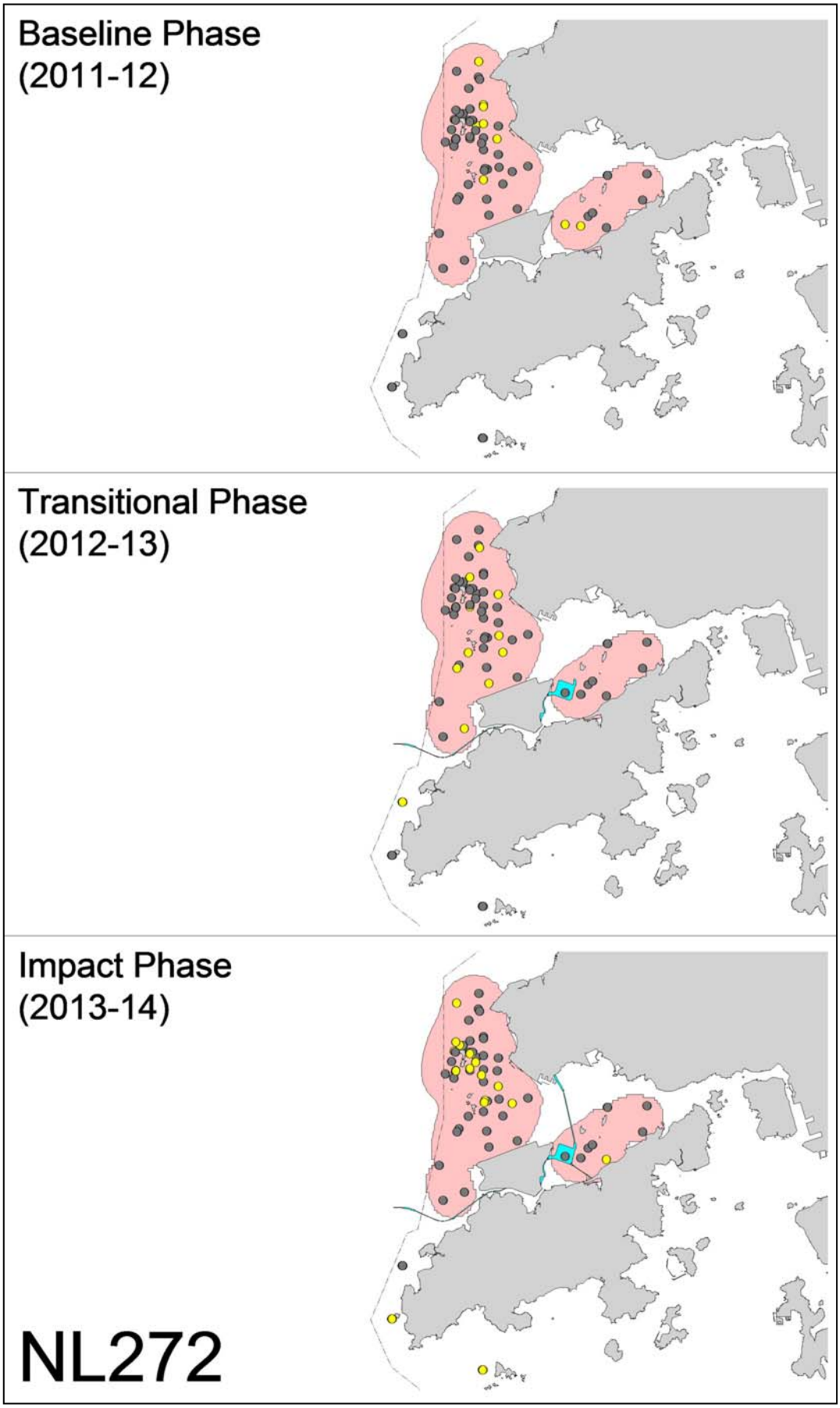

