

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

*Thirtieth Quarterly Environmental Monitoring &
Audit (EM&A) Report*

02 November 2021

Environmental Resources Management

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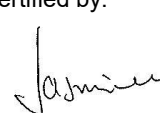

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*Thirtieth Quarterly Environmental Monitoring & Audit
(EM&A) Report*

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Client: DBJV		Project No: 0212330			
Summary: This document presents the Thirtieth Quarterly EM&A Report for Tuen Mun – Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section.		Date: 02 November 2021			
		Approved by: 			
		<i>Mr Craig Reid Partner</i>			
		Certified by: 			
		<i>Dr Jasmine Ng ET Leader</i>			
	30 th Quarterly EM&A Report	VAR	JN	CAR	02/11/21
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> 			

27 October 2021

By Fax (2293 6300) and By Post

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

Attention: Mr. Roger Man

Dear Mr. Man,

**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
30th Quarterly EM&A Summary Report for March 2021 to May 2021**

Reference is made to the ET's submission of 30th Quarterly EM&A Summary Report for March 2021 to May 2021 (ET's ref.: "0212330_30th Quarterly EM&A_20211026.doc" dated 26 October 2021) certified by the ET Leader.

Please be informed that we have no adverse comments on the captioned Report.

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

c.c.

HyD	Mr. Patrick Ng	(By Fax: 3188 6614)
HyD	Mr. Alan Ip	(By Fax: 3188 6614)
AECOM	Mr. Conrad Ng	(By Fax: 3922 9797)
ERM	Dr. Jasmine Ng	(By Fax: 2723 5660)
DBJV	Mr. Bryan Lee	(By Fax: 2293 7499)

Internal: DY, YH, ENPO Site

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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 Ltd. 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 and will tentatively be completed in 2021. 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.

This is the Thirtieth Quarterly EM&A report presenting the EM&A works carried out during the period from 1 March 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 Project. As informed by the Contractor, there was no major activities in the reporting quarter.

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.

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

24-hour TSP Monitoring	3 sessions
1-hour TSP Monitoring	3 sessions
Operational Phase Water Quality Monitoring	3 sessions
Operational Phase Dolphin Monitoring	6 sessions
Joint Environmental Site Inspection	3 sessions

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.

Summary of Breaches of Action/Limit Levels

Breaches of Action and Limit Levels for Air Quality

No Action and Limit Level exceedance was recorded.

Dolphin Monitoring

One (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between March and May 2021.

Environmental Complaints, Non-compliance & Summons

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

No environmental complaint was received in this reporting period.

No environmental summons was received in this reporting period.

Reporting Change

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.

Upcoming Works for the Next Reporting Period

As informed by the Contractor, there was no major activities undertaken in the coming quarterly period.

Future Key Issues

As informed by the Contractor, there was no major activities undertaken in the coming quarterly period.

1.1

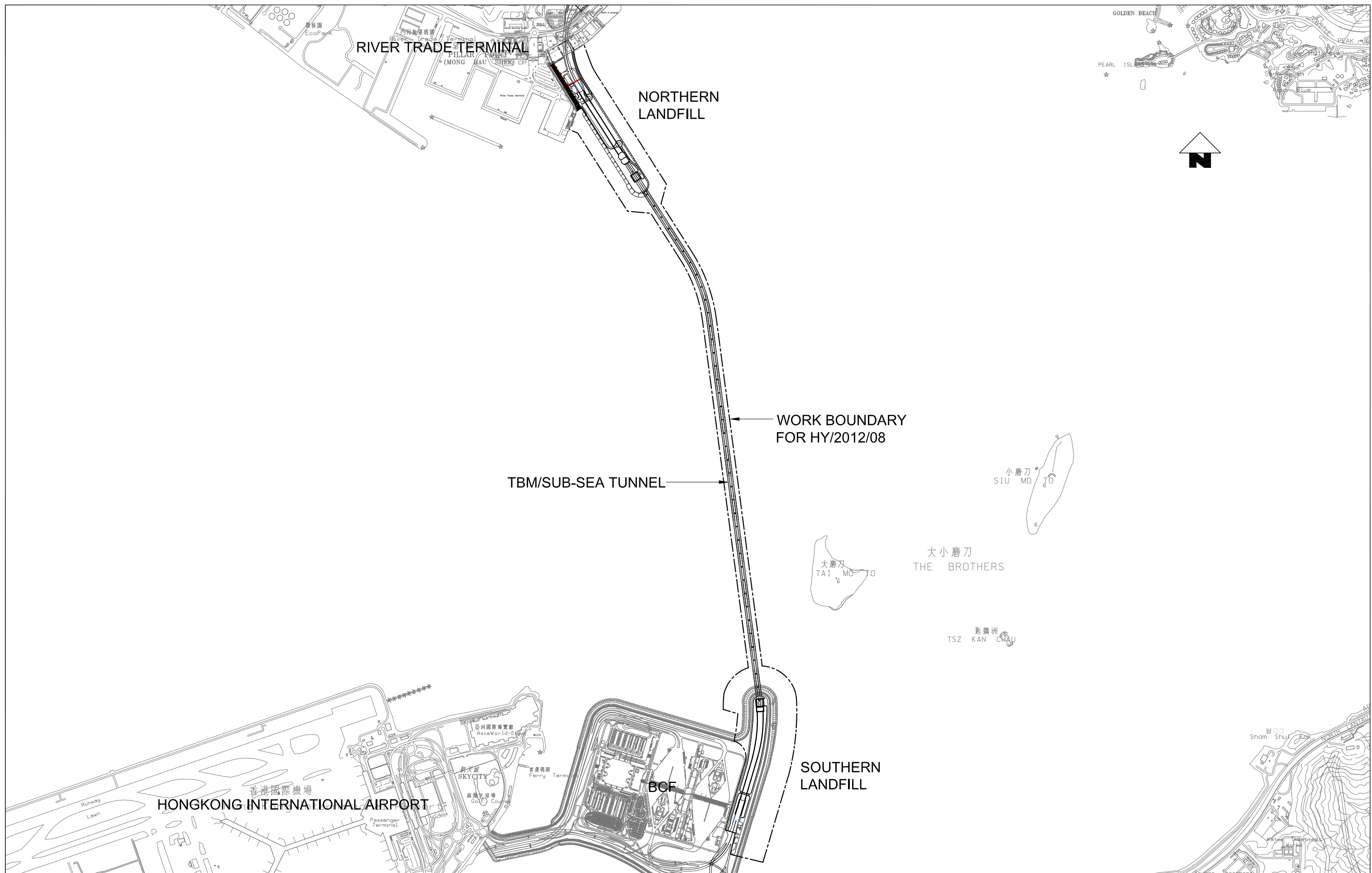
BACKGROUND

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-354/2009/A) 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) in accordance with Environmental Permit No. EP-354/2009/A. Ramboll Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO).

