

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

***Eighth Annual Environmental Monitoring & Audit
(EM&A) Report***

14 December 2021

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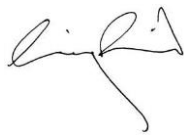
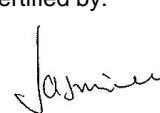


Contract No. HY/2012/08 Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

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*Eighth Annual Environmental Monitoring & Audit
(EM&A) Report*

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Client: DBJV		Project No: 0212330			
Summary: This document presents the Eighth Annual EM&A Report for Tuen Mun – Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section.		Date: 14 December 2021			
		Approved by: 			
		Mr Craig Reid Partner			
		Certified by: 			
		Dr Jasmine Ng ET Leader			
	8 th Annual EM&A Report	VAR	JN	CAR	14/12/21
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p>		<p>Distribution</p> <p><input type="checkbox"/> Internal</p> <p><input checked="" type="checkbox"/> Public</p> <p><input type="checkbox"/> Confidential</p>			
		 			

Ref.: HYDHZMBEEM00_0_8643L.22

17 January 2022

AECOM
Supervising Officer Representative's Office
No.8 Mong Fat Street, Tuen Mun,
New Territories, Hong Kong

By Fax (2293 6300) and By Post

Attention: Mr. K P Wong

Dear Mr. Wong,

**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
Eighth Annual Environmental Monitoring & Audit (EM&A) Report**

Reference is made to the Seventh Annual EM&A Report (Nov. 2020 – May 2021) (ET's ref.: "0212330_8th Annual EM&A_20211214.doc" dated 14 December 2021) certified by the ET Leader and provided to us via e-mail on 14 December 2021.

Please be informed that we have no further comments on the captioned Report. However, as mentioned in our letters for the First, Second, Third, Fourth, Fifth, sixth and Seventh Annual EM&A Report (our ref. HYDHZMBEEM00_0_4359L.16, HYDHZMBEEM00_0_5396L.17, HYDHZMBEEM00_0_6338L.18, HYDHZMBEEM00_0_7021L.18, HYDHZMBEEM00_0_7600L.19, HYDHZMBEEM00_0_8369L.21 and HYDHZMBEEM00_0_8574L.21), 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,



Brian Tam
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

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c.c. HyD – Mr. Stephen Wong (By Fax: 3188 6614)
HyD – Mr. Tony Wong (By Fax: 3188 6614)
AECOM – Mr. Conrad Ng (By Fax: 3922 9797)
ERM – Dr. Jasmine Ng (By Fax: 2723 5660)
Dragages – Bouygues JV - Mr. Bryan Lee (By Fax: 2293 7499)

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EXECUTIVE SUMMARY

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*. Ramboll Hong Kong Limited was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO). Subsequent applications for variation of environmental permits (VEP), *EP-354/2009/B*, *EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

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

Termination proposal for construction EM&A programme was approved by EPD on 19 March 2021. The construction phase EM&A programme of the Contract has been terminated since 19 March 2021.

This is the Eighth Annual EM&A report presenting the EM&A works carried out during the period from 1 November 2020 to 31 May 2021 for the *Contract No. HY/2012/08 Northern Connection Sub-sea Tunnel Section* (the “Contract”) in accordance with the Updated EM&A Manual of the TM-CLK Link Contract. As informed by the Contractor, the major activities in the reporting year included:

Construction Activities Undertaken

Land-based Works

- Installation of green roof system & chain fence - South Ventilation Building;
 - Defect works for reinstatement at Box culvert – Northern Landfall; and
 - Demolition works and backfilling works of CLP substation.
-

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

24-hour TSP Monitoring	25 sessions
1-hour TSP Monitoring	25 sessions
Operational Phase Water Quality Monitoring	7 sessions
Operational Phase Dolphin Monitoring	14 sessions

Implementation of Marine Mammal Exclusion Zone

No marine works were undertaken during the reporting period, therefore, daily 250 m marine mammal exclusion zone monitoring was not undertaken during the reporting period.

Summary of Breaches of Action/Limit Levels*Breaches of Action and Limit Levels for Air Quality*

Six (6) Action Level exceedances and one (1) Limit Level exceedance of 1-hour TSP were recorded in the air quality monitoring during this reporting period. Two (2) Action Level exceedances of 24-hour TSP were recorded in the air quality monitoring during this reporting period. No Limit Level exceedance of 24-hour TSP was recorded.

Dolphin Monitoring

Three (3) Limit Level exceedances were recorded for three (3) sets of quarterly post-construction (operational) dolphin monitoring data between November 2020 and May 2021.

Environmental Complaints, Non-compliance & Summons

No environmental complaint, non-compliance with EIA recommendations, EP conditions and other requirements and environmental summons associated with the construction of this Contract was recorded 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 were also considered to be effective and efficient in reducing the potential environmental impacts associated with the construction of the Contract. No change was thus considered necessary.

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

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. Subsequent applications for variation of environmental permits (VEP), EP-354/2009/B, EP-354/2009/C and EP-354/2009/D, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

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). Ramboll Hong Kong Limited 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*.



Designed By	PKV
Drawn By	DAI
Approved By	SPo
Date	11SEP2013
Rev.	Description
A	FIRST ISSUE
	11SEP13
	PKV
	Checked

Main Contractor

Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營

Client

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

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

Termination proposal for construction EM&A programme was approved by EPD on 19 March 2021. The construction phase EM&A programme of the Contract has been terminated since 19 March 2021.

1.2 SCOPE OF REPORT

This is the Eighth 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 2020 to 31 May 2021.

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 24/SD	Ken T.M. Cheng	2762 4062	3188 6614
SOR (AECOM Asia Company Limited)	Chief Resident Engineer	Roger Man	2293 6388	2293 6300
ENPO / IEC (Ramboll Hong Kong Ltd.)	ENPO Leader	Y.H. Hui	3465 2850	3465 2899
	IEC	Brian Tam ⁽¹⁾	9700 6767	3465 2899
Contractor (Dragages – Bouygues Joint Venture)	Deputy Environmental Manager	Bryan Lee	2293 7323	2293 7499
	24-hour hotline		2293 7330	
ET (ERM-HK)	ET Leader	Jasmine Ng	2271 3311	2723 5660

(1) The role and responsibilities as the IEC of the Contract has been taken up by Mr Brian Tam instead of Mr. Manson Yeung since 12 April 2021.

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*.

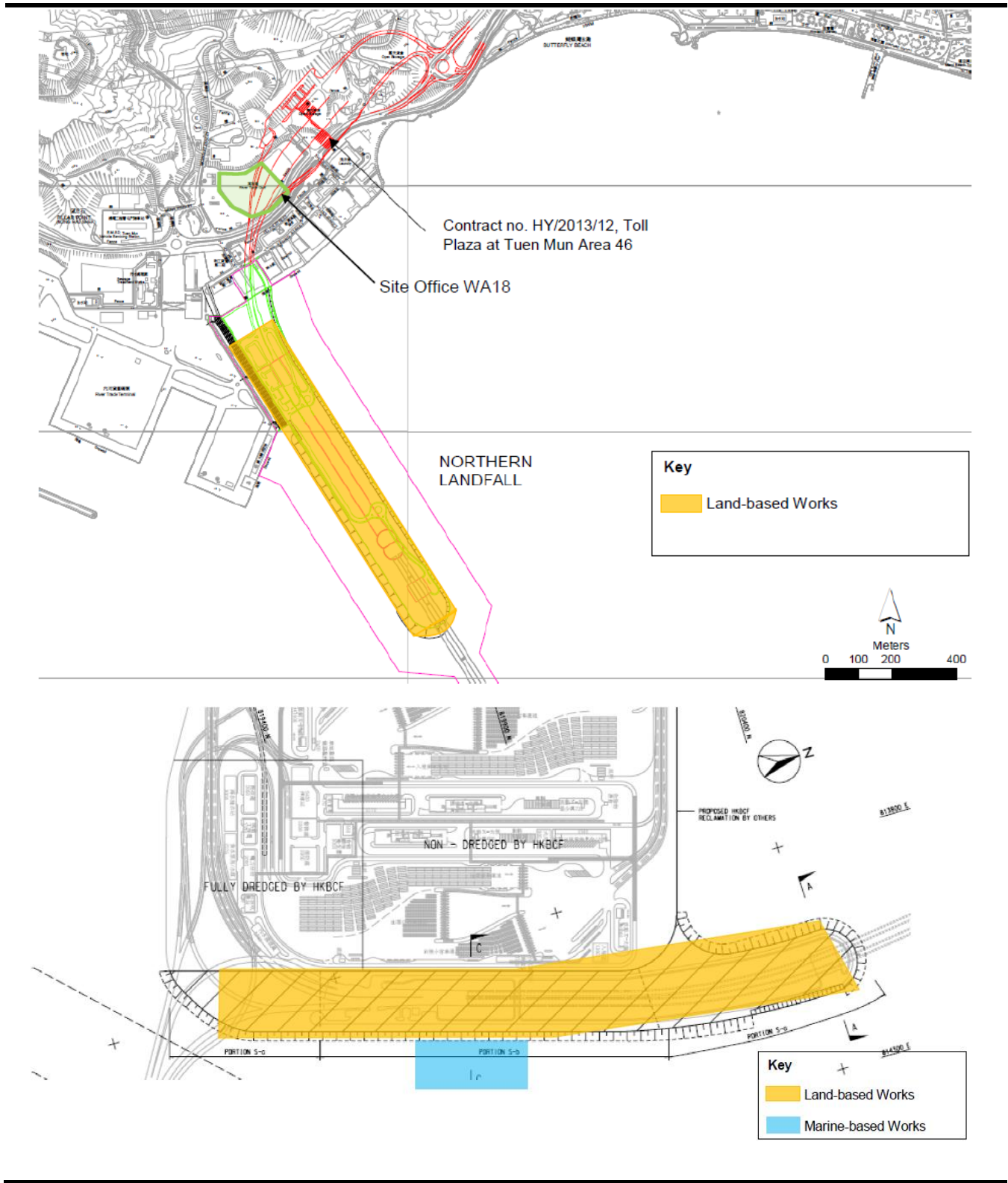
The general layout plan of the site showing the detailed works areas is shown in *Figure 1.2*. The Environmental Sensitive Receivers in the vicinity of the Project are shown in *Figure 1.3*.

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
<i>Land-based Works</i>
<ul style="list-style-type: none">• Installation of green roof system & chain fence - South Ventilation Building;• Defect works for reinstatement at Box culvert – Northern Landfall; and• Demolition works and backfilling works of CLP substation.

Figure 1.2 Locations of Construction Activities – November 2020 to May 2021



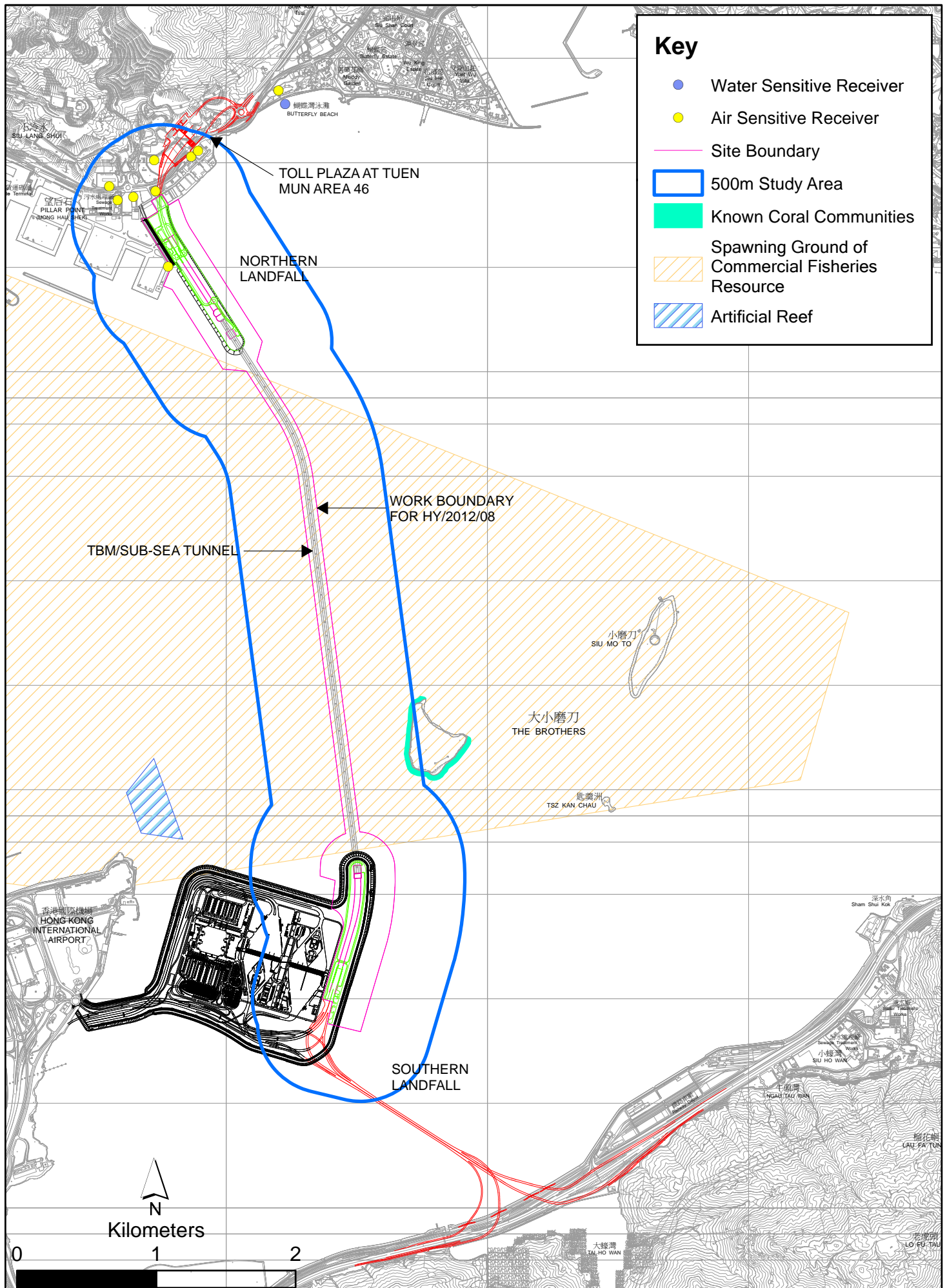


Figure 1.3 Environmental Sensitive Receivers in the vicinity of Contract No. HY/2012/08 Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-Sea Tunnel Section

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Date: 15/4/2014

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

2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual and the *Enhanced TSP Monitoring Plan* ⁽¹⁾, 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-hr and 24-hr TSP monitoring frequency was increased to three times per day every three days and daily every three days respectively as excavation works for launching shaft commenced on 24 October 2014.

Excavation works for launching shaft were completed and notification of change on air quality monitoring frequency was submitted to EPD on 14 September 2020. 1-hr and 24-hr TSP monitoring frequency was changed to three times per day every six days and daily every six days, respectively, since 14 September 2020.

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*.

Termination proposal for construction EM&A programme was approved by EPD on 19 March 2021. The construction phase EM&A programme of the Contract has been terminated since 19 March 2021.

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

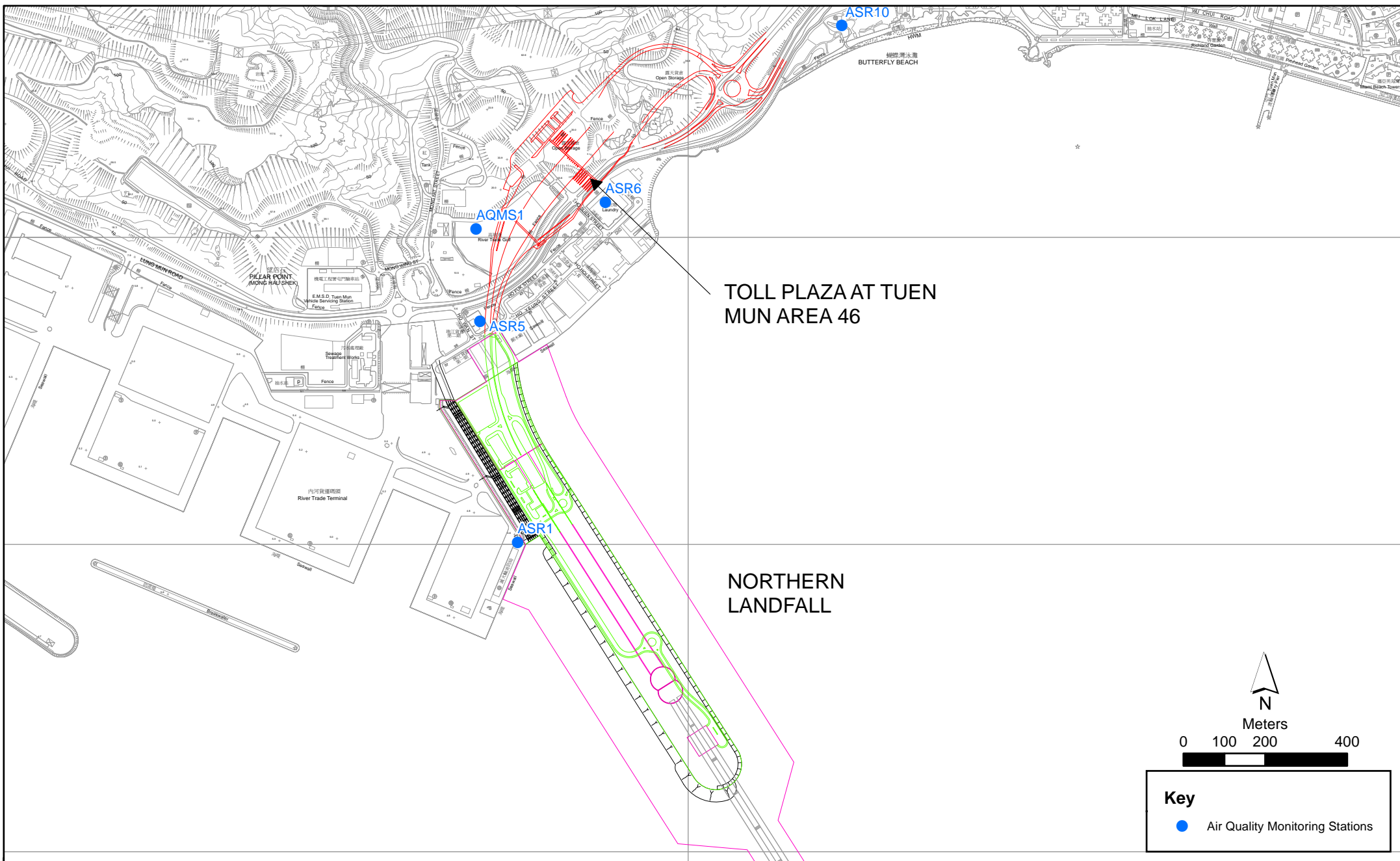


Figure 2.1

Air Quality Monitoring Stations for the Enhanced TSP Monitoring

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
ASR5	Pillar Point Fire Station	Office	<ul style="list-style-type: none"> 1-hour Total Suspended Particulates (1-hour TSP, $\mu\text{g}/\text{m}^3$), 3 times in every 6 days
AQMS1	Previous River Trade Golf	Bare ground	<ul style="list-style-type: none"> 24-hour Total Suspended Particulates (24-hour TSP, $\mu\text{g}/\text{m}^3$), daily for 24-hour in every 6 days
ASR6	Butterfly Beach Laundry	Office	
ASR10	Butterfly Beach Park	Recreational uses	Enhanced TSP monitoring (commenced on 24 October 2014) <ul style="list-style-type: none"> 1-hour Total Suspended Particulates (1-hour TSP, $\mu\text{g}/\text{m}^3$), 3 times in every 3 days 24-hour Total Suspended Particulates (24-hour TSP, $\mu\text{g}/\text{m}^3$), daily for 24-hour in every 3 days

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	Davis (Model: Vantage Pro 2 (S/N: AS160104014))
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 acceptable 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 *Eighty-Fifth to Eighty-ninth Monthly EM&A Reports*.

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

Month/Year	Station	Average ($\mu\text{g}/\text{m}^3$)	Range ($\mu\text{g}/\text{m}^3$)	Action Level ($\mu\text{g}/\text{m}^3$)	Limit Level ($\mu\text{g}/\text{m}^3$)
November	ASR 1	160	78 - 887	331	500
2020 to March	ASR 5	179	85 - 472	340	500
2021	AQMS1	129	48 - 248	335	500
	ASR6	154	61 - 358	338	500
	ASR10	103	39 - 246	337	500

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

Month/Year	Station	Average ($\mu\text{g}/\text{m}^3$)	Range ($\mu\text{g}/\text{m}^3$)	Action Level ($\mu\text{g}/\text{m}^3$)	Limit Level ($\mu\text{g}/\text{m}^3$)
November	ASR 1	109	47 - 244	213	260
2020 to March	ASR 5	108	47 - 176	238	260
2021	AQMS1	81	37 - 141	213	260
	ASR6	106	62 - 185	238	260
	ASR10	73	46 - 121	214	260

In this reporting period, a total of 25 monitoring events were undertaken. Six (6) Action Level exceedances and one (1) Limit Level exceedance of 1-hour TSP were recorded in the air quality monitoring in this reporting period. Two (2) Action Level exceedances of 24-hour TSP were recorded in the air quality monitoring during this reporting period. No Limit Level exceedance of 24-hour TSP was recorded. Summary of exceedances for Air Quality Impact Monitoring in this reporting period is detailed in *Table 2.13*.

As shown in *Table 2.5*, the annual average 1-hour TSP and 24-hour TSP level in the reporting period were generally lower than the corresponding average levels of baseline at some monitoring stations. The annual average 1-hour TSP was higher than the corresponding average levels of baseline at ASR1, ASR5 and ASR6.

In order to determine any significant air quality impacts caused by construction activities from this Contract, one-way ANOVA (with setting α at 0.05) was conducted to examine whether the observed differences are significant between reporting period and baseline monitoring. For 1-hour TSP, the average results of monitoring stations AQMS1 and ASR10 in the reporting period were lower than the average results of baseline monitoring while the average results of monitoring stations ASR1, ASR6 and ASR5 in the reporting period were higher than the average results of baseline monitoring (AQMS1: $F_{1,116} = 0.053, p = 0.819$, ASR6: $F_{1,116} = 4.43, p = 0.038$, ASR1: $F_{1,116} = 4.30, p = 0.040$, ASR10: $F_{1,116} = 17.38, p < 0.01$ and ASR5: $F_{1,116} = 11.09, p < 0.01$). For 24-hour TSP, the average results of all monitoring stations in the reporting period were significantly lower than the average results of baseline monitoring (AQMS1: $F_{1,38} = 24.59, p < 0.01$, ASR6: $F_{1,38} = 30.49, p < 0.01$, ASR1: $F_{1,38} = 1.72, p = 0.198$, ASR10: $F_{1,38} = 44.58, p < 0.01$ and ASR5: $F_{1,38} = 20.41, p < 0.01$). In the reporting period, 1-hour and 24-hour TSP were 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 $\mu\text{g}/\text{m}^3$)

Monitoring Station	Average Baseline Monitoring	Average Impact Monitoring
ASR1(1-hour TSP)	125	160
ASR1(24-hour TSP)	128	109
ASR5(1-hour TSP)	138	179
ASR5(24-hour TSP)	167	108
AQMS1(1-hour TSP)	131	129
AQMS1(24-hour TSP)	127	81
ASR6(1-hour TSP)	135	155
ASR6(24-hour TSP)	166	106
ASR10(1-hour TSP)	134	103
ASR10(24-hour TSP)	129	73

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 during the reporting period.

Table 2.6 Linear Regression Result of TSP Monitoring

Parameter	Station	R ²	F-ratio	p-value	Intercept	Coefficient
1-hour TSP	AQMS1	<u>0.042</u>	$F_{1,74} = 3.21$	<u>0.030</u>	679.4	-0.210
	ASR6	<u>0.020</u>	$F_{1,74} = 1.52$	<u>0.111</u>	655.6	-0.191
	ASR1	<u>0.121</u>	$F_{1,74} = 10.07$	<0.001	2549.6	-0.910
	ASR10	<u>0.005</u>	$F_{1,74} = 0.35$	<u>0.352</u>	281.0	-0.068
	ASR5	<u>0.060</u>	$F_{1,74} = 4.69$	<u>0.032</u>	20568.6	-0.461
24-hour TSP	AQMS1	<u>0.245</u>	$F_{1,24} = 7.45$	0.006	829.0	-0.285
	ASR6	<u>0.213</u>	$F_{1,24} = 6.24$	<u>0.011</u>	1038.7	-0.356

Parameter	Station	R ²	F-ratio	p-value	Intercept	Coefficient
	ASR1	<u>0.335</u>	F _{1,24} = 11.58	0.001	1749.4	-0.625
	ASR10	<u>0.306</u>	F _{1,24} = 10.02	0.002	811.3	-0.281
	ASR5	<u>0.296</u>	F _{1,24} = 9.65	0.003	1327.0	-0.464

Note:

1. Dependent variable is set as TSP levels (in µg/m³) and independent variable is set as number of day of construction works.

2. R² < 0.6 and p-value > 0.01 (i.e. showing the regression insignificant) are underlined.

2.2 WATER QUALITY MONITORING

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

2.2.1 Monitoring Requirements & Equipment

According to the Updated EM&A Manual, an operational phase water quality monitoring shall be performed monthly during the first year of Project operation at all designated monitoring stations including control stations. The operational phase water quality monitoring shall be ceased after the first year of operation of the Project subject to the first year review. Operational phase water quality monitoring commenced in June 2020 and completed in May 2021. Locations of water quality monitoring stations presented in Figure 2.2 and in Table 2.7.

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

Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS(Mf)11	Impact Station (Close to HKBCF construction site)	813562	820716	<ul style="list-style-type: none"> Temperature(°C) pH(pH unit) Turbidity (NTU) Water depth (m) Salinity (ppt) 	3 water depths: 1m below sea	Monthly at each station, at mid-flood and mid-ebb tides during the first year of Project operation.
SR4(N2)	Sensitive receiver (Tai Ho Inlet)	814688	817996	<ul style="list-style-type: none"> DO (mg/L and % of saturation) 	surface, mid-depth and 1m above	
CS2(A)	Control Station	805232	818606	<ul style="list-style-type: none"> SS (mg/L) 		

⁽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 ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
CS(Mf)5	Control Station	817990	821129		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.	

***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. With reference to the EM&A Report under Contract No. HY/2011/03, water quality monitoring station SR3 was relocated to SR3(N) since 1 September 2017.

With reference to the EM&A Report under Contract No. HY/2011/03, water quality monitoring station SR4 was relocated to SR4(N) since 1 January 2018.

With reference to the EM&A Report under Contract No. HY/2011/03, water quality monitoring station SR4(N) was relocated to SR4(N2) since 21 August 2019.

With reference to the EM&A Report under Contract No. HY/2011/03, water quality monitoring station CS2 was relocated to CS2(A) since 23 August 2017.

Table 2.8 summarizes the equipment used in the impact, post construction and operational phase water quality monitoring programme.

Table 2.8 Water Quality Monitoring Equipment

Equipment	Model	Qty.
Multi-Parameters	YSI ProDss 18A104824	1
Multi-Parameters	YSI ProDss 17H105557	1
Multi-Parameters	YSI ProDss 16H104234	1
Multi-Parameters	YSI ProDss 16H104233	1
Multi-Parameters	YSI ProDss 15M100005	1
Multi-Parameters	YSI 6920V2 00019CB2	1
Multi-Parameters	YSI 6920V2 0001C6A7	1
Positioning Equipment	Furuno GP-170	1
Water Depth Detector	Lowrance Mark 5x / Garmin Striker 4	1

2.2.2 Results and Observations

In this reporting period, a total of 7 monitoring events were undertaken for operational phase water quality monitoring. Operational phase monitoring results are presented graphically in *Appendix E* and detailed operational phase water quality monitoring data were reported in the *Eighty-fifth to Ninety-first Monthly EM&A Reports*.

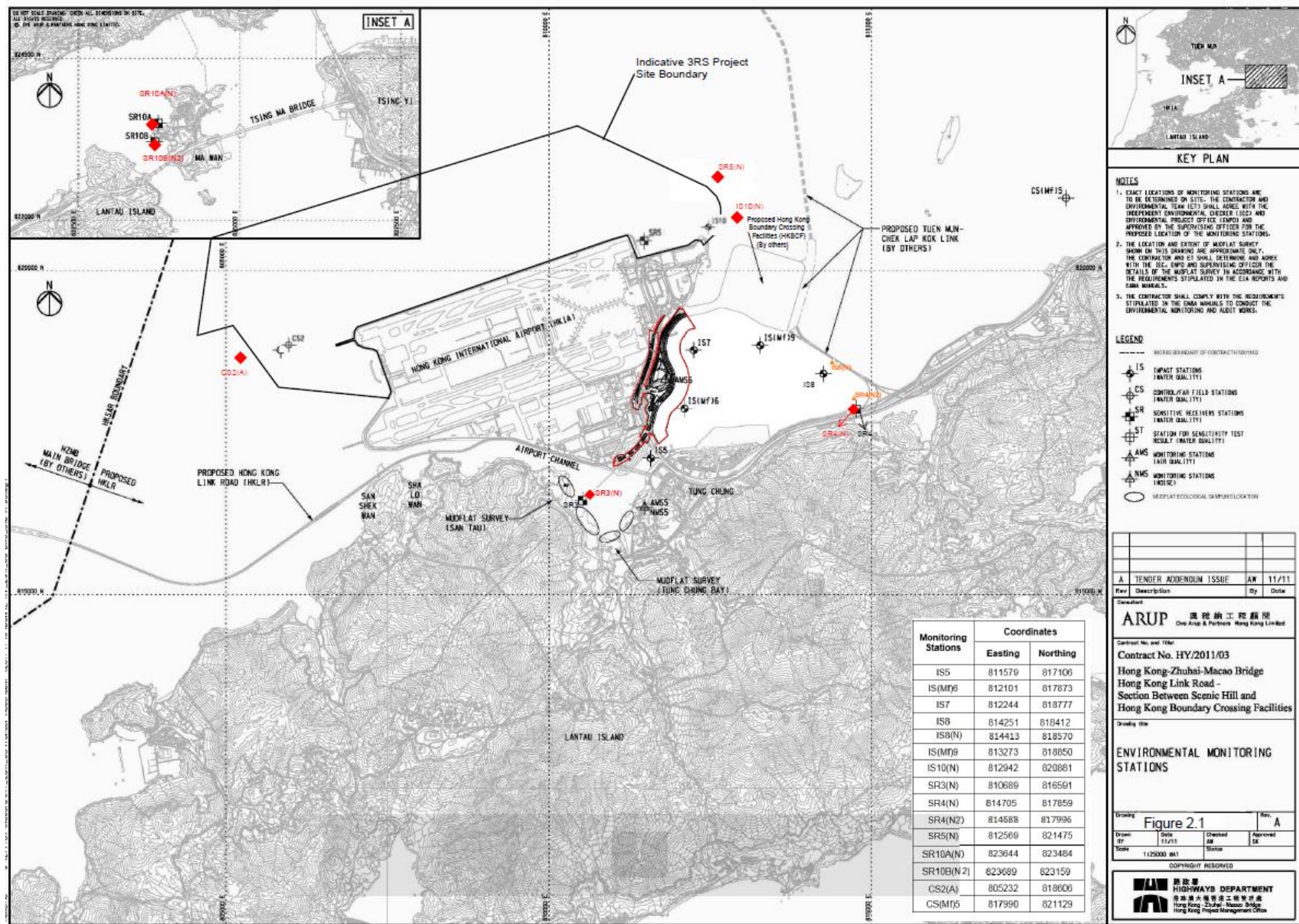


Figure 2.2

Operational Phase Water Quality Monitoring Stations SR3(N), CS2(A), SR4(N2) & CS(Mf)5

(Source from Contract No. HY/2011/03 EM&A Report)

Environmental Resources Management



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, Contract No. HY/2012/08 has taken over the responsibility for implementation of dolphin monitoring from HZMB HKLR Contract No. HY/2011/03 since October 2019.

According to the EM&A Manual, Operational Phase Monitoring on dolphin monitoring shall be undertaken based upon the frequency of forty-eight, one-day survey events at a frequency of 2 per month over a period of 24 months following cessation of the construction. Post construction (operational) phase dolphin monitoring commenced since June 2019.

2.3.2 *Monitoring Equipment*

Table 2.9 summarize the equipment used for the impact and operational phase dolphin monitoring.

Table 2.9 *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 and operational phase dolphin monitoring were carried out in the NEL and NWL along the line transect as depicted in Figure 2.3. The coordinates of all transect lines are shown in Table 2.10 below.

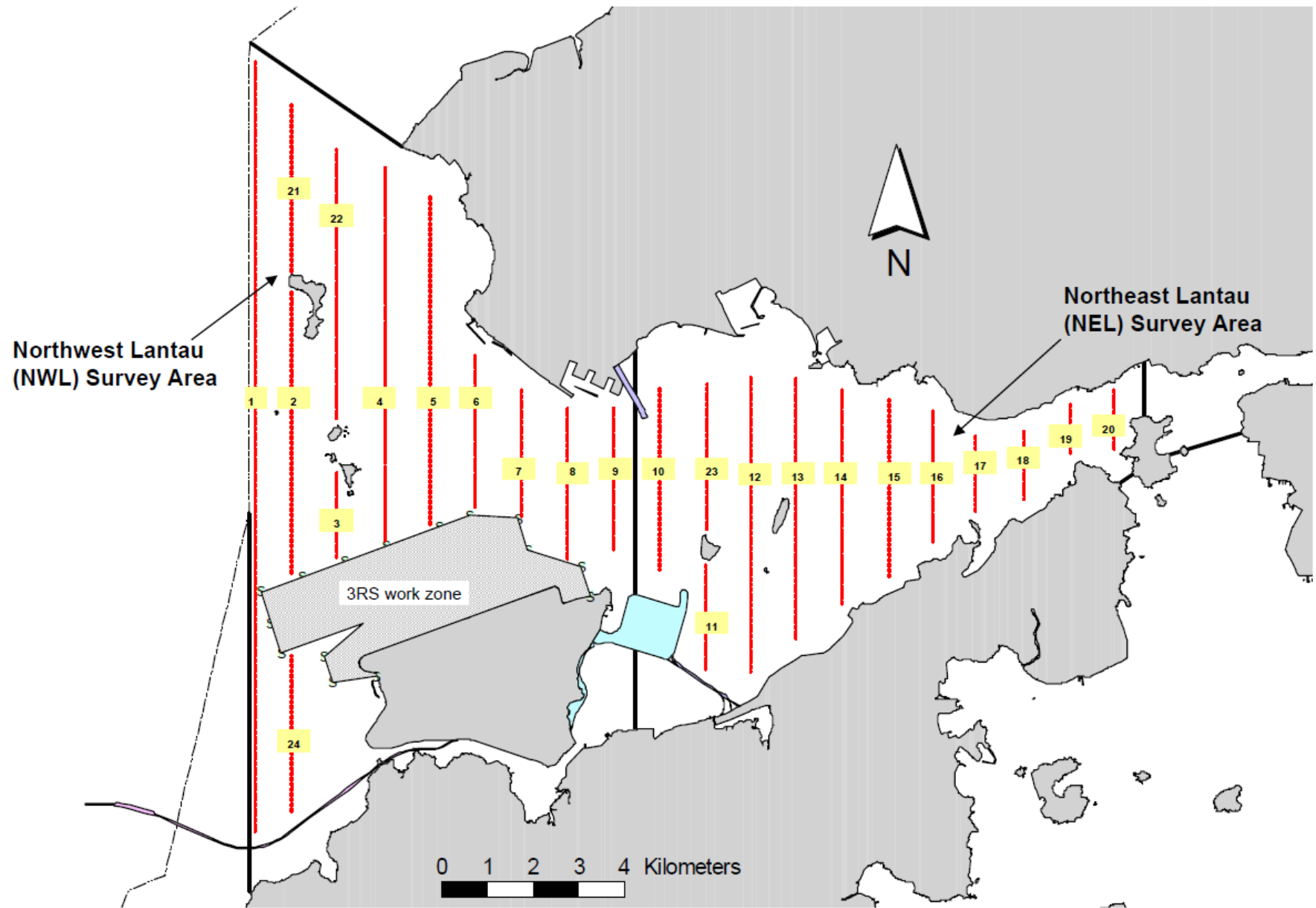


Figure 2.3

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

Table 2.10 *Impact and Operational Phase Dolphin Monitoring Line Transect Co-ordinates*

Line No.		Easting	Northing	Line No.		Easting	Northing
1	Start Point	804671	815456	13	Start Point	816506	819480
1	End Point	804671	831404	13	End Point	816506	824859
2	Start Point	805476	820800*	14	Start Point	817537	820220
2	End Point	805476	826654	14	End Point	817537	824613
3	Start Point	806464	821150*	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	821500*	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	821850*	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	822150*	18	Start Point	821504	822371
6	End Point	809490	825352	18	End Point	821504	823761
7	Start Point	810499	822000*	19	Start Point	822513	823268
7	End Point	810499	824613	19	End Point	822513	824321
8	Start Point	811508	821123	20	Start Point	823477	823402
8	End Point	811508	824254	20	End Point	823477	824613
9	Start Point	812516	821303	21	Start Point	805476	827081
9	End Point	812516	824254	21	End Point	805476	830562
10	Start Point	813525	821176	22	Start Point	806464	824033
10	End Point	813525	824657	22	End Point	806464	829598
11	Start Point	814556	818853	23	Start Point	814559	821739
11	End Point	814556	820992	23	End Point	814559	824768
12	Start Point	815542	818807	24*	Start Point	805476*	815900*
12	End Point	815542	824882	24*	End Point	805476*	819100*

Remarks: The coordinates of several starting and ending points have been revised since August 2017 due to the presence of a work zone to the north of the airport platform with intense construction activities in association with the construction of the third runway expansion for the Hong Kong International Airport. Co-ordinates in red and marked with asterisk are revised co-ordinates of transect line.

2.3.5 *Action & Limit Levels*

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

2.3.6 *Results & Observations*

Results of the operational phase dolphin monitoring between June 2020 and May 2021 were presented in this session.

A total of 3,097.24 km of survey effort was collected, with 99.4% of the total survey effort being conducted under favourable weather conditions (ie Beaufort Sea State 3 or below with good visibility) in the first year of operational phase monitoring. Amongst the two areas, 1,140.90 km and 1,946.34 km of survey effort were collected from NEL and NWL survey areas, respectively. The total survey effort conducted on primary and secondary lines were 2,291.49 km and 795.75 km, respectively. The survey efforts are summarized in *Appendix F*.

A total of 22 groups of 58 Chinese White Dolphin sightings were recorded during the 24 sets of surveys in the first year of operational phase monitoring. All sightings were made during on-effort search. Nineteen (19) on-effort sightings were made on primary lines, while three (3) other on-effort sightings were made on secondary lines. During this reporting year, all dolphin groups were sighted in NWL, while none of them were sighted in NEL.

Dolphin sighting distribution of the first year operational phase monitoring period (June 2020 to May 2021) was compared to the ones during the baseline phase (February 2011 to January 2012), transitional phase (November 2012 to October 2013) and the first, second, third, fourth and fifth years of impact phase (November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016, November 2017 to October 2018 and November 2018 to October 2019 respectively). As TMCLKL construction works commenced in November 2013, a 12-month period between baseline phase and impact phase is defined as transitional phase.