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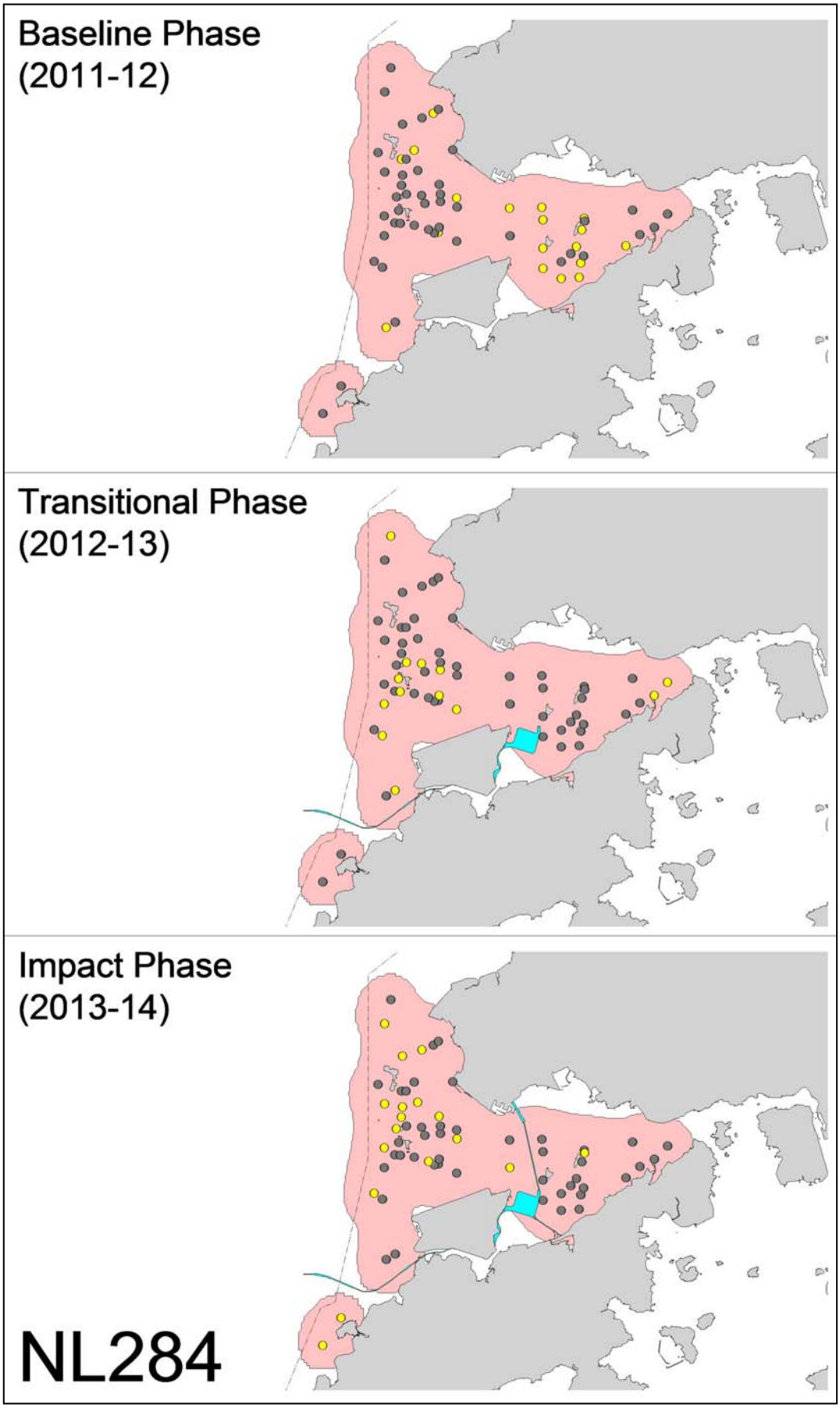