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



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

Main Contractor

Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營

Client

路政署
HIGHWAYS DEPARTMENT

Contractor's Designer

Arup Ove Arup & Partners
Hong Kong Limited

Project

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

Drawing Title

Figure 1.1

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

The construction phase of the Contract commenced on 1 November 2013 and will tentatively be completed in 2021. 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 Thirtieth Quarterly 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 March 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

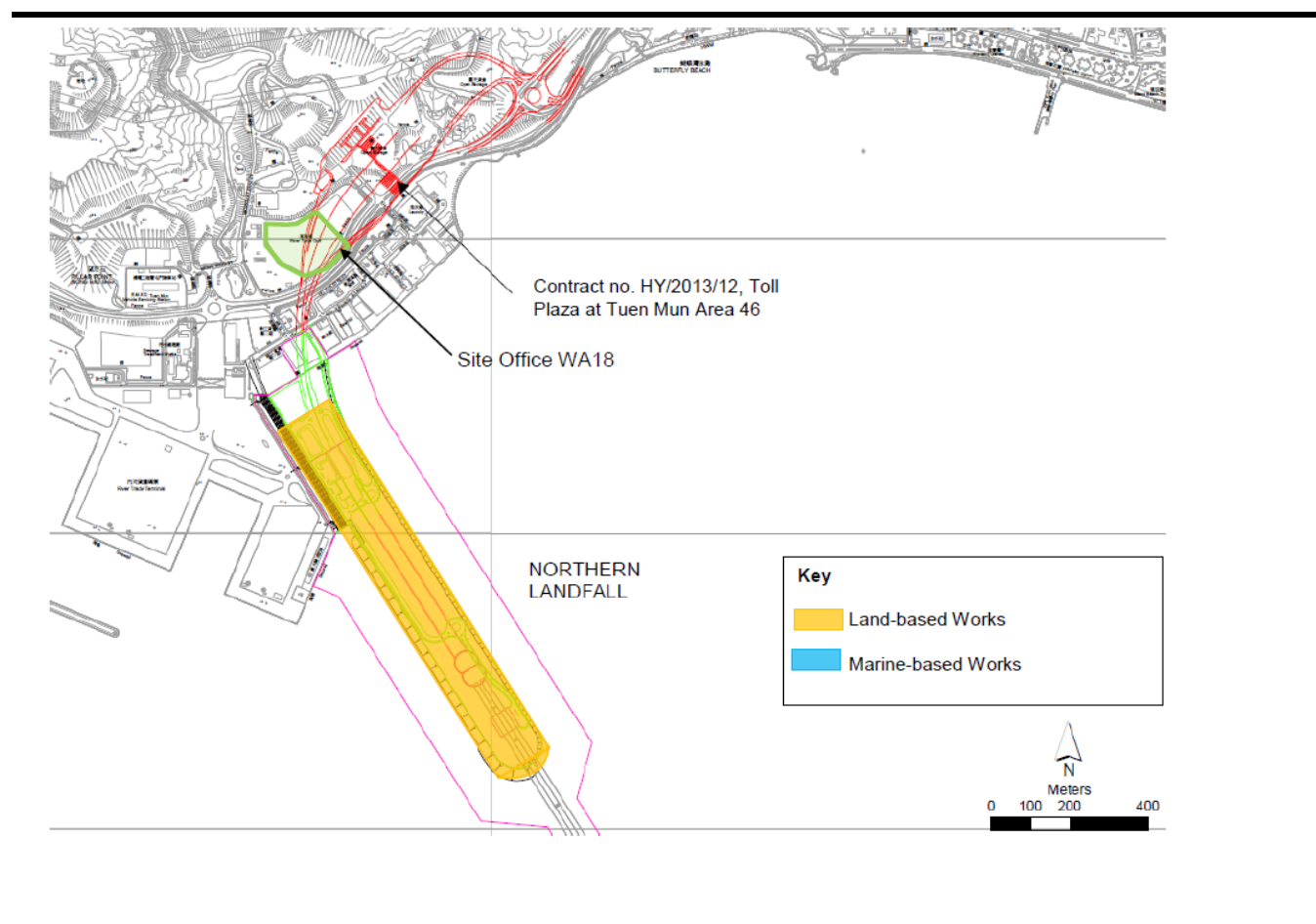
The construction phase of this Contract was commenced on 1 November 2013. The construction programme is shown in *Appendix B*.