During the 12-month operational 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 2.21*.

Table 2.21 *Average Daily 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
Operational Phase (2020-21)	0.00	1.31 ± 1.88	0.00	3.39 ± 5.73
Impact Phase (2018-19)	0.00	1.42 ± 1.80	0.00	3.62 ± 4.93
Impact Phase (2017-18)	0.00	2.68 ± 3.04	0.00	9.02 ± 14.63
Impact Phase (2016-17)	0.00	2.35 ± 2.62	0.00	8.57 ± 11.05
Impact Phase (2015-16)	0.00	2.10 ± 1.83	0.00	8.54 ± 8.53
Impact Phase (2014-15)	0.11 ± 0.54	2.54 ± 2.49	0.11 ± 0.54	11.64 ± 14.04

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

Note: Comparison of average daily dolphin encounter rates from the first, second, third, fourth, fifth and sixth years of impact phase (November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016, November 2016 to October 2017, November 2017 to October 2018 and November 2018 to October 2019 respectively), transitional phase (November 2012 - October 2013), baseline phase monitoring periods (February 2011 - January 2012) and operational phase monitoring period (June 2020 - May 2021). ± denotes the standard deviation of the value.

Group size of Chinese White Dolphins ranged from one to eight (1-8) individuals per group in North Lantau region during June 2020 - May 2021. The average dolphin group sizes from the 12-month operational phase monitoring period were compared with the ones deduced from baseline and transitional phases, as shown in *Table 2.22*.

Table 2.22 Comparison of Average Dolphin Group Sizes from Operational Monitoring Period, Impact Monitoring Period and Baseline Monitoring Period

	Average Dolphin Group Size		
	Overall	Northeast Lantau	Northwest Lantau
Operational Phase (2020-21)	2.64 ± 2.08 (n = 22)	0.00	2.64 ± 2.08 (n = 22)
Impact Phase (2018-19)	2.52 ± 1.45 (n = 27)	0.00	2.52 ± 1.45 (n = 27)
Impact Phase (2017-18)	3.12 ± 2.86 (n = 42)	0.00	3.12 ± 2.86 (n = 42)
Impact Phase (2016-17)	3.51 ± 2.68 (n = 43)	0.00	3.51 ± 2.68 (n = 43)
Impact Phase (2015-16)	3.73 ± 3.14 (n = 45)	1.00 (n = 1)	3.80 ± 3.14 (n = 44)
Impact Phase (2014-15)	4.24 ± 3.15 (n = 54)	1.00 (n = 1)	4.30 ± 3.15 (n = 53)
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)

Note: Comparison of average dolphin group sizes from the first, second, third, fourth, fifth and sixth years of impact phase (November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016, November 2016 to October 2017, November 2017 to October 2018 and November 2018 to October 2018 respectively), transitional phase (November 2012 - October 2013), baseline phase monitoring periods (February 2011 - January 2012) and operational phase monitoring period (June 2020 - May 2021). (± denotes the standard deviation of the average value)

Whilst four (4) Limit Level exceedances were observed for the quarterly dolphin monitoring data between June 2020 and May 2021.

In this reporting period, three (3) Limit Level exceedances were recorded for three (3) sets of quarterly post-construction (operational) dolphin monitoring data between November 2020 and May 2021. 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 North Lantau region for the rest of the impact phase monitoring period.

2.3.7 *Implementation of Marine Mammal Exclusion Zone*

No marine works were undertaken since 30 December 2019, therefore, daily 250 m marine mammal exclusion zone monitoring was not undertaken since 30 December 2019.

No Passive Acoustic Monitoring (PAM) was implemented in the reporting period.

2.4 *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. Twenty (20) site inspections were carried out in the reporting period. Key observations were summarized in the *Eighty-fifth to Ninety-first Monthly EM&A Reports*.

2.5 *WASTE MANAGEMENT STATUS*

The Contractor was registered 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) and recyclable materials. 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 2.11*.

Table 2.11 *Quantities of Different Waste Generated in the Reporting Period*

Month/Year	Inert Construction Waste (a) (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 2020	251
December 2020	554	0	173	0	0	0	
January 2021	1031	0	71	0	0	0	
February 2021	210	0	11	0	0	0	
March 2021	409	0	34	0	0	0	
April 2021	8	0	68	0	0	0	
May 2021	0	0	28	0	0	0	
Total	2463	0	552	0	0	0	0

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.

2.6 *ENVIRONMENTAL LICENSES AND PERMITS*

The status of environmental licensing and permit is summarized in *Table 2.12* below.

Table 2.12 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/D	13-Mar-15	Throughout the Contract	HyD	Application for VEP on 3 March 2015 to supersede EP-354/2009/C
Construction Dust Notification	435068	27-Jun-18	Throughout the Contract	DBJV	Northern Landfall
Construction Dust Notification	435505	12-Jul-18	Throughout the Contract	DBJV	Southern Landfall
Chemical Waste Registration	5213-422-D2516-02	18-Jan-17	Throughout the Contract	DBJV	Northern Landfall
Chemical Waste Registration	5213-951-D2591-01	25-May-16	Throughout the Contract	DBJV	Southern Landfall
Construction Waste Disposal Account	7018108	28-Aug-13	Throughout the Contract	DBJV	Waste disposal in Contract No. HY/2012/08
Waste Water Discharge License	WT00031435-2018	2-Aug-18	31-Aug-23	DBJV	Southern Landfall
Waste Water Discharge License	WT00034060-2019	25-Jul-19	30-Jun-24	DBJV	Northern Landfall (4 Discharge Point)
Construction Noise Permit	GW-RS0418-20	22-Jun-20	21-Dec-20	DBJV	Southern Landfall

Notes:

HyD = Highways Department

DBJV = Dragages - Bouygues Joint Venture

VEP = Variation of Environmental Permit

2.7 **IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES**

In response to the EM&A site audit findings mentioned in *Section 2.4* 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.

2.8 **SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT**

In this reporting period, a total of 25 air quality monitoring events were undertaken in which six (6) Action Level exceedances and one (1) Limit Level exceedance of 1-hour TSP were recorded in the air quality monitoring of this reporting period. Two (2) Action Level exceedances of 24-hour TSP were recorded in the air quality monitoring during this reporting period. No Limit Level exceedance of 24-hour TSP was recorded (*Table 2.13*).

Table 2.13 *Summary of Exceedances for Air Quality Impact Monitoring in this Reporting Year*

Station	Exceedance Level	Number of Exceedances	
		1-hr TSP	24-hr TSP
AQMS1	Action Level	0	0
	Limit Level	0	0
ASR1	Action Level	1	2
	Limit Level	1	0
ASR5	Action Level	4	0
	Limit Level	0	0
ASR6	Action Level	1	0
	Limit Level	0	0
ASR10	Action Level	0	0
	Limit Level	0	0
Total number of Action level Exceedances:		6	2
Total number of Limit level Exceedances:		1	0

There were a total of three (3) Limit Level exceedances were recorded for three (3) sets of quarterly post-construction (operational) dolphin monitoring data between November 2020 and May 2021.

Detailed investigation findings are presented in *the Twenty-Eighth to Thirtieth Quarterly EM&A Reports*.

Cumulative statistics are provided in *Appendix H*.

2.9 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.

No environmental complaint, non-compliance with EIA recommendations, EP conditions and other requirements and environmental summons associated with the construction of this Contract was recorded in this reporting period.

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

2.10 COMPARISON OF EM&A DATA WITH EIA PREDICTIONS

Findings of the EM&A activities undertaken during the period from 1 November 2020 to 31 May 2021 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.

2.10.1 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.

Excavation works for launching shaft were completed and notification of change on air quality monitoring frequency was submitted to EPD on 14 September 2020. 1-hr and 24-hr TSP monitoring frequency was changed to three times per day every six days and daily every six days, respectively, since 14 September 2020.

Comparison of EIA prediction, average baseline monitoring and average impact monitoring results of TSP is presented in *Table 2.14*.

Table 2.14 Comparison of EIA prediction and EM&A Results on Air Quality

Station	EIA Predicted Maximum	Maximum Impact Monitoring	Average Impact Monitoring	Maximum Baseline Monitoring	Average Baseline Monitoring
ASR1 (1-hour)	195	887	160	182	125
ASR1 (24-hour)	148	244	109	173	128
ASR5 (1-hour)	235	472	179	211	138

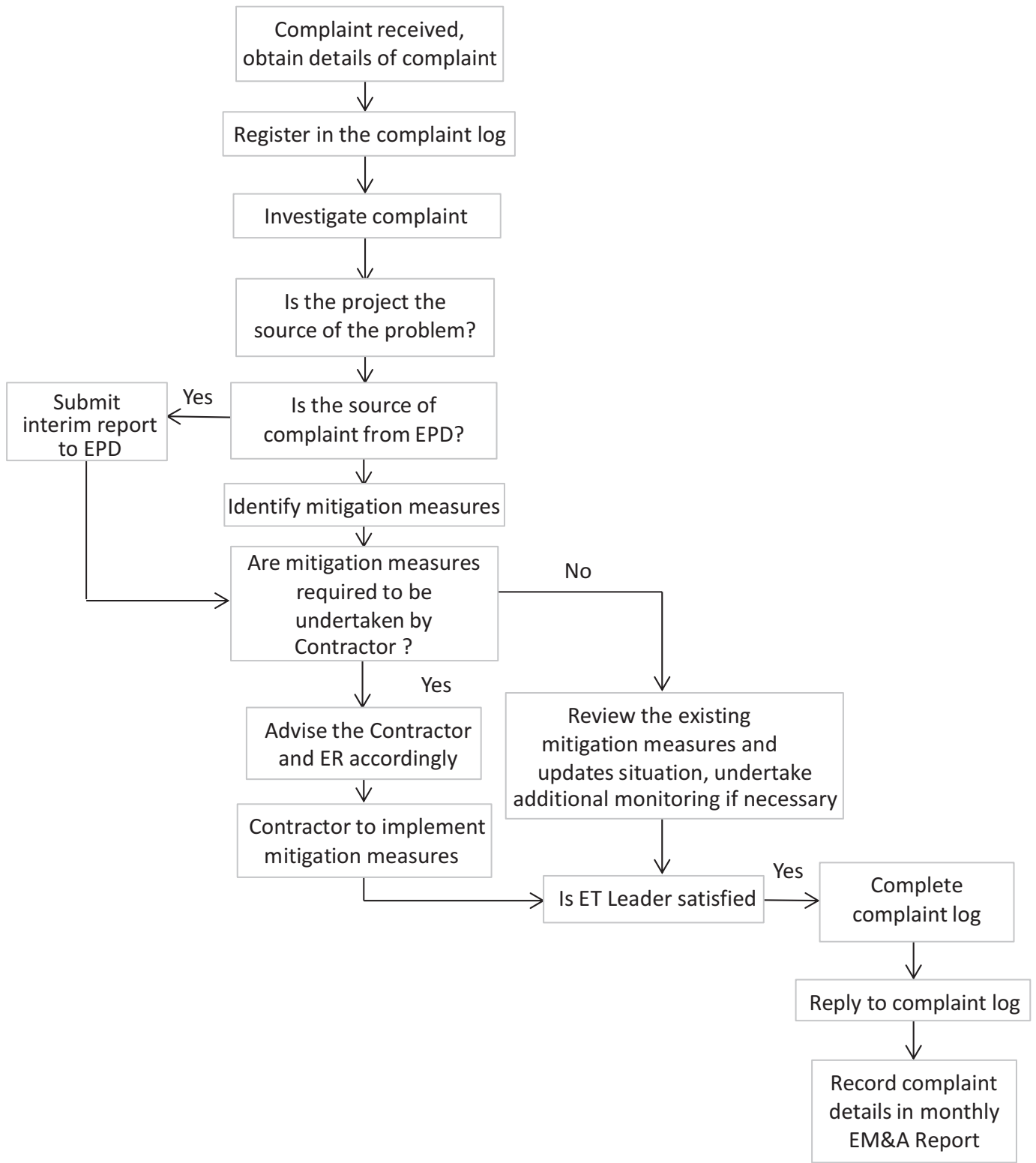


Figure 2.4

Environmental Complaint Handling Procedure

Station	EIA Predicted Maximum	Maximum Impact Monitoring	Average Impact Monitoring	Maximum Baseline Monitoring	Average Baseline Monitoring
ASR5 (24-hour)	133	176	108	249	167
AQMS1 (1-hour)	N/A	248	129	196	131
AQMS1 (24-hour)	N/A	141	81	211	127
ASR6 (1-hour)	226	358	155	226	135
ASR6 (24-hour)	153	185	106	221	166
ASR10 (1-hour)	189	246	103	215	134
ASR10 (24-hour)	112	121	73	181	129

As shown in *Table 2.14*, maximum 1-hour TSP at ASR1, ASR5, AQMS1, ASR6 and ASR10 and 24-hour TSP impact monitoring levels at ASR1 were higher than their corresponding EIA predicted maximum levels. Occasional exceedances were recorded at these stations during impact monitoring period. However, they were not project-related upon investigation. It also 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.

2.10.2 *Water Quality*

According to the Updated EM&A Manual, an operational phase water quality monitoring shall be performed monthly during the first year of Project operation at all designated monitoring stations including control stations. The operational phase water quality monitoring shall be ceased after the first year of operation of the Project subject to the first year review. Operational phase water quality monitoring commenced in June 2020 and completed in May 2021.

A total of 7 monitoring events were undertaken for operational phase water quality monitoring. Operational phase monitoring results are presented graphically in *Appendix E* and detailed operational phase water quality monitoring data were reported in the *Eighty-Fifth to Ninety-First Monthly EM&A Reports*.

2.10.3 *Marine Ecology*

During the operational phase monitoring period in 2020-21, the most heavily utilized habitats by Chinese White Dolphins were only found on both northwestern end of the North Lantau region, mainly to the north and east of Lung Kwu Chau. Dolphin usage of NWL waters declined during the present and previous phase monitoring periods. 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 monitoring period to keep track on the trend of dolphin ranging pattern.

2.10.4 *Waste Management*

For wastes generated from the construction activities including C&D materials (inert and non-inert), chemical wastes, recyclable materials and marine sediments (both categories L and M), the types of wastes generated were in line with the EIA predictions. The wastes were disposed of in accordance with the recommendations of the EIA.

2.11 *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 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.

2.12 *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 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. Six (6) Action Level exceedances and one (1) Limit Level exceedance of 1-hour TSP were recorded in the air quality monitoring of this reporting period. Two (2) Action Level exceedances of 24-hour TSP were recorded in the air quality monitoring of this reporting period. No Limit Level exceedance of 24-hour TSP was recorded.

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*

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*

No marine works were undertaken since 30 December 2019, therefore, daily 250 m marine mammal exclusion zone monitoring was not undertaken since 30 December 2019.

No Passive Acoustic Monitoring (PAM) was implemented in the reporting period.

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.

CONCLUSIONS

This Eighth Annual EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 November 2020 to 31 May 2021, in accordance with the Updated EM&A Manual and the requirements of EP-354/2009/D.

Air quality (including 1-hour TSP and 24-hour TSP) and dolphin monitoring were carried out in the reporting period. Six (6) Action Level exceedances and one (1) Limit Level exceedance of 1-hour TSP were recorded in the air quality monitoring of this reporting period. Two (2) Action Level exceedances of 24-hour TSP were recorded in the air quality monitoring of this reporting period. No Limit Level exceedance of 24-hour TSP was recorded. The Contractor was reminded to ensure that all dust mitigation measures are provided at the construction sites.

A total of 22 groups of 58 Chinese White Dolphin sightings were recorded during the 24 sets of surveys in the first year of operational phase monitoring. Three (3) Limit Level exceedances were recorded for three (3) sets of quarterly post-construction (operational) dolphin monitoring data between November 2020 and May 2021.

Twenty (20) 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.

No environmental complaint, non-compliance with EIA recommendations, EP conditions and other requirements and environmental summons associated with the construction of this Contract was recorded in this reporting period.

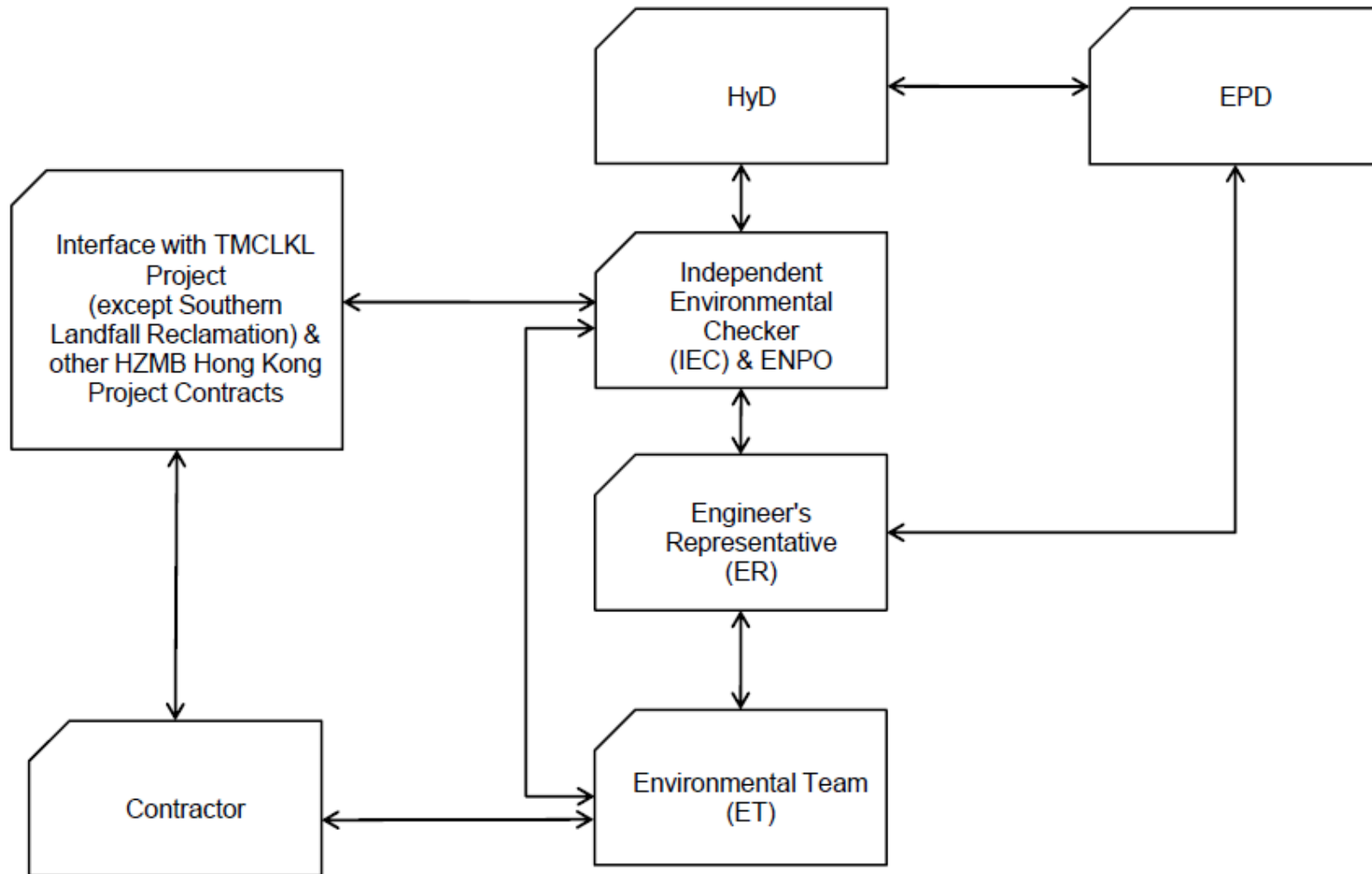
Termination proposal for construction EM&A programme was approved by EPD on 19 March 2021. The construction phase EM&A programme of the Contract has been terminated since 19 March 2021.

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 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



↔ Line of Communication

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		✓
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 practicable.	All exposed surfaces / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓

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						D	C	O	
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									
<i>Marine Works (Sequence A)</i>									
6.1	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		✓
Figure 6.2a Appendix D6a									
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		✓
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		✓

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						D	C	O	
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 - Reclamation dredging and filling for Portion 1 of HKLR;	TM-CLKL northern landfall, Portion D of HKBCF and HKLR	Contractor	TM-EIAO		Y		✓
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		✓

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						D	C	O	
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		✓
<i>General Marine Works</i>									
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 Guidelines. DASO permit conditions.		Y		✓
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		✓

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						D	C	O	
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 conditions.		Y		✓
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		✓
<i>Land Works</i>									
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		✓

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						D	C	O	
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		✓
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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						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		✓

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						D	C	O	
<i>Water Quality Monitoring</i>									
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	Operational phase water quality monitoring commenced in June 2020 and completed in May
ECOLOGY									
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 3,600m ² 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		✓

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						D	C	O	
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		✓
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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						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		<>
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		✓

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

*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	
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		✓
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		✓

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

*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	
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: - suitable for the substance to be held, - resistant to corrosion, maintained in good conditions and securely closed; - Having a capacity of <450L unless the specifications have been approved by the EPD; and - Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations. - Clearly labelled and used solely for the storage of chemical wastes; - Enclosed with at least 3 sides; - 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; - Adequate ventilation; - Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and - Incompatible materials are adequately separated.	All areas / throughout construction period	Contractor	TMEIA		Y		<>
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

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

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	
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		✓
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 $\mu\text{g}/\text{m}^3$	ASR1 = 213 ASR5 = 238 AQMS1 = 213 ASR6 = 238 ASR10 = 214	260
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	ASR1 = 331 ASR5 = 340 AQMS1 = 335 ASR6 = 338 ASR10 = 337	500

Table C2 Action and Limit Levels for Post-Construction 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 C3 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

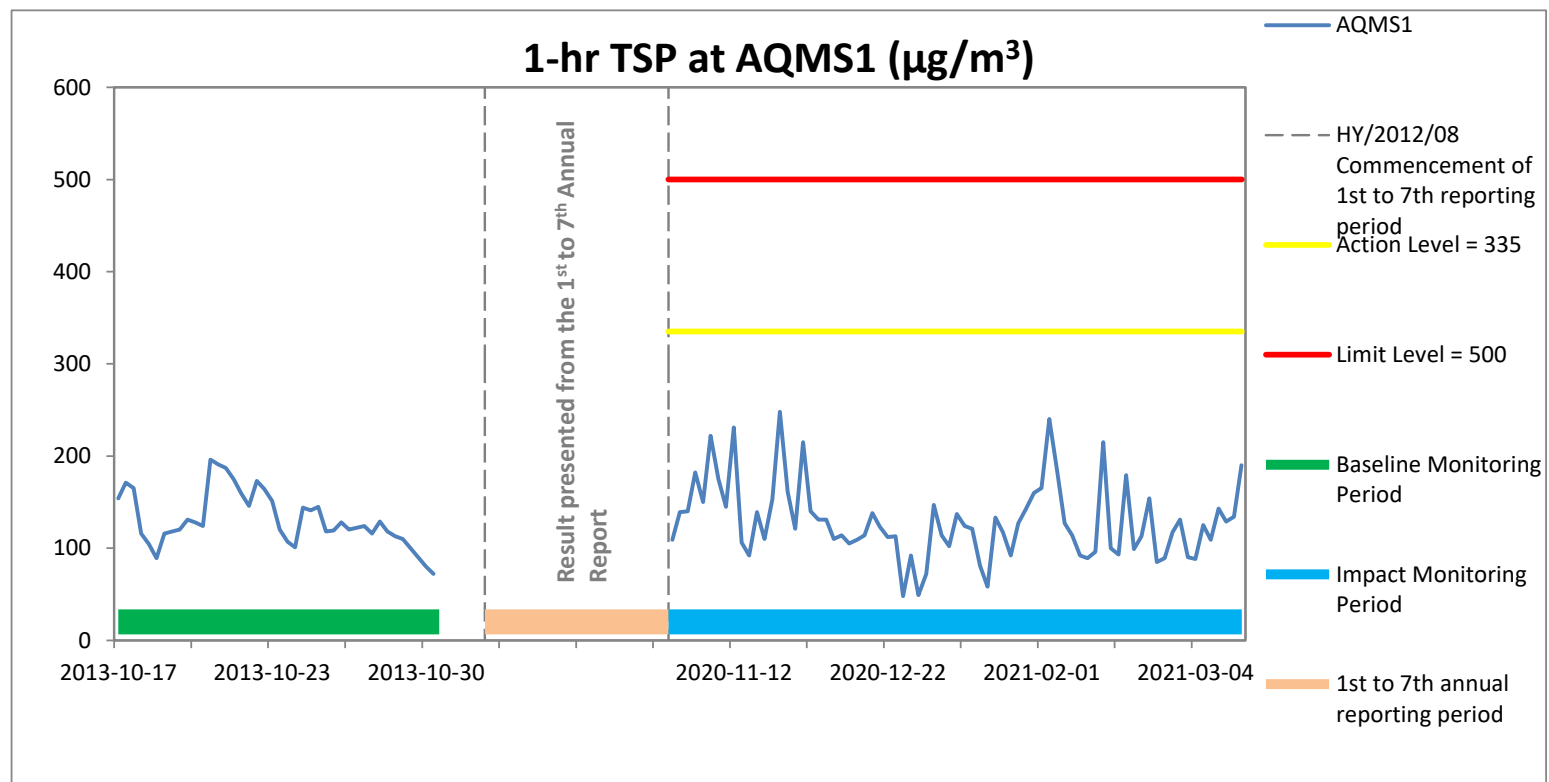


Figure D.1 Baseline & Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at AQMS1 between 17 October 2013 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx

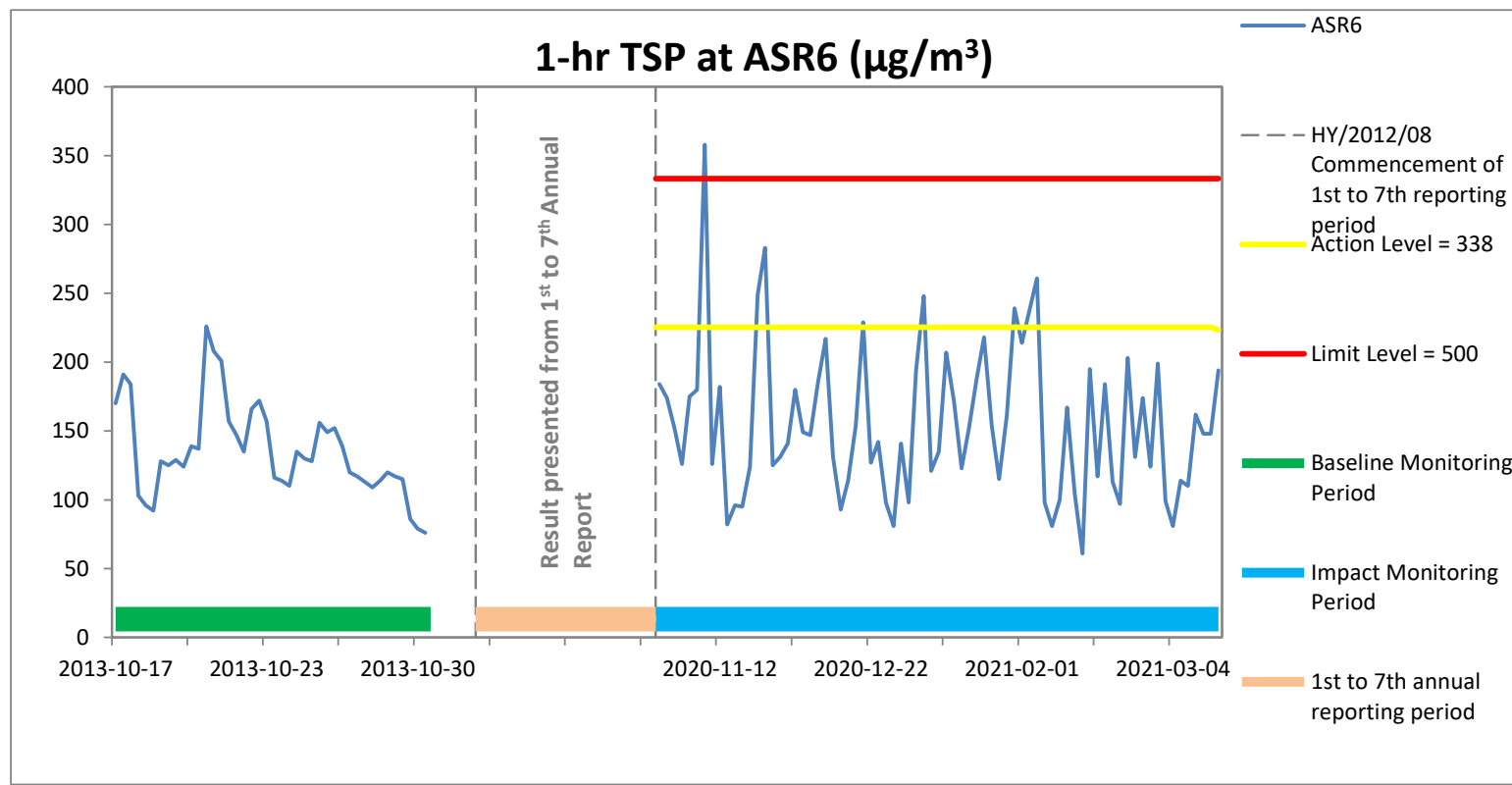


Figure D.2 Baseline & Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR6 between 17 October 2013 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



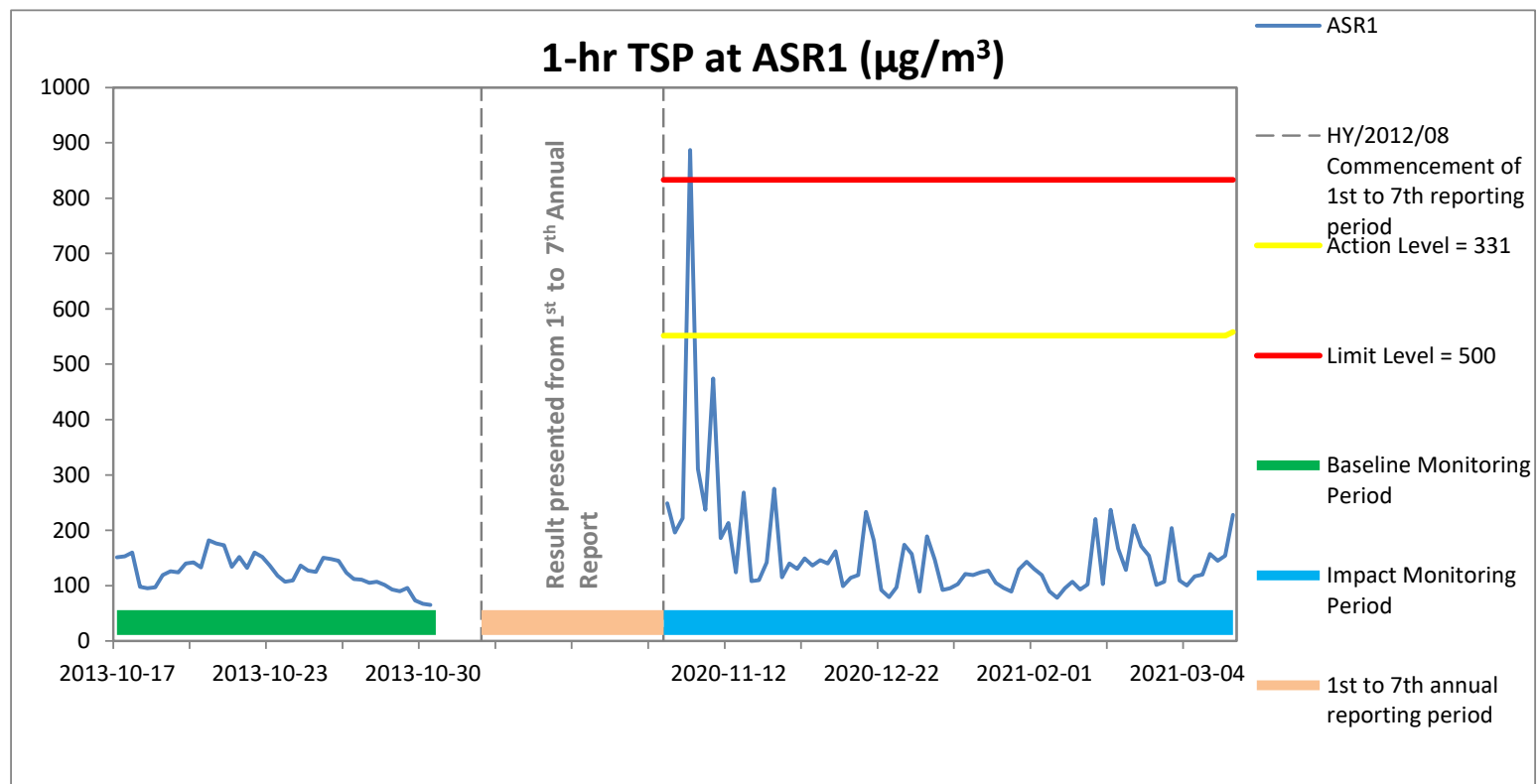


Figure D.3 Baseline & Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR1 between 17 October 2013 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



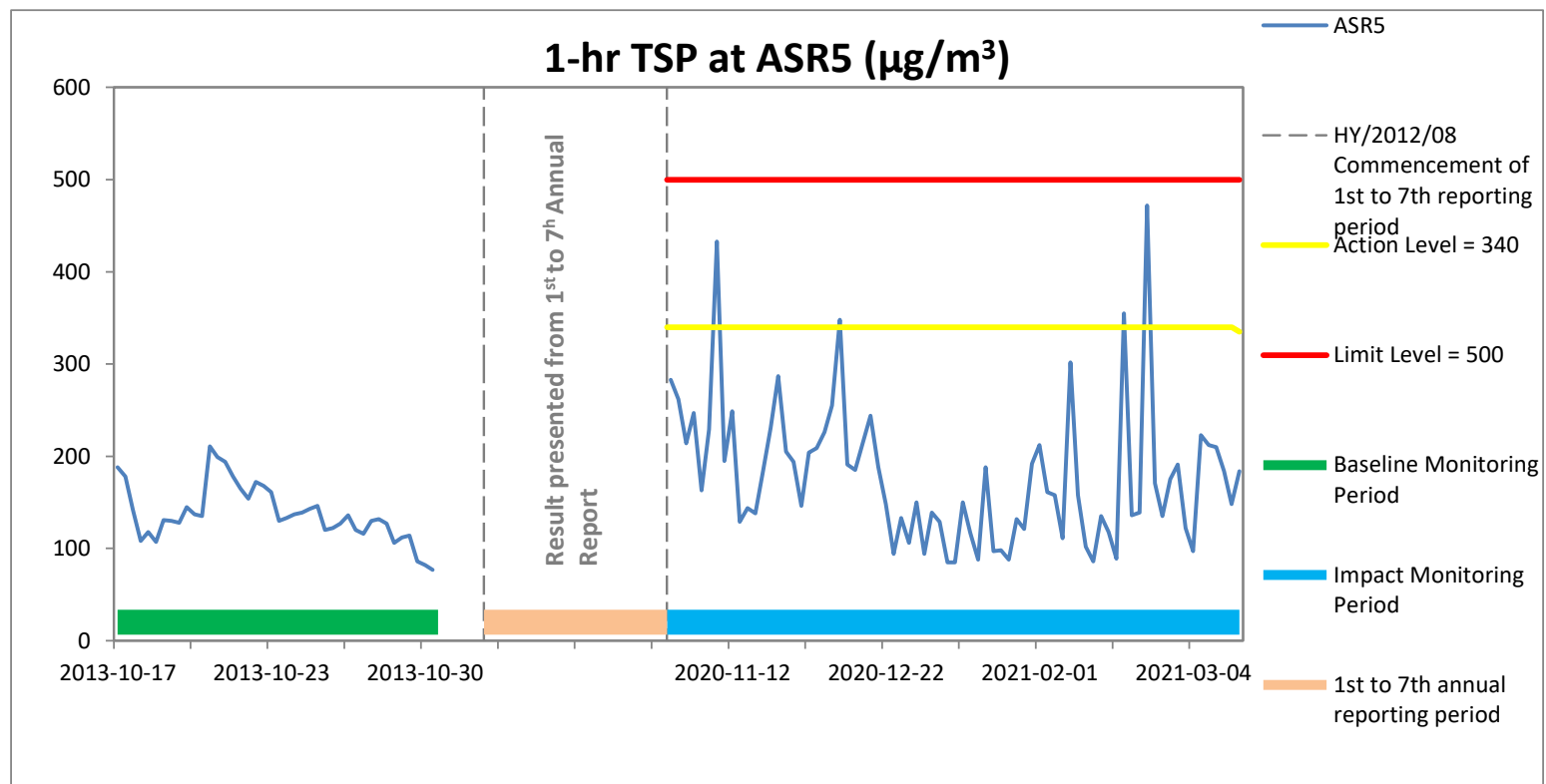


Figure D.4 Baseline & Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR5 between 17 October 2013 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



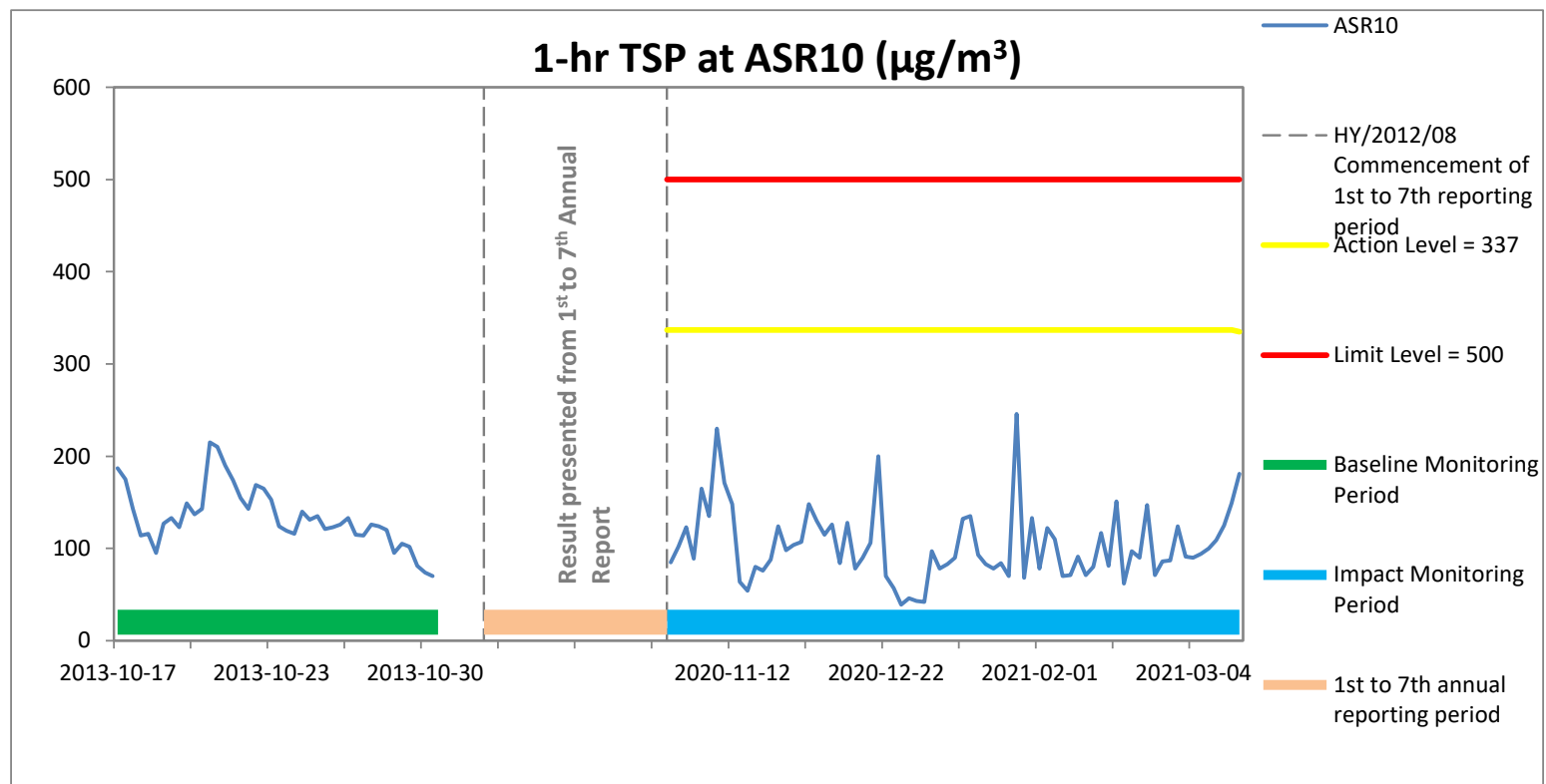


Figure D.5 Baseline & Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR10 between 17 October 2013 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