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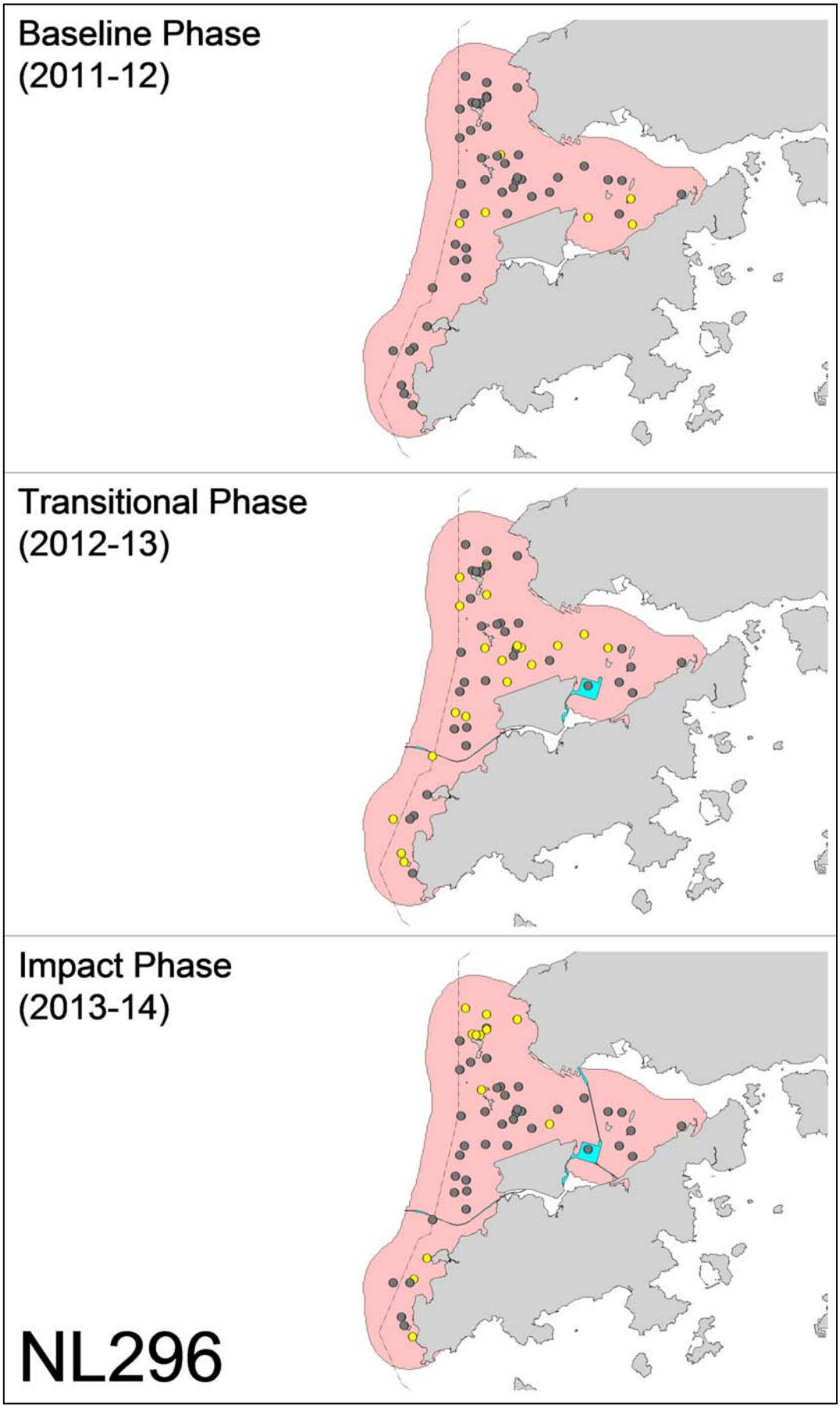