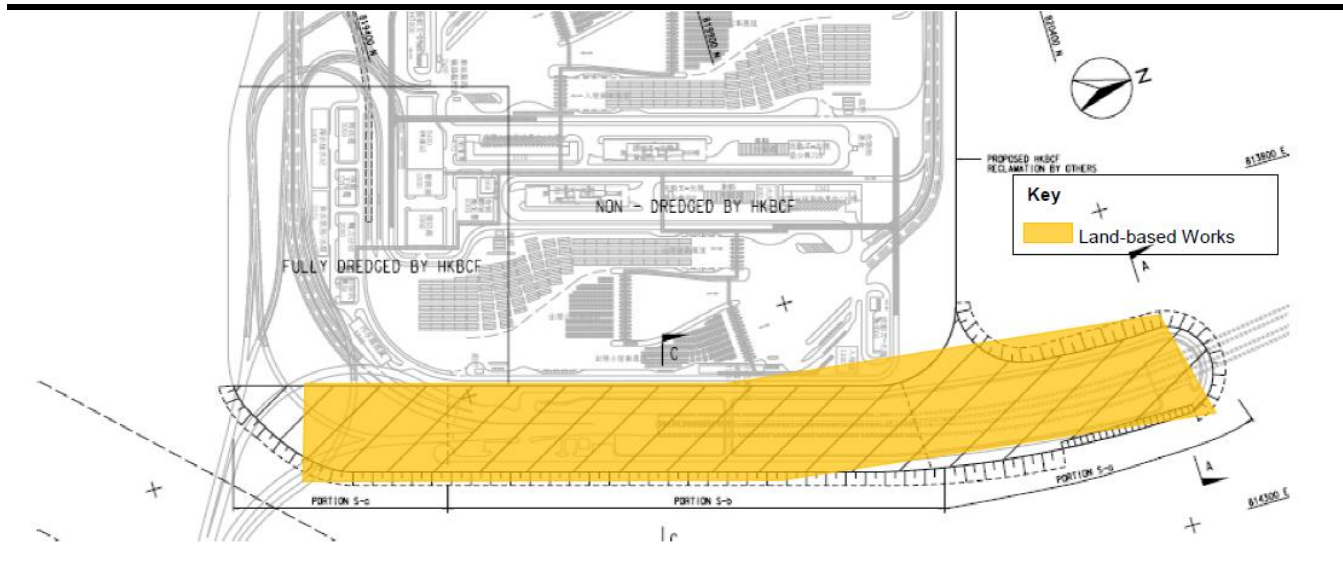
As per DBJV's information, there was no major activities undertaken in the reporting period.

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 Contract are shown in *Figure 1.3*.

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

Figure 1.2 General layout plan of the site





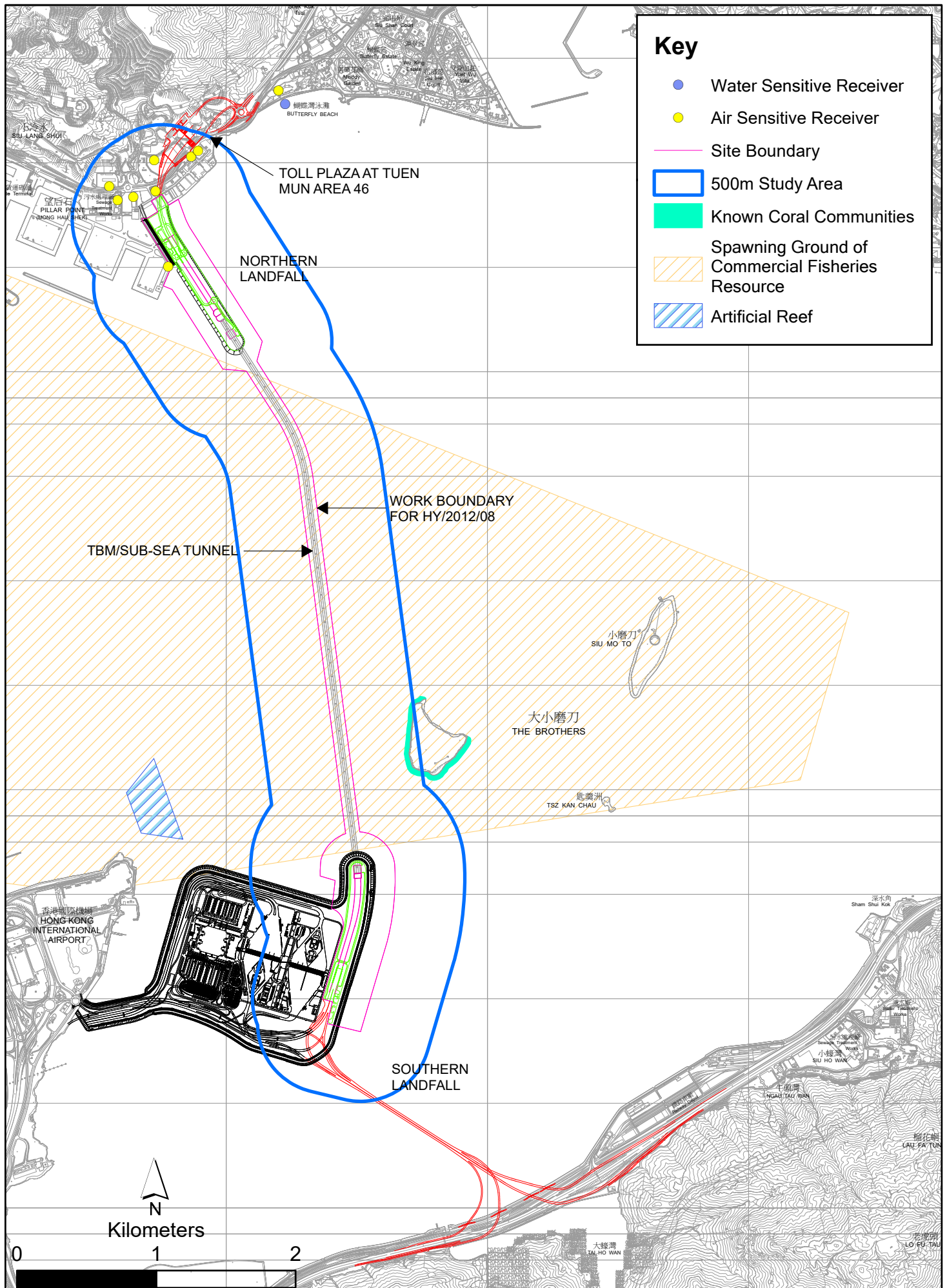


Figure 1.3 Environmental Sensitive Receivers in the vicinity of Contract No. HY/2012/08 Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-Sea Tunnel Section

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

2.1 AIR QUALITY

As per the requirements under *Condition 2.4* of *EP-354/2009/D*, the Enhanced TSP Monitoring Plan has been prepared under *Contract No. HY/2012/08*. Details of the monitoring plan are presented in the *Enhanced TSP Monitoring Plan* ⁽¹⁾.