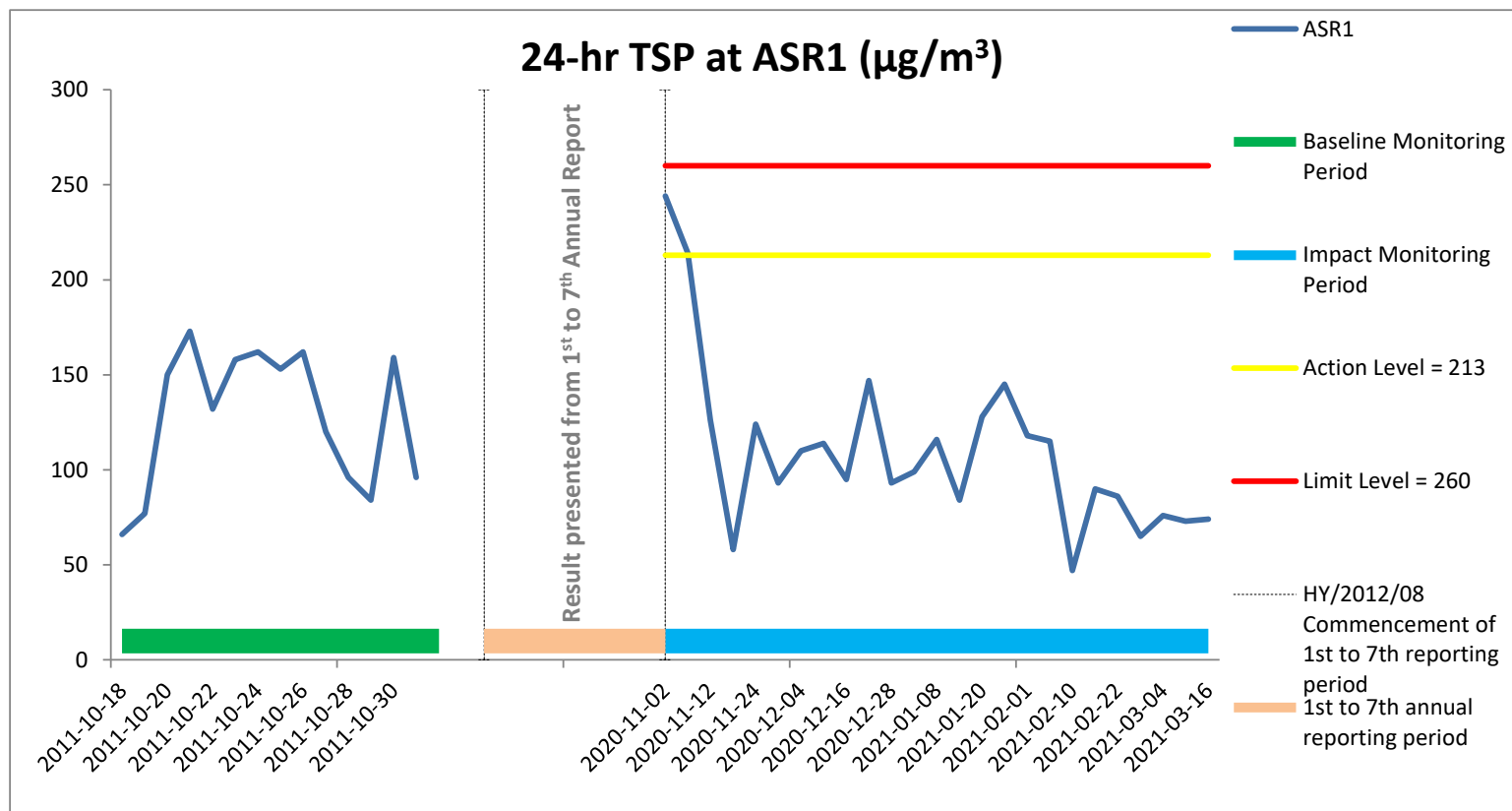


Figure D.6 Baseline & Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR1 between 17 October 2013 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



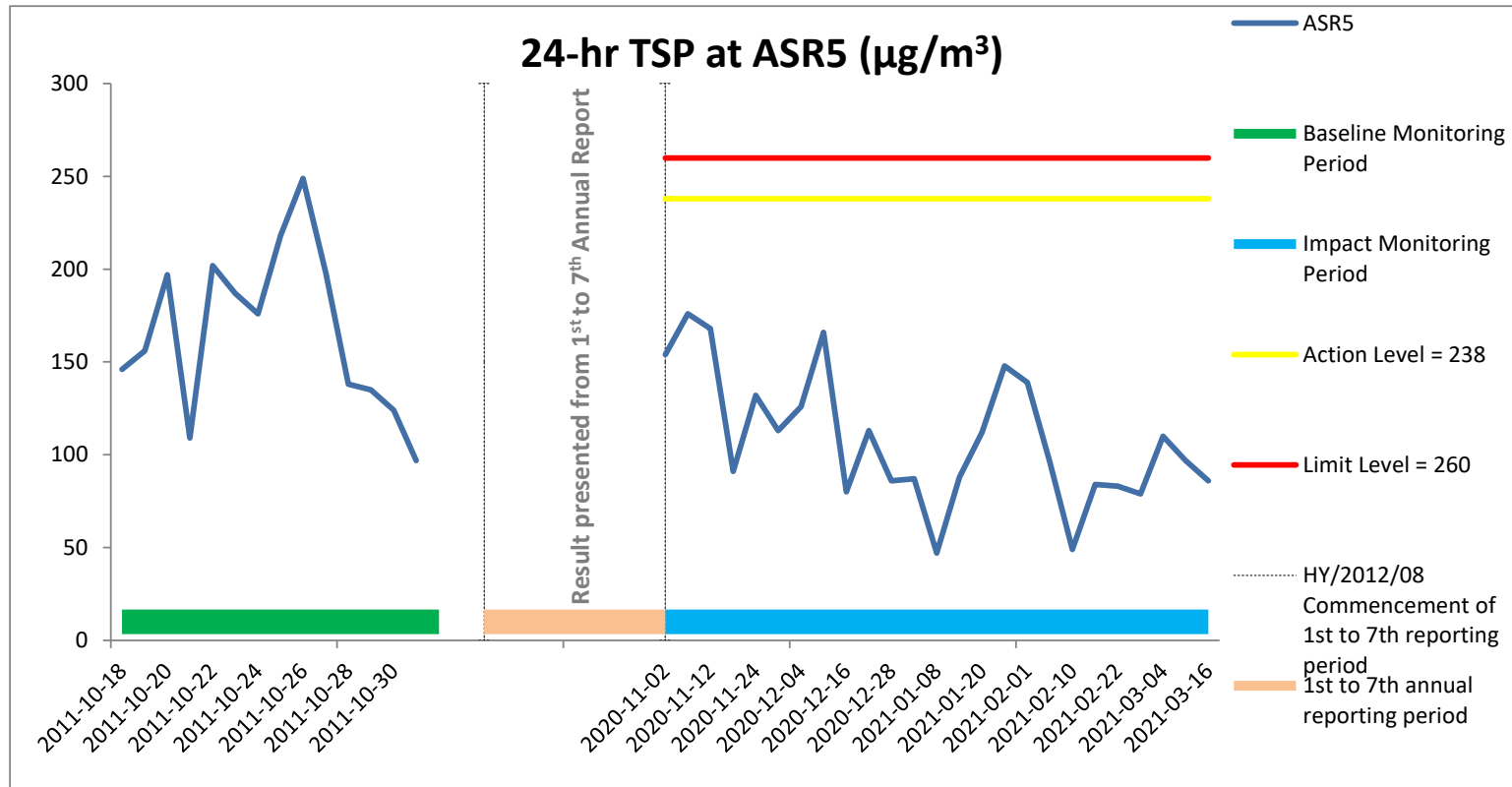


Figure D.7 Baseline & Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR5 between 17 October 2011 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



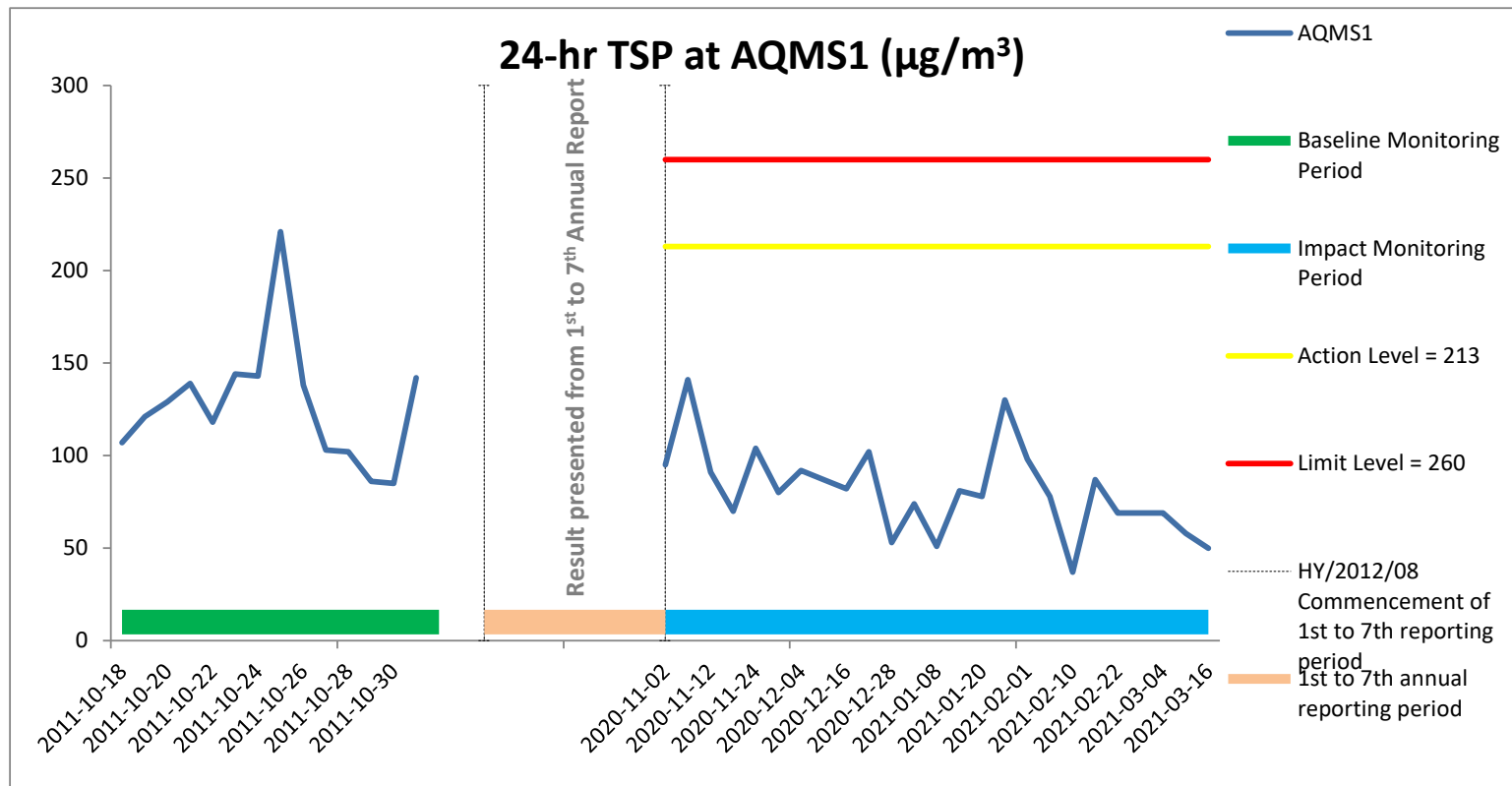


Figure D.8 Baseline & Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at AQMS1 between 17 October 2013 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



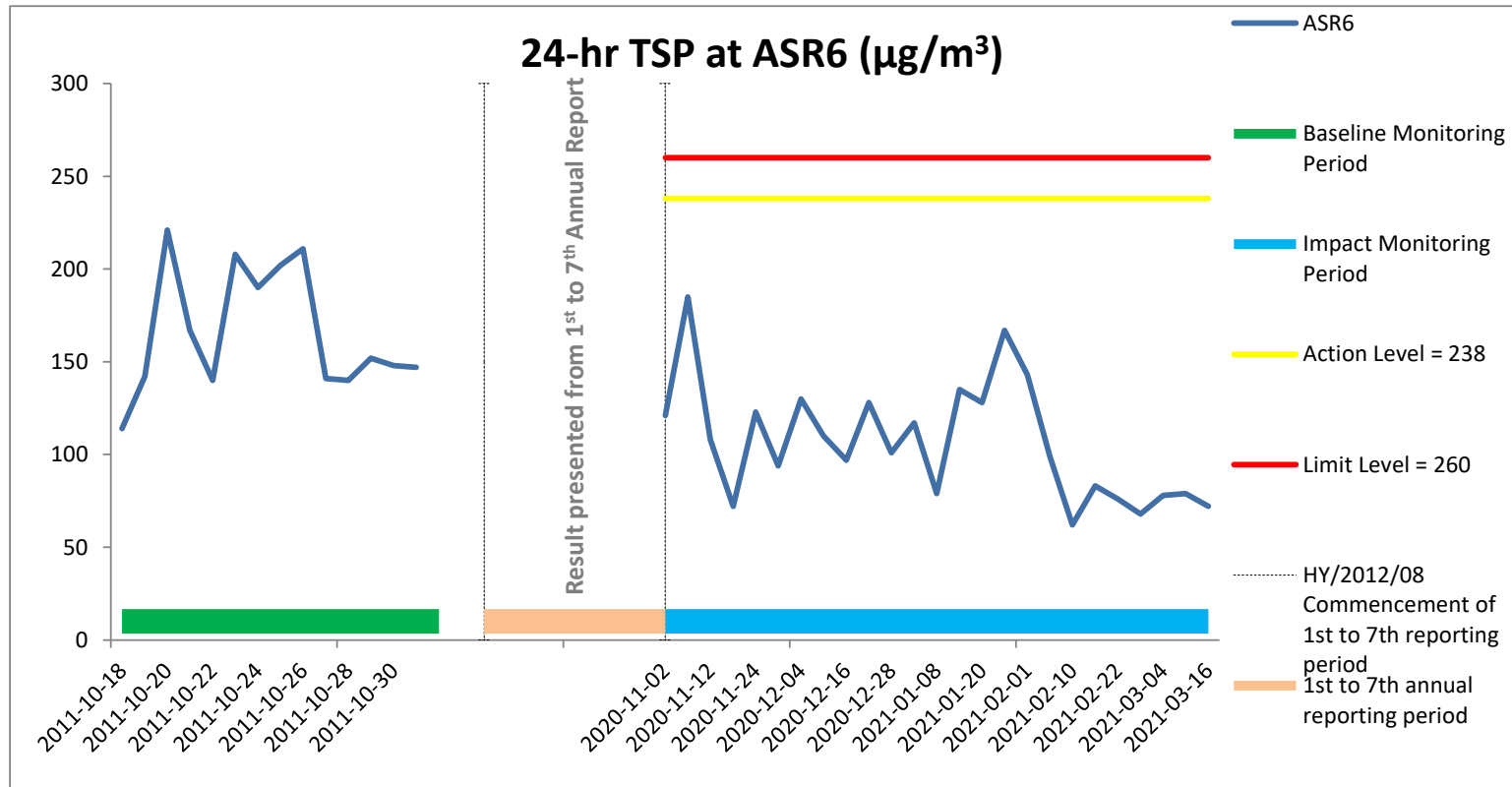


Figure D.9 Baseline & Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR6 between 17 October 2011 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



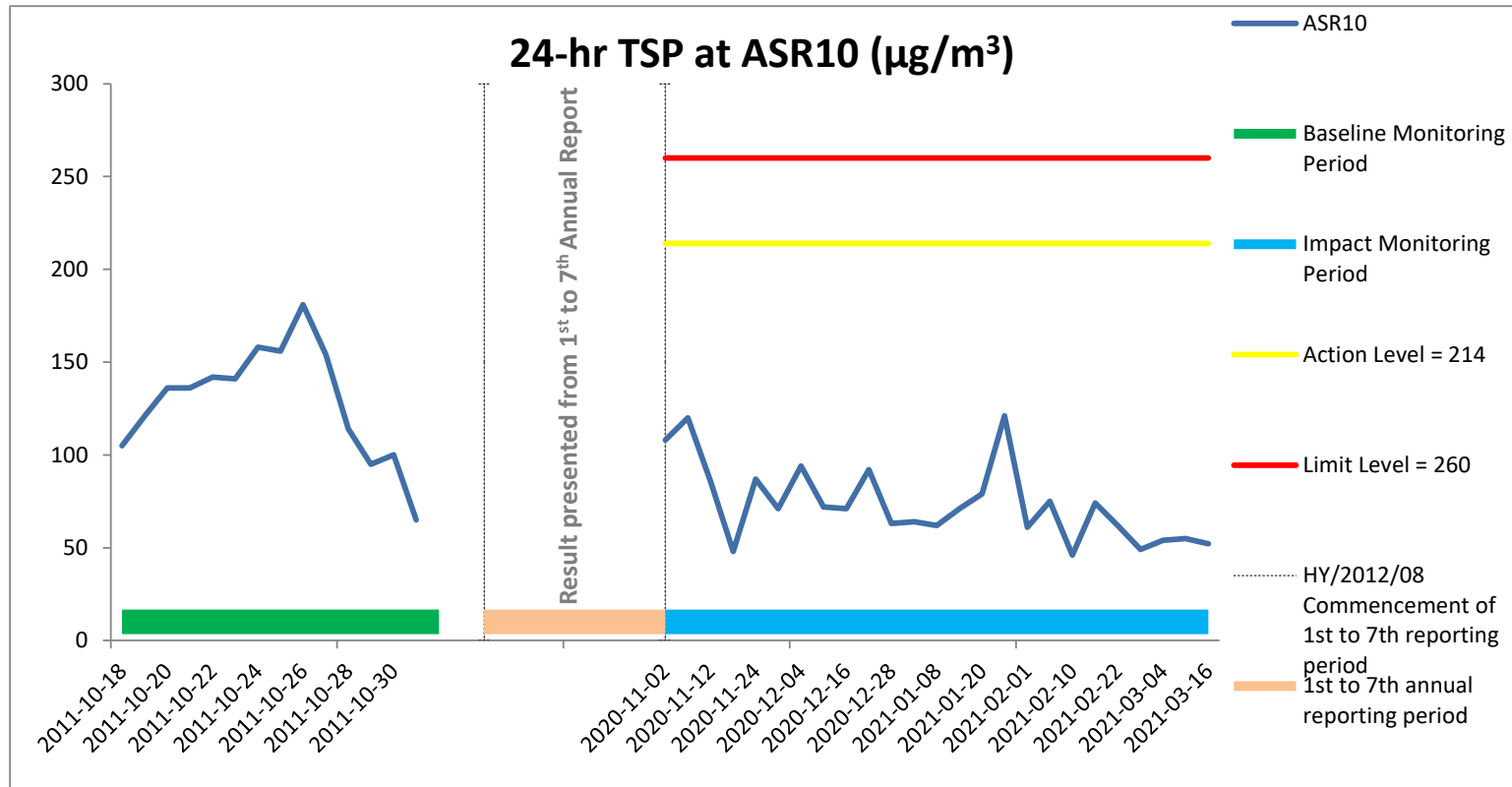


Figure D.10 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR10 between 17 October 2011 and 19 March 2021 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

Ref: 0212330_Impact AQM graphs_8thAnnual_REV a.xlsx



Appendix E

Operational Phase Water Quality Monitoring Results

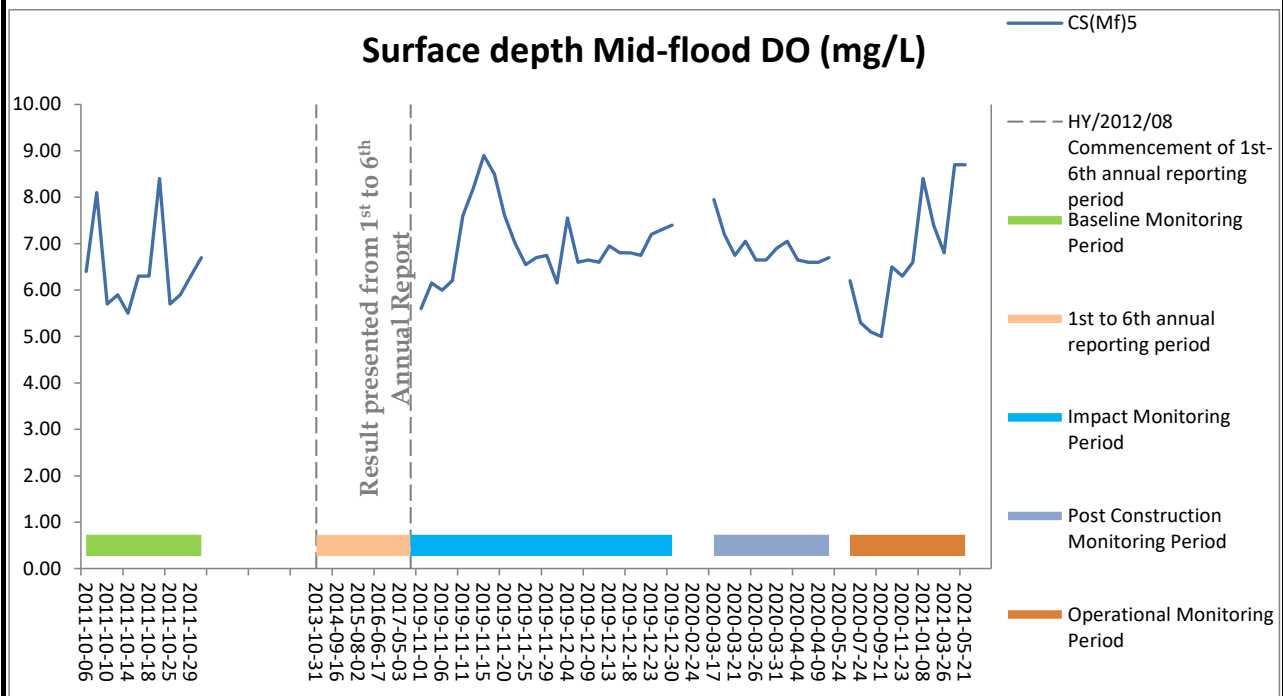
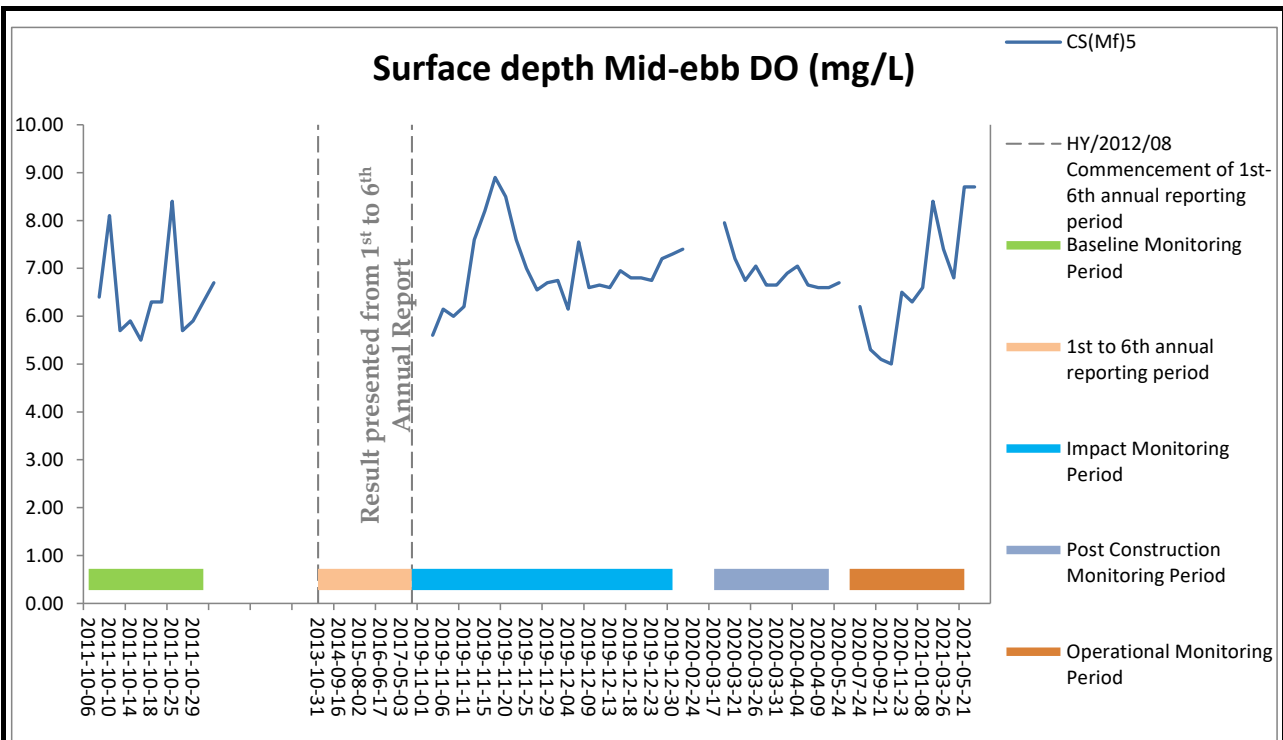


Figure E1 Baseline, Impact, Post-construction & Operational Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS(Mf)5. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



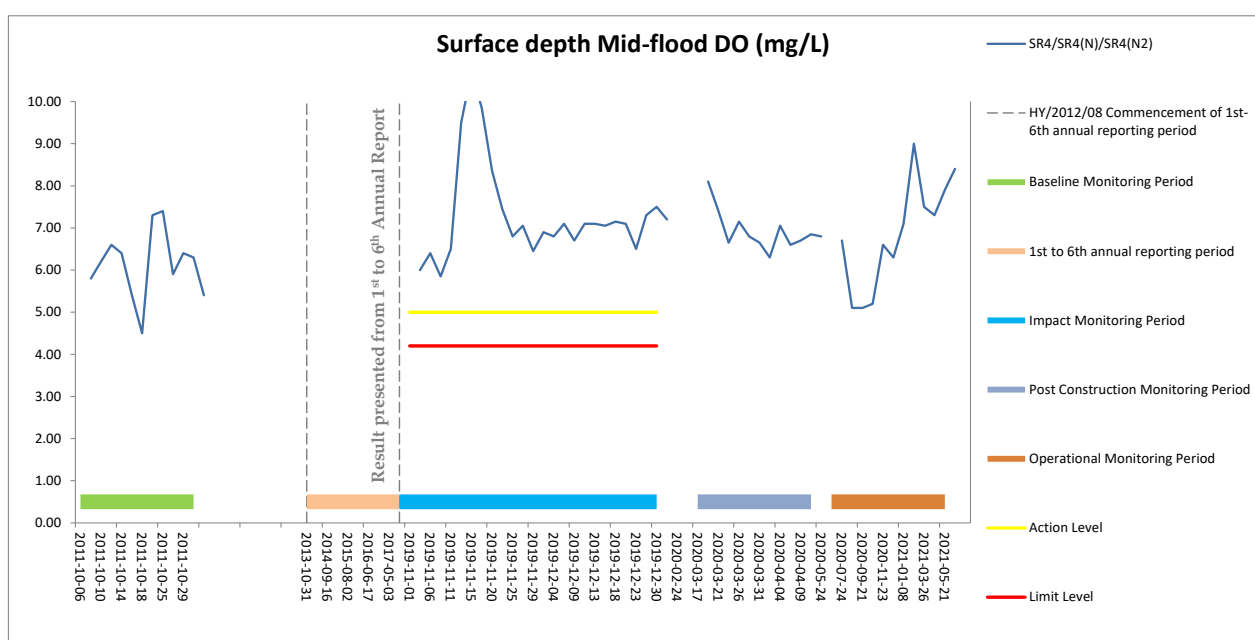
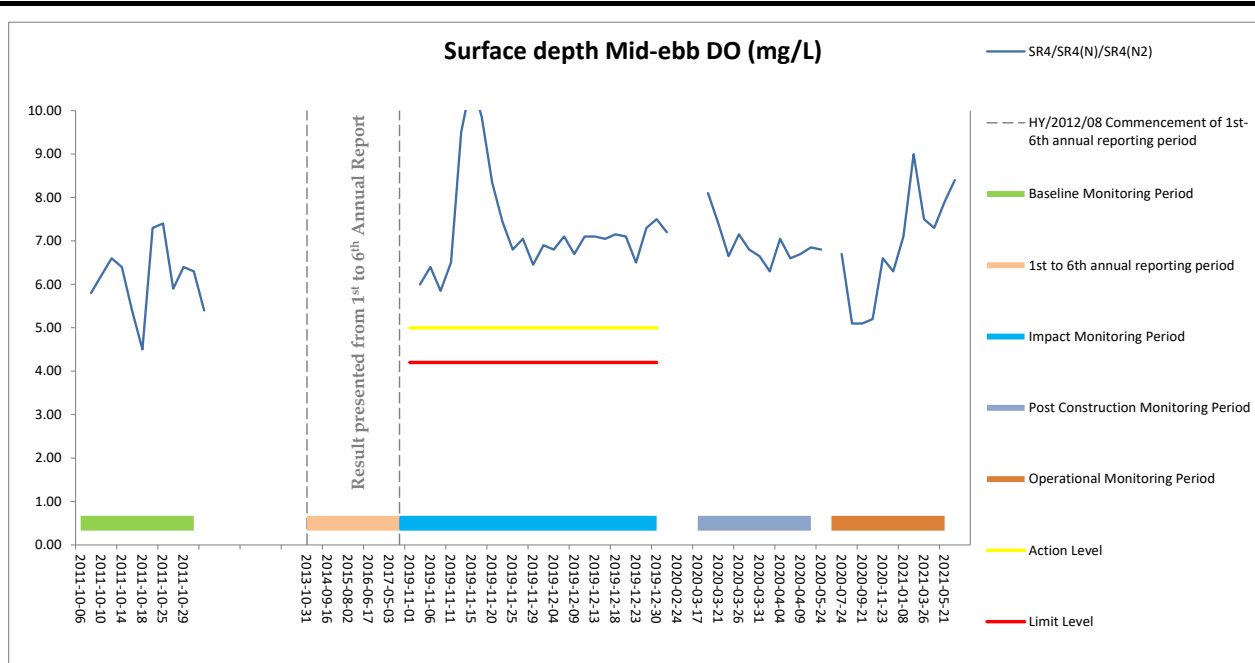


Figure E2 Baseline, Impact, Post-construction & Operational Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR4/SR4(N)/SR4(N2). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



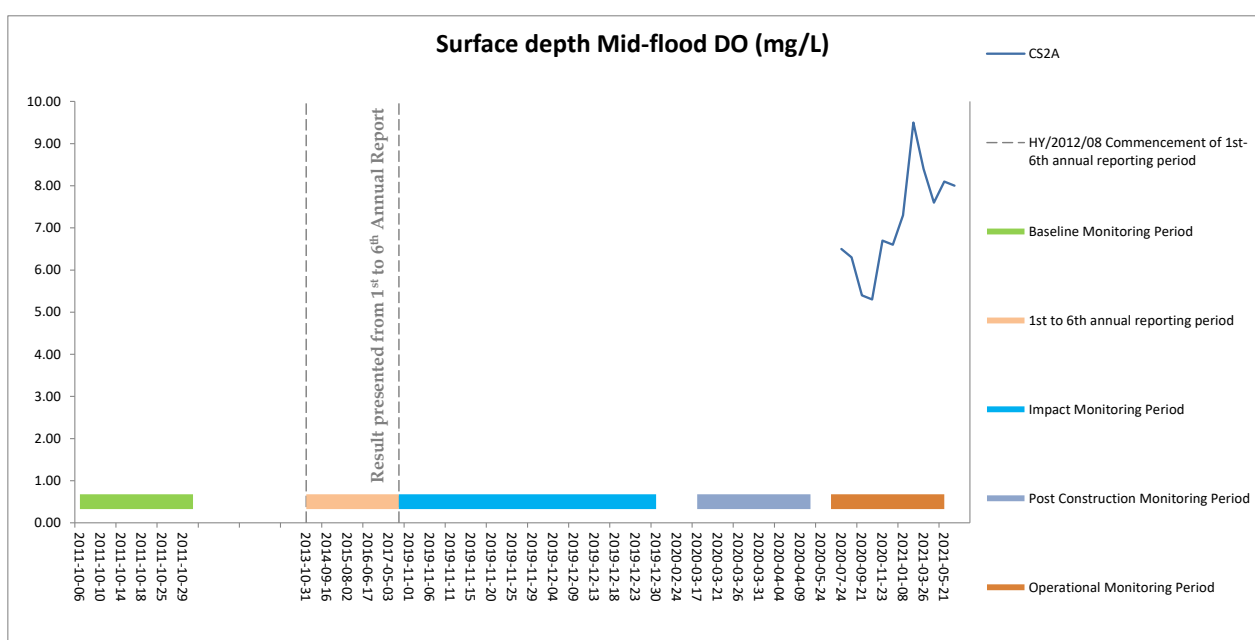
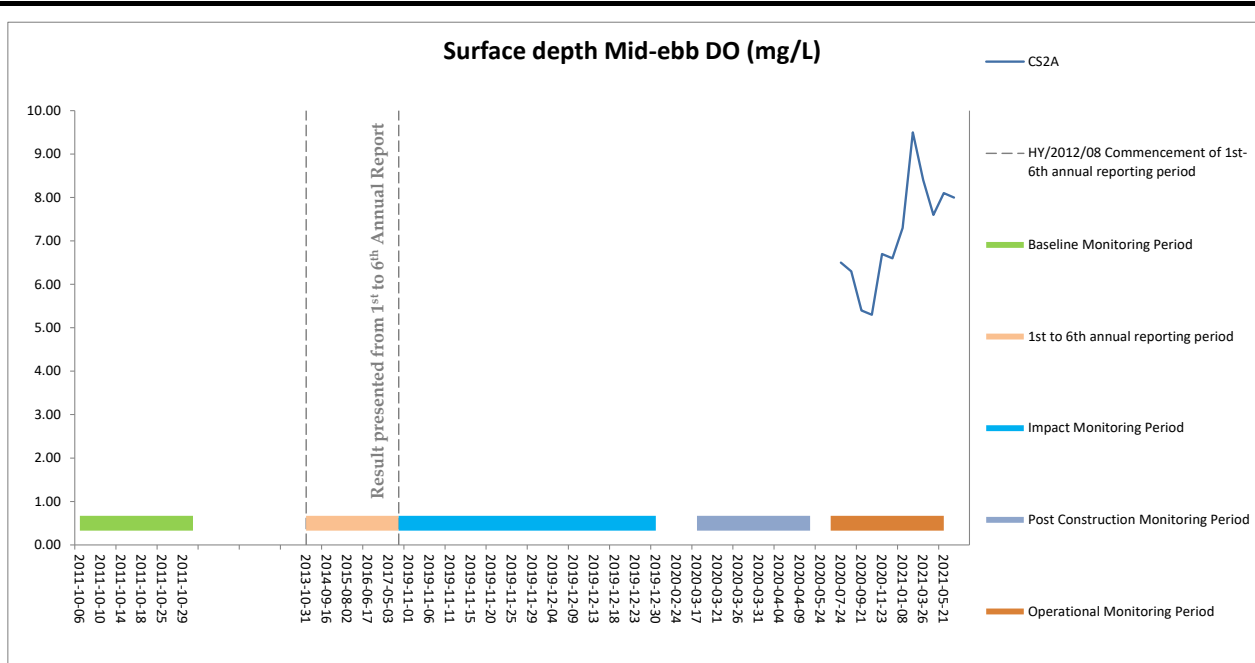


Figure E3 Baseline, Impact, Post-construction & Operational Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS2A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