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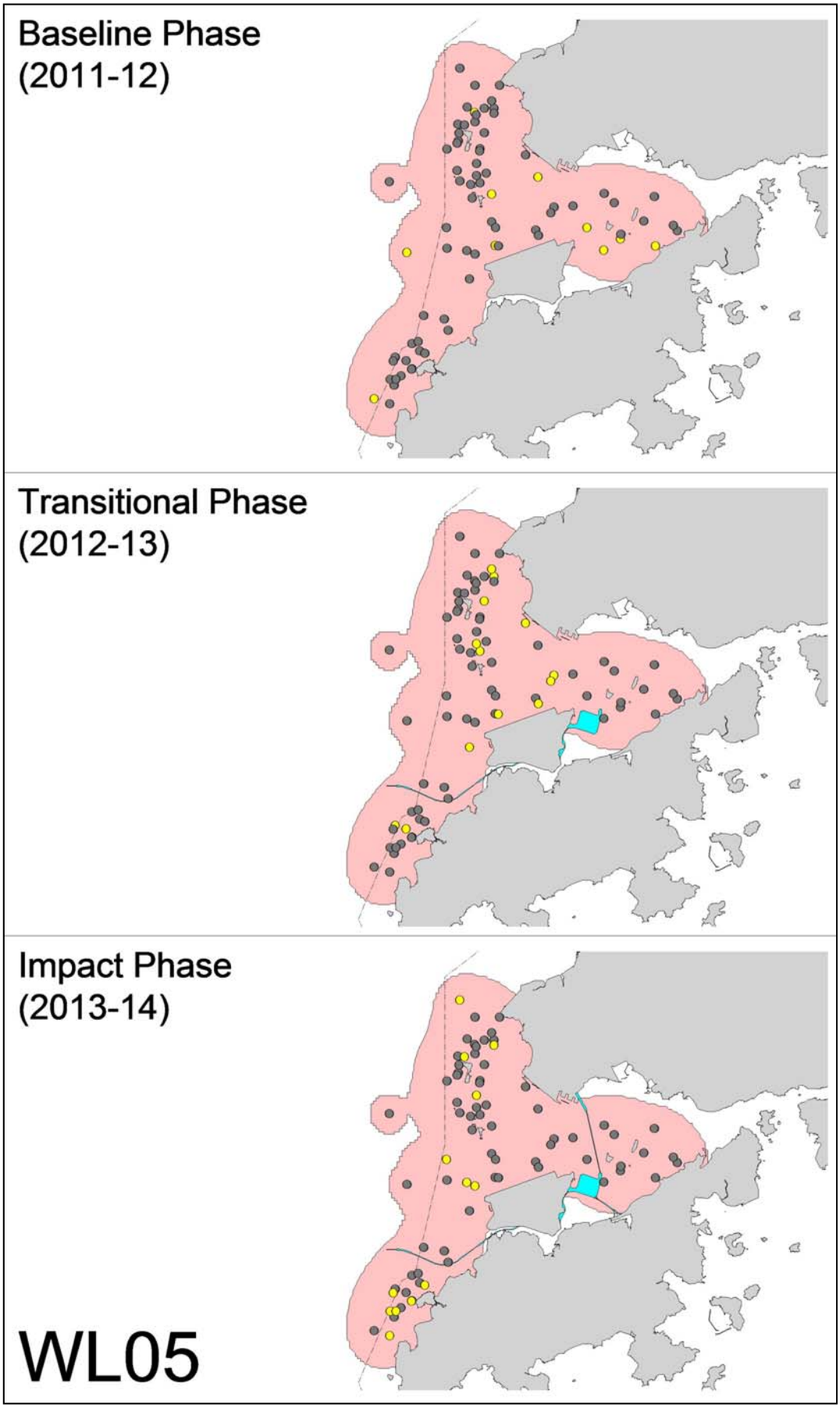