2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual and the Enhanced TSP Monitoring Plan, impact 1-hour TSP monitoring was conducted three (3) times every six (6) days and impact 24-hour TSP monitoring was carried out once 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 quarter 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.

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

Monitoring Station	Monitoring Dates	Location	Description	Parameters & Frequency
--------------------	------------------	----------	-------------	------------------------

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

Monitoring Station	Monitoring Dates	Location	Description	Parameters & Frequency
ASR1	4, 10 and 16 March 2021	Tuen Mun Fireboat Station	Office	TSP monitoring • 1-hour Total Suspended Particulates (1-hour TSP, $\mu\text{g}/\text{m}^3$), 3 times in every 6 days
ASR5		Pillar Point Fire Station	Office	• 24-hour Total Suspended Particulates (24-hour TSP, $\mu\text{g}/\text{m}^3$), daily for 24-hour in every 6 days
AQMS1		Previous River Trade Golf	Bare ground	Enhanced TSP monitoring (commenced on 24 October 2014)
ASR6		Butterfly Beach Laundry	Office	• 1-hour Total Suspended Particulates (1-hour TSP, $\mu\text{g}/\text{m}^3$), 3 times in every 3 days
ASR10		Butterfly Beach Park	Recreational uses	• 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 is provided in *Appendix D*. The Event and Action plan is presented in *Appendix H*.

2.1.3 *Monitoring Schedule for the Reporting Quarter*

The schedule for air quality monitoring in the reporting quarter is provided in *Appendix E*.

2.1.4 *Results and Observations*

Impact air quality monitoring was conducted at all designated monitoring stations in the reporting period under favorable weather conditions. The major dust sources in the reporting period included nearby traffic emissions.

The monitoring results for 1-hour TSP and 24-hour TSP are summarized in *Tables 2.3* and *2.4*, respectively. Monitoring results are presented graphically in *Appendix G* and detailed impact air quality monitoring data were reported in the *Eighty-ninth EM&A Report*.

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 ($\mu\text{g}/\text{m}^3$)
March 2021	ASR 1	148	100 – 228	331	500

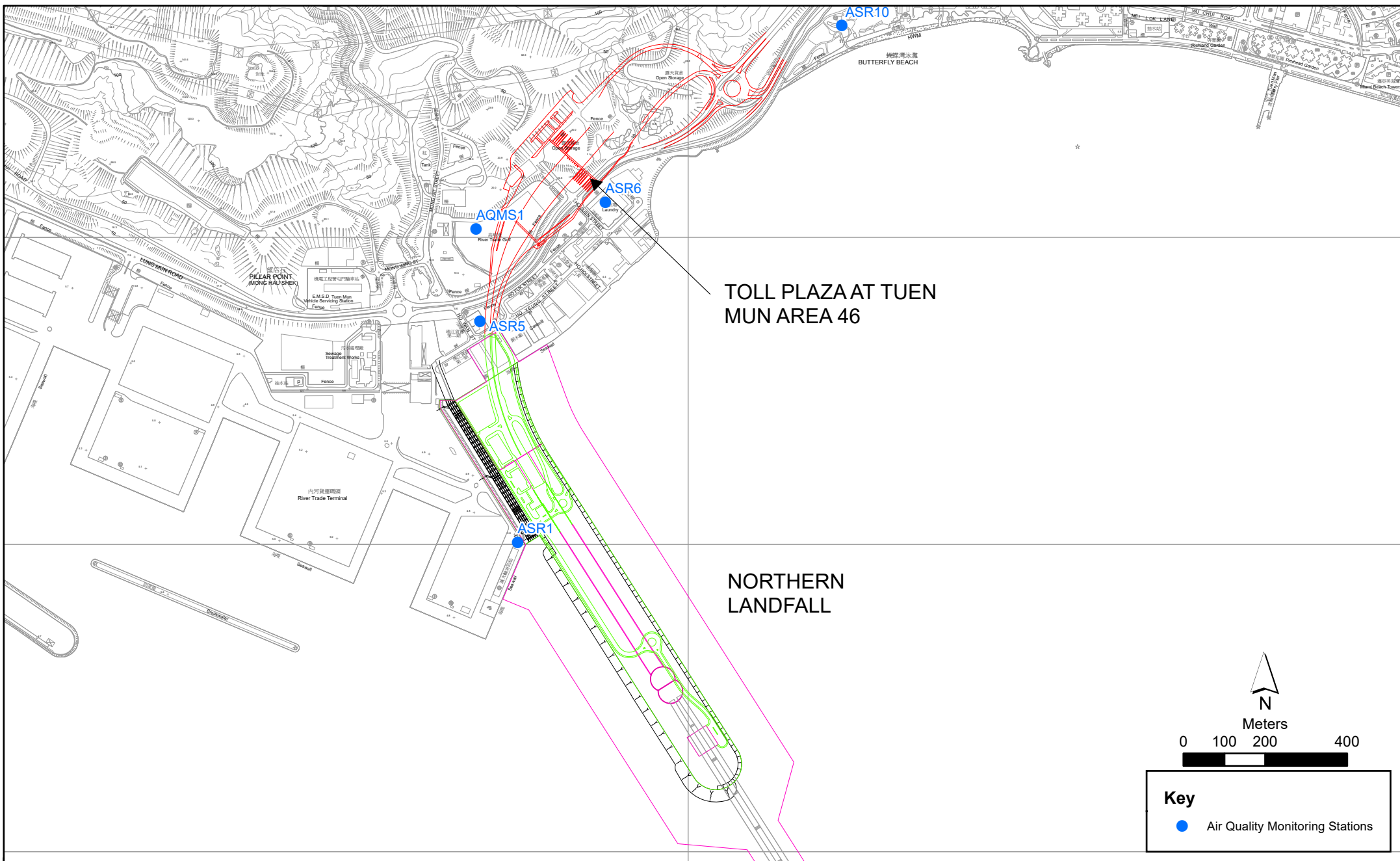


Figure 2.1

Air Quality Monitoring Stations for the Enhanced TSP Monitoring

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 ($\mu\text{g}/\text{m}^3$)
	ASR 5	175	97 - 223	340	500
	AQMS1	127	88 - 190	335	500
	ASR6	1392	81 - 194199	338	500
	ASR10	118	90 - 181	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 ($\mu\text{g}/\text{m}^3$)
March 2021	ASR 1	74	73 - 76	213	260
	ASR 5	98	86 - 110	238	260
	AQMS1	59	50 - 69	213	260
	ASR6	76	72 - 79	238	260
	ASR10	54	52 - 55	214	260

No Action and Limit Level exceedance was recorded during this reporting month.