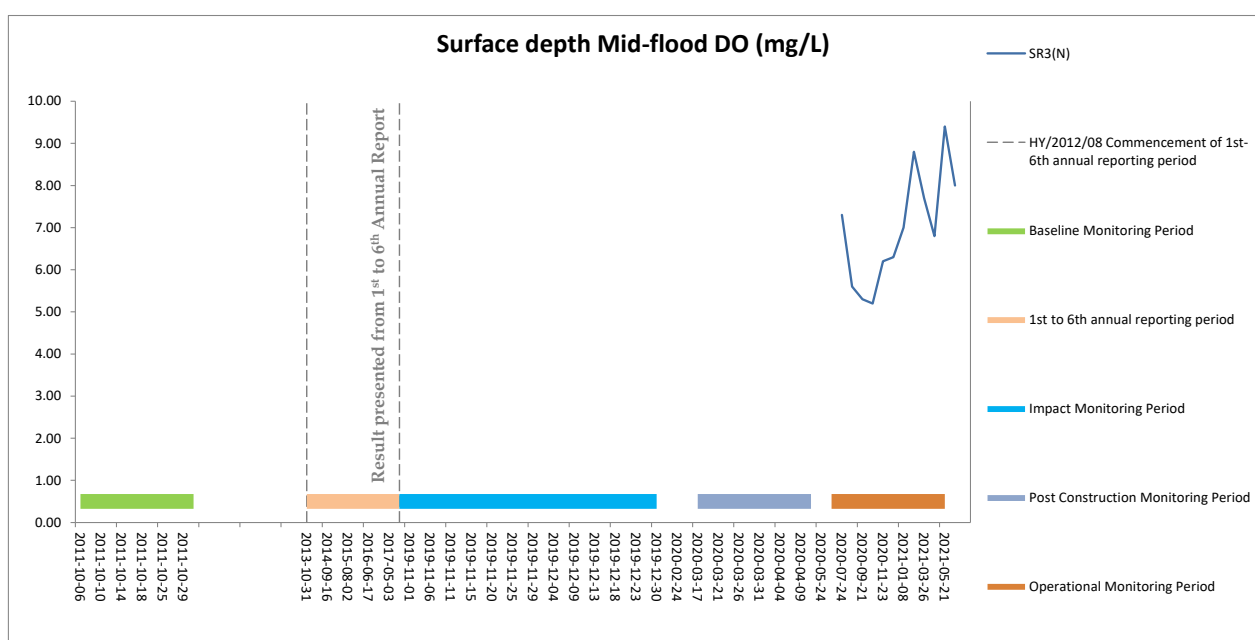
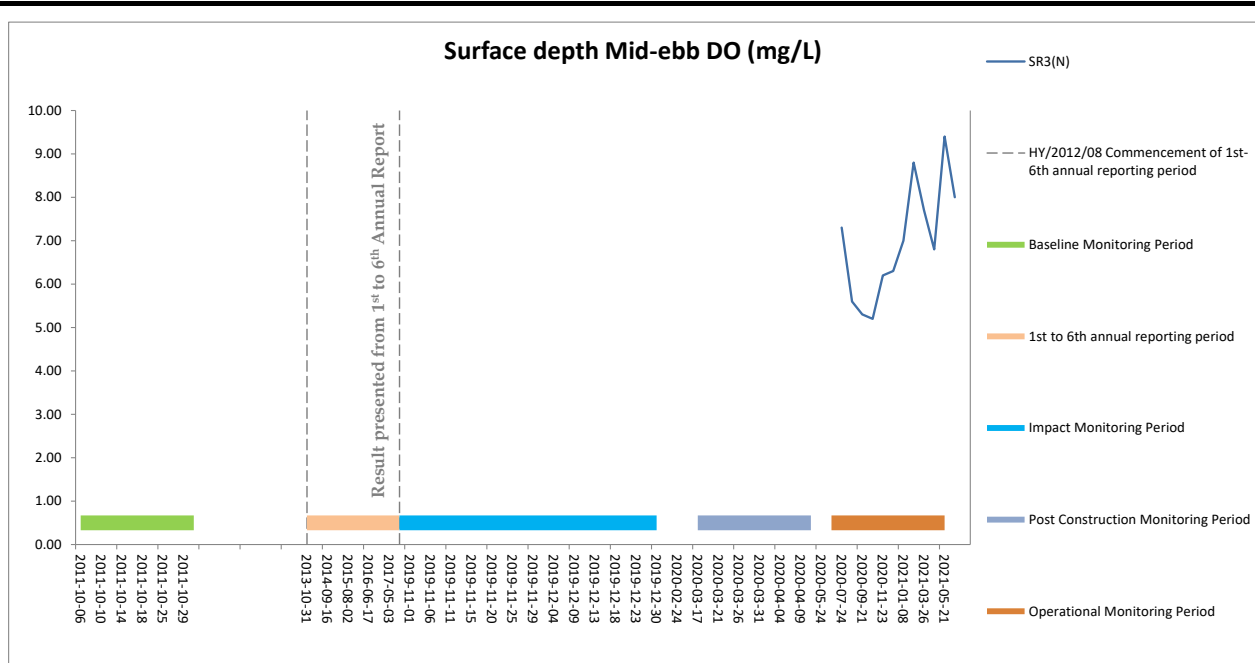
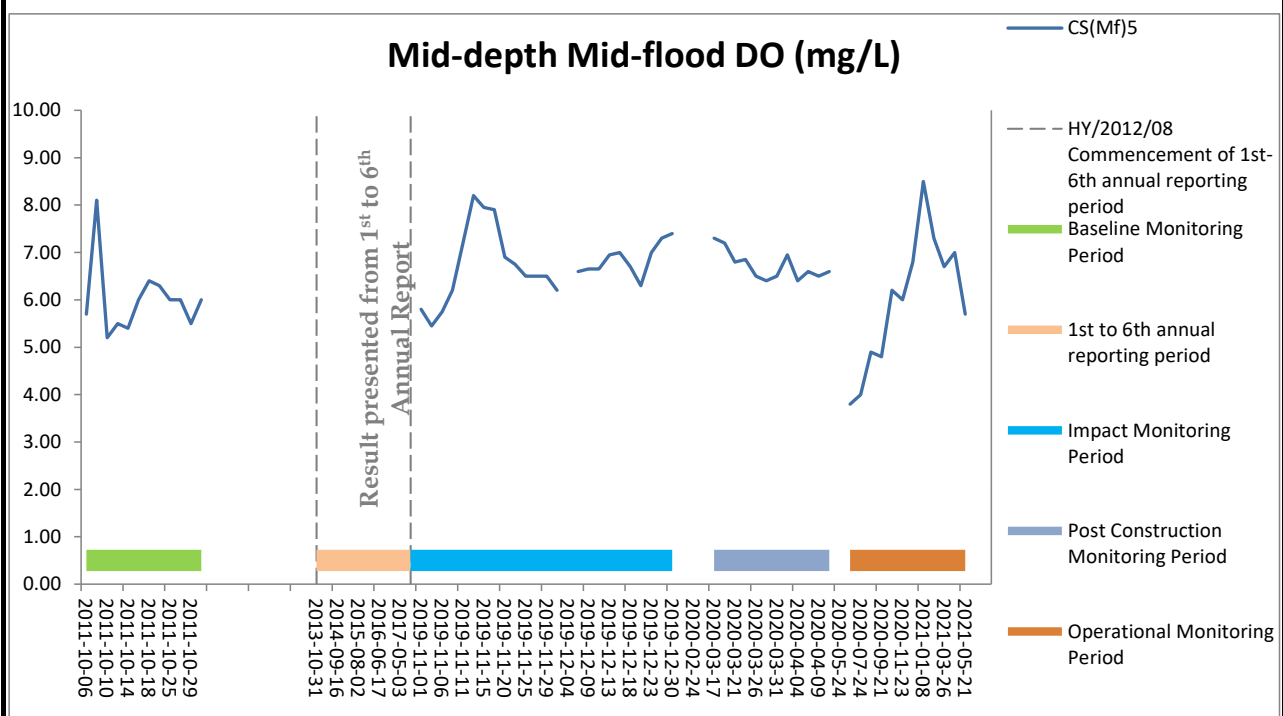
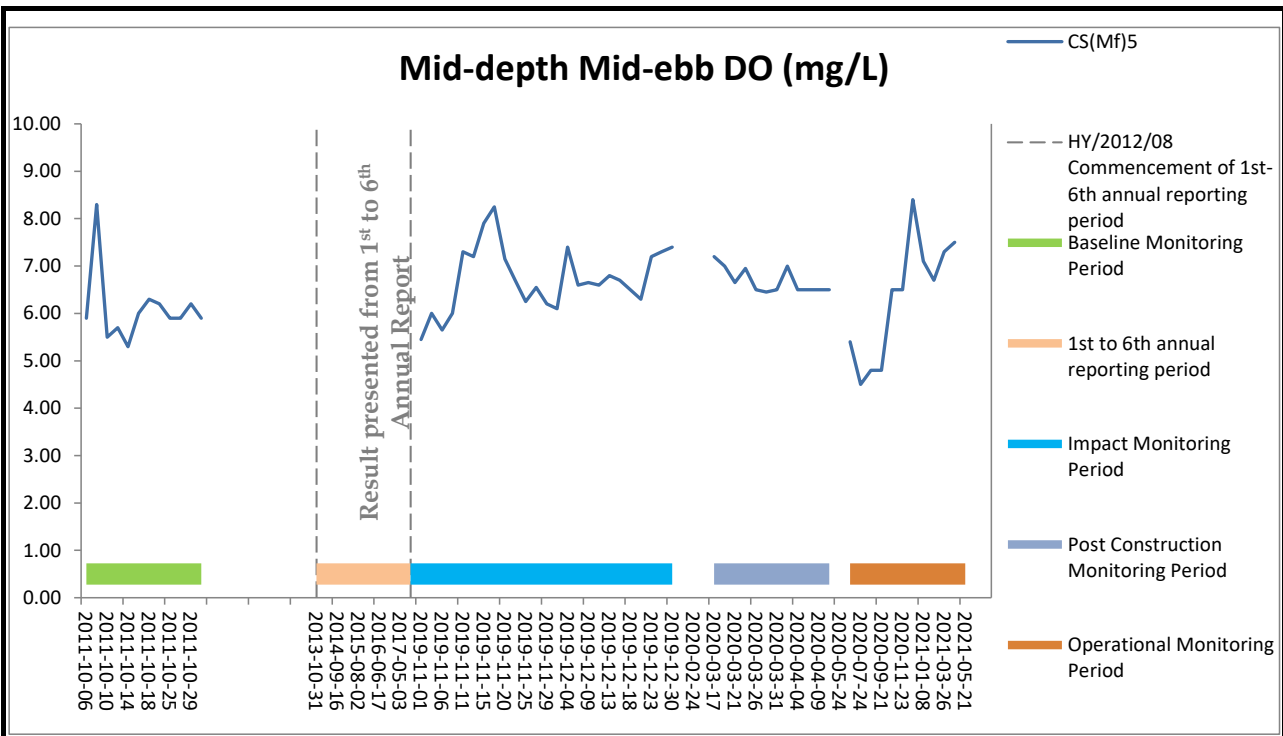


Figure E4 Baseline, Impact, Post-construction & Operational Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR3(N). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.

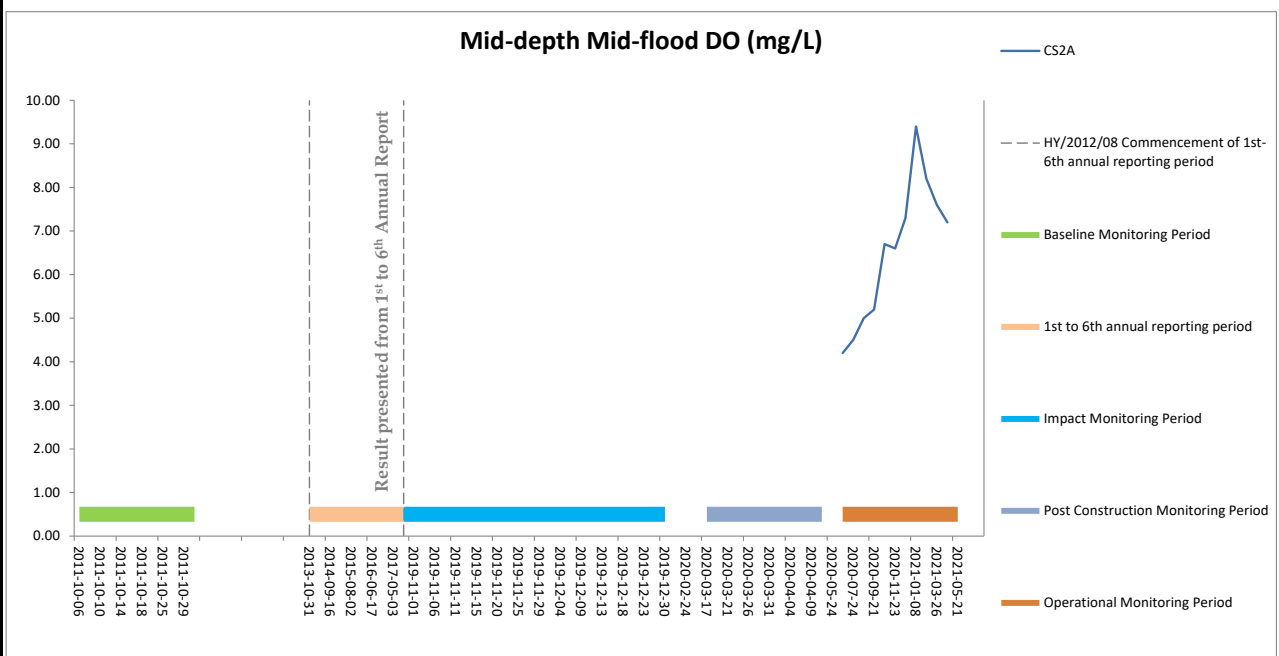
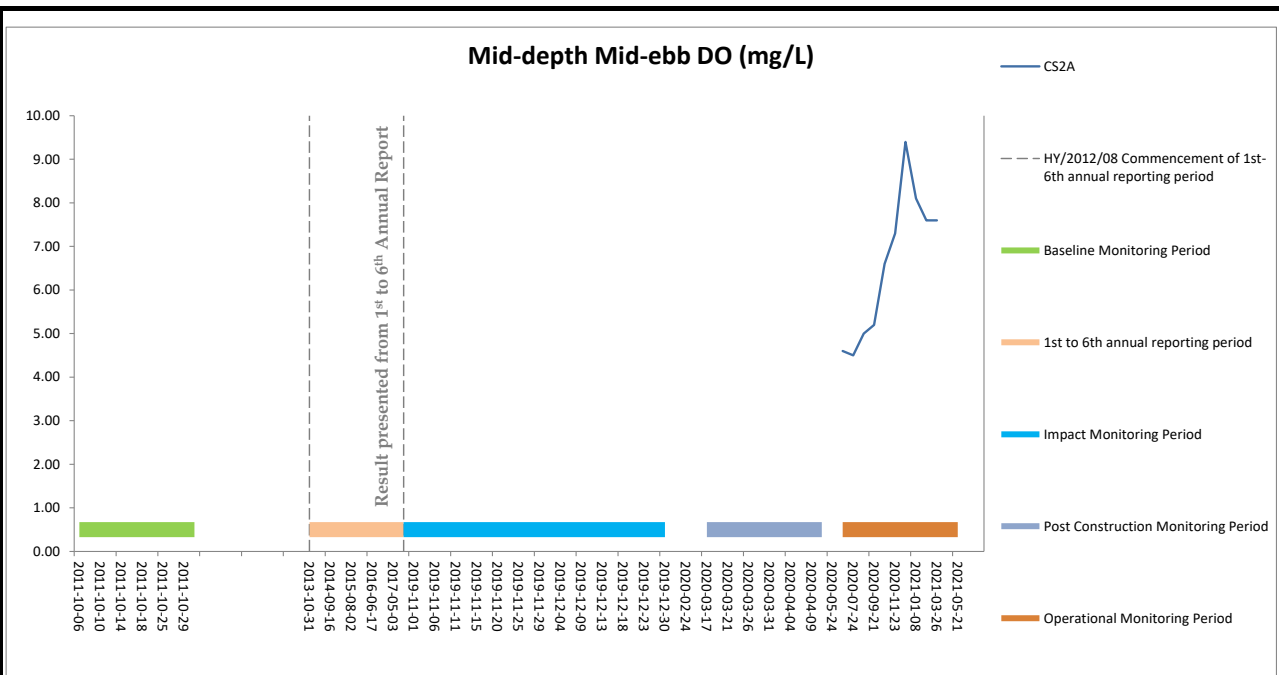




*No data for Stations SR4/SR4(N)/SR4(N2) and SR3(N) during mid-ebb tide due to shallow water depth (< 6m).

Figure E5 Baseline, Impact, Post-construction & Operational Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS(Mf)5. 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: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.





*No data for Stations SR4/SR4(N)/SR4(N2) and SR3(N) during mid-ebb tide due to shallow water depth (< 6m).

Figure E6 Baseline, Impact, Post-construction & Operational Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS2(A). 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: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



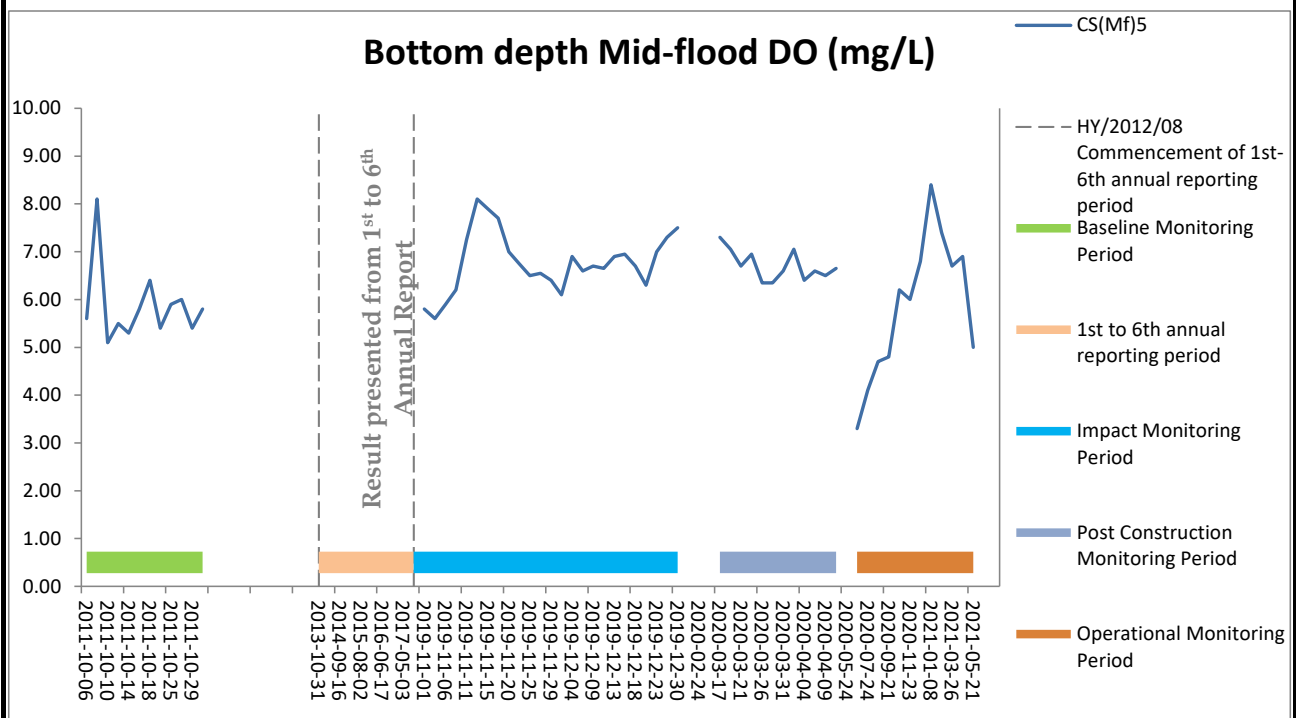
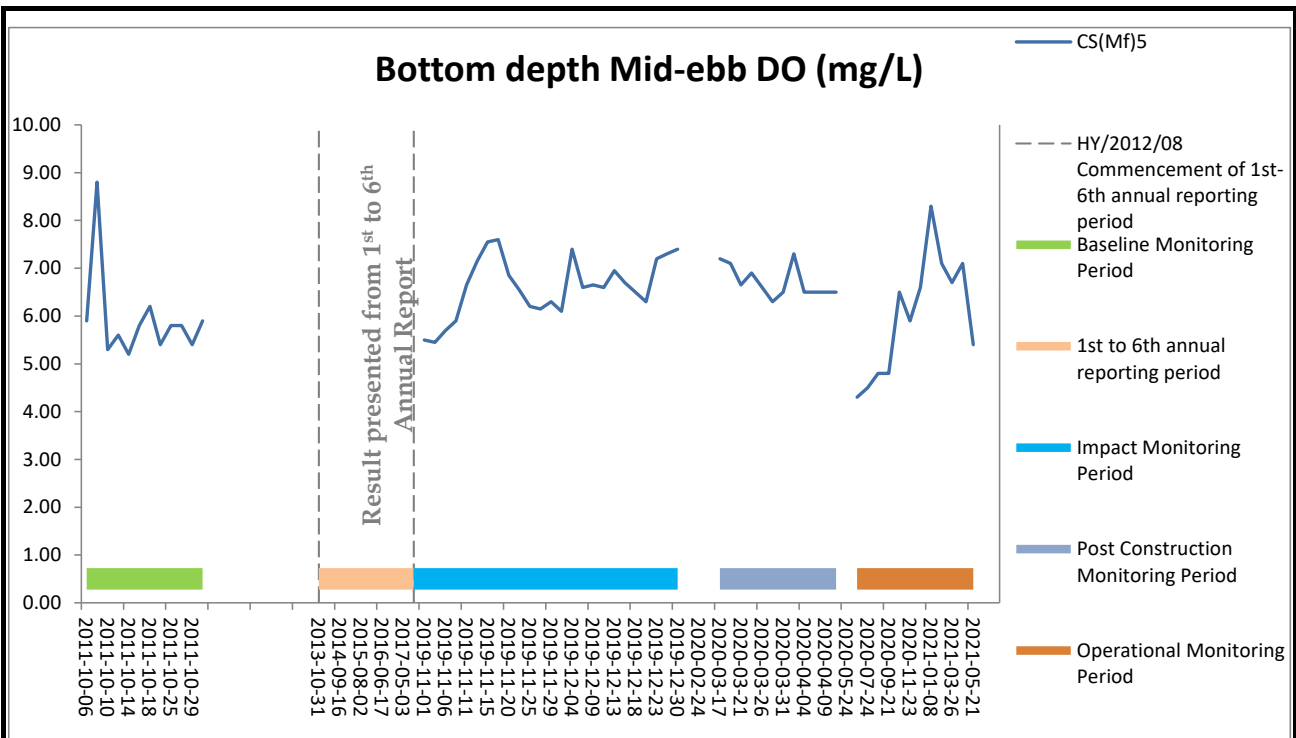


Figure E7 Baseline, Impact, Post-construction & Operational Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS(Mf)5. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



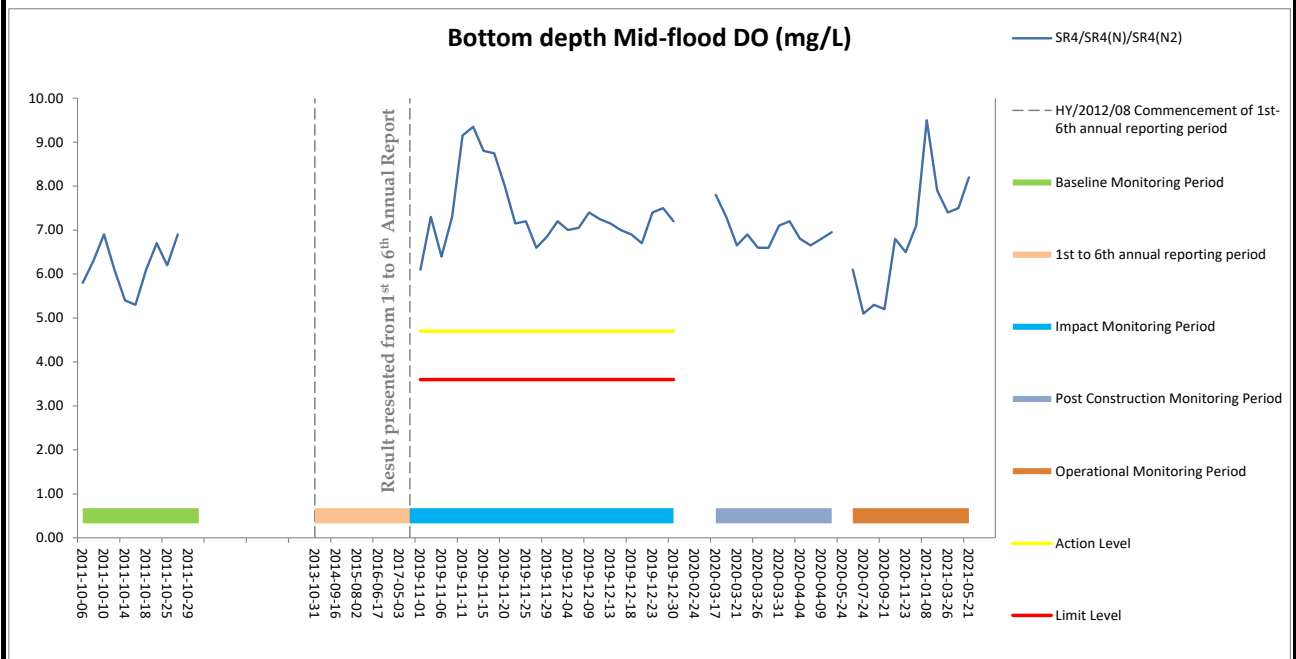
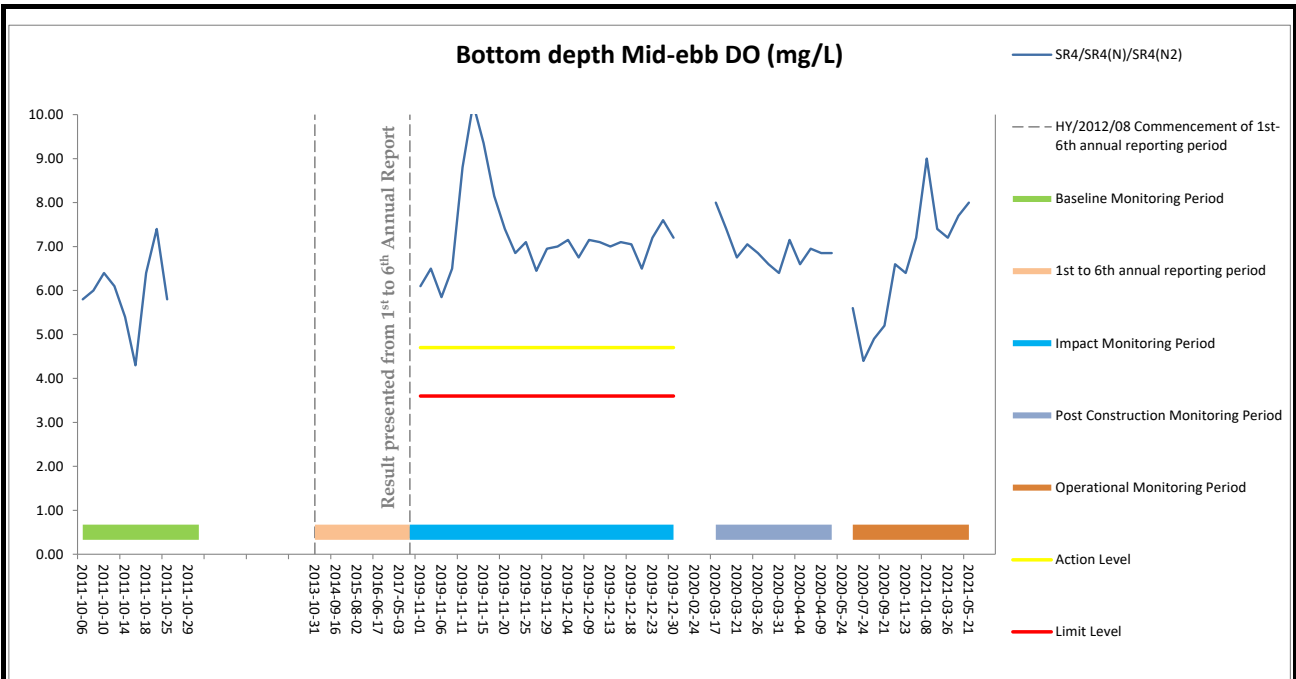


Figure E8 Baseline, Impact, Post-construction & Operational Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR4/SR4(N)/SR4(N2). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



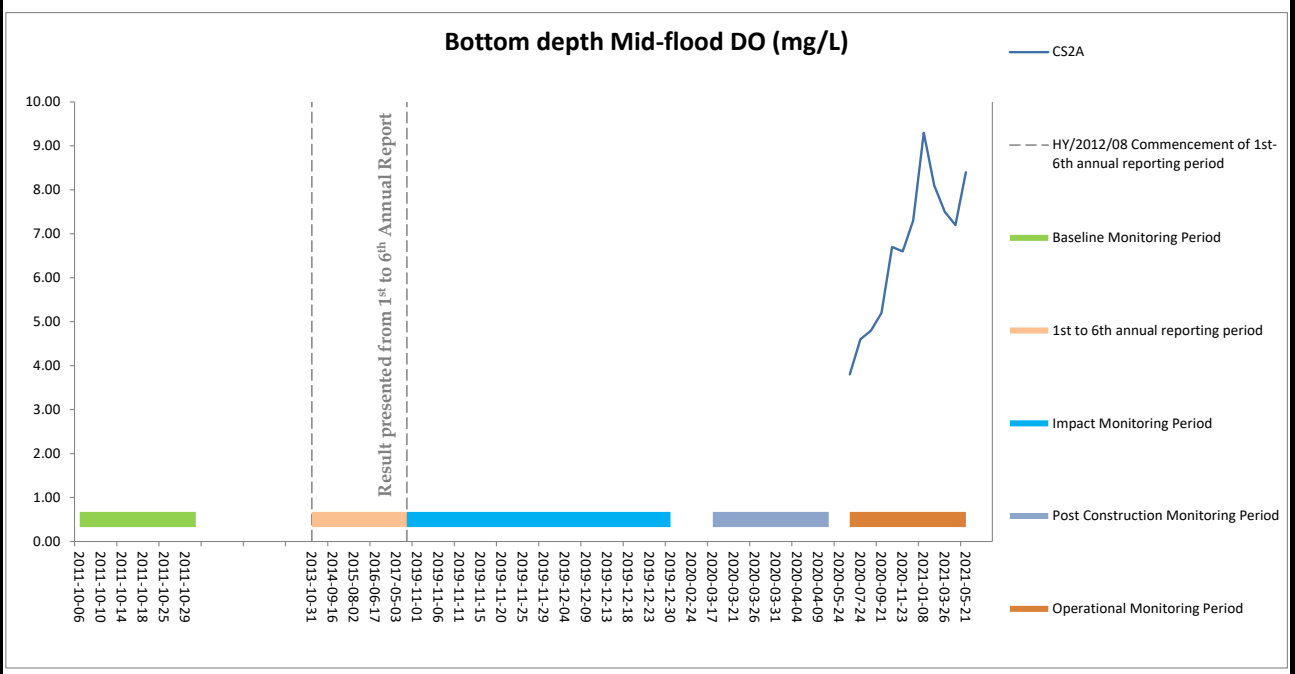
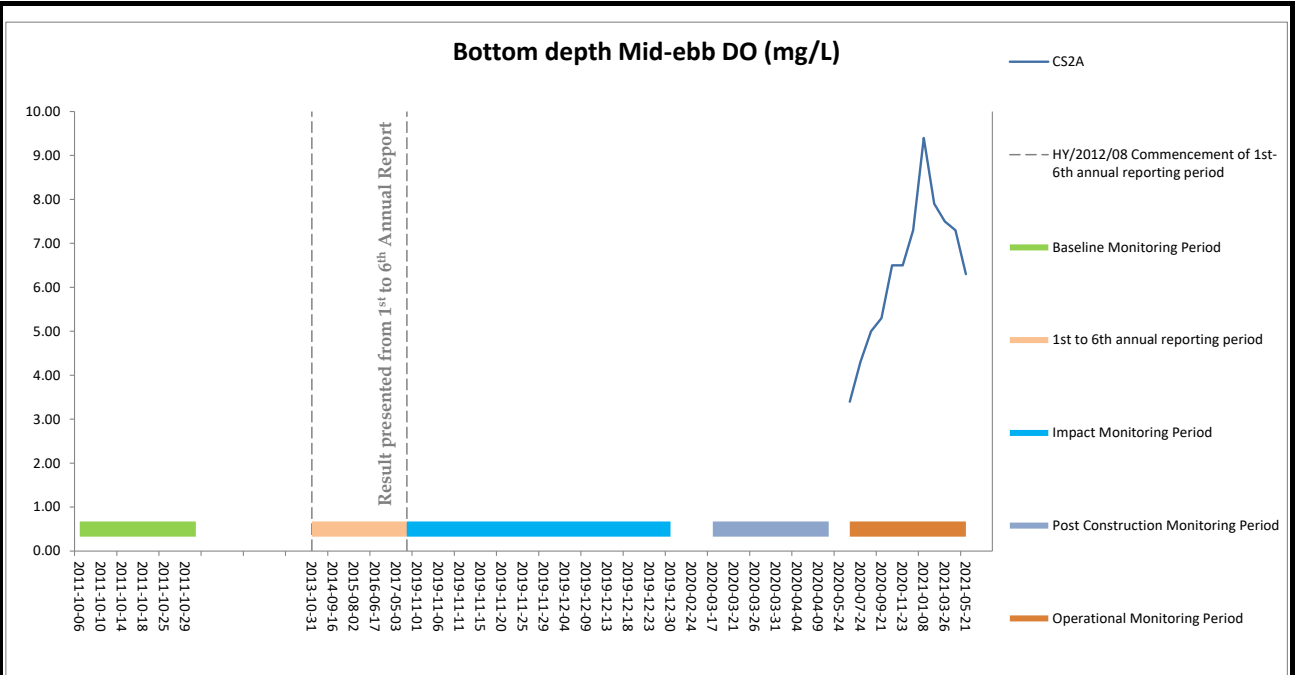


Figure E9 Baseline, Impact, Post-construction & Operational Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS2A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



Ref: 0212330_Impact-WQM_8th annual.xlsx

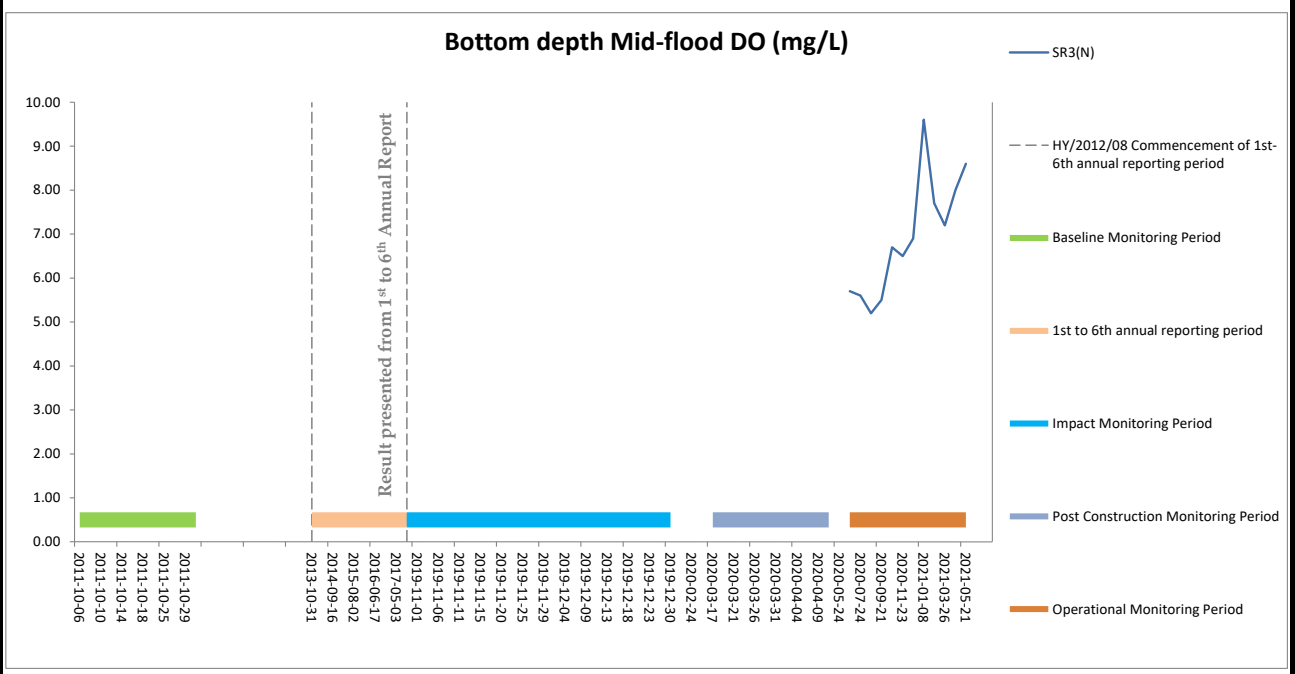
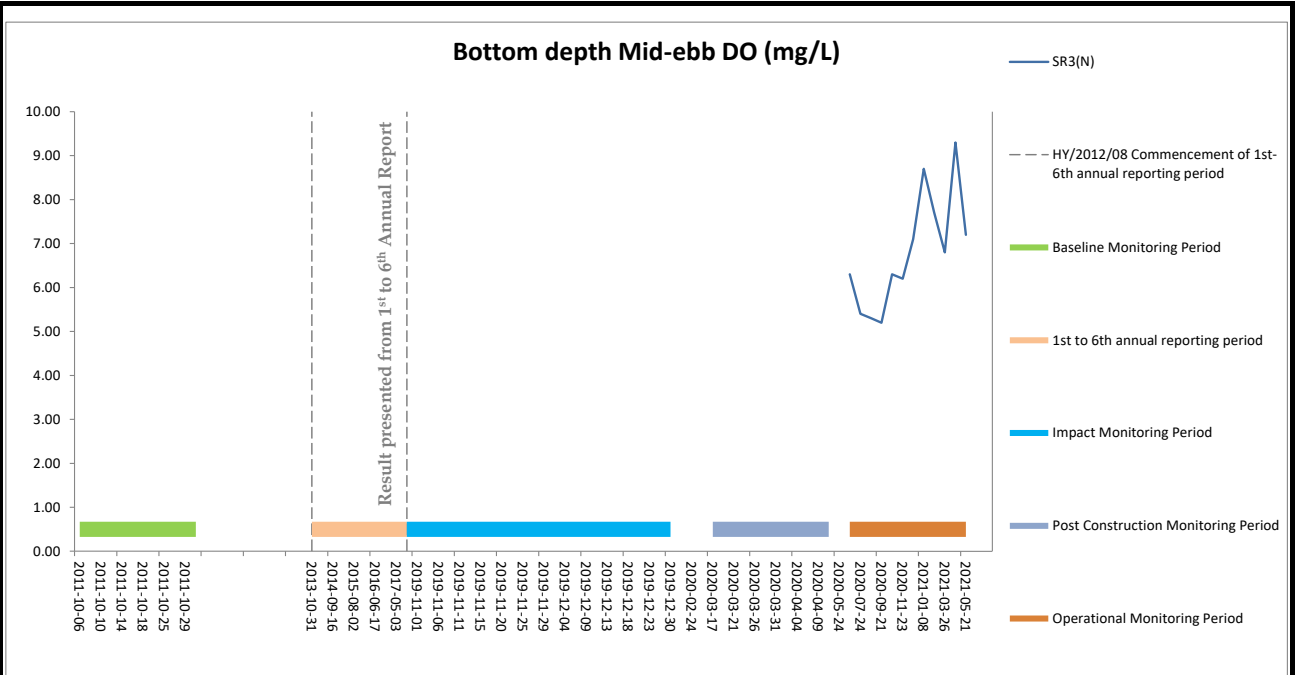


Figure E10 Baseline, Impact, Post-construction & Operational Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom waters between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR3(N). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