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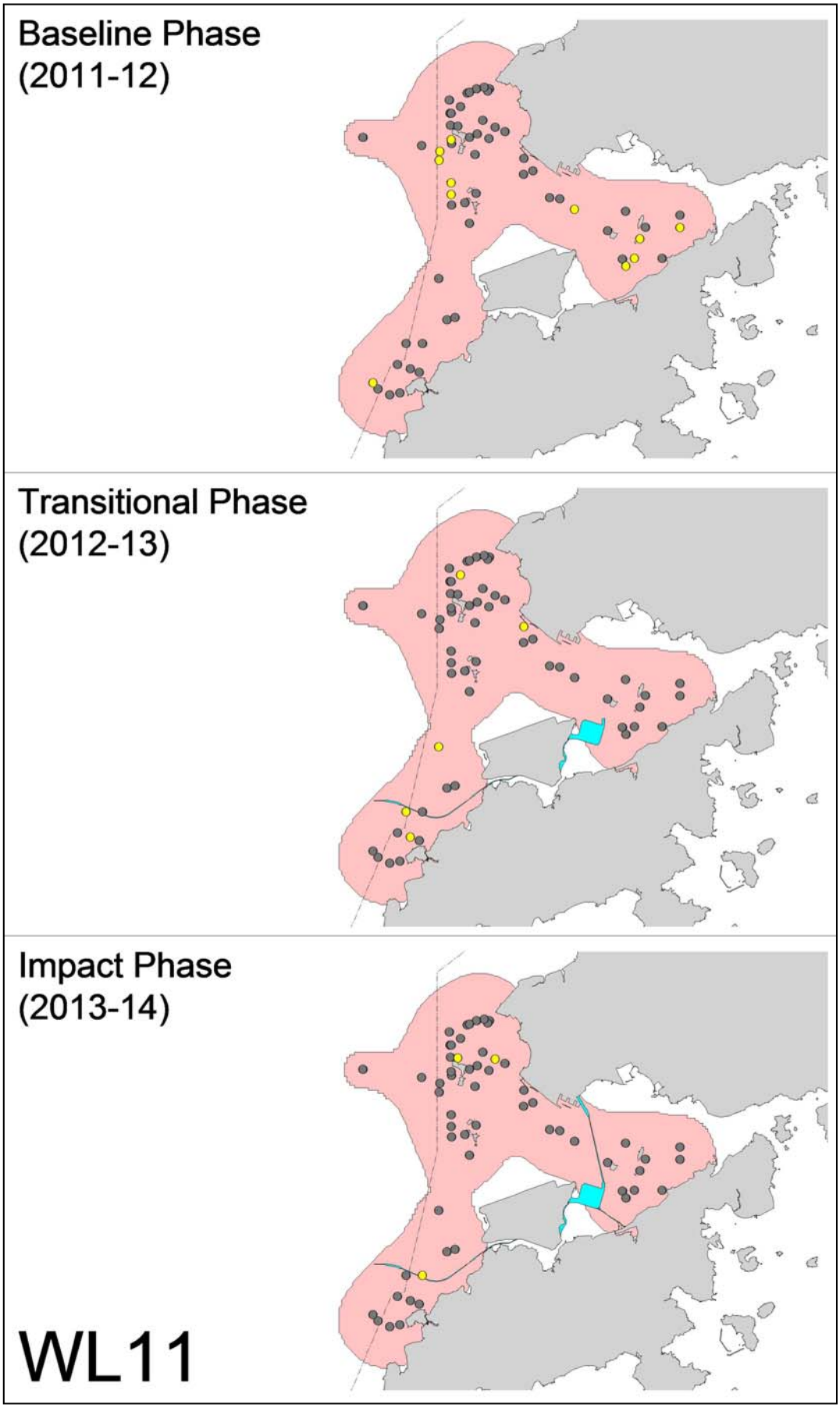

Appendix V. (cont'd)

Appendix G

Event and Action Plan

Event and Action Plan for Impact Air Monitoring

	Action			
	ET [(a)]	**IEC [(a)]**	**SOR [(a)]**	**Contractor(s)**
Action Level Exceedance				
	1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Action Level, the exceedance is then confirmed. 3. Inform the IEC and the SOR. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Discuss with the IEC and the Contractor on remedial actions required. 7. If exceedance continues, arrange meeting with the IEC and the SOR. 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check the Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented.	1. Rectify any unacceptable practice 2. Amend working methods if appropriate 3. If the exceedance is confirmed to be Project related, submit proposals for remedial actions to IEC within 3 working days of notification 4. Implement the agreed proposals 5. Amend proposal if appropriate

	Action			
	ET [(a)]	**IEC [(a)]**	**SOR [(a)]**	**Contractor(s)**
Limit Level Exceedance				
	1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Limit Level, the exceedance is then confirmed. 3. Inform the IEC, the SOR, the DEP and the Contractor. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 7. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken. 8. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results. 9. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. If the exceedance is confirmed to be Project related after investigation, in consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance. 2. If the exceedance is confirmed to be Project related after investigation, submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Amend proposal if appropriate. 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

Note: (a) ET – Environmental Team; IEC – Independent Environmental Checker; SOR – Supervising Officer's Representative

Event & Action Plan for Impact Water Quality Monitoring

Event	ET Leader	IEC	SOR	Contractor
Action level being exceeded by one sampling day	1. Repeat *in situ* measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor and SOR; 4. Check monitoring data, all plant, equipment and Contractor's working methods.	1. Check monitoring data submitted by ET and Contractor's working methods.	1. Confirm receipt of notification of non-compliance in writing; 2. Notify Contractor.	1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Amend working methods if appropriate.
Action level being exceeded by two or more consecutive sampling days	1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, Contractor, SOR and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SOR and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Action level;	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the SOR accordingly; 4. Supervise the implementation of mitigation measures.	1. Discuss with IEC on the proposed mitigation measures; 2. Ensure mitigation measures are properly implemented; 3. Assess the effectiveness of the implemented mitigation measures.	1. Inform the Supervising Officer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of additional mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR; 5. Implement the agreed mitigation measures.
Limit level being exceeded by one sampling day	1. Repeat measurement on next day of exceedance to confirm findings;	1. Check monitoring data submitted by ET and	1. Confirm receipt of notification of failure in	1. Inform the SOR and confirm notification of the