2.2 WATER QUALITY MONITORING

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 operation 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 2.5*.

Table 2.5 *Locations of 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($^{\circ}\text{C}$) pH(pH unit) Turbidity (NTU) Water depth (m) Salinity (ppt) 	3 water depths: 1m below sea surface, mid-depth and 1m above sea bed.	Monthly at each station, at mid-flood and mid-ebb tides during the construction period of the Contract.
SR4(N2)	Sensitive receiver (Tai Ho Inlet)	814688	817996	<ul style="list-style-type: none"> DO (mg/L and % of saturation) 		
CS2(A)	Control Station	805232	818606	<ul style="list-style-type: none"> SS (mg/L) 		

Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
CS(Mf)5	Control Station	817990	821129		If the water depth is less than 3m, mid-depth sampling only. If water depth is 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 2.6 summarizes the equipment used in the impact water quality monitoring programme.

Table 2.6 Water Quality Monitoring Equipment

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

2.2.2 Monitoring Schedule for the Reporting Period

The schedule for water quality monitoring in the reporting quarter is provided in *Appendix E*.

2.2.3 Results and Observations

In total of 3 monitoring events for operational phase water quality monitoring were conducted at all designated monitoring stations in the reporting period. Results and graphical presentations of impact water quality monitoring are presented in *Appendix G*. Detailed operational phase water quality monitoring results were reported in the *Eighty-ninth to Ninety-first Monthly EM&A Reports*.

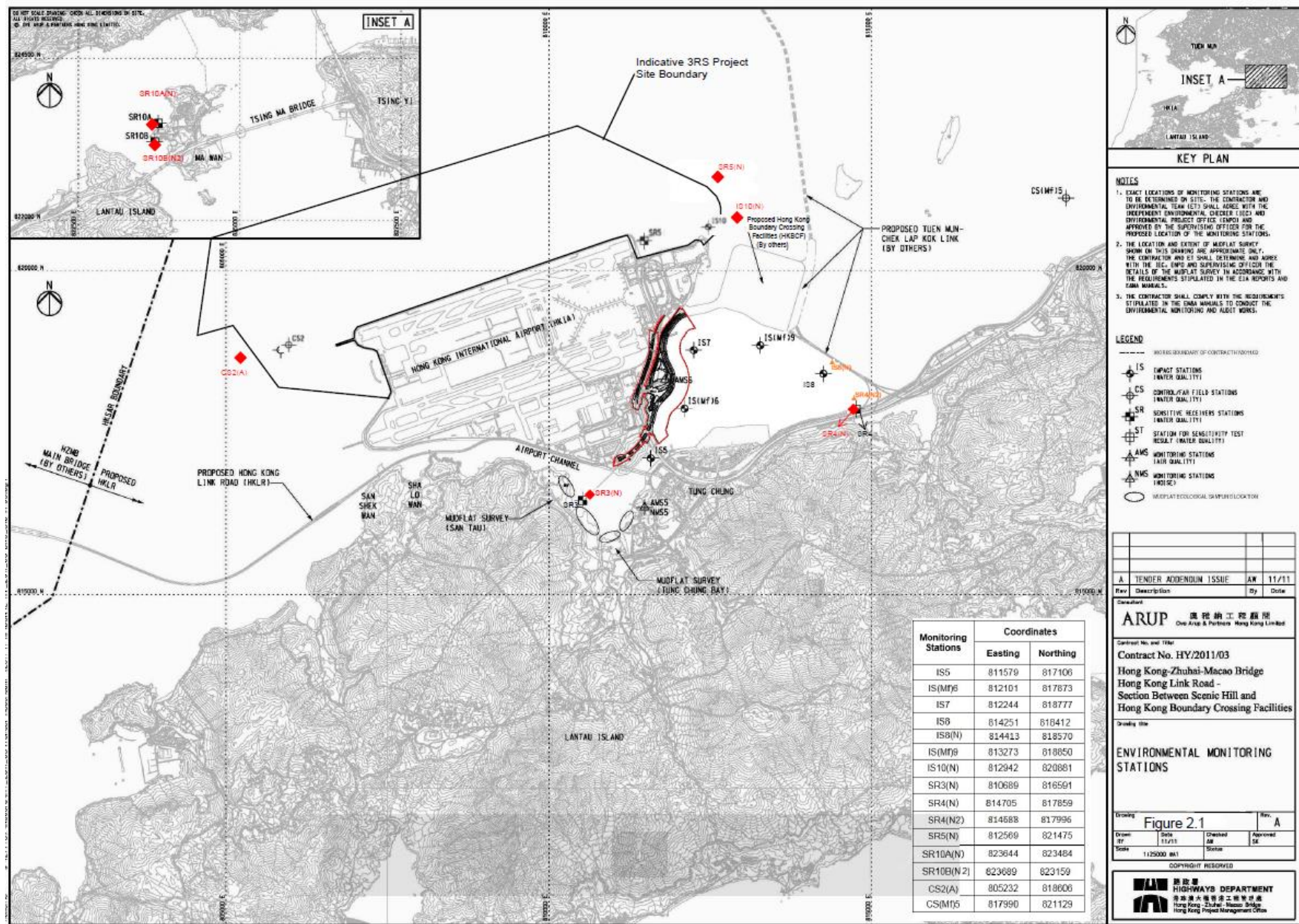


Figure 2.2

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

Post construction (operational) phase 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.