Ref: 0212330_Impact-WQM_8th annual.xlsx

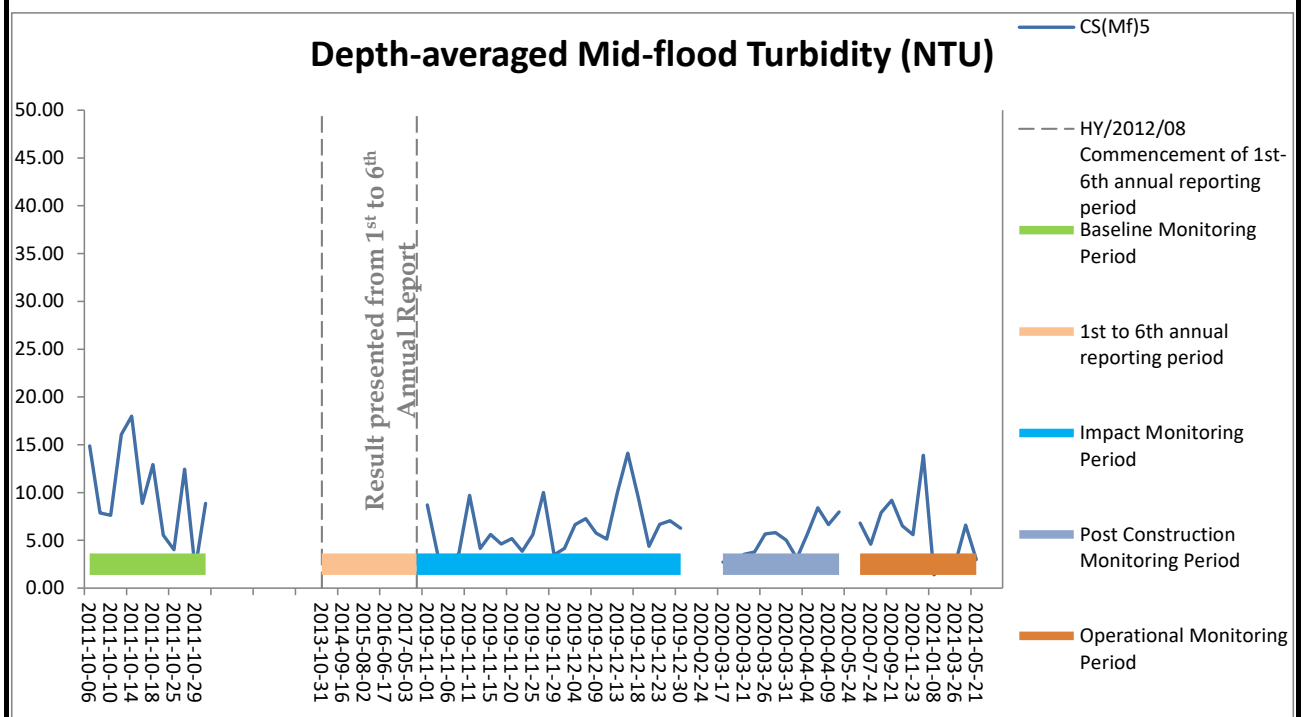
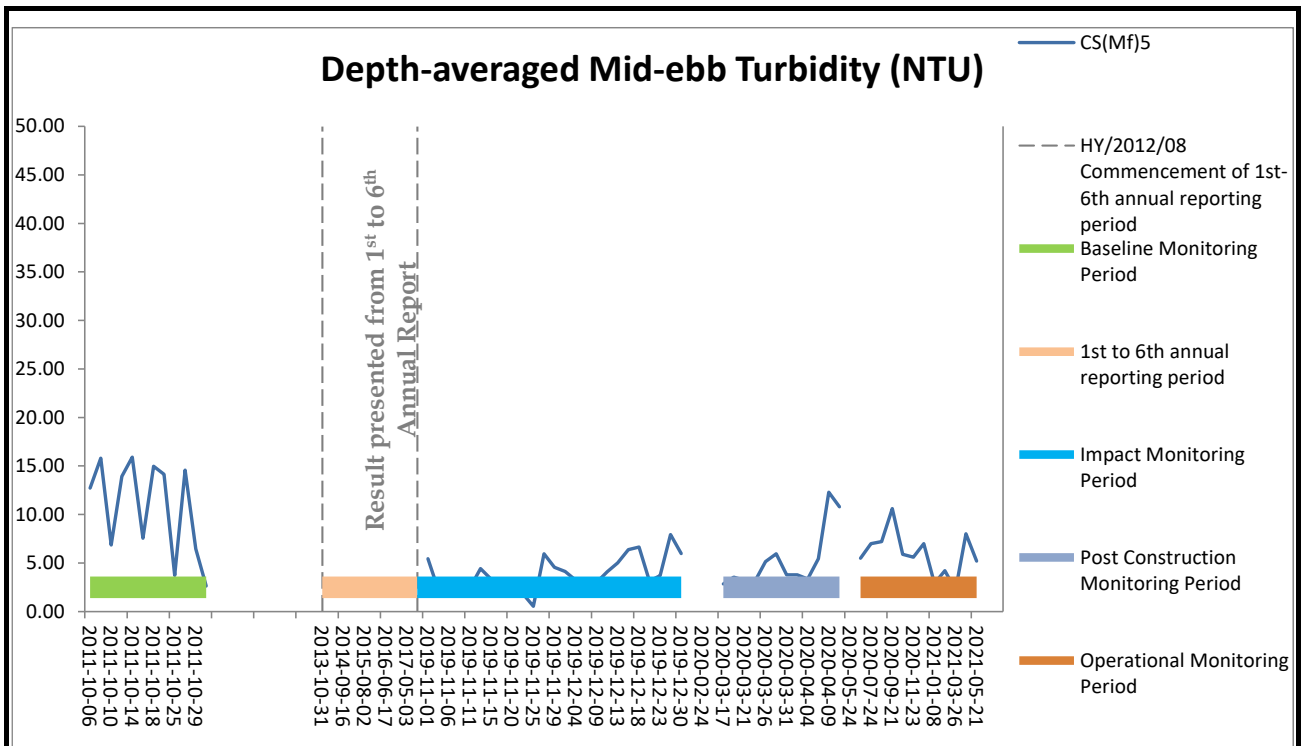


Figure E11 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS(Mf)5. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



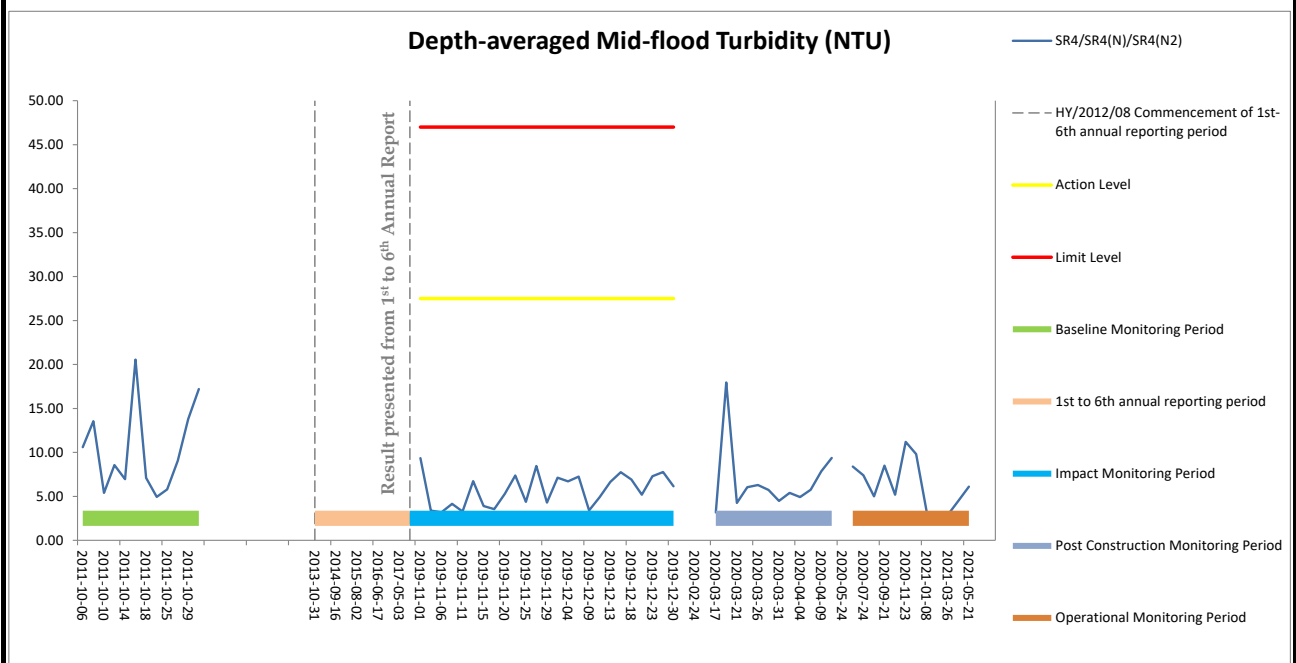
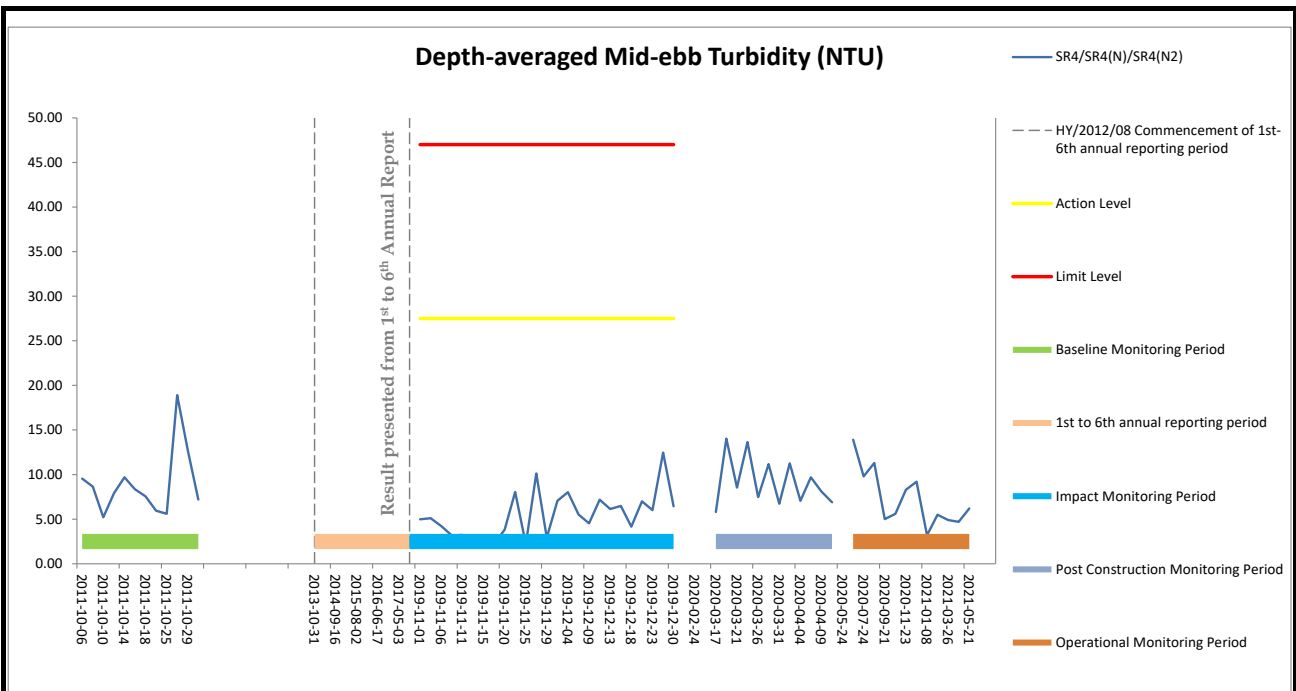


Figure E12 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR4/SR4(N)/SR4/SR4(N)/SR4(N2). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



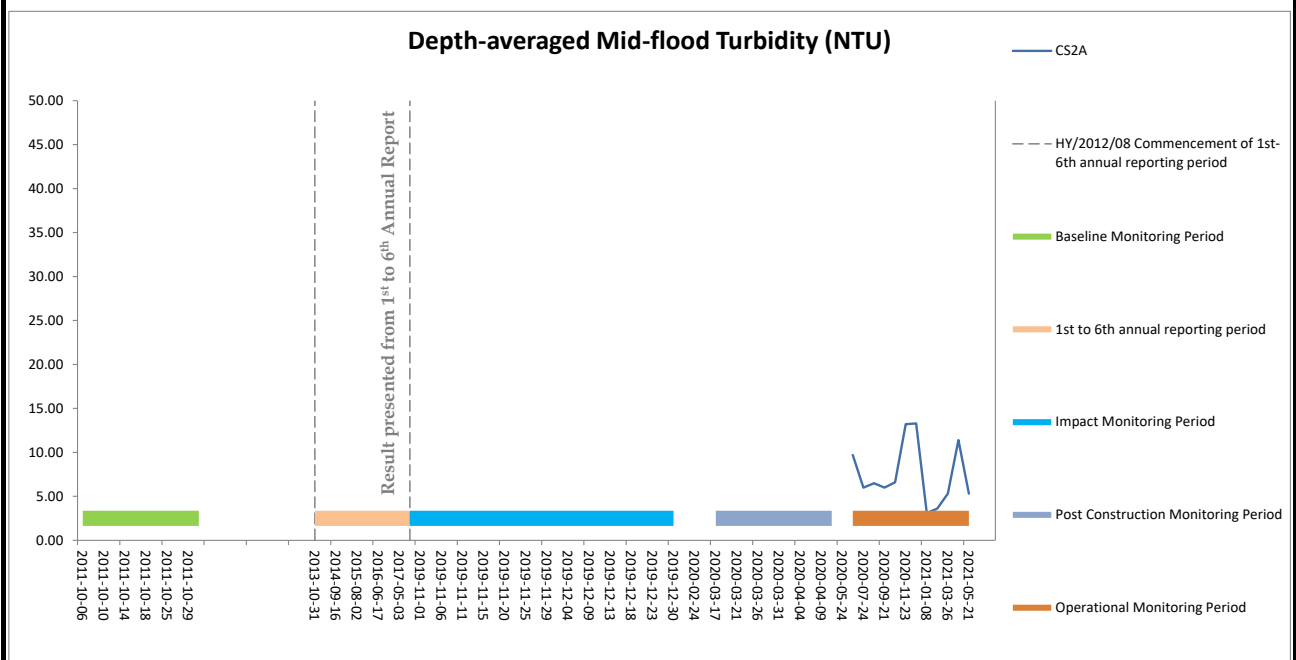
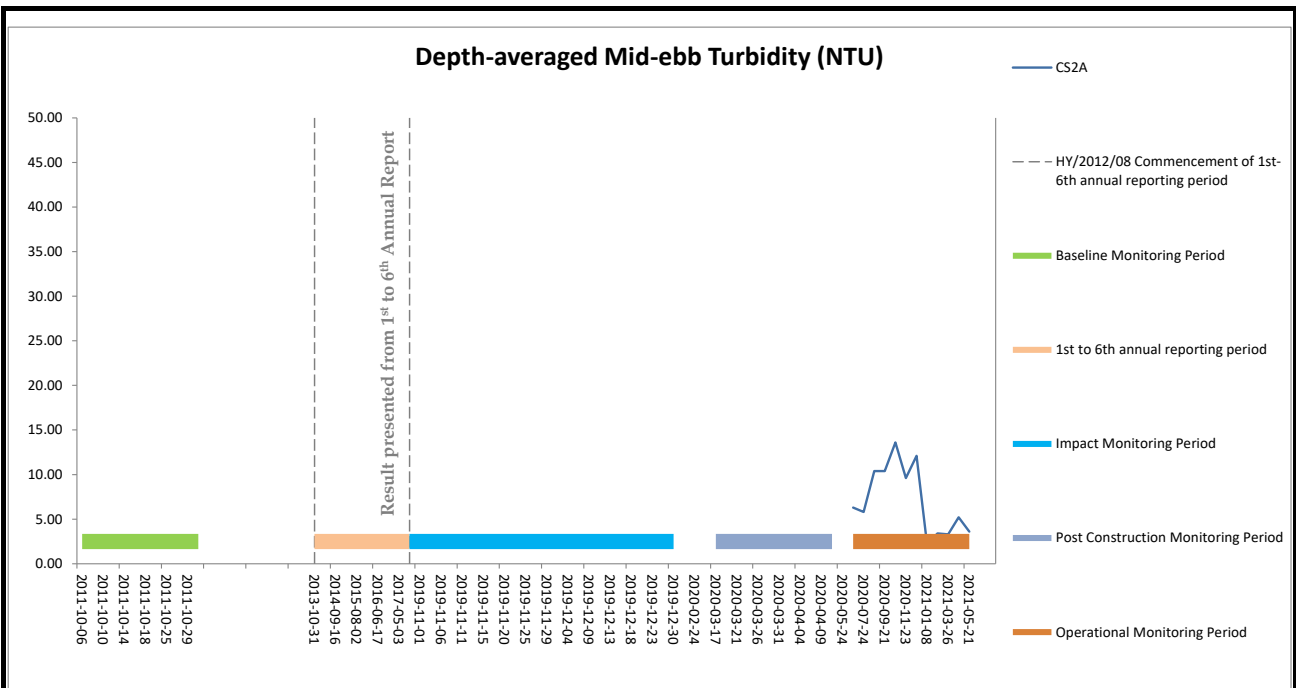


Figure E13 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS2A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



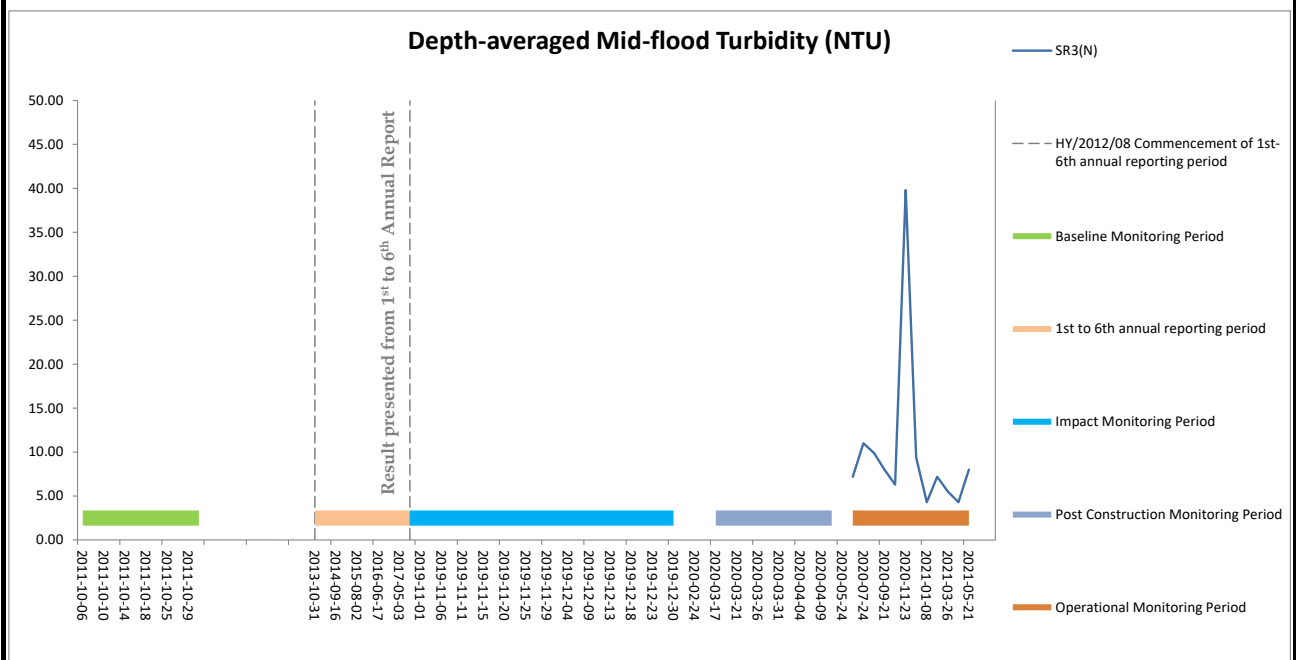
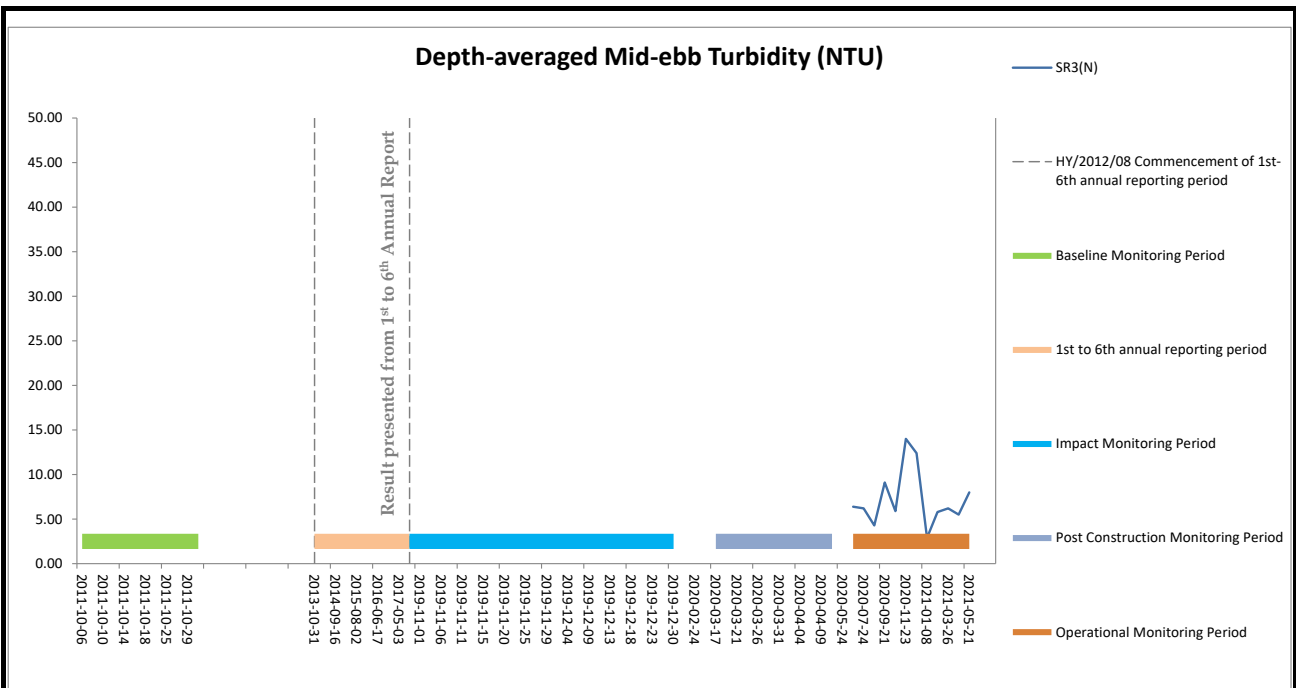


Figure E14 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR3(N). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



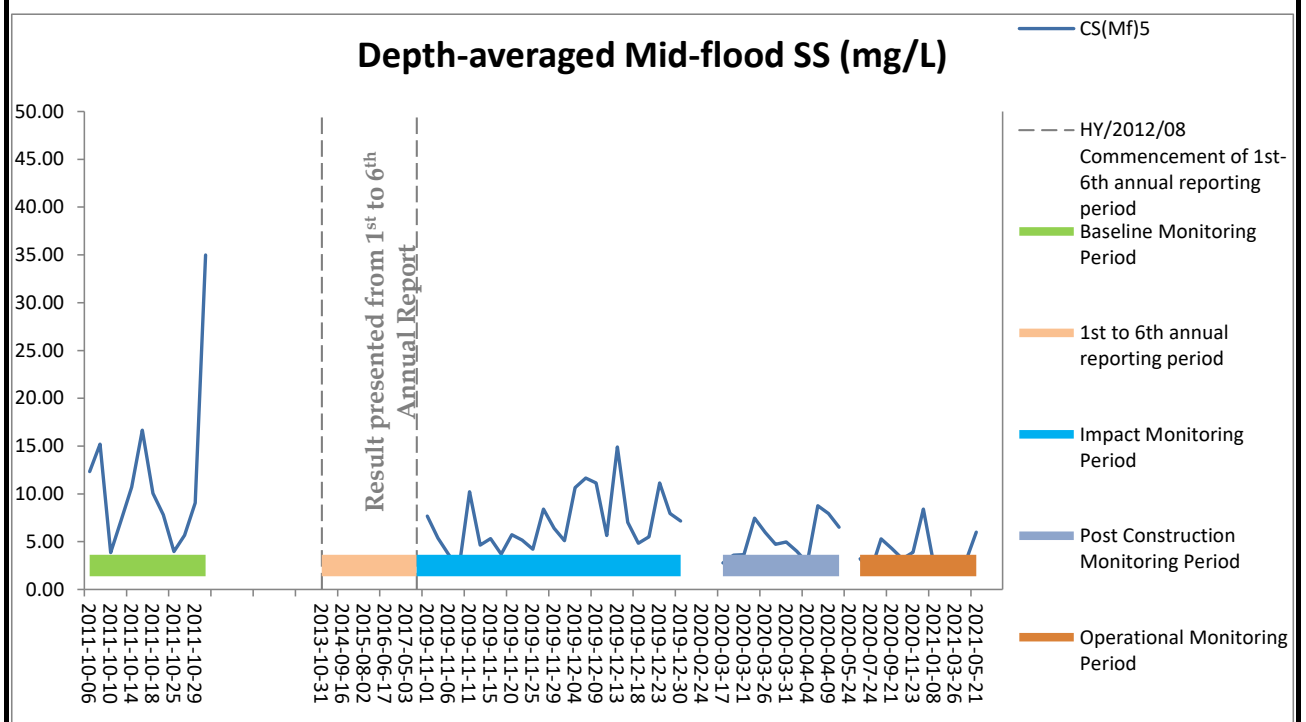
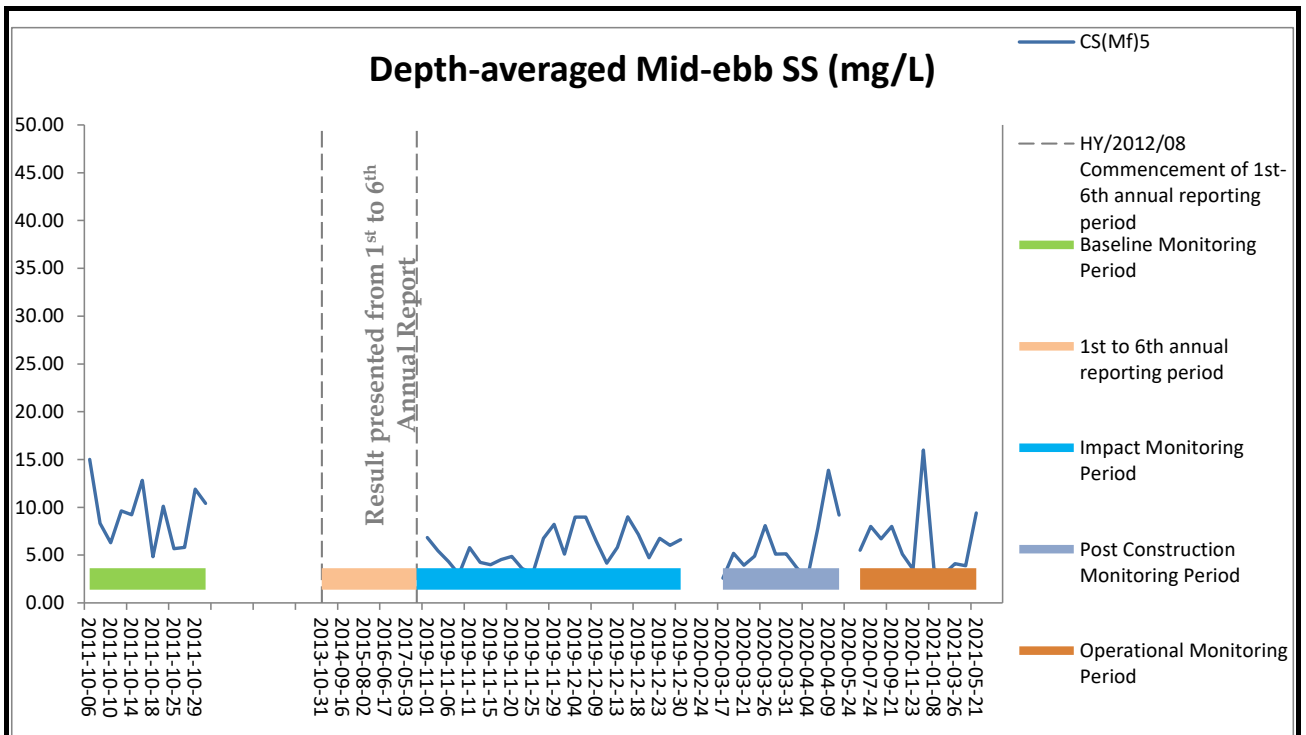


Figure E15 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS(Mf)5. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



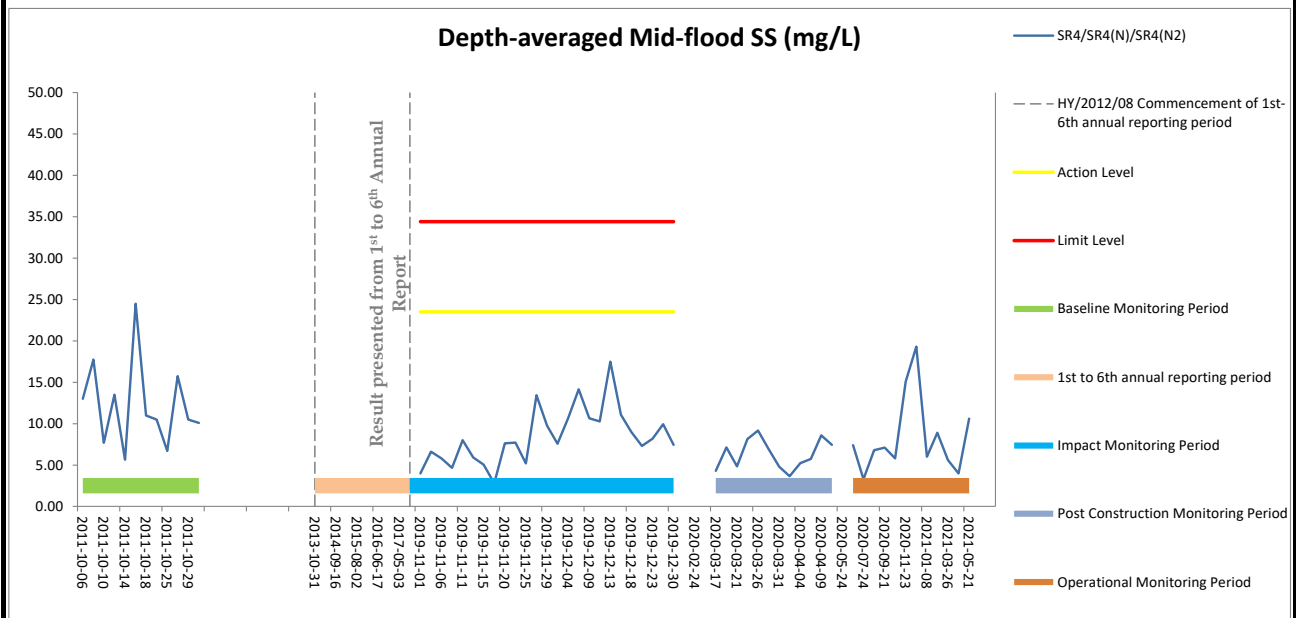
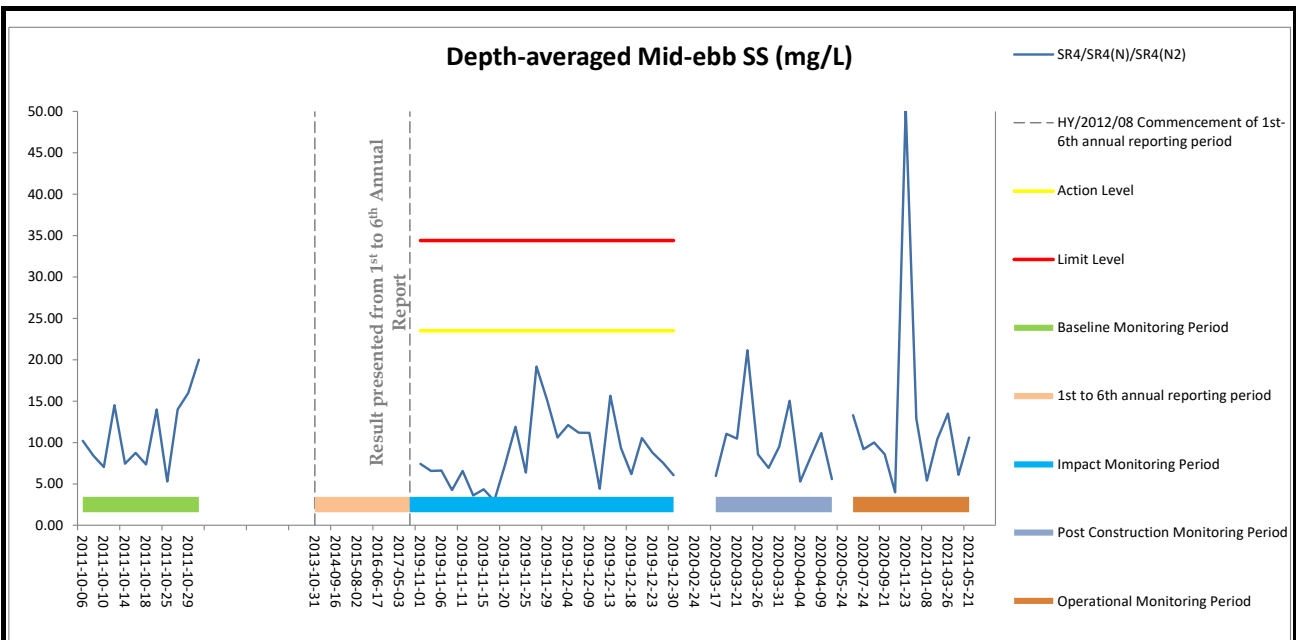


Figure E16 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR4/SR4(N)/SR4/SR4(N)/SR4(N2). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



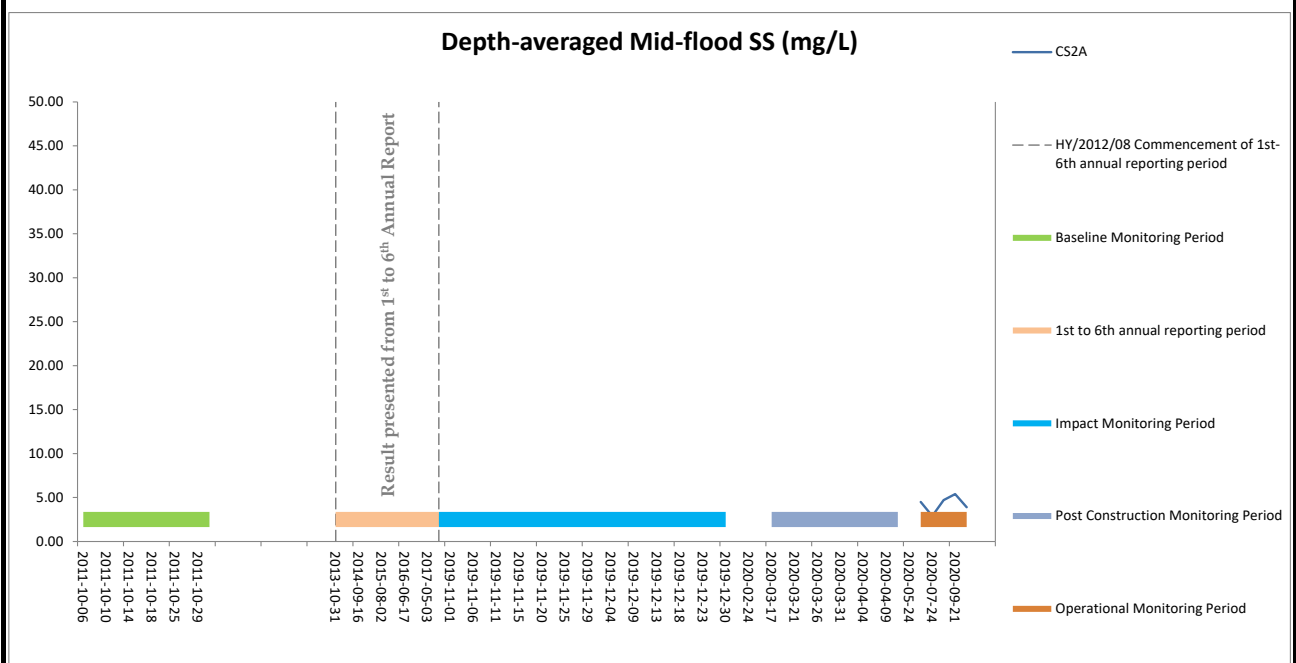
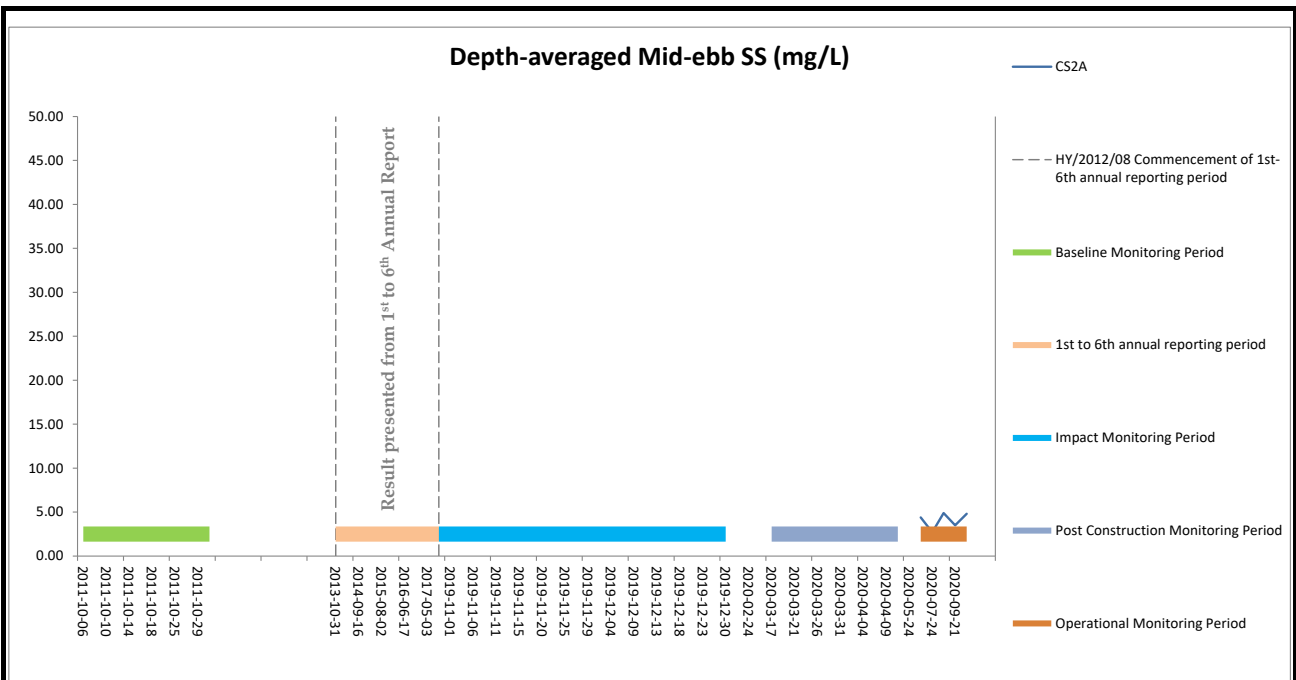