Event	ET Leader	IEC	SOR	Contractor
	2. Identify source(s) of impact; 3. Inform IEC, Contractor, SOR and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SOR and Contractor;	Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the SOR accordingly.	writing; 2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 3. Request Contractor to review the working methods.	non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR.
Limit level being exceeded by two or more consecutive sampling days	1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, SOR and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SOR and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days;	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the SOR accordingly; 4. Supervise the implementation of mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Ensure mitigation measures are properly implemented; 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.	1. Take immediate action to avoid further exceedance; 2. Submit proposal of mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR; 3. Implement the agreed mitigation measures; 4. Resubmit proposals of mitigation measures if problem still not under control; 5. As directed by the Supervising Officer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, SOR – Supervising Officer's Representative

Event / Action Plan for Impact Dolphin Monitoring

EVENT	ACTION			
	ET	**IEC**	**SOR**	**Contractor**
Action Level	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SOR and Contractor; 5. Check monitoring data. 6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and finding with the ET and the Contractor.	1. Discuss monitoring with the IEC and any other measures proposed by the ET; 2. If SOR is satisfied with the proposal of any other measures, SOR to signify the agreement in writing on the measures to be implemented.	1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.
Limit Level	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and findings with the ET and the Contractor; 3. Attend the meeting to discuss with ET, SOR and	1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures. 2. If SOR is satisfied with the	1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Attend the meeting to discuss with ET, IEC and SOR the necessity of additional dolphin monitoring and any other

EVENT	ACTION			
	ET	**IEC**	**SOR**	**Contractor**
	3. Identify source(s) of impact; 4. Inform the IEC, SOR and Contractor of findings; 5. Check monitoring data; 6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary. 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, 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.	Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures. 4. Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and advise SOR of the results and findings accordingly. 5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise SOR the results and findings accordingly.	proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, SOR to signify the agreement in writing on such proposals and any other mitigation measures. 3. Supervise the implementation of additional monitoring and/or any other mitigation measures.	potential mitigation measures. 3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary. 4. Implement the agreed additional dolphin monitoring and/or any other mitigation measures.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, SOR – Supervising Officer's Representative

Appendix H

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

Table H1 *Cumulative Statistics on Exceedances*

Monitoring Parameters	Action/Limit Level	Total No. recorded in this reporting year (Nov 2013 to Oct 2014)	Total No. recorded since project commencement
1-Hr TSP	Action	26	26
	Limit	2	2
24-Hr TSP	Action	5	5
	Limit	1	1
Water Quality	Action	6	6
	Limit	1	1
Impact Dolphin Monitoring	Action	5	5
	Limit	0	0

Table H2 *Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions*

Reporting Period	Cumulative Statistics		
	Complaints	Notifications of Summons	Successful Prosecutions
This Reporting Period (Nov 2013 to Oct 2014)	2	0	0
Total No. received since project commencement	2	0	0

Appendix I

Waste Flow Table

Name of Department: HyD **Contract No. / Works Order No.:** HY/2012/08

Monthly Summary Waste Flow Table for December 2013 [to be submitted not later than the 15th day of each month following reporting month]

(All quantities shall be rounded off to 3 decimal places.)