2.3.2 Monitoring Equipment

Table 2.7 summarizes the equipment used for the impact dolphin monitoring.

Table 2.7 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 and operational phase. 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 and operational phase dolphin monitoring.

2.3.4 Monitoring Location

The operational phase dolphin monitoring was carried out in the NEL and NWL along the line transect as depicted in Figure 2.3. The co-ordinates of all transect lines are shown in Table 2.8 below.

Table 2.8 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

Line No.	Easting	Northing	Line No.	Easting	Northing	
2	End Point	805476	14	End Point	817537	824613
3	Start Point	806464	15	Start Point	818568	820735
3	End Point	806464	15	End Point	818568	824433
4	Start Point	807518	16	Start Point	819532	821420
4	End Point	807518	16	End Point	819532	824209
5	Start Point	808504	17	Start Point	820451	822125
5	End Point	808504	17	End Point	820451	823671
6	Start Point	809490	18	Start Point	821504	822371
6	End Point	809490	18	End Point	821504	823761
7	Start Point	810499	19	Start Point	822513	823268
7	End Point	810499	19	End Point	822513	824321
8	Start Point	811508	20	Start Point	823477	823402
8	End Point	811508	20	End Point	823477	824613
9	Start Point	812516	21	Start Point	805476	827081
9	End Point	812516	21	End Point	805476	830562
10	Start Point	813525	22	Start Point	806464	824033
10	End Point	813525	22	End Point	806464	829598
11	Start Point	814556	23	Start Point	814559	821739
11	End Point	814556	23	End Point	814559	824768
12	Start Point	815542	24*	Start Point	805476*	815900*
12	End Point	815542	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 D*. The Event and Action plan is presented in *Appendix I*.

2.3.6 **Monitoring Schedule for the Reporting Period**

The dolphin monitoring schedules for the reporting period are shown in *Appendix E*.

2.3.7 **Results & Observations**

A total of 764.33 km of survey effort was conducted, with 100% of the total survey effort being conducted under favourable weather conditions (ie Beaufort Sea State 3 or below with good visibility) in this reporting quarter. Amongst the two areas, 279.60 km and 484.73 km of survey effort were

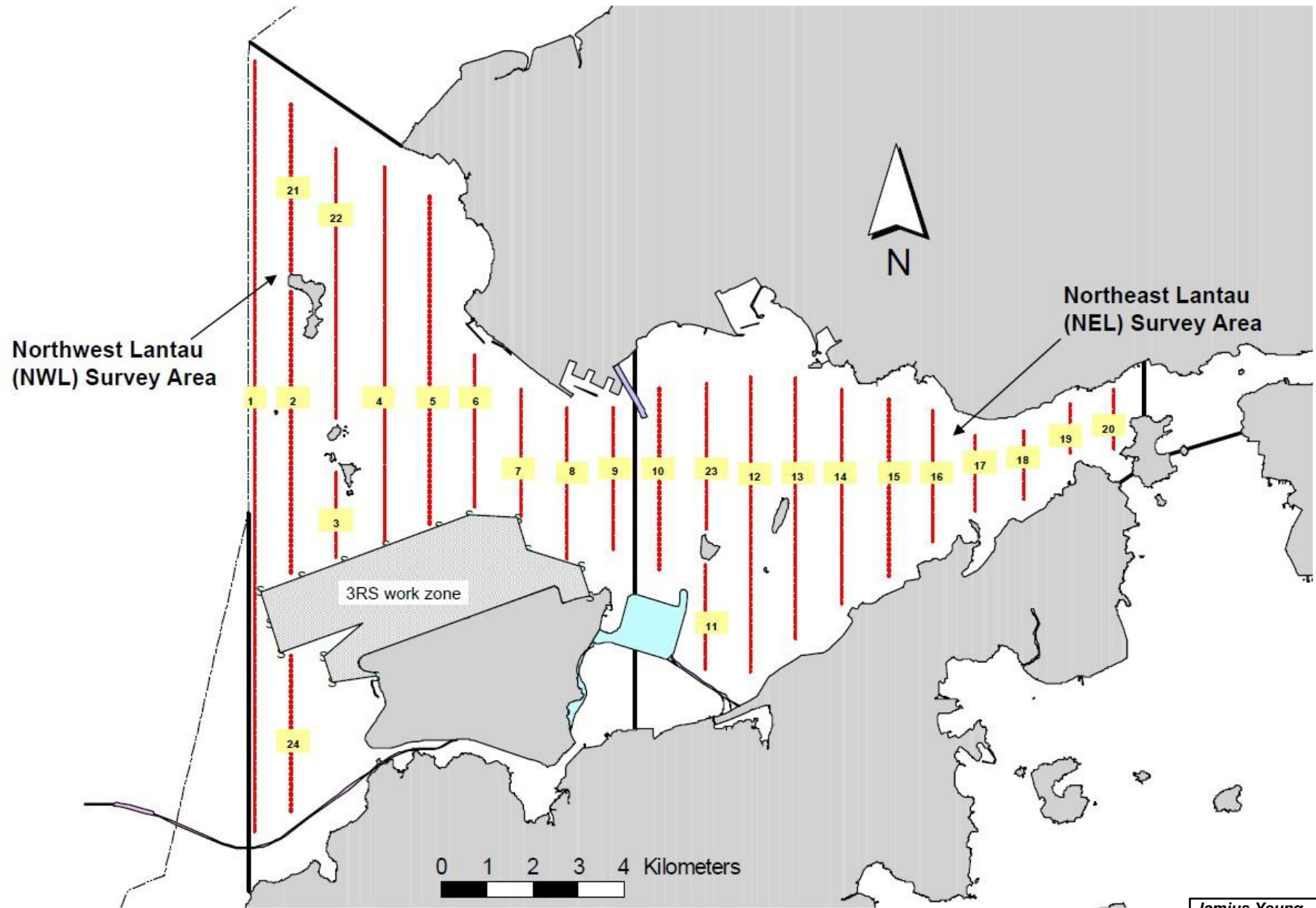


Figure 2.3

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

conducted from NEL and NWL survey areas, respectively. The total survey effort conducted on primary and secondary lines were 565.74 km and 198.59 km, respectively. The survey efforts are summarized in *Appendix H*.