Figure E17 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at CS2A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



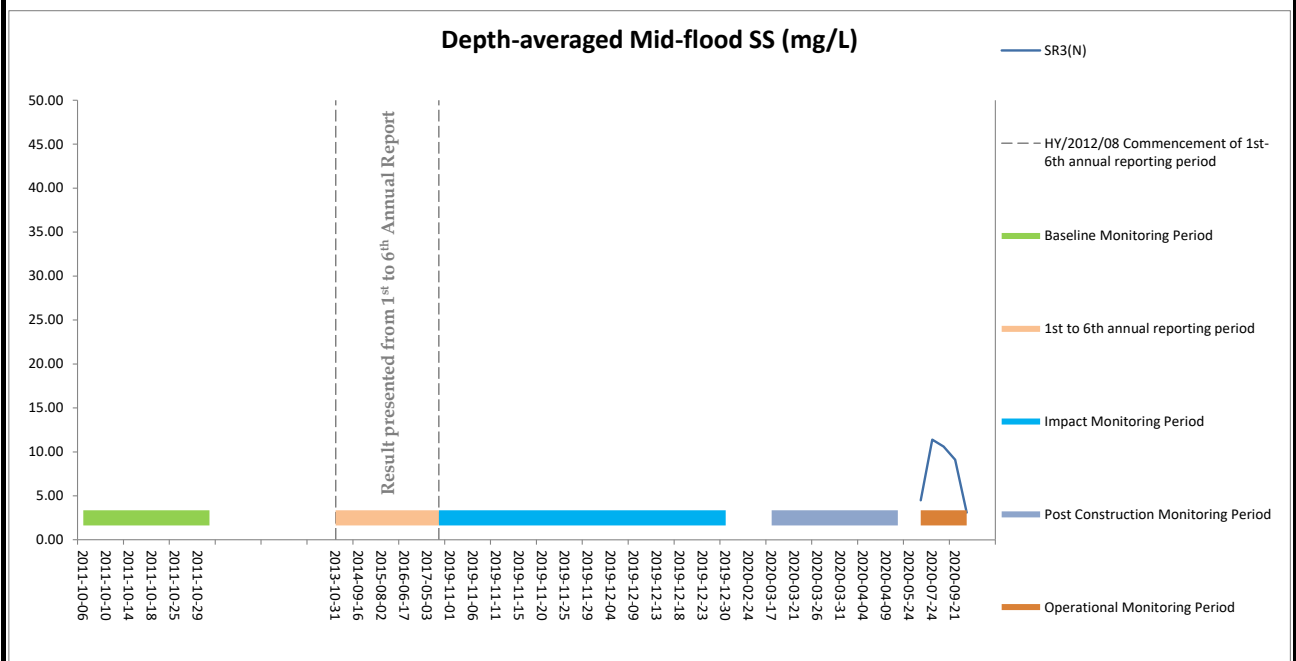
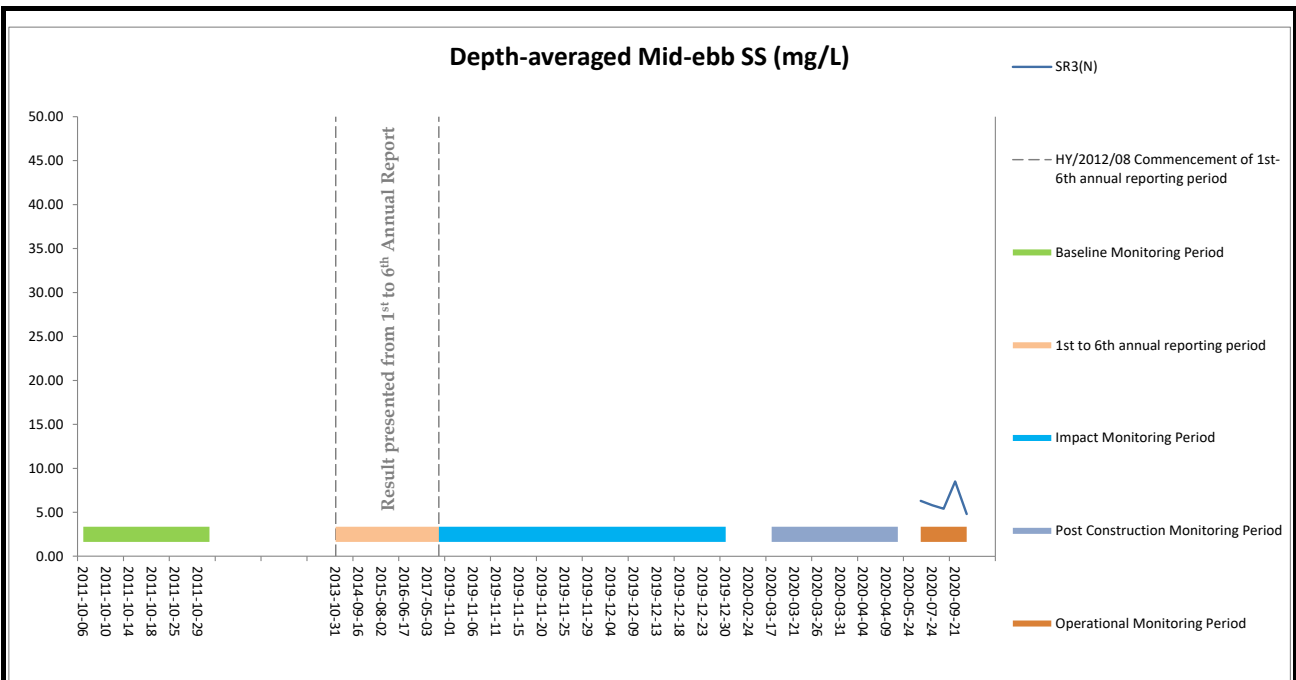


Figure E18 Baseline, Impact, Post-construction & Operational Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline, Impact, Post-construction & Operational Monitoring (1/11/2019 to 31/5/2021) at SR3(N). Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Installation of green roof system & chain fence - South Ventilation Building; Defect works for reinstatement at Box culvert - Northern Landfall; and Demolition works and backfilling works of CLP substation.



Appendix F

Operational Phase 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)
Post-Construction Dolphin Monitoring**

*First Annual Progress Report (June 2020 – May 2021)
submitted to ERM Hong Kong Ltd.*

Submitted by
Hong Kong Cetacean Research Project

22 September 2021

1. Introduction

- 1.1. As part of the Hong Kong-Zhuhai-Macao Bridge (HZMB), the Tuen Mun-Chek Lap Kok Link (TMCLKL) is a designated project under the Environmental Impact Assessment Ordinance (EIAO). The Environmental Impact Assessment (EIA) Report and Environmental Monitoring and Audit (EM&A) Manual (EIA Register No.: AEIAR-146/2009) for the project were approved by the Director of Environmental Protection in October 2009 and the Environmental Permit No. EP-354/2009 (EP) was issued in November 2009. The EP has been subject to several variations and the current one is EP No. EP-354/2009/D.
- 1.2. The TMCLKL was constructed under two works contracts namely Contract No. HY/2012/07 (Southern Connection Viaduct Section) and Contract No. HY/2012/08 (North Connection Sub-sea Tunnel Section). In accordance with the EP, the Contractors of Contract No. HY/2012/07 and Contract No. HY/2012/08 have separately employed their own Environmental Team (ET) and ET Leader to conduct construction phase monitoring of Chinese White Dolphin (CWD) in the North Lantau (NL) waters, which included the Northeast Lantau (NEL) and Northwest Lantau (NWL) survey areas, following the requirements specified in the EM&A Manual and the relevant contract specifications of the two contracts.
- 1.3. In accordance with Section 6.1 of the EM&A Manual and the EP, an ecological monitoring and audit programme is needed to monitor potential impacts through construction and operation activities of TMCLKL. The construction and post-construction (operational) EM&A objectives are to ensure that the ecological contract works and construction mitigation procedures recommended in the EIA are carried out as specified and are effective. Post-construction phase EM&A will comprise the audit of the measures as appropriate. In order for such monitoring to be effective, it needs to be divided into three phases: pre-disturbance (i.e. baseline phase), the entire period of disturbance (i.e. construction phase) and post-disturbance after the completion of construction works (i.e. post-construction phase). Survey techniques must be held

constant from phase to phase, and survey equipment and personnel should ideally be the same as well.

- 1.4. The main objective of the current assignment commissioned by the Highways Department is to conduct the post-construction monitoring of CWD in NL waters in compliance with the requirements stipulated in the EM&A Manual and the EP for the TMCLKL works. Such monitoring should be conducted for two years upon the completion of all marine-based construction activities for the TMCLKL according to the EM&A Manual, which were completed in May 2020. From June 2020 to August 2021, 15 months of post-construction dolphin monitoring had been carried out by the ET / ET Leader appointed under Contract No. HY/2012/08, while the remaining nine months of post-construction dolphin monitoring will be completed under Agreement No. HMWSD 1/2021 (EP), from September 2021 to May 2022.
- 1.5. In August 2021, the ERM Hong Kong (ERMHK) Limited has been appointed as the Consultant responsible for the nine months of post-construction monitoring of CWD in NL waters for the TMCLKL. Subsequently, the Hong Kong Cetacean Research Project (HKCRP) has been appointed by ERMHK to collaborate and undertake the dolphin monitoring tasks to conduct systematic line-transect vessel surveys
- 1.6. As part of the post-construction dolphin monitoring programme, this report is the first annual progress report summarizing the results of the surveys findings during the first annual post-construction monitoring period of June 2020 to May 2021.

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 post-construction monitoring period. The co-ordinates of all transect lines conducted during the post-construction dolphin monitoring surveys are shown in Table 1.

Table 1 Co-ordinates of transect lines

Line No.		Easting	Northing		Line No.		Easting	Northing
1	Start Point	804671	815456		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805476	820800		14	Start Point	817537	820220
2	End Point	805476	826654		14	End Point	817537	824613
3	Start Point	806464	821150		15	Start Point	818568	820735

3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	821500		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	821850		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671
6	Start Point	809490	822150		18	Start Point	821504	822371
6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	822000		19	Start Point	822513	823268
7	End Point	810499	824613		19	End Point	822513	824321
8	Start Point	811508	821123		20	Start Point	823477	823402
8	End Point	811508	824254		20	End Point	823477	824613
9	Start Point	812516	821303		21	Start Point	805476	827081
9	End Point	812516	824254		21	End Point	805476	830562
10	Start Point	813525	821176		22	Start Point	806464	824033
10	End Point	813525	824657		22	End Point	806464	829598
11	Start Point	814556	818853		23	Start Point	814559	821739
11	End Point	814556	820992		23	End Point	814559	824768
12	Start Point	815542	818807		24	Start Point	805476	815900
12	End Point	815542	824882		24	End Point	805476	819100

2.1.2. The survey teams 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 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2021). 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.

2.1.4. Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to

the bow, which is defined as 0°). 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.

- 2.1.5. 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.
- 2.1.6. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.7. 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.
- 2.1.8. 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 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* 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 dolphin monitoring data collected during the first year of TMCLKL post-construction dolphin monitoring from June 2020 to May 2021. Furthermore, these analyses were also conducted for the one-year baseline phase (one year before commencement of HZMB construction works; i.e. February 2011 to January 2012); the one-year of transitional phase (one year after the commencement of HZMB construction works (HKBCF and HKLR works), but before the commencement of TMCLKL construction works; i.e. November 2012 to October 2013); and the first to sixth years of TMCLKL construction (i.e. November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016; November 2016 to October 2017; November 2017 to October 2018; and November 2018 to October 2019).
- 2.3.2. Along with the analyzed results from the baseline, transitional and impact phases, results from the first year of post-construction phase can then be interpreted from the examination of any temporal changes before, during and after the construction activities of TMCLKL on dolphin usage in North Lantau waters. Notably, 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.

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 further 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 post-construction phase were calculated in two ways for comparisons with different phases of HZMB 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 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 ones deduced from the events during the six years of impact phase as well as the transitional and baseline phases.
- 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 dividing 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 12-month post-construction phase monitoring period were plotted onto 1-km² grids among NWL and NEL survey areas on GIS. Sighting densities (number of on-effort sightings per km²) and dolphin densities (total number of dolphins from on-effort sightings per km²) 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 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 sightings per 100 units of survey effort. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of dolphins per 100 units of survey effort. Among the 1-km² 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-km² grid within the study area:

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

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 present 12-month post-construction 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 post-construction phase monitoring from June 2020 to May 2021, a total of 24 sets of systematic line-transect vessel surveys were conducted to cover all transect lines in NWL and NEL survey areas twice per month.
- 3.1.2. From these surveys, a total of 3,087.24 km of survey effort was collected, with 99.4% 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, 1,140.90 km and 1,946.34 km of survey effort were conducted in NEL and NWL survey areas respectively.
- 3.1.3. Within the 12-month study period, the total survey effort conducted on primary lines was 2,291.49 km, while the effort on secondary lines was 795.75 km. The survey effort conducted on primary and secondary lines were both considered as on-effort survey data. Summary table of the survey effort is shown in Appendix I.
- 3.1.4. From the 24 sets of 2020-21 monitoring surveys, a total of 22 groups of 58 Chinese White Dolphins were sighted. All dolphin groups were sighted in NWL during on-effort search, with 19 made on primary lines, and the other three made on secondary lines. No dolphin was sighted at all 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 first year of TMCLKL post-

construction monitoring surveys from June 2020 to May 2021 is shown in Figure 1. Almost all of these sightings were concentrated at the western end of the North Lantau region, with slightly higher concentrations at the northern portion of the Sha Chau and Lung Kwu Chau Marine Park as well as to the north of the HKLR09 bridge alignment (Figure 1). A few sightings were also made near Black Point, Pillar Point and Sha Chau.

- 3.2.2. Notably, none of the dolphin groups were sighted in the vicinity of the entire alignment of TMCLKL as well as the reclamation sites of HKLR03 and HKBCF (Figure 1). In general, dolphins appeared to have mostly avoided the construction areas of HZMB works during the present impact phase monitoring period, which was consistent with the dolphin distribution patterns observed throughout the TMCLKL construction period.
- 3.2.3. Dolphin sighting distribution of the present post-construction monitoring period in 2020-21 was compared with the ones during the baseline phase in 2011-12, the transitional phase in 2012-13 and the six years of impact phase (2013-14, 2014-15, 2015-16, 2016-17, 2017-18, and 2018-19). In 2020-21, dolphin distribution was quite similar to the previous five impact phase periods from 2014-19, with dolphins being largely vacated from the eastern and central portions of NL region (Figure 2).
- 3.2.4. This was in stark contrast to their very frequent occurrence around the Brothers Islands, Shum Shui Kok, the waters between Pillar Point and airport platform, and the vicinity of HZMB-associated work sites during the baseline period (Figure 2). Even in the transitional phase, dolphins still utilized these waters in a moderate extent, but such usage has progressively diminished during the six annual periods of impact phase of TMCLKL construction as well as the first annual period after the construction (Figure 2).
- 3.2.5. The only area where dolphin occurrence was relatively consistent across the nine periods was around the Lung Kwu Chau area, but even so, such occurrence has been progressively diminishing in past seven annual periods. Such decline in dolphin usage was even more evident in the past two annual periods in 2018-19 and 2020-21, with much lower occurrences in this area (Figure 2).
- 3.3. *Encounter rate*
- 3.3.1. During the present 12-month post-construction 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, transitional and six years of impact phases (Table 2).
- 3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the same 12-month study period using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 1.09 sightings and 2.96 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both nil with no on-effort sighting being made there in 2020-21.

Table 2. Comparison of average daily dolphin encounter rates from the first year of post-construction phase, six years of impact phase, transitional phase and baseline phase monitoring periods (Note: encounter rates deduced were calculated based on survey and on-effort sighting data made along the primary transect lines under favourable conditions; \pm 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
Post-Construction Phase (2020-21)	0.00	1.31 \pm 1.88	0.00	3.39 \pm 5.73
Impact Phase (2018-19)	0.00	1.42 \pm 1.80	0.00	3.62 \pm 4.93
Impact Phase (2017-18)	0.00	2.68 \pm 3.04	0.00	9.02 \pm 14.63
Impact Phase (2016-17)	0.00	2.35 \pm 2.62	0.00	8.57 \pm 11.05
Impact Phase (2015-16)	0.00	2.10 \pm 1.83	0.00	8.54 \pm 8.53
Impact Phase (2014-15)	0.11 \pm 0.54	2.54 \pm 2.49	0.11 \pm 0.54	11.64 \pm 14.04
Impact Phase (2013-14)	0.22 \pm 0.74	6.93 \pm 4.08	0.76 \pm 2.59	26.31 \pm 17.56
Transitional Phase (2012-13)	1.70 \pm 2.26	7.68 \pm 4.36	4.75 \pm 7.61	27.51 \pm 18.06
Baseline Phase (2011-12)	6.05 \pm 5.04	7.75 \pm 5.69	19.91 \pm 21.30	29.57 \pm 26.96

- 3.3.3. In NEL, the dolphin encounter rates (both STG and ANI) during the first year of post-construction monitoring period were nil as in the previous four periods in 2015-16, 2016-17, 2017-18 and 2018-19, and these were in stark contrast to the higher averages during the baseline and transitional phases (Table 2). Such progressive decline in dolphin encounter rates has actually existed in this area since the transitional phase in 2012-13 (i.e. well before the TMCLKL construction works commenced), with such averages being much lower than the ones in the baseline phase (with reductions of 71.9% for ER(STG) and 76.1% for ER(ANI)). Since then, dolphin occurrence diminished further to an extremely low level during the first and second impact phase periods of TMCLKL construction works, and then to complete absences in the subsequent annual periods (Table 2).
- 3.3.4. On the other hand, the average dolphin encounter rates (STG and ANI) in NWL during the present post-construction phase monitoring period were much lower (with reductions of 83.1% and 88.5% for ER(STG) and ER(ANI) respectively) than the ones recorded in the baseline period (Table 2), indicating a dramatic decline in dolphin usage of this survey area. Notably, those annual encounter rates remained at consistently low levels in the past six consecutive periods since 2014-15.
- 3.3.5. It should also be noted that the encounter rates in NWL during the first year of impact phase (2013-14) were only slightly lower than the baseline and transitional phases, but such decline has quickly accelerated during the subsequent impact phase and post-construction phase monitoring periods. Such dramatic drop in dolphin occurrences between 2013-14 and 2014-15 at the peak of HZMB construction works signaled a further

widespread of declining usage from NEL waters to the entire North Lantau region with no sign of recovery, even though most marine works associated with the HZMB construction has already been completed.

- 3.3.6. A two-way ANOVA with repeated measures of variance and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the nine monitoring periods throughout baseline, transitional, impact and post-construction phases. The two variables that were examined included the different periods and the two locations (i.e. NEL and NWL).
- 3.3.7. Such comparison revealed that the p-value for the differences in average dolphin encounter rates of STG and ANI were both 0.000000 and 0.000000 respectively. Even if the alpha value is set at 0.00001, significant differences were detected among the different 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 singletons to eight individuals per group in NL region during the first post-construction monitoring period in 2020-21. The average dolphin group sizes in the present monitoring period were compared with the ones deduced from baseline, transitional and impact phases, as shown in Table 3.

Table 3. Comparison of average dolphin group sizes from the first year of post-construction phase, six years of impact phase, transitional phase and baseline phase monitoring periods (\pm denotes the standard deviation of the average encounter rates)

	Average Dolphin Group Size		
	Overall	Northeast Lantau	Northwest Lantau
Post-construction Phase (2020-21)	2.64 \pm 2.08 (n = 22)	0.00	2.64 \pm 2.08 (n = 22)
Impact Phase (2018-19)	2.52 \pm 1.45 (n = 27)	0.00	2.52 \pm 1.45 (n = 27)
Impact Phase (2017-18)	3.12 \pm 2.86 (n = 42)	0.00	3.12 \pm 2.86 (n = 42)
Impact Phase (2016-17)	3.51 \pm 2.68 (n = 43)	0.00	3.51 \pm 2.68 (n = 43)
Impact Phase (2015-16)	3.73 \pm 3.14 (n = 45)	1.00 (n = 1)	3.80 \pm 3.14 (n = 44)
Impact Phase (2014-15)	4.24 \pm 3.15 (n = 54)	1.00 (n = 1)	4.30 \pm 3.15 (n = 53)
Impact Phase (2013-14)	3.76 \pm 2.57 (n = 136)	5.00 \pm 2.71 (n = 4)	3.73 \pm 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 \pm 2.98 (n = 186)	2.64 \pm 2.38 (n = 22)	3.47 \pm 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 \pm 2.86 (n = 288)	2.80 \pm 2.35 (n = 79)	3.52 \pm 3.01 (n = 209)

- 3.4.2. The average dolphin group size in NWL waters (and also the entire North Lantau region as no dolphin was sighted in NEL waters) during the present post-construction phase monitoring period was the second lowest among all annual periods of the baseline, transitional and impact phases, and was only slightly higher than the previous impact phase in 2018-19 by a very small margin (Table 3).

- 3.4.3. Among the 22 dolphin groups sighted in 2020-21, 18 of them were composed of 1-4 individuals only, while there were four groups with more than 5 animals, with one group each with five, six, seven and eight animals (Appendix II).
- 3.4.4. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present monitoring period is shown in Figure 3, with comparison to the ones from the six years of impact phase as well as the transitional and baseline phases. During the post-construction period in 2020-21, distribution of the four dolphin groups with moderate sizes were scattered in the northwestern and southwestern portions of the NWL survey area with no particular concentration (Figure 3).
- 3.4.5. Throughout the six impact phases as well as the present post-construction phase, distribution of these slightly larger groups has been consistently confined to the northwestern portion of North Lantau region. Such limited distribution was drastically different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many of them also sighted in NEL waters (Figure 3). The dramatic decline in occurrences of larger dolphin groups was evident in the past six annual periods since 2014-15.
- 3.5. *Habitat use*
- 3.5.1. During the present post-construction phase monitoring period in 2020-21, only 18 grids recorded dolphin densities, and all of these grids were with low to moderately low densities, except a grid near the HKLR09 alignment (i.e. G20) with slightly higher density (Figures 4a and 4b). Moreover, all grids near the HKLR03 and HKBCF reclamation sites as well as the entire alignment of TMCLKL did not record any presence of dolphins in the present monitoring period in 2020-21 (Figures 4a and 4b).
- 3.5.2. When compared with the habitat use patterns during the baseline phase, dolphin usage in NEL has progressively diminished during the transitional phase and the subsequent six periods of impact phase as well as the first period of post-construction phase (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, and most grids in NEL recorded dolphin usage. This was in stark contrast to the complete absence of dolphin in this area during the past three impact phase periods and the present post-construction phase period (Figure 5).
- 3.5.3. Moreover, dolphin usage of NWL waters has also declined dramatically in recent years (including the present one in 2020-21), with slightly higher densities only occurred near Lung Kwu Chau and the HKLR09 alignment (Figure 5). This is in contrast to a more evenly spread usage in NWL during the baseline phase, transitional phase and the first year of impact phase monitoring. Apparently, there has been a more widespread decline of dolphin usage throughout the North Lantau waters in recent years of impact phase monitoring as well as the present post-construction monitoring period, to the lowest level in 2018-19 and 2020-21 (Figure 5).
- 3.6. *Mother-calf pairs*
- 3.6.1. During the first year of post-construction monitoring, only one unspotted juvenile (UJ)

was sighted near Pillar Point in the NWL survey area (Figure 6). Notably, the extremely low occurrence of young calves have been persistent in recent impact phase monitoring periods as well as the present post-construction period, ranging from 0% in 2015-16 and 2017-18 to 1.5% in 2018-19 and 1.7% in 2020-21, in comparison to the higher percentages recorded during the first impact phase monitoring period in 2013-14 (5.7%), the transitional phase (6.7%) and the baseline phase (4.5%).

3.6.2. The very rare occurrence of young calves in NL region in the past six monitoring periods was drastically different from the distribution patterns observed during the baseline and transitional phases when the young calves were sighted throughout NWL and NEL waters (Figure 6).

3.7. *Activities and associations with fishing boats*

3.7.1. A total of four dolphin sightings were associated with feeding activities during the 2020-21 monitoring period. Even though the percentage of sightings associated with feeding activities during the first year of post-construction phase (18.2%) was similar to the impact phase period in 2016-17 (18.6%) and higher than the baseline period (12.8%), transitional period (8.6%) as well as the other impact phase periods (5.9-11.1%), it should be considered that the sample size in 2020-21 was much smaller than all other periods.

3.7.2. On the other hand, none of the dolphin sightings made in 2020-21 was associated with socializing activities. Besides the 2016-17 monitoring period also recorded no sighting associated with socializing activity, the percentage of such sightings in 2020-21 was lower than all other impact monitoring periods (2018-19 (3.7%), 2017-18 (4.8%), 2015-16 (8.9%), 2014-15 (5.5%) and 2013-14 (5.9%)) as well as the transitional period (6.4%) and the baseline period (3.8%). Notably, none of the 22 dolphin groups was engaged in traveling or resting/milling activities in 2020-21.

3.7.3. Distribution of dolphins engaged in feeding activities during the present post-construction period is shown in Figure 7. The four groups engaged in feeding activities were scattered to the west of Lung Kwu Chau and just to the north of the HKLR09 alignment. The comparison in distribution of dolphins engaged in different activities during different monitoring phases revealed that feeding activities were more frequently sighted during the baseline and transitional periods along the Urmston Road, within the Sha Chau and Lung Kwu Chau Marine Park, to the west of the airport platform and around the Brothers Islands, while the socializing activities were more scattered throughout the North Lantau region for these periods (Figure 7). It is apparent that the “hotspots” where dolphins engaged in different activities were considerably different between the baseline, transitional, impact phases as well as the present post-construction phase.

3.7.4. Notably, none of the 22 dolphin groups sighted during the present monitoring period in 2020-21 was found to be associated with any operating fishing vessel. The extremely rare events of fishing boat associations by the dolphins in recent years of TMCLKL monitoring (including the present period in 2020-21) were very different from the baseline period with 14 of 288 dolphin groups associated with fishing boats.

3.8. *Summary of photo-identification works*

- 3.8.1. During the present post-construction phase monitoring period in 2020-21, a total of 28 individuals sighted 40 times altogether were identified (see Appendix III). All of these re-sightings were made in NWL.
- 3.8.2. The vast majority of identified individuals were sighted only once or twice, while only three individuals were sighted more than twice. These included NL331 and WL179 being sighted three times each, as well as NL202 being sighted five times in 2020-21. Their relatively more frequent occurrences during the first year of post-construction phase monitoring indicated slightly stronger reliance of NWL waters as part of their home ranges, while most identified individuals rarely ventured into NWL waters.
- 3.8.3. Notably, a total of five well-recognized females (i.e. NL98, NL202, NL272, WL98 and WL145) were accompanied with their calves during their re-sightings recorded in 2020-21 monitoring period.
- 3.9. *Individual range use*
- 3.9.1. Ranging patterns of the 28 individuals identified during the 12-month post-construction phase monitoring period in 2020-21 were determined by fixed kernel method, and are shown in Appendix IV.
- 3.9.2. The individual range use analysis revealed that only half of the identified dolphins sighted in NWL waters within this 12-month period have been utilizing their ranges primarily in North Lantau in the past and present. On the contrary, the other half had their ranges primarily centered in WL and SWL waters but have infrequently ventured into NWL waters (albeit mostly at the juncture of NWL and WL survey areas, such as NL331, WL145, WL283 and WL301) during the present post-construction monitoring period (Appendix IV).
- 3.9.3. Notably, all dolphins identified in 2020-21 have avoided the NEL waters, the area where many individual dolphins have utilized as their core areas of activities before the HZMB construction.

4. **References**

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Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.

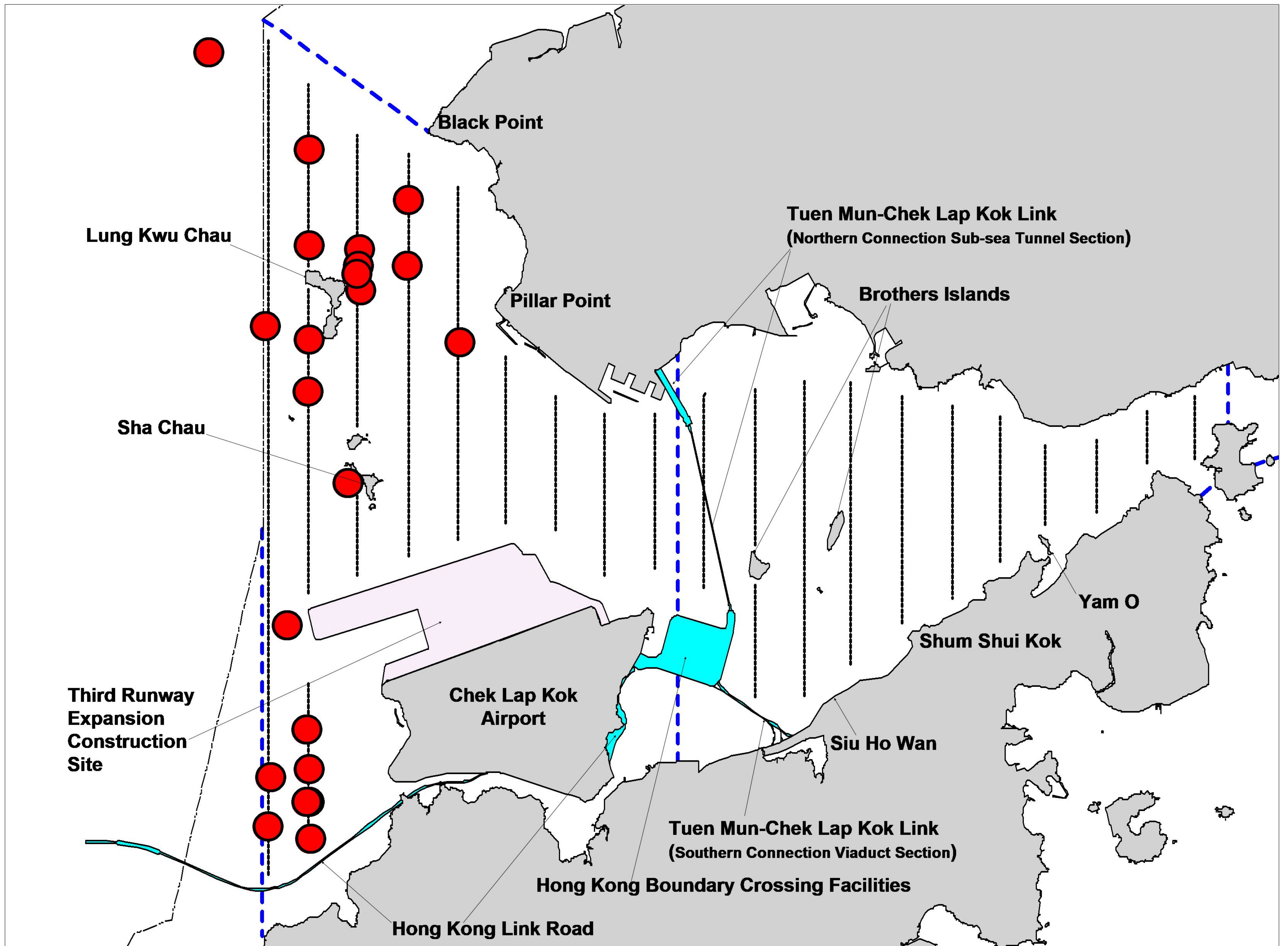


Figure 1. Distribution of Chinese White Dolphin sightings in North Lantau region during the first year of TMCLKL post- construction monitoring period from June 2020 to May 2021

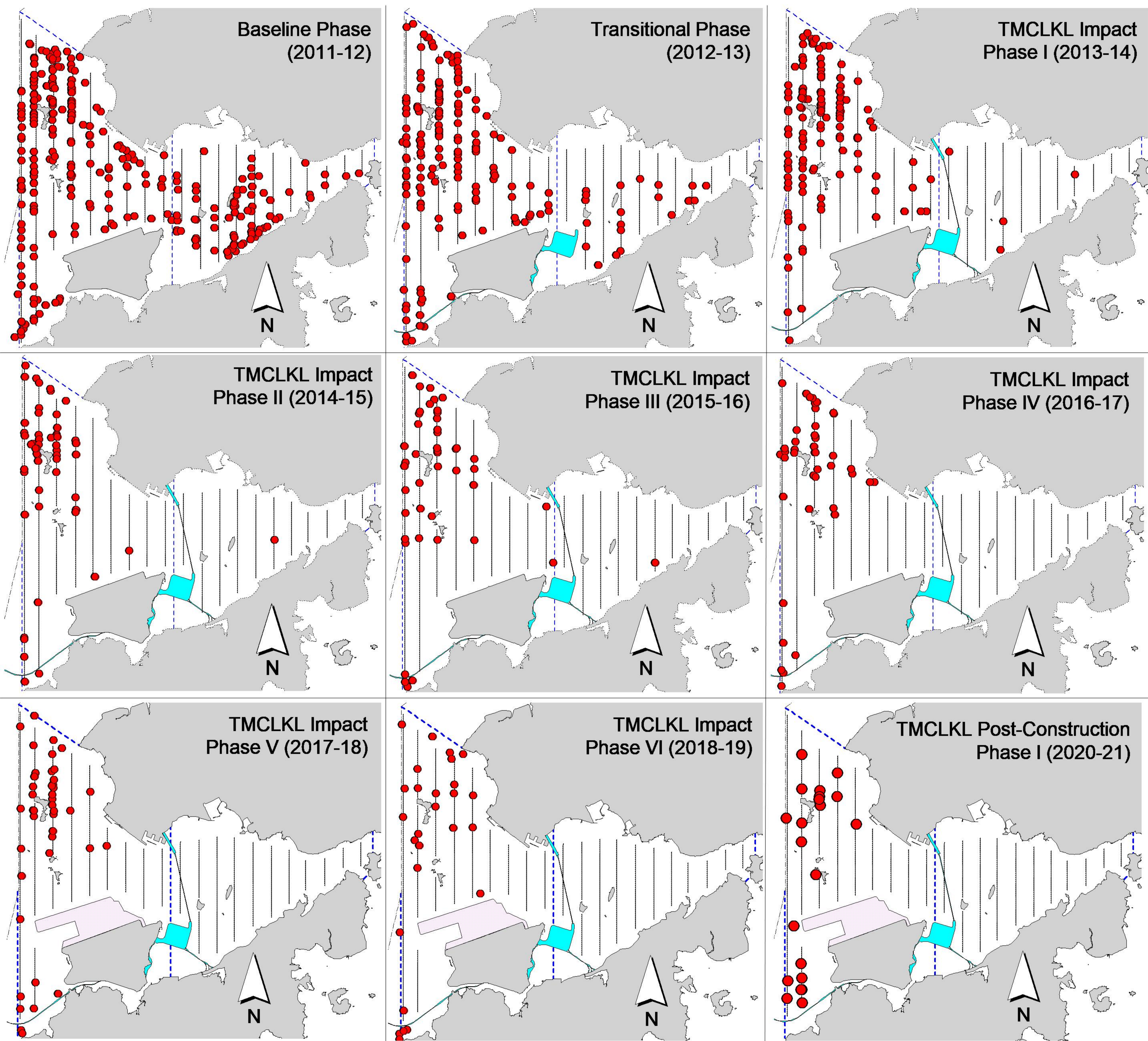


Figure 2. A comparison on distribution of Chinese White Dolphin sightings in North Lantau region during the baseline (2011-12), transitional (2012-13), six impact phases (2013-14, 2014-15, 2015-16, 2016-17, 2017-18 & 2018-19) and the first post-construction phase (2020-21) of TMCLKL construction works

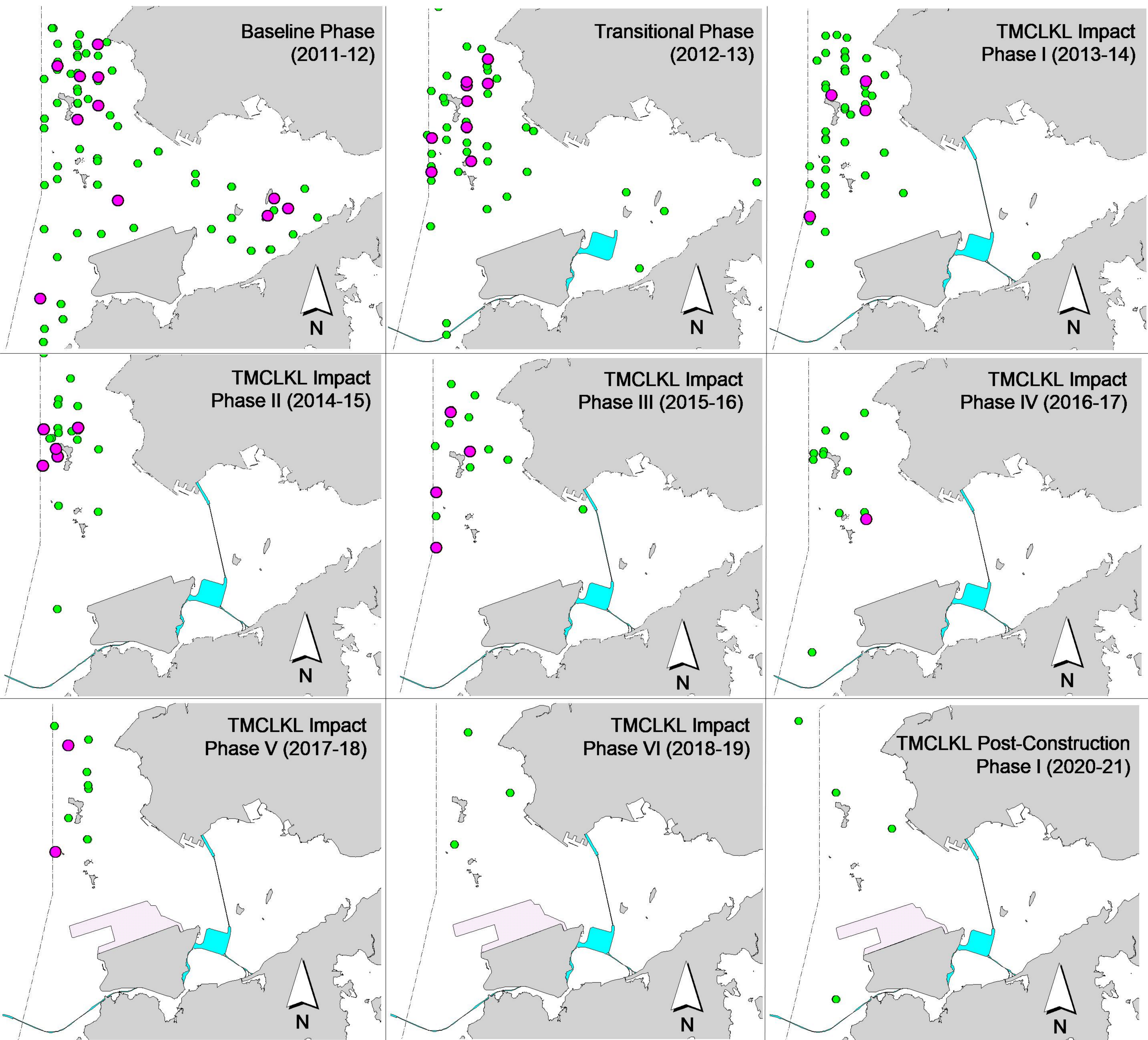


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

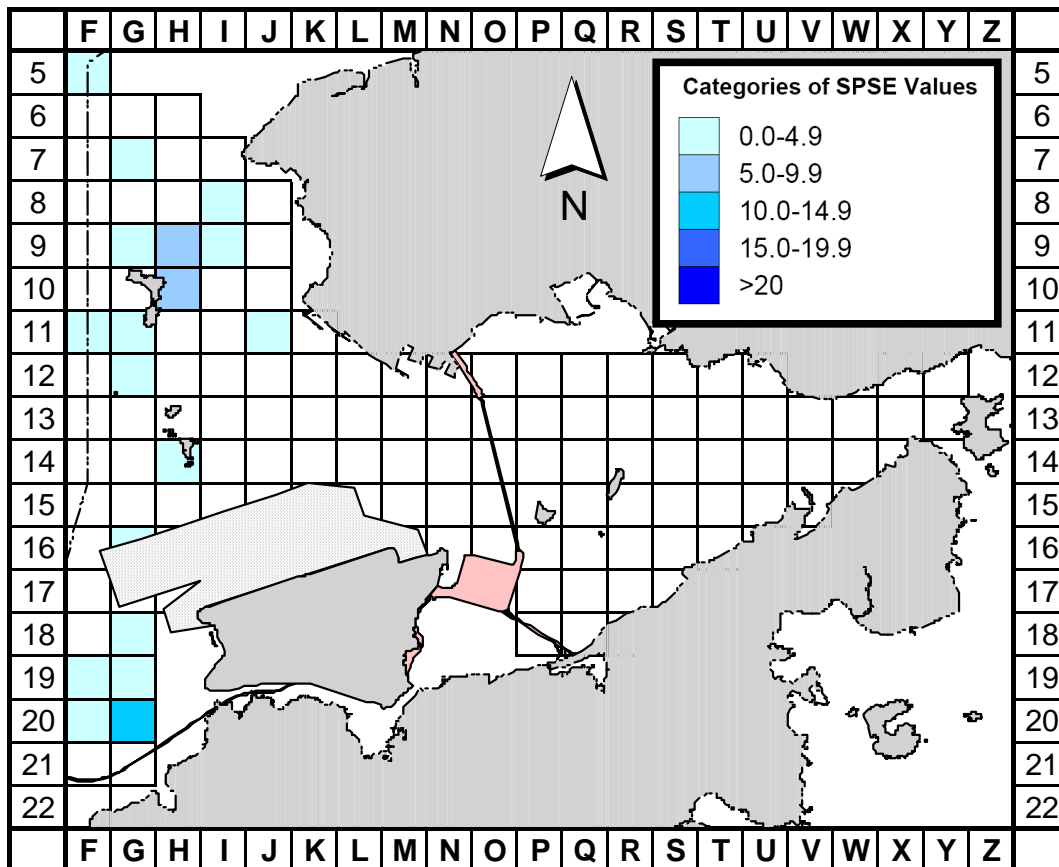


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during the TMCLKL post-construction monitoring period in Jun20-May21 (SPSE = no. of on-effort sightings per 100 units of survey effort)