Month	Actual Quantities of Inert Construction Waste Generated Monthly									
	(a)=(b)+(c)+(d)+(e) Total Quantity Generated	(b) Hard Rock and Large Broken Concrete	(c) Reused in the Contract	(d) Reused in other Projects	(e) Disposed of as Public Fill	Imported Fill to WA 23 & Reclamation Area (Rockfill 400)	Imported Fill to WA 23 & Reclamation Area (Rockfill Type A)	Imported Fill to RTT Barging Point	Marine Disposal (Cat. L)	Marine Disposal (Cat. M)
	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 m^3)	(in '000 m^3)
Jan										
Feb										
Mar										
Apr										
May										
Jun										
Sub-total										
Jul										
Aug										
Sep	0.000	0.000	0.000	0.000	0.000	1.820	0.788	0.000	0.000	0.000
Oct	0.000	0.000	0.000	0.000	0.000	18.667	3.328	0.000	0.000	0.000
Nov	2.835	0.000	0.000	0.000	2.835	45.929	1.520	0.000	21.100	13.200
Dec	0.883	0.000	0.000	0.000	0.883	145.125	13.824	45.472	40.500	5.000
Total	3.718	0.000	0.000	0.000	3.718	211.541	19.460	45.472	61.600	18.200

First Issue Date - 15 : 07 : 2013
Current Issue Date - 01 : 08 : 2013

Month	**Actual Quantities of Non-inert Construction Waste Generated Monthly**								
	Metals		Paper/ cardboard packaging		Plastics (see Note 3)		Chemical Waste		Others, e.g. General Refuse disposed at Landfill
	(in '000kg)		(in '000kg)		(in '000kg)		(in '000kg)		(in '000ton)
	generated	recycled	generated	recycled	generated	recycled	generated	recycled	generated
Jan									
Feb									
Mar									
Apr									
May									
Jun									
Sub-total									
Jul									
Aug									
Sep	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
Oct	0.000	0.000	0.120	0.120	0.000	0.000	0.000	0.000	0.000
Nov	0.000	0.000	0.130	0.130	0.000	0.000	0.000	0.000	0.152
Dec	0.000	0.000	0.130	0.130	0.000	0.000	0.000	0.000	0.012
Total	0.000	0.000	0.380	0.380	0.000	0.000	0.000	0.000	0.172

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*							
Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed of as Public Fill	Imported Fill	Marine Disposal (Cat. L)	Marine Disposal (Cat. M)
(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 m^3)	(in '000 m^3)
10.000	0.000	0.000	0.000	10.000	180.000	5.000	40.000

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*				
Metals	Paper/ cardboard packaging	Plastics (see Note 3)	Chemical Waste	General Refuse disposed of at Landfill
(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000m^3)
0.000	0.050	0.000	0.000	0.100

Notes:
(1) The performance targets are given in the **ER Appendix 8J Clause 14** and the EM & A Manual(s).
(2) The waste flow table shall also include C&D materials to be imported for use at the Site.
(3) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.
(4) The Contractor shall also submit the latest forecast of the total amount of C&D materials expected to be generated from the Works, together with a breakdown of the nature where the amount of C&D materials expected to be generated from the Works is equal to or exceeding 50,000 m^3. (**ER Part 8 Clause 8.8.5 (d) (ii)** refers).

Name of Department: HyD **Contract No. / Works Order No.:** HY/2012/08

Monthly Summary Waste Flow Table for October 2014 [to be submitted not later than the 15th day of each month following reporting month]

(All quantities shall be rounded off to 3 decimal places.)

Month	Actual Quantities of Inert Construction Waste Generated Monthly				
	(a)=(b)+(c)+(d)+(e) Total Quantity Generated	(b) Hard Rock and Large Broken Concrete	(c) Reused in the Contract	(d) Reused in other Projects	(e) Disposed of as Public Fill
	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)
2013 Sub-total	3.718	0.000	0.000	0.000	3.718
Jan-2014	9.012	0.000	0.000	0.000	9.012
Feb-2014	0.000	0.000	0.000	0.000	0.000
Mar-2014	0.105	0.000	0.000	0.000	0.105
Apr-2014	0.022	0.000	0.000	0.000	0.022
May-2014	1.016	0.000	0.000	0.000	1.016
Jun-2014	4.393	0.000	0.000	0.000	4.393
Half Year Sub-total	14.548	0.000	0.000	0.000	14.548
Jul-2014	14.405	0.000	0.000	0.000	14.405
Aug-2014	12.728	0.000	0.000	0.000	12.728
Sep-2014	6.843	0.000	0.000	0.000	6.843
Oct-2014	1.228	0.000	0.000	0.000	1.228
Nov-2014					
Dec-2014					
Project Total Quantities	53.470	0.000	0.000	0.000	53.470