A total of four groups of 12 Chinese White Dolphins sightings were recorded during the six sets of surveys in this reporting quarter. All dolphin sightings were made during on-effort search and all dolphin groups were made on primary lines. During this reporting quarter, all dolphin groups were sighted in NWL, while no dolphin was sighted in NEL.

Encounter rates of Chinese White Dolphins are deduced from the survey effort and on-effort sighting data made under favorable conditions (Beaufort 3 or below with good visibility) in the reporting quarter with the results and comparison with baseline results present in *Tables 2.9* and *2.10*.

Table 2.9 Individual Survey Event 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)
		Primary Lines Only	Primary Lines Only
NEL	Set 1 (3 & 8 Mar 2021)	0.00	0.00
	Set 2 (17 & 25 Mar 2021)	0.00	0.00
	Set 3 (8 & 22 Apr 2021)	0.00	0.00
	Set 4 (27 & 29 Apr 2021)	0.00	0.00
	Set 5 (3 & 11 May 2021)	0.00	0.00
	Set 6 (25 & 26 May 2021)	0.00	0.00
NWL	Set 1 (3 & 8 Mar 2021)	3.31	8.28
	Set 2 (17 & 25 Mar 2021)	1.65	3.30
	Set 3 (8 & 22 Apr 2021)	0.00	0.00
	Set 4 (27 & 29 Apr 2021)	0.00	0.00
	Set 5 (3 & 11 May 2021)	1.81	9.06
	Set 6 (25 & 26 May 2021)	0.00	0.00

Note: Dolphin Encounter Rates are deduced from the Two Sets of Surveys (Two Surveys in Each Set) in the reporting quarter in Northeast (NEL) and Northwest Lantau (NWL)

Table 2.10 Quarterly 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)	
	March -	September -	March -	September -

	May 2021	November 2011	May 2021	November 2011
Northeast Lantau	0.0	6.00 ± 5.05	0.0	22.19 ± 26.81
Northwest Lantau	1.13 ± 1.37	9.85 ± 5.85	3.44 ± 4.26	44.66 ± 29.85

Note: Encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions.

Group size of Chinese White Dolphins ranged from 2 – 5 individuals per group in North Lantau region during March to May 2021. The average dolphin group sizes from these three months were compared with the ones deduced from the baseline period in September to November 2011, as shown in *Table 2.11*.

Table 2.11 *Average Dolphin Group Size*

	Average Dolphin Group Size	
	March - May 2021	September - November 2011
Overall	3.00 ± 1.41 (n = 4)	3.72 ± 3.13 (n = 66)
Northeast Lantau	---	3.18 ± 2.16 (n = 17)
Northwest Lantau	3.00 ± 1.41 (n = 4)	3.92 ± 3.40 (n = 49)

One limit level exceedance was observed for the quarterly dolphin monitoring data between March to May 2021.

2.3.8 *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.

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. Three (3) site inspections were carried out in the reporting quarter on 3, 10 and 17 March 2021.

Key observations during the site inspections in this reporting period are summarized in *Table 2.12*.

Table 2.12 *Specific Observations and Recommendations during the Weekly Site Inspection in this Reporting Period*

Inspection Date	Environmental Observations	Recommendations/ Remarks
3 March 2021	Northern Landfall (Zone C) <ul style="list-style-type: none"> Chemical was placed on landscape planting area without provision of drip tray 	Northern Landfall (Zone C) <ul style="list-style-type: none"> The Contractor was reminded to provide drip tray to chemicals.

Inspection Date	Environmental Observations	Recommendations/ Remarks
10 March 2021	Northern Landfall (Zone C) <ul style="list-style-type: none"> Compressor was observed not placed on drip tray. 	Northern Landfall (Zone C) <ul style="list-style-type: none"> The Contractor was reminded to provide drip tray.
17 March 2021	Northern Landfall (N6) <ul style="list-style-type: none"> Oil stain was observed and chemicals were observed not placed in drip tray. 	Northern Landfall (N6) <ul style="list-style-type: none"> The Contractor was reminded to clear the oil stain and place chemicals in drip tray.

The Contractor has rectified all of the observations as identified during environmental site inspections in the reporting quarter.

2.5 WASTE MANAGEMENT STATUS

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

Wastes generated during this reporting period include mainly construction wastes (inert and non-inert). Reference has been made to the waste flow table prepared by the Contractor (*Appendix K*). The quantities of different types of wastes are summarized in *Table 2.13*.

Table 2.13 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 (M _p & M _f)	Mixed (L+M)
November March 2021	251409	0	16734	0	0	0	0	0
April 2021	8	0	68	0	0	0	0	0
May 2021	0	0	28	0	0	0	0	0

Notes:

- (a) Inert construction wastes include hard rock and large broken concrete, and materials disposed as public fill.
- (b) Non-inert construction wastes include general refuse disposed at landfill.
- (c) Recyclable materials include metals, paper, cardboard, plastics, timber and others.

The Contractor was advised to properly maintain on site C&D materials and waste collection, sorting and recording system, dispose of C&D materials and wastes at designated ground and maximize reuse/ recycle of C&D materials and wastes. The Contractor was also reminded to properly maintain the site tidiness and dispose of the wastes accumulated on site regularly and properly.

For chemical waste containers, the Contractor was reminded to treat properly and store temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.

2.6

ENVIRONMENTAL LICENSES AND PERMITS

The status of environmental licensing and permit is summarized in *Table 2.14* below.

Table 2.14 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 March 2015	Throughout the Contract	HyD	Application for VEP on 3 March 2015 to supersede EP-354/2009/C
Construction Dust Notification	435068	27 June 2018	Throughout the Contract	DBJV	Northern Landfall
Construction Dust Notification	435505	12 July 2018	Throughout the Contract	DBJV	Southern Landfall
Chemical Waste Registration	5213-422-D2516-02	18 January 2017	Throughout the Contract	DBJV	Northern Landfall
Chemical Waste Registration	5213-951-D2591-01	25 May 2016	Throughout the Contract	DBJV	Southern Landfall
Construction Waste Disposal Account	7018108	28 August 2013	Throughout the Contract	DBJV	Waste disposal in Contract No. HY/2012/08
Waste Water Discharge License	WT00031435-2018	2 August 2018	31 August 2023	DBJV	Southern Landfall
Waste Water Discharge License	WT00034060-2019	25 July 2019	30 June 2024	DBJV	Northern Landfall (4 Discharge Point)

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 site audit findings, the Contractors carried out all corrective actions.

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

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

For air quality impact monitoring, a total of three monitoring events for both 1-hour TSP and 24-hour TSP were undertaken in which no Action and Limit Level exceedances of 1-hour TSP and 24-hour TSP monitoring were recorded.

One (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between March and May 2021.

Cumulative statistics are provided in *Appendix J*.

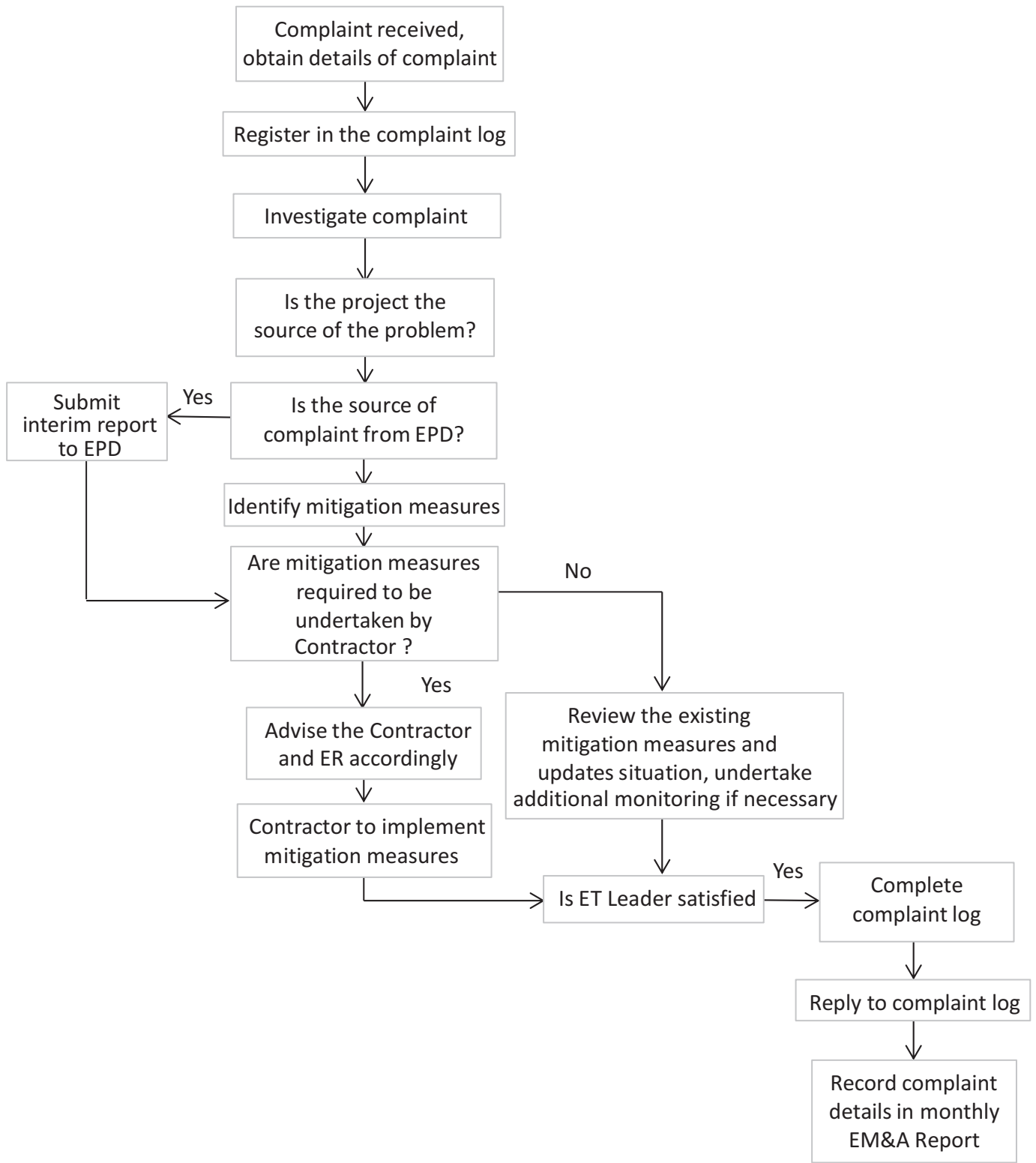
2.9 *SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS*

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

No environmental complaint was received in this reporting period.

No environmental summons was received in this reporting period.

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



Environmental Complaint Handling Procedure

Figure 2.4

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DATE: 06/12/2013

Environmental Resources Management



3 *FUTURE KEY ISSUES*

3.1 *CONSTRUCTION ACTIVITIES FOR THE COMING QUARTER*

As informed by the Contractor, there was no major activities undertaken in the coming quarterly period.

3.2 *KEY ISSUES FOR THE COMING QUARTER*

Potential environmental impacts in the coming quarterly period are expected to be mainly associated with waste management issues.

3.3 *MONITORING SCHEDULE FOR THE COMING QUARTER*

Post construction (operational) phase dolphin monitoring is scheduled to continue for the next 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 considered to be necessary at this stage. The monitoring programme will be evaluated as appropriate in the next reporting period.

CONCLUSIONS

This Thirtieth Quarterly EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 March 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), operational phase water quality monitoring and post construction (operational) phase dolphin monitoring were carried out in the reporting period. No Action and Limit