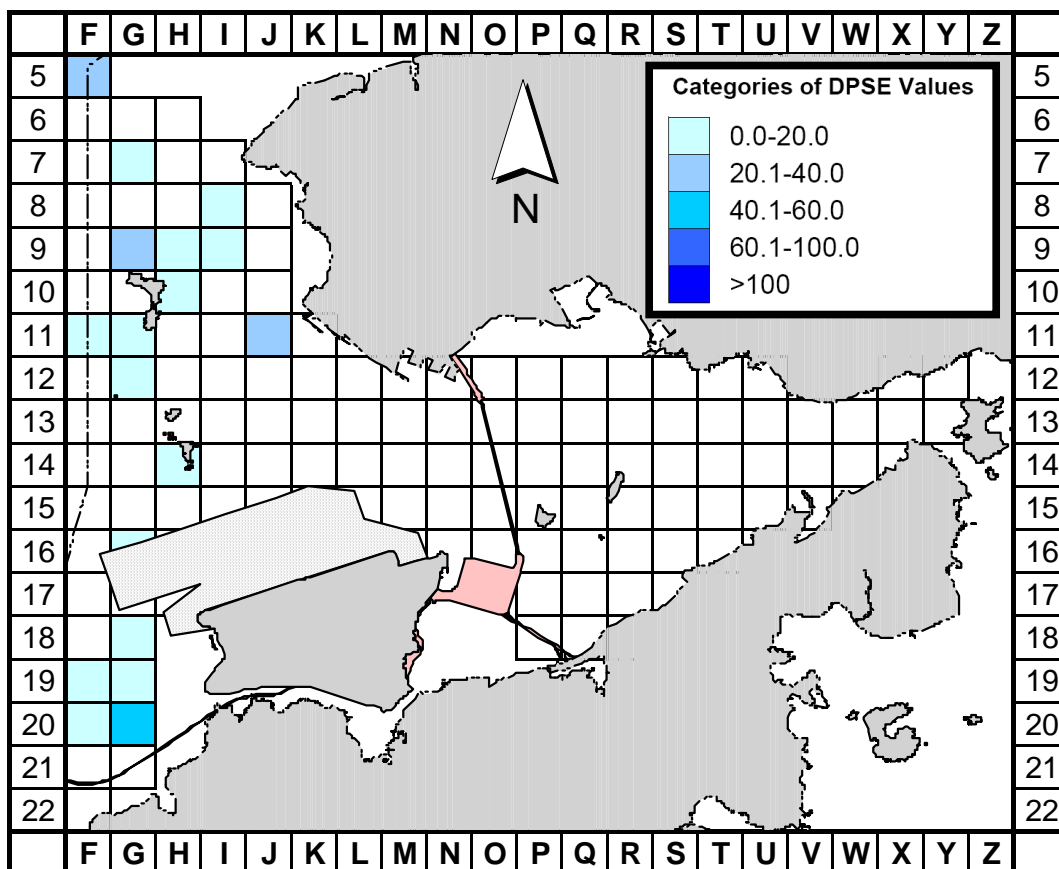


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during the TMCLKL post-construction monitoring period in Jun20-May 21 (DPSE = no. of dolphins per 100 units of survey effort)

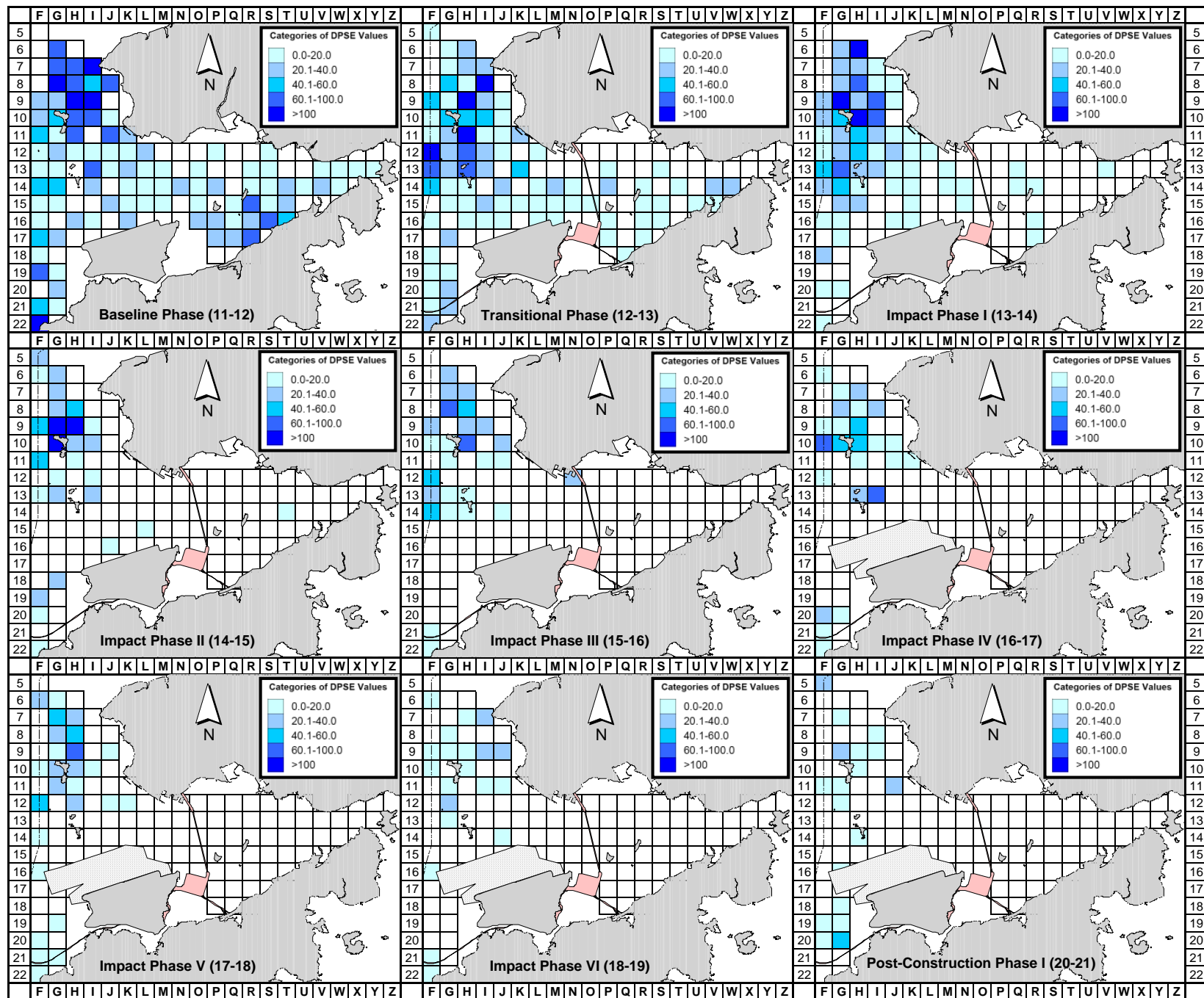


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km² in NWL and NEL survey areas between the first post-construction phase of TMCLKL in 2020-21, the six impact phases of TMCLKL (2013-14, 2014-15, 2015-16, 2016-17, 2017-18 & 2018-19), transitional phase in 2012-13 and baseline phase in 2011-12 (DPSE = no. of dolphins per 100 units of survey effort)

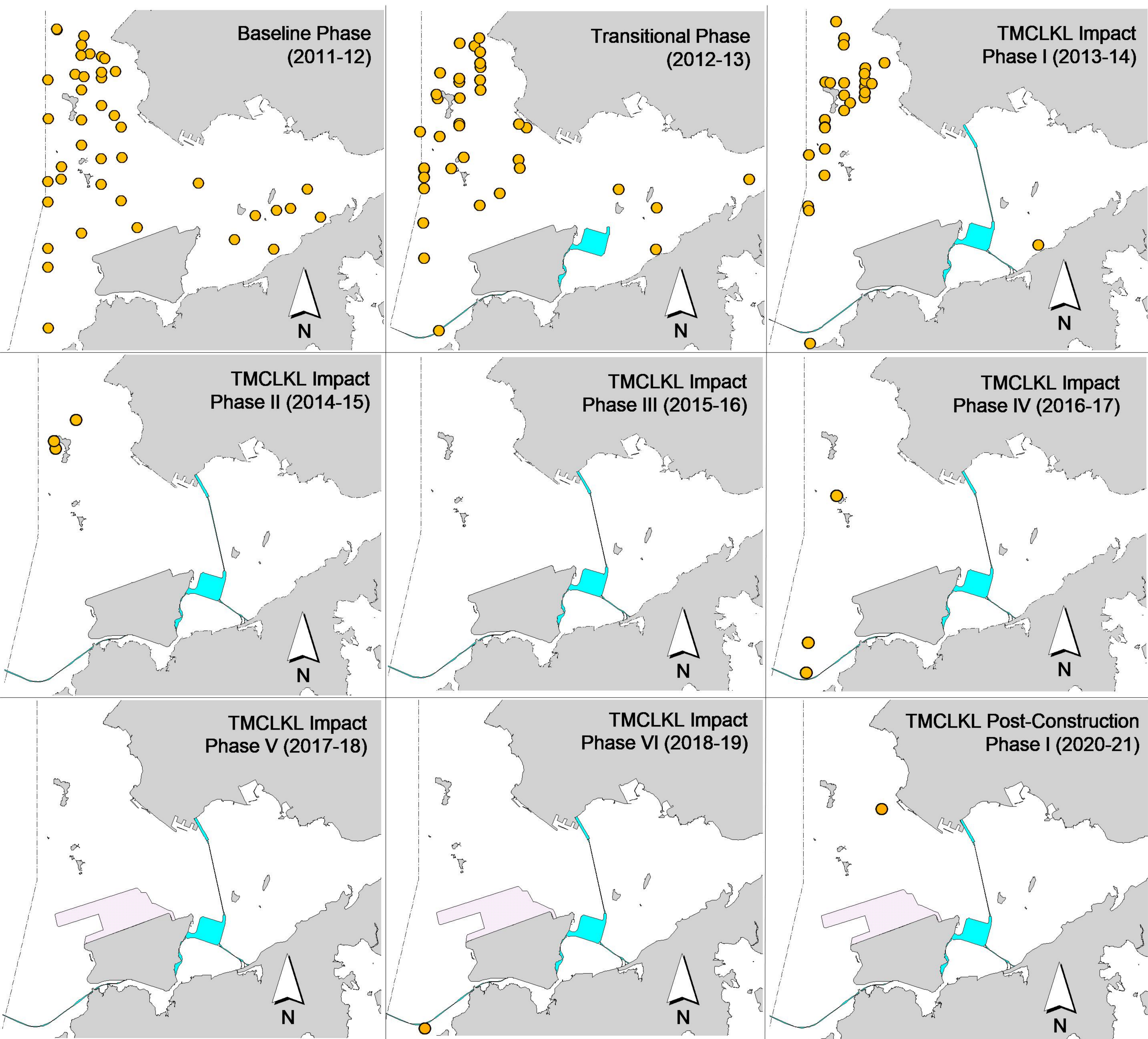


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works

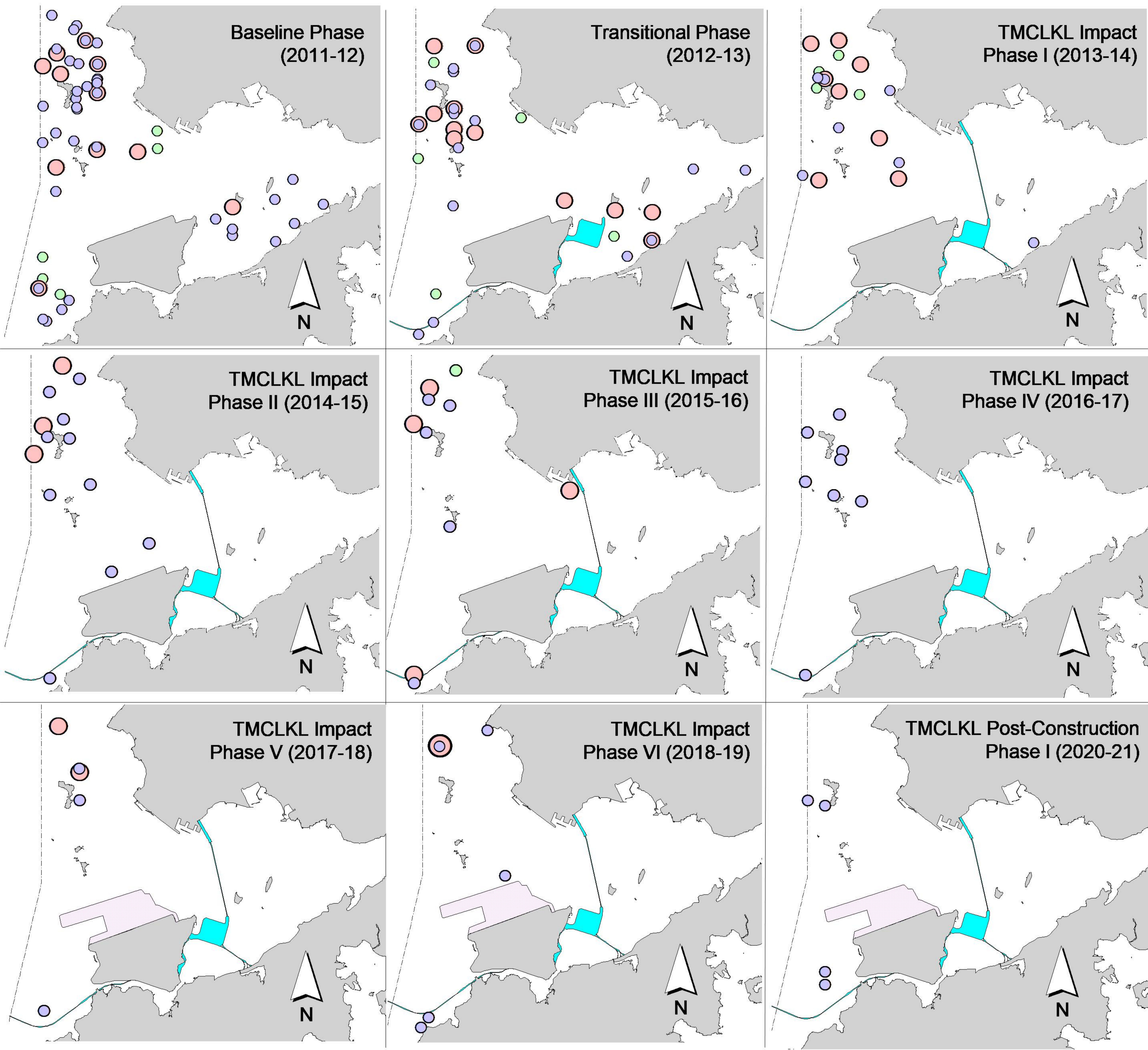


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works

Appendix I. TMCLKL Survey Effort Database (June 2020 - May 2021)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
4-Jun-20	NW LANTAU	2	8.70	SUMMER	STANDARD36826	TMCLKL	P
4-Jun-20	NW LANTAU	3	17.62	SUMMER	STANDARD36826	TMCLKL	P
4-Jun-20	NW LANTAU	2	3.50	SUMMER	STANDARD36826	TMCLKL	S
4-Jun-20	NW LANTAU	3	9.58	SUMMER	STANDARD36826	TMCLKL	S
4-Jun-20	NE LANTAU	2	25.33	SUMMER	STANDARD36826	TMCLKL	P
4-Jun-20	NE LANTAU	3	8.60	SUMMER	STANDARD36826	TMCLKL	P
4-Jun-20	NE LANTAU	2	11.57	SUMMER	STANDARD36826	TMCLKL	S
4-Jun-20	NE LANTAU	3	1.10	SUMMER	STANDARD36826	TMCLKL	S
9-Jun-20	NW LANTAU	2	27.60	SUMMER	STANDARD36826	TMCLKL	P
9-Jun-20	NW LANTAU	3	5.50	SUMMER	STANDARD36826	TMCLKL	P
9-Jun-20	NW LANTAU	2	9.10	SUMMER	STANDARD36826	TMCLKL	S
9-Jun-20	NW LANTAU	3	2.10	SUMMER	STANDARD36826	TMCLKL	S
11-Jun-20	NW LANTAU	2	20.23	SUMMER	STANDARD36826	TMCLKL	P
11-Jun-20	NW LANTAU	3	5.70	SUMMER	STANDARD36826	TMCLKL	P
11-Jun-20	NW LANTAU	2	9.87	SUMMER	STANDARD36826	TMCLKL	S
11-Jun-20	NE LANTAU	2	27.09	SUMMER	STANDARD36826	TMCLKL	P
11-Jun-20	NE LANTAU	3	8.40	SUMMER	STANDARD36826	TMCLKL	P
11-Jun-20	NE LANTAU	2	8.71	SUMMER	STANDARD36826	TMCLKL	S
11-Jun-20	NE LANTAU	3	2.10	SUMMER	STANDARD36826	TMCLKL	S
16-Jun-20	NW LANTAU	2	23.10	SUMMER	STANDARD36826	TMCLKL	P
16-Jun-20	NW LANTAU	3	12.79	SUMMER	STANDARD36826	TMCLKL	P
16-Jun-20	NW LANTAU	2	10.11	SUMMER	STANDARD36826	TMCLKL	S
16-Jun-20	NW LANTAU	3	0.50	SUMMER	STANDARD36826	TMCLKL	S
2-Jul-20	NW LANTAU	2	13.11	SUMMER	STANDARD36826	TMCLKL	P
2-Jul-20	NW LANTAU	3	15.06	SUMMER	STANDARD36826	TMCLKL	P
2-Jul-20	NW LANTAU	2	7.43	SUMMER	STANDARD36826	TMCLKL	S
2-Jul-20	NW LANTAU	3	2.10	SUMMER	STANDARD36826	TMCLKL	S
2-Jul-20	NE LANTAU	1	2.38	SUMMER	STANDARD36826	TMCLKL	P
2-Jul-20	NE LANTAU	2	31.42	SUMMER	STANDARD36826	TMCLKL	P
2-Jul-20	NE LANTAU	2	11.80	SUMMER	STANDARD36826	TMCLKL	S
7-Jul-20	NW LANTAU	2	21.74	SUMMER	STANDARD36826	TMCLKL	P
7-Jul-20	NW LANTAU	3	9.90	SUMMER	STANDARD36826	TMCLKL	P
7-Jul-20	NW LANTAU	2	2.01	SUMMER	STANDARD36826	TMCLKL	S
7-Jul-20	NW LANTAU	3	6.60	SUMMER	STANDARD36826	TMCLKL	S
9-Jul-20	NW LANTAU	3	24.11	SUMMER	STANDARD36826	TMCLKL	P
9-Jul-20	NW LANTAU	4	4.60	SUMMER	STANDARD36826	TMCLKL	P
9-Jul-20	NW LANTAU	3	10.69	SUMMER	STANDARD36826	TMCLKL	S
9-Jul-20	NE LANTAU	2	26.80	SUMMER	STANDARD36826	TMCLKL	P
9-Jul-20	NE LANTAU	3	8.75	SUMMER	STANDARD36826	TMCLKL	P
9-Jul-20	NE LANTAU	2	11.35	SUMMER	STANDARD36826	TMCLKL	S
9-Jul-20	NE LANTAU	3	1.10	SUMMER	STANDARD36826	TMCLKL	S
20-Jul-20	NW LANTAU	2	23.18	SUMMER	STANDARD36826	TMCLKL	P
20-Jul-20	NW LANTAU	3	8.71	SUMMER	STANDARD36826	TMCLKL	P
20-Jul-20	NW LANTAU	2	11.11	SUMMER	STANDARD36826	TMCLKL	S
20-Jul-20	NW LANTAU	3	1.00	SUMMER	STANDARD36826	TMCLKL	S
4-Aug-20	NW LANTAU	1	20.77	SUMMER	STANDARD36826	TMCLKL	P
4-Aug-20	NW LANTAU	2	7.90	SUMMER	STANDARD36826	TMCLKL	P
4-Aug-20	NW LANTAU	1	7.33	SUMMER	STANDARD36826	TMCLKL	S
4-Aug-20	NW LANTAU	2	3.50	SUMMER	STANDARD36826	TMCLKL	S
4-Aug-20	NE LANTAU	2	18.34	SUMMER	STANDARD36826	TMCLKL	P
4-Aug-20	NE LANTAU	3	16.56	SUMMER	STANDARD36826	TMCLKL	P
4-Aug-20	NE LANTAU	2	8.60	SUMMER	STANDARD36826	TMCLKL	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
4-Aug-20	NE LANTAU	3	4.60	SUMMER	STANDARD36826	TMCLKL	S
14-Aug-20	NW LANTAU	1	7.35	SUMMER	STANDARD36826	TMCLKL	P
14-Aug-20	NW LANTAU	2	23.38	SUMMER	STANDARD36826	TMCLKL	P
14-Aug-20	NW LANTAU	3	1.15	SUMMER	STANDARD36826	TMCLKL	P
14-Aug-20	NW LANTAU	2	6.42	SUMMER	STANDARD36826	TMCLKL	S
14-Aug-20	NW LANTAU	3	2.40	SUMMER	STANDARD36826	TMCLKL	S
18-Aug-20	NW LANTAU	1	3.24	SUMMER	STANDARD36826	TMCLKL	P
18-Aug-20	NW LANTAU	2	21.53	SUMMER	STANDARD36826	TMCLKL	P
18-Aug-20	NW LANTAU	3	3.40	SUMMER	STANDARD36826	TMCLKL	P
18-Aug-20	NW LANTAU	1	4.16	SUMMER	STANDARD36826	TMCLKL	S
18-Aug-20	NW LANTAU	2	3.67	SUMMER	STANDARD36826	TMCLKL	S
18-Aug-20	NW LANTAU	3	2.40	SUMMER	STANDARD36826	TMCLKL	S
18-Aug-20	NE LANTAU	1	10.37	SUMMER	STANDARD36826	TMCLKL	P
18-Aug-20	NE LANTAU	2	5.19	SUMMER	STANDARD36826	TMCLKL	P
18-Aug-20	NE LANTAU	1	3.03	SUMMER	STANDARD36826	TMCLKL	S
18-Aug-20	NE LANTAU	2	1.71	SUMMER	STANDARD36826	TMCLKL	S
21-Aug-20	NW LANTAU	1	2.56	SUMMER	STANDARD36826	TMCLKL	P
21-Aug-20	NW LANTAU	2	30.10	SUMMER	STANDARD36826	TMCLKL	P
21-Aug-20	NW LANTAU	1	2.80	SUMMER	STANDARD36826	TMCLKL	S
21-Aug-20	NW LANTAU	2	7.90	SUMMER	STANDARD36826	TMCLKL	S
21-Aug-20	NE LANTAU	1	9.62	SUMMER	STANDARD36826	TMCLKL	P
21-Aug-20	NE LANTAU	2	10.89	SUMMER	STANDARD36826	TMCLKL	P
21-Aug-20	NE LANTAU	1	1.10	SUMMER	STANDARD36826	TMCLKL	S
21-Aug-20	NE LANTAU	2	6.49	SUMMER	STANDARD36826	TMCLKL	S
9-Sep-20	NW LANTAU	1	12.70	AUTUMN	STANDARD36826	TMCLKL	P
9-Sep-20	NW LANTAU	2	16.50	AUTUMN	STANDARD36826	TMCLKL	P
9-Sep-20	NW LANTAU	1	5.92	AUTUMN	STANDARD36826	TMCLKL	S
9-Sep-20	NW LANTAU	2	5.48	AUTUMN	STANDARD36826	TMCLKL	S
9-Sep-20	NE LANTAU	1	7.01	AUTUMN	STANDARD36826	TMCLKL	P
9-Sep-20	NE LANTAU	2	28.49	AUTUMN	STANDARD36826	TMCLKL	P
9-Sep-20	NE LANTAU	1	5.00	AUTUMN	STANDARD36826	TMCLKL	S
9-Sep-20	NE LANTAU	2	7.80	AUTUMN	STANDARD36826	TMCLKL	S
15-Sep-20	NW LANTAU	1	4.25	AUTUMN	STANDARD36826	TMCLKL	P
15-Sep-20	NW LANTAU	2	26.45	AUTUMN	STANDARD36826	TMCLKL	P
15-Sep-20	NW LANTAU	3	2.28	AUTUMN	STANDARD36826	TMCLKL	P
15-Sep-20	NW LANTAU	2	10.93	AUTUMN	STANDARD36826	TMCLKL	S
21-Sep-20	NW LANTAU	1	1.77	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-20	NW LANTAU	2	15.75	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-20	NW LANTAU	3	9.30	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-20	NW LANTAU	2	7.08	AUTUMN	STANDARD36826	TMCLKL	S
21-Sep-20	NW LANTAU	3	5.10	AUTUMN	STANDARD36826	TMCLKL	S
21-Sep-20	NE LANTAU	2	13.67	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-20	NE LANTAU	3	21.76	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-20	NE LANTAU	2	6.48	AUTUMN	STANDARD36826	TMCLKL	S
21-Sep-20	NE LANTAU	3	5.39	AUTUMN	STANDARD36826	TMCLKL	S
23-Sep-20	NW LANTAU	1	14.56	AUTUMN	STANDARD36826	TMCLKL	P
23-Sep-20	NW LANTAU	2	16.32	AUTUMN	STANDARD36826	TMCLKL	P
23-Sep-20	NW LANTAU	3	2.00	AUTUMN	STANDARD36826	TMCLKL	P
23-Sep-20	NW LANTAU	2	8.42	AUTUMN	STANDARD36826	TMCLKL	S
7-Oct-20	NW LANTAU	2	6.09	AUTUMN	STANDARD36826	TMCLKL	P
7-Oct-20	NW LANTAU	3	20.74	AUTUMN	STANDARD36826	TMCLKL	P
7-Oct-20	NW LANTAU	2	3.90	AUTUMN	STANDARD36826	TMCLKL	S
7-Oct-20	NW LANTAU	3	7.77	AUTUMN	STANDARD36826	TMCLKL	S
7-Oct-20	NE LANTAU	2	31.32	AUTUMN	STANDARD36826	TMCLKL	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
7-Oct-20	NE LANTAU	3	3.11	AUTUMN	STANDARD36826	TMCLKL	P
7-Oct-20	NE LANTAU	2	10.22	AUTUMN	STANDARD36826	TMCLKL	S
7-Oct-20	NE LANTAU	3	2.25	AUTUMN	STANDARD36826	TMCLKL	S
12-Oct-20	NW LANTAU	2	16.39	AUTUMN	STANDARD36826	TMCLKL	P
12-Oct-20	NW LANTAU	3	15.53	AUTUMN	STANDARD36826	TMCLKL	P
12-Oct-20	NW LANTAU	2	8.68	AUTUMN	STANDARD36826	TMCLKL	S
19-Oct-20	NW LANTAU	2	14.73	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-20	NW LANTAU	3	11.54	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-20	NW LANTAU	2	7.60	AUTUMN	STANDARD36826	TMCLKL	S
19-Oct-20	NW LANTAU	3	4.63	AUTUMN	STANDARD36826	TMCLKL	S
19-Oct-20	NE LANTAU	1	3.80	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-20	NE LANTAU	2	28.13	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-20	NE LANTAU	3	3.00	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-20	NE LANTAU	1	1.20	AUTUMN	STANDARD36826	TMCLKL	S
19-Oct-20	NE LANTAU	2	9.47	AUTUMN	STANDARD36826	TMCLKL	S
19-Oct-20	NE LANTAU	3	0.80	AUTUMN	STANDARD36826	TMCLKL	S
22-Oct-20	NW LANTAU	3	32.58	AUTUMN	STANDARD36826	TMCLKL	P
22-Oct-20	NW LANTAU	2	0.90	AUTUMN	STANDARD36826	TMCLKL	S
22-Oct-20	NW LANTAU	3	9.62	AUTUMN	STANDARD36826	TMCLKL	S
4-Nov-20	NW LANTAU	2	19.01	AUTUMN	STANDARD36826	TMCLKL	P
4-Nov-20	NW LANTAU	3	9.69	AUTUMN	STANDARD36826	TMCLKL	P
4-Nov-20	NW LANTAU	2	7.30	AUTUMN	STANDARD36826	TMCLKL	S
4-Nov-20	NW LANTAU	3	3.10	AUTUMN	STANDARD36826	TMCLKL	S
4-Nov-20	NE LANTAU	2	34.20	AUTUMN	STANDARD36826	TMCLKL	P
4-Nov-20	NE LANTAU	3	2.70	AUTUMN	STANDARD36826	TMCLKL	P
4-Nov-20	NE LANTAU	2	12.50	AUTUMN	STANDARD36826	TMCLKL	S
4-Nov-20	NE LANTAU	3	1.00	AUTUMN	STANDARD36826	TMCLKL	S
9-Nov-20	NW LANTAU	2	12.64	AUTUMN	STANDARD36826	TMCLKL	P
9-Nov-20	NW LANTAU	3	19.96	AUTUMN	STANDARD36826	TMCLKL	P
9-Nov-20	NW LANTAU	2	7.26	AUTUMN	STANDARD36826	TMCLKL	S
9-Nov-20	NW LANTAU	3	1.54	AUTUMN	STANDARD36826	TMCLKL	S
17-Nov-20	NW LANTAU	2	3.80	AUTUMN	STANDARD36826	TMCLKL	P
17-Nov-20	NW LANTAU	3	24.32	AUTUMN	STANDARD36826	TMCLKL	P
17-Nov-20	NW LANTAU	2	3.47	AUTUMN	STANDARD36826	TMCLKL	S
17-Nov-20	NW LANTAU	3	7.33	AUTUMN	STANDARD36826	TMCLKL	S
17-Nov-20	NE LANTAU	2	32.10	AUTUMN	STANDARD36826	TMCLKL	P
17-Nov-20	NE LANTAU	3	3.38	AUTUMN	STANDARD36826	TMCLKL	P
17-Nov-20	NE LANTAU	2	12.72	AUTUMN	STANDARD36826	TMCLKL	S
23-Nov-20	NW LANTAU	2	11.30	AUTUMN	STANDARD36826	TMCLKL	P
23-Nov-20	NW LANTAU	3	20.90	AUTUMN	STANDARD36826	TMCLKL	P
23-Nov-20	NW LANTAU	2	8.30	AUTUMN	STANDARD36826	TMCLKL	S
1-Dec-20	NW LANTAU	2	9.10	WINTER	STANDARD36826	TMCLKL	P
1-Dec-20	NW LANTAU	3	13.63	WINTER	STANDARD36826	TMCLKL	P
1-Dec-20	NW LANTAU	4	4.83	WINTER	STANDARD36826	TMCLKL	P
1-Dec-20	NW LANTAU	2	9.00	WINTER	STANDARD36826	TMCLKL	S
1-Dec-20	NW LANTAU	3	2.44	WINTER	STANDARD36826	TMCLKL	S
1-Dec-20	NE LANTAU	1	2.50	WINTER	STANDARD36826	TMCLKL	P
1-Dec-20	NE LANTAU	2	32.93	WINTER	STANDARD36826	TMCLKL	P
1-Dec-20	NE LANTAU	1	1.20	WINTER	STANDARD36826	TMCLKL	S
1-Dec-20	NE LANTAU	2	11.77	WINTER	STANDARD36826	TMCLKL	S
3-Dec-20	NW LANTAU	2	1.43	WINTER	STANDARD36826	TMCLKL	P
3-Dec-20	NW LANTAU	3	23.50	WINTER	STANDARD36826	TMCLKL	P
3-Dec-20	NW LANTAU	4	8.46	WINTER	STANDARD36826	TMCLKL	P
3-Dec-20	NW LANTAU	2	1.84	WINTER	STANDARD36826	TMCLKL	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
3-Dec-20	NW LANTAU	3	6.47	WINTER	STANDARD36826	TMCLKL	S
8-Dec-20	NW LANTAU	2	5.40	WINTER	STANDARD36826	TMCLKL	P
8-Dec-20	NW LANTAU	3	22.14	WINTER	STANDARD36826	TMCLKL	P
8-Dec-20	NW LANTAU	2	3.60	WINTER	STANDARD36826	TMCLKL	S
8-Dec-20	NW LANTAU	3	8.06	WINTER	STANDARD36826	TMCLKL	S
8-Dec-20	NE LANTAU	2	35.51	WINTER	STANDARD36826	TMCLKL	P
8-Dec-20	NE LANTAU	2	12.49	WINTER	STANDARD36826	TMCLKL	S
10-Dec-20	NW LANTAU	2	27.88	WINTER	STANDARD36826	TMCLKL	P
10-Dec-20	NW LANTAU	3	4.95	WINTER	STANDARD36826	TMCLKL	P
10-Dec-20	NW LANTAU	2	8.26	WINTER	STANDARD36826	TMCLKL	S
25-Jan-21	NW LANTAU	1	4.08	WINTER	STANDARD36826	TMCLKL	P
25-Jan-21	NW LANTAU	2	28.26	WINTER	STANDARD36826	TMCLKL	P
25-Jan-21	NW LANTAU	2	8.25	WINTER	STANDARD36826	TMCLKL	S
26-Jan-21	NW LANTAU	1	4.74	WINTER	STANDARD36826	TMCLKL	P
26-Jan-21	NW LANTAU	2	24.42	WINTER	STANDARD36826	TMCLKL	P
26-Jan-21	NW LANTAU	1	1.50	WINTER	STANDARD36826	TMCLKL	S
26-Jan-21	NW LANTAU	2	8.81	WINTER	STANDARD36826	TMCLKL	S
26-Jan-21	NE LANTAU	1	2.60	WINTER	STANDARD36826	TMCLKL	P
26-Jan-21	NE LANTAU	2	33.98	WINTER	STANDARD36826	TMCLKL	P
26-Jan-21	NE LANTAU	1	2.30	WINTER	STANDARD36826	TMCLKL	S
26-Jan-21	NE LANTAU	2	9.92	WINTER	STANDARD36826	TMCLKL	S
27-Jan-21	NW LANTAU	1	6.50	WINTER	STANDARD36826	TMCLKL	P
27-Jan-21	NW LANTAU	2	26.15	WINTER	STANDARD36826	TMCLKL	P
27-Jan-21	NW LANTAU	1	3.90	WINTER	STANDARD36826	TMCLKL	S
27-Jan-21	NW LANTAU	2	6.75	WINTER	STANDARD36826	TMCLKL	S
28-Jan-21	NW LANTAU	1	0.52	WINTER	STANDARD36826	TMCLKL	P
28-Jan-21	NW LANTAU	2	22.11	WINTER	STANDARD36826	TMCLKL	P
28-Jan-21	NW LANTAU	3	3.73	WINTER	STANDARD36826	TMCLKL	P
28-Jan-21	NW LANTAU	1	2.53	WINTER	STANDARD36826	TMCLKL	S
28-Jan-21	NW LANTAU	2	9.50	WINTER	STANDARD36826	TMCLKL	S
28-Jan-21	NE LANTAU	2	21.46	WINTER	STANDARD36826	TMCLKL	P
28-Jan-21	NE LANTAU	3	14.01	WINTER	STANDARD36826	TMCLKL	P
28-Jan-21	NE LANTAU	2	8.40	WINTER	STANDARD36826	TMCLKL	S
28-Jan-21	NE LANTAU	3	4.03	WINTER	STANDARD36826	TMCLKL	S
2-Feb-21	NW LANTAU	1	3.60	WINTER	STANDARD36826	TMCLKL	P
2-Feb-21	NW LANTAU	2	24.81	WINTER	STANDARD36826	TMCLKL	P
2-Feb-21	NW LANTAU	1	2.45	WINTER	STANDARD36826	TMCLKL	S
2-Feb-21	NW LANTAU	2	7.70	WINTER	STANDARD36826	TMCLKL	S
2-Feb-21	NE LANTAU	0	1.60	WINTER	STANDARD36826	TMCLKL	P
2-Feb-21	NE LANTAU	1	15.60	WINTER	STANDARD36826	TMCLKL	P
2-Feb-21	NE LANTAU	2	18.77	WINTER	STANDARD36826	TMCLKL	P
2-Feb-21	NE LANTAU	1	5.60	WINTER	STANDARD36826	TMCLKL	S
2-Feb-21	NE LANTAU	2	8.33	WINTER	STANDARD36826	TMCLKL	S
8-Feb-21	NW LANTAU	2	9.76	WINTER	STANDARD36826	TMCLKL	P
8-Feb-21	NW LANTAU	3	23.48	WINTER	STANDARD36826	TMCLKL	P
8-Feb-21	NW LANTAU	2	0.90	WINTER	STANDARD36826	TMCLKL	S
8-Feb-21	NW LANTAU	3	7.33	WINTER	STANDARD36826	TMCLKL	S
18-Feb-21	NW LANTAU	1	5.60	WINTER	STANDARD36826	TMCLKL	P
18-Feb-21	NW LANTAU	2	18.88	WINTER	STANDARD36826	TMCLKL	P
18-Feb-21	NW LANTAU	3	3.50	WINTER	STANDARD36826	TMCLKL	P
18-Feb-21	NW LANTAU	1	1.50	WINTER	STANDARD36826	TMCLKL	S
18-Feb-21	NW LANTAU	2	10.02	WINTER	STANDARD36826	TMCLKL	S
18-Feb-21	NE LANTAU	1	9.55	WINTER	STANDARD36826	TMCLKL	P
18-Feb-21	NE LANTAU	2	20.88	WINTER	STANDARD36826	TMCLKL	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
18-Feb-21	NE LANTAU	3	4.70	WINTER	STANDARD36826	TMCLKL	P
18-Feb-21	NE LANTAU	1	2.74	WINTER	STANDARD36826	TMCLKL	S
18-Feb-21	NE LANTAU	2	8.73	WINTER	STANDARD36826	TMCLKL	S
18-Feb-21	NE LANTAU	3	1.20	WINTER	STANDARD36826	TMCLKL	S
23-Feb-21	NW LANTAU	1	9.54	WINTER	STANDARD36826	TMCLKL	P
23-Feb-21	NW LANTAU	2	18.92	WINTER	STANDARD36826	TMCLKL	P
23-Feb-21	NW LANTAU	3	5.20	WINTER	STANDARD36826	TMCLKL	P
23-Feb-21	NW LANTAU	1	7.39	WINTER	STANDARD36826	TMCLKL	S
23-Feb-21	NW LANTAU	2	3.55	WINTER	STANDARD36826	TMCLKL	S
3-Mar-21	NW LANTAU	2	17.29	SPRING	STANDARD36826	TMCLKL	P
3-Mar-21	NW LANTAU	3	10.70	SPRING	STANDARD36826	TMCLKL	P
3-Mar-21	NW LANTAU	2	6.60	SPRING	STANDARD36826	TMCLKL	S
3-Mar-21	NW LANTAU	3	4.75	SPRING	STANDARD36826	TMCLKL	S
3-Mar-21	NE LANTAU	2	32.08	SPRING	STANDARD36826	TMCLKL	P
3-Mar-21	NE LANTAU	3	3.05	SPRING	STANDARD36826	TMCLKL	P
3-Mar-21	NE LANTAU	2	11.87	SPRING	STANDARD36826	TMCLKL	S
3-Mar-21	NE LANTAU	3	1.00	SPRING	STANDARD36826	TMCLKL	S
8-Mar-21	NW LANTAU	2	7.06	SPRING	STANDARD36826	TMCLKL	P
8-Mar-21	NW LANTAU	3	25.36	SPRING	STANDARD36826	TMCLKL	P
8-Mar-21	NW LANTAU	2	2.86	SPRING	STANDARD36826	TMCLKL	S
8-Mar-21	NW LANTAU	3	5.32	SPRING	STANDARD36826	TMCLKL	S
17-Mar-21	NW LANTAU	1	9.65	SPRING	STANDARD36826	TMCLKL	P
17-Mar-21	NW LANTAU	2	18.44	SPRING	STANDARD36826	TMCLKL	P
17-Mar-21	NW LANTAU	1	3.10	SPRING	STANDARD36826	TMCLKL	S
17-Mar-21	NW LANTAU	2	7.99	SPRING	STANDARD36826	TMCLKL	S
17-Mar-21	NE LANTAU	1	3.50	SPRING	STANDARD36826	TMCLKL	P
17-Mar-21	NE LANTAU	2	31.93	SPRING	STANDARD36826	TMCLKL	P
17-Mar-21	NE LANTAU	1	2.00	SPRING	STANDARD36826	TMCLKL	S
17-Mar-21	NE LANTAU	2	9.37	SPRING	STANDARD36826	TMCLKL	S
25-Mar-21	NW LANTAU	2	6.30	SPRING	STANDARD36826	TMCLKL	P
25-Mar-21	NW LANTAU	3	26.28	SPRING	STANDARD36826	TMCLKL	P
25-Mar-21	NW LANTAU	2	5.92	SPRING	STANDARD36826	TMCLKL	S
25-Mar-21	NW LANTAU	3	4.90	SPRING	STANDARD36826	TMCLKL	S
8-Apr-21	NW LANTAU	2	25.85	SPRING	STANDARD36826	TMCLKL	P
8-Apr-21	NW LANTAU	3	6.95	SPRING	STANDARD36826	TMCLKL	P
8-Apr-21	NW LANTAU	2	10.80	SPRING	STANDARD36826	TMCLKL	S
8-Apr-21	NE LANTAU	2	34.14	SPRING	STANDARD36826	TMCLKL	P
8-Apr-21	NE LANTAU	2	11.56	SPRING	STANDARD36826	TMCLKL	S
22-Apr-21	NW LANTAU	1	5.79	SPRING	STANDARD36826	TMCLKL	P
22-Apr-21	NW LANTAU	2	26.60	SPRING	STANDARD36826	TMCLKL	P
22-Apr-21	NW LANTAU	2	11.11	SPRING	STANDARD36826	TMCLKL	S
27-Apr-21	NW LANTAU	2	15.81	SPRING	STANDARD36826	TMCLKL	P
27-Apr-21	NW LANTAU	3	12.76	SPRING	STANDARD36826	TMCLKL	P
27-Apr-21	NW LANTAU	2	8.23	SPRING	STANDARD36826	TMCLKL	S
27-Apr-21	NW LANTAU	3	3.00	SPRING	STANDARD36826	TMCLKL	S
27-Apr-21	NE LANTAU	2	5.30	SPRING	STANDARD36826	TMCLKL	P
27-Apr-21	NE LANTAU	3	31.17	SPRING	STANDARD36826	TMCLKL	P
27-Apr-21	NE LANTAU	2	3.70	SPRING	STANDARD36826	TMCLKL	S
27-Apr-21	NE LANTAU	3	8.43	SPRING	STANDARD36826	TMCLKL	S
29-Apr-21	NW LANTAU	2	16.60	SPRING	STANDARD36826	TMCLKL	P
29-Apr-21	NW LANTAU	3	11.22	SPRING	STANDARD36826	TMCLKL	P
29-Apr-21	NW LANTAU	2	7.08	SPRING	STANDARD36826	TMCLKL	S
29-Apr-21	NW LANTAU	3	1.40	SPRING	STANDARD36826	TMCLKL	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
3-May-21	NW LANTAU	3	26.45	SPRING	STANDARD36826	TMCLKL	P
3-May-21	NW LANTAU	2	1.10	SPRING	STANDARD36826	TMCLKL	S
3-May-21	NW LANTAU	3	11.85	SPRING	STANDARD36826	TMCLKL	S
3-May-21	NE LANTAU	2	15.62	SPRING	STANDARD36826	TMCLKL	P
3-May-21	NE LANTAU	3	18.05	SPRING	STANDARD36826	TMCLKL	P
3-May-21	NE LANTAU	2	4.70	SPRING	STANDARD36826	TMCLKL	S
3-May-21	NE LANTAU	3	7.33	SPRING	STANDARD36826	TMCLKL	S
11-May-21	NW LANTAU	2	2.72	SPRING	STANDARD36826	TMCLKL	P
11-May-21	NW LANTAU	3	25.99	SPRING	STANDARD36826	TMCLKL	P
11-May-21	NW LANTAU	2	4.46	SPRING	STANDARD36826	TMCLKL	S
11-May-21	NW LANTAU	3	6.24	SPRING	STANDARD36826	TMCLKL	S
25-May-21	NW LANTAU	1	2.78	SPRING	STANDARD36826	TMCLKL	P
25-May-21	NW LANTAU	2	26.32	SPRING	STANDARD36826	TMCLKL	P
25-May-21	NW LANTAU	2	7.40	SPRING	STANDARD36826	TMCLKL	S
26-May-21	NW LANTAU	1	1.60	SPRING	STANDARD138716	TMCLKL	P
26-May-21	NW LANTAU	2	30.69	SPRING	STANDARD138716	TMCLKL	P
26-May-21	NW LANTAU	1	4.80	SPRING	STANDARD138716	TMCLKL	S
26-May-21	NW LANTAU	2	6.61	SPRING	STANDARD138716	TMCLKL	S
26-May-21	NE LANTAU	1	11.39	SPRING	STANDARD138716	TMCLKL	P
26-May-21	NE LANTAU	2	14.50	SPRING	STANDARD138716	TMCLKL	P
26-May-21	NE LANTAU	3	5.80	SPRING	STANDARD138716	TMCLKL	P
26-May-21	NE LANTAU	1	3.51	SPRING	STANDARD138716	TMCLKL	S
26-May-21	NE LANTAU	2	8.00	SPRING	STANDARD138716	TMCLKL	S
26-May-21	NE LANTAU	3	1.60	SPRING	STANDARD138716	TMCLKL	S