Month	**Actual Quantities of Inert Construction Waste Generated Monthly**							
	Imported Fill to WA 23 & Reclamation Area (Rockfill 400)	Imported Fill to WA 23 & Reclamation Area (Rockfill 200)	Imported Fill to WA 23 & Reclamation Area (Rockfill Type A)	Imported Fill to Reclamation Area (Public Fill) (by Barge)	Imported Fill to Reclamation Area (Public Fill)(From Rambler Channel) (by Truck)	Imported Fill to Reclamation Area (From RTT Barging Point) (by Truck)	Marine Disposal (Cat. L)	Marine Disposal (Cat. M_P &M_F)
	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 m^3)	(in '000 m^3)
2013 Sub-total	211.541	2.508	19.460	0.000	0.000	45.472	61.600	18.200
Jan-2014	177.300	4.050	8.544	0.000	0.000	124.412	34.000	12.500
Feb-2014	143.891	27.825	5.371	0.000	0.000	81.296	18.500	24.500
Mar-2014	257.304	53.388	27.958	113.789	0.000	63.961	37.300	40.450
Apr-2014	198.245	10.186	41.702	191.094	0.000	26.640	28.600	15.400
May-2014	236.816	4.612	65.308	150.749	43.718	15.165	18.700	29.150
Jun-2014	233.430	2.856	37.103	108.667	25.433	0.000	40.700	7.700
Half Year Sub-total	1246.986	102.917	185.986	564.299	69.151	311.474	177.800	129.700
Jul-2014	177.859	0.000	65.758	161.817	22.958	0.000	37.950	7.150
Aug-2014	174.710	23.110	33.127	351.703	40.379	0.000	12.100	0.000
Sep-2014	124.251	28.994	23.424	476.618	22.932	0.000	0.000	0.000
Oct-2014	17.190	22.729	14.791	472.527	0.000	0.000	0.000	0.000
Nov-2014								
Dec-2014								
Project Total Quantities	1952.537	180.258	342.546	2026.964	155.420	356.946	289.450	155.050

Month	Actual Quantities of Non-inert Construction Waste Generated Monthly								
	Metals		Paper/ cardboard packaging		Plastics (see Note 3)		Chemical Waste		Others, e.g. General Refuse disposed at Landfill
	(in '000kg)		(in '000kg)		(in '000kg)		(in '000kg)		(in '000ton)
	generated	recycled	generated	recycled	generated	recycled	generated	recycled	generated
2013 Sub-total	0.000	0.000	0.380	0.380	0.000	0.000	0.000	0.000	0.172
Jan-2014	0.000	0.000	0.130	0.130	0.000	0.000	0.000	0.000	0.045
Feb-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.028
Mar-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036
Apr-2014	0.000	0.000	0.160	0.160	0.000	0.000	0.000	0.000	0.026
May-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042
Jun-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.030	0.030
Half Year Sub-total	0.000	0.000	0.290	0.290	0.000	0.000	0.050	0.050	0.207
Jul-2014	0.000	0.000	0.300	0.300	0.000	0.000	0.000	0.000	0.033
Aug-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
Sep-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039
Oct-2014	0.000	0.000	0.080	0.080	0.000	0.000	0.060	0.060	0.033
Nov-2014									
Dec-2014									
Project Total Quantities	0.000	0.000	1.050	1.050	0.000	0.000	0.110	0.110	0.506

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*							
Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed of as Public Fill	Imported Fill	Marine Disposal (Cat. L)	Marine Disposal (Cat. M)
(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 m^3)	(in '000 m^3)
5.000	0.000	0.000	0.000	5.000	180.000	5.000	40.000

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*				
Metals	Paper/ cardboard packaging	Plastics (see Note 3)	Chemical Waste	General Refuse disposed of at Landfill
(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000m^3)
0.000	0.050	0.000	0.000	0.100

Notes:
(1) The performance targets are given in the **ER Appendix 8J Clause 14** and the EM & A Manual(s).
(2) The waste flow table shall also include C&D materials to be imported for use at the Site.
(3) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.
(4) The Contractor shall also submit the latest forecast of the total amount of C&D materials expected to be generated from the Works, together with a breakdown of the nature where the amount of C&D materials expected to be generated from the Works is equal to or exceeding 50,000 m^3. (**ER Part 8 Clause 8.8.5 (d) (ii)** refers).