Appendix II. TMCLKL Chinese White Dolphin Sighting Database (June 2020 - May 2021)

(Abbreviations: 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)

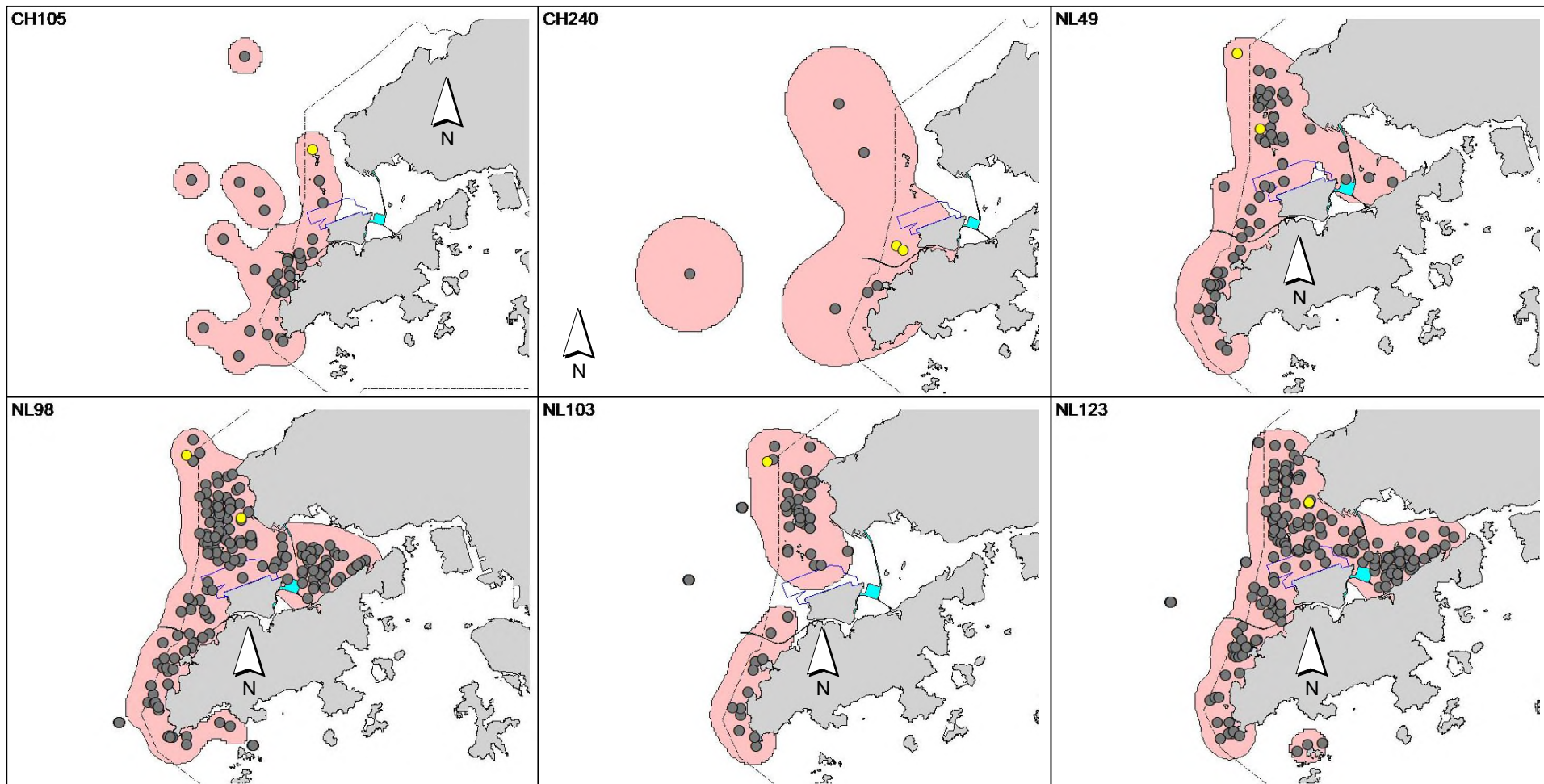
DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
20-Jul-20	1	1201	1	NW LANTAU	2	208	ON	TMCLKL	827414	806478	SUMMER	NONE	P
21-Aug-20	1	1022	1	NW LANTAU	1	337	ON	TMCLKL	817308	804686	SUMMER	NONE	P
15-Sep-20	1	1213	2	NW LANTAU	1	218	ON	TMCLKL	827104	806457	AUTUMN	NONE	P
17-Nov-20	1	1018	2	NW LANTAU	3	105	ON	TMCLKL	818225	805409	AUTUMN	NONE	P
10-Dec-20	1	1326	2	NW LANTAU	2	6	ON	TMCLKL	822941	806253	WINTER	NONE	S
25-Jan-21	1	1057	1	NW LANTAU	2	237	ON	TMCLKL	825934	804590	WINTER	NONE	P
25-Jan-21	2	1123	8	NW LANTAU	2	852	ON	TMCLKL	831175	803417	WINTER	NONE	P
25-Jan-21	3	1329	2	NW LANTAU	2	165	ON	TMCLKL	826628	806507	WINTER	NONE	P
26-Jan-21	1	1013	1	NW LANTAU	1	55	ON	TMCLKL	817461	805469	WINTER	NONE	P
28-Jan-21	1	1052	1	NW LANTAU	3	67	ON	TMCLKL	824681	805453	WINTER	NONE	P
28-Jan-21	2	1105	4	NW LANTAU	2	85	ON	TMCLKL	825689	805465	WINTER	NONE	P
28-Jan-21	3	1133	6	NW LANTAU	2	62	ON	TMCLKL	827494	805469	WINTER	NONE	S
28-Jan-21	4	1213	2	NW LANTAU	2	74	ON	TMCLKL	827103	807466	WINTER	NONE	P
2-Feb-21	1	1011	7	NW LANTAU	1	215	ON	TMCLKL	816841	805468	WINTER	NONE	P
2-Feb-21	2	1050	1	NW LANTAU	2	1589	ON	TMCLKL	820219	805032	WINTER	NONE	S
2-Feb-21	3	1127	1	NW LANTAU	2	112	ON	TMCLKL	829332	805473	WINTER	NONE	P
8-Feb-21	1	1022	3	NW LANTAU	2	172	ON	TMCLKL	816378	804643	WINTER	NONE	P
23-Feb-21	1	1136	1	NW LANTAU	2	71	ON	TMCLKL	826949	806446	WINTER	NONE	P
3-Mar-21	1	1011	3	NW LANTAU	3	404	ON	TMCLKL	816830	805427	SPRING	NONE	P
3-Mar-21	2	1151	2	NW LANTAU	2	121	ON	TMCLKL	828365	807489	SPRING	NONE	P
17-Mar-21	1	1016	2	NW LANTAU	1	786	ON	TMCLKL	816121	805487	SPRING	NONE	P
11-May-21	1	1046	5	NW LANTAU	3	191	ON	TMCLKL	825639	808524	SPRING	NONE	P

Appendix III. Individual dolphins identified during TMCLKL monitoring surveys conducted from June 2020 to May 2021

ID#	DATE	STG#	AREA
CH105	28/01/21	3	NW LANTAU
CH240	21/08/20	1	NW LANTAU
	02/02/21	1	NW LANTAU
NL49	25/01/21	2	NW LANTAU
	28/01/21	1	NW LANTAU
NL98	25/01/21	2	NW LANTAU
	11/05/21	1	NW LANTAU
NL103	25/01/21	2	NW LANTAU
NL123	11/05/21	1	NW LANTAU
NL182	03/03/21	2	NW LANTAU
	11/05/21	1	NW LANTAU
NL202	20/07/20	1	NW LANTAU
	15/09/20	1	NW LANTAU
	28/01/21	4	NW LANTAU
	23/02/21	1	NW LANTAU
	03/03/21	2	NW LANTAU
NL242	25/01/21	2	NW LANTAU
NL261	10/12/20	1	NW LANTAU
NL272	11/05/21	1	NW LANTAU
NL280	28/01/21	2	NW LANTAU
NL286	15/09/20	1	NW LANTAU
NL299	25/01/21	2	NW LANTAU
NL321	25/01/21	3	NW LANTAU
NL331	17/11/20	1	NW LANTAU
	26/01/21	1	NW LANTAU
	02/02/21	1	NW LANTAU

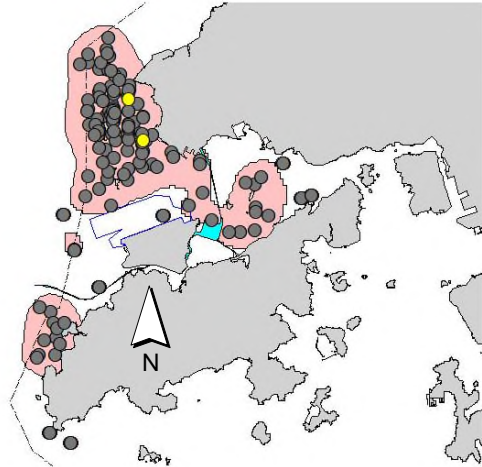
ID#	DATE	STG#	AREA
SL67	10/12/20	1	NW LANTAU
WL05	25/01/21	2	NW LANTAU
WL79	03/03/21	1	NW LANTAU
WL98	08/02/21	1	NW LANTAU
WL145	02/02/21	1	NW LANTAU
WL179	25/01/21	1	NW LANTAU
	02/02/21	3	NW LANTAU
	03/03/21	1	NW LANTAU
WL227	28/01/21	3	NW LANTAU
WL243	17/11/20	1	NW LANTAU
WL283	02/02/21	1	NW LANTAU
WL294	03/03/21	1	NW LANTAU
WL301	02/02/21	1	NW LANTAU
WL304	08/02/21	1	NW LANTAU

Appendix IV. Ranging patterns (95% kernel ranges) of 28 individual dolphins that were sighted during the first year of TMCLKL post-construction period, utilizing the TMCLKL08 monitoring data collected in 2020-21 (note: yellow dots indicates sightings made in June 2020 to May 2021)

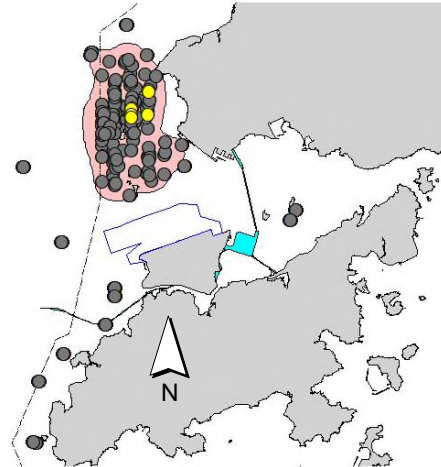


Appendix IV. (cont'd)

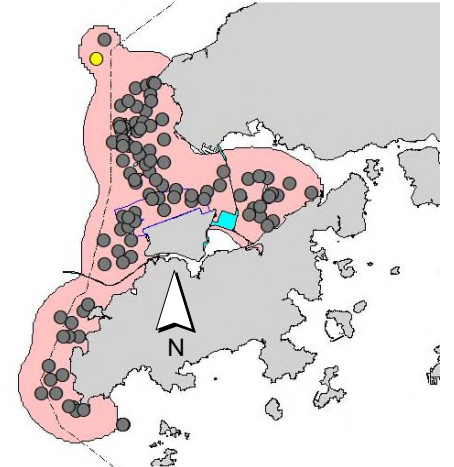
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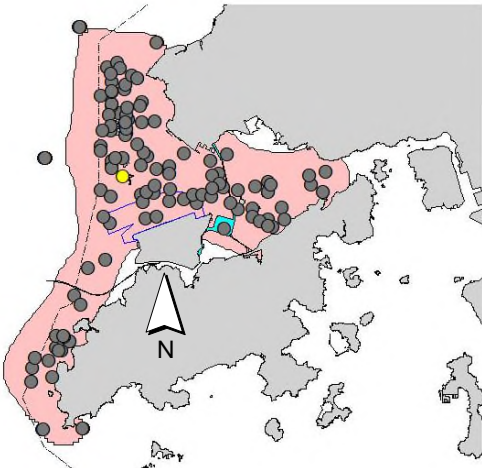
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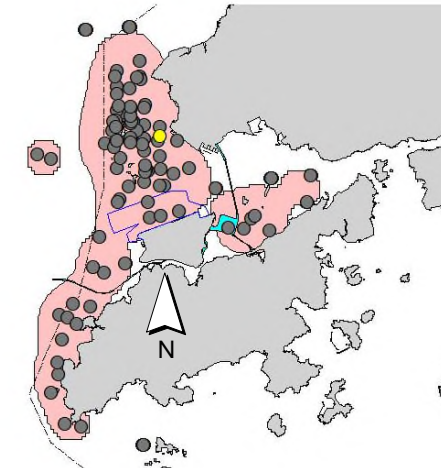
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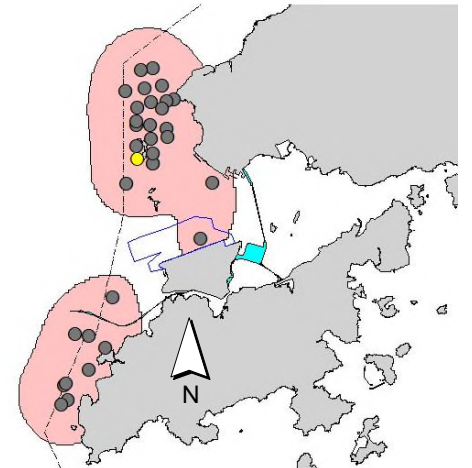
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NL272

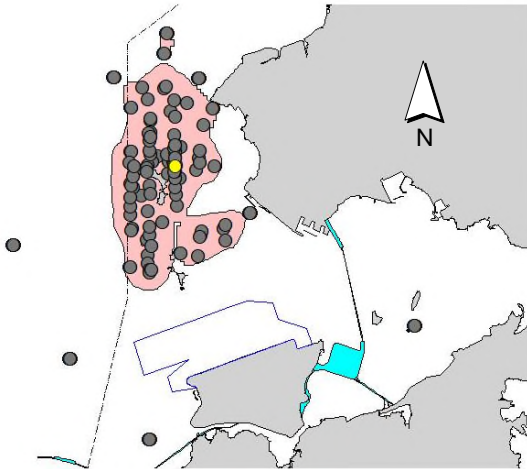


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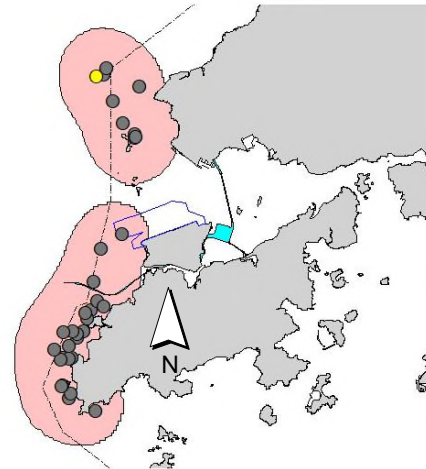


Appendix IV. (cont'd)

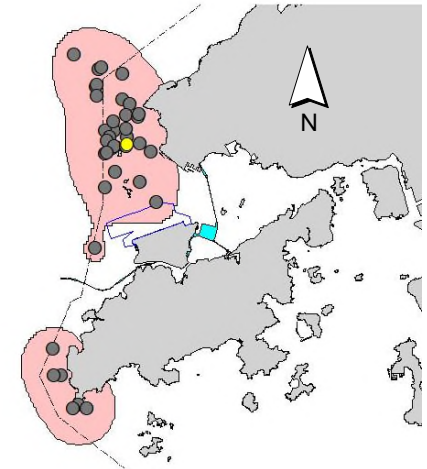
NL286



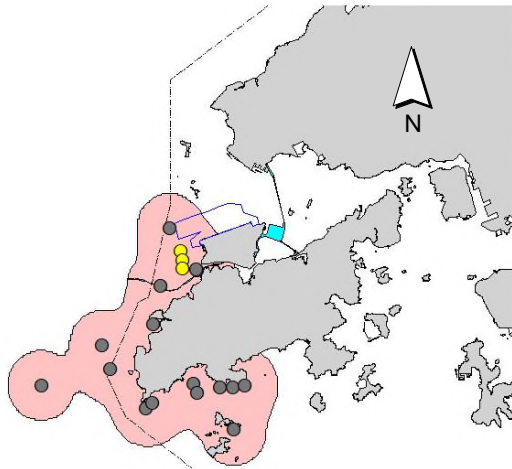
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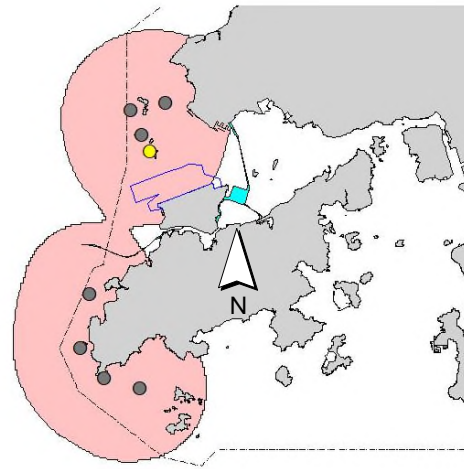
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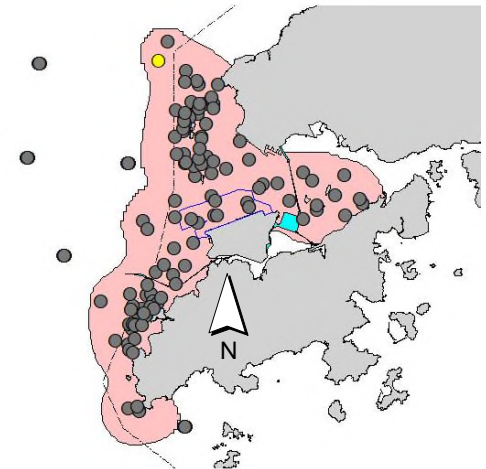
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SL67

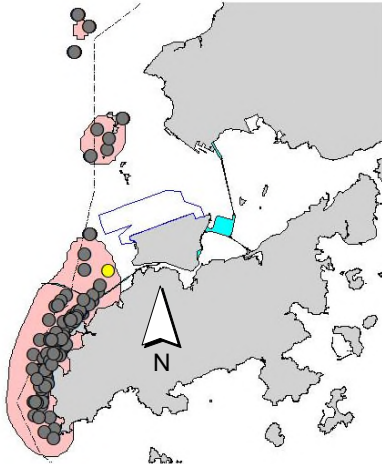


WL05

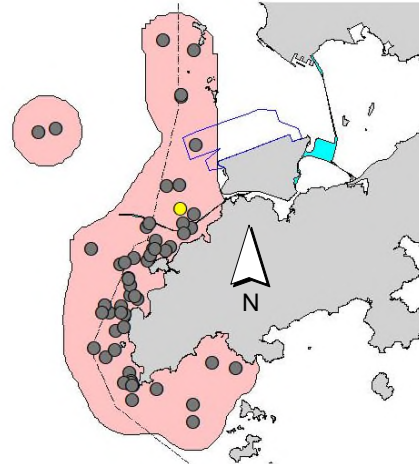


Appendix IV. (cont'd)

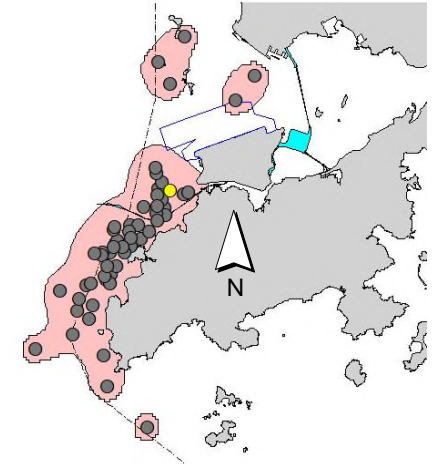
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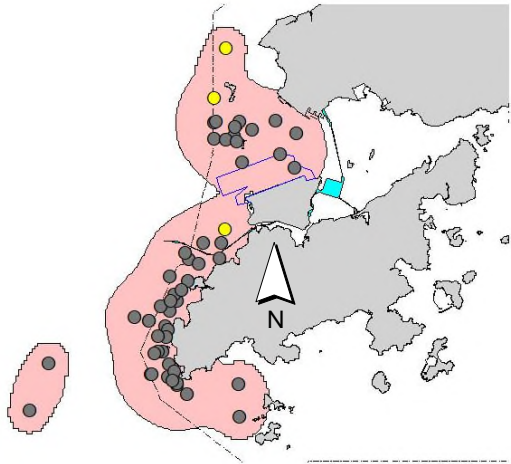
WL98



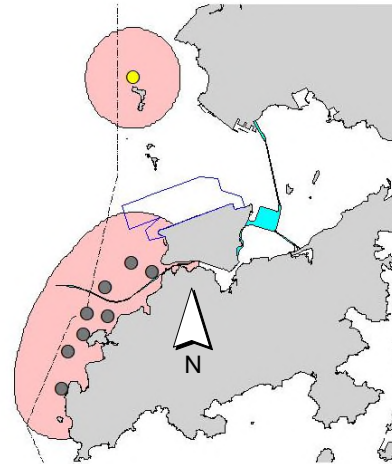
WL145



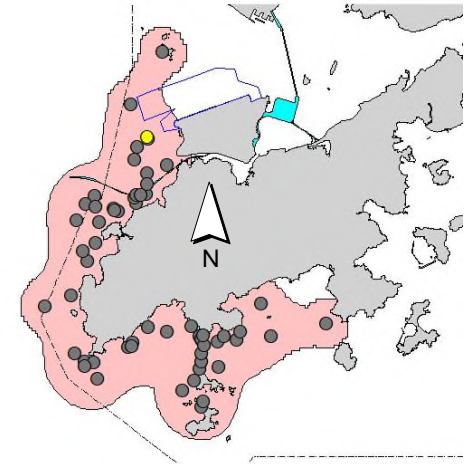
WL179



WL227

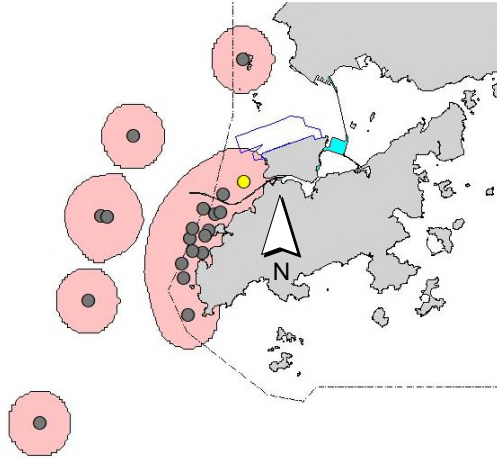


WL243

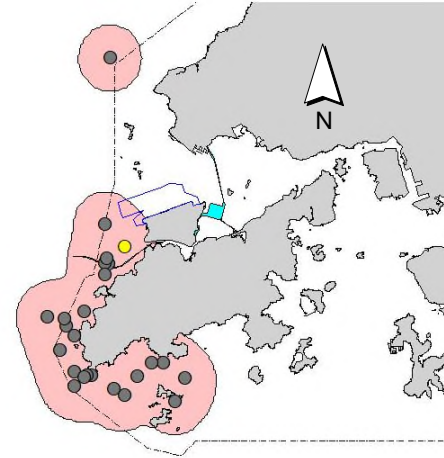


Appendix IV. (cont'd)

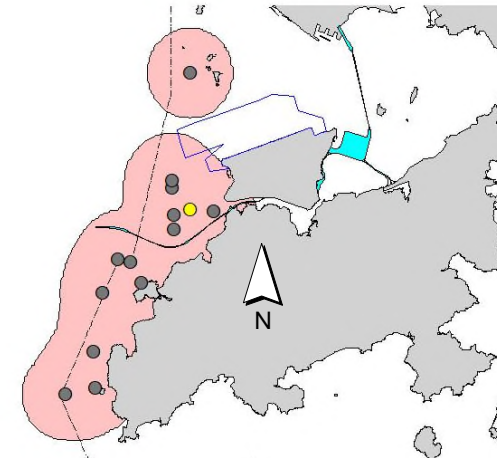
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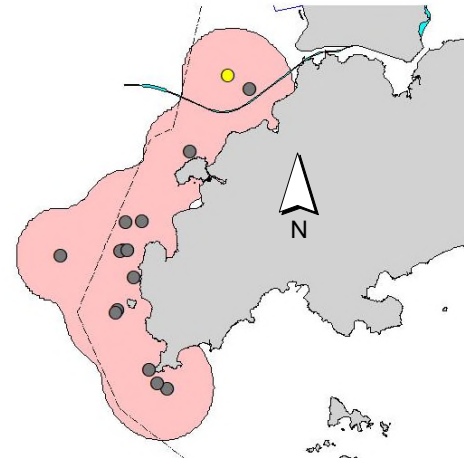
WL294



WL301



WL304



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

	Action			
	ET (a)	IEC (a)	SOR (a)	Contractor(s)
Limit Level Exceedance				
	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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 Post Construction Dolphin Monitoring

EVENT	ACTION			
	ET	IEC	SOR	Contractor
Action Level	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and finding with the ET and the Contractor. 	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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; 	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 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 2020 to May 2021)	Total No. recorded since Contract commencement
1-Hr TSP	Action	6	122
	Limit	1	15
24-Hr TSP	Action	2	12
	Limit	0	4
Water Quality	Action	0	167
	Limit	0	19
Impact Dolphin Monitoring	Action	0	11
	Limit	0	19
Post Construction (Operational) Dolphin Monitoring	Action	0	0
	Limit	3	4

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 2020 to May 2021)	0	0	0
Total No. received since Contract commencement	17	1	0

Appendix I

Waste Flow Table

Monthly Summary Waste Flow Table

Name of Department: HyD

Contract No. / Works Order No.: HY/2012/08

Monthly Summary Waste Flow Table for **December 2020** [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	Monthly Break-down of <u>Inert</u> Construction & Demolition Materials (i.e. Public Fill Materials)				
	(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)
Sub-total	3008.812	0.000	336.902	889.467	1782.443
Jan-2020	174.69	0.000	0.000	0.000	174.69
Feb-2020	1.455	0.000	0.000	0.000	1.455
Mar-2020	3.252	0.000	0.000	0.000	3.252
Apr-2020	4.200	0.000	0.000	0.000	4.200
May-2020	7.015	0.000	0.000	0.000	7.015
Jun-2020	2.670	0.000	0.000	0.000	2.693
Half Year Sub-total	193.282	0.000	0.000	0.000	193.305
Jul-2020	1.440	0.000	0.000	0.000	1.440
Aug-2020	1.159	0.000	0.000	0.000	1.159
Sep-2020	0.074	0.000	0.000	0.000	0.074
Oct-2020	0.253	0.000	0.000	0.000	0.253
Nov-2020	0.251	0.000	0.000	0.000	0.251
Dec-2020	0.554	0.000	0.000	0.000	0.554
Project Total Quantities	3205.825	0.000	336.902	889.467	1979.479

Month	Actual Quantities of <u>Non-inert</u> 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	Disposed	generated
Sub-total	9890.77	9890.77	14.64	14.64	16.84	16.84	85.807	85.807	21.943
Jan-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.54
Feb-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.349
Mar-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.226
Apr-2020	22.14	22.14	1.30	1.30	0.00	0.00	6.40	6.40	0.521
May-2020	6.2	6.2	0.54	0.54	0.00	0.00	0.60	0.60	0.536
Jun-2020	0.00	0.00	0.74	0.74	0.00	0.00	1.00	1.00	0.303
Half Year Sub-total	28.34	28.34	2.58	2.58	0.00	0.00	8.00	8.00	5.475
Jul-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.140
Aug-2020	0.00	0.00	1.06	1.06	0.00	0.00	0.00	0.00	0.110
Sep-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.100
Oct-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.145
Nov-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.167
Dec-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.173
Project Total Quantities	9919.11	9919.11	18.28	18.28	16.84	16.84	93.807	93.807	28.243

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
(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)
3200.000	0.000	350.000	1000.000	2000.000

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 '000 ton)
10000.00	20.00	18.00	120.00	30.000

- 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 m³. (**ER Part 8 Clause 8.8.5 (d) (ii)** refers).

Monthly Summary Waste Flow Table

Name of Department: HyD

Contract No. / Works Order No.: HY/2012/08

Monthly Summary Waste Flow Table for May 2021 [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	Monthly Break-down of <u>Inert</u> Construction & Demolition Materials (i.e. Public Fill Materials)				
	(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)
Sub-total	3205.825	0.000	336.902	889.467	1979.479
Jan-2021	1.031	0.000	0.000	0.000	1.031
Feb-2021	0.210	0.000	0.000	0.000	0.210
Mar-2021	0.409	0.000	0.000	0.000	0.409
Apr-2021	0.008	0.000	0.000	0.000	0.008
May-2021	0.000	0.000	0.000	0.000	0.000
Jun-2021					
Half Year Sub-total					
Jul-2021					
Aug-2021					
Sep-2021					
Oct-2021					
Nov-2021					
Dec-2021					
Project Total Quantities	3207.483	0.000	336.902	889.467	1981.137

Month	Actual Quantities of <u>Non-inert</u> 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	Disposed	generated
Sub-total	9919.11	9919.11	18.28	18.28	16.84	16.84	93.807	93.807	28.243
Jan-2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.071
Feb-2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.011
Mar-2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.034
Apr-2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.068
May-2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.028
Jun-2021									
Half Year Sub-total									
Jul-2021									
Aug-2021									
Sep-2021									
Oct-2021									
Nov-2021									
Dec-2021									
Project Total Quantities	9919.11	9919.11	18.28	18.28	16.84	16.84	93.807	93.807	28.455

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
(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)
3200.000	0.000	350.000	1000.000	2000.000

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 '000 ton)
10000.00	20.00	18.00	120.00	30.000

- 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 m³. (**ER Part 8 Clause 8.8.5 (d) (ii)** refers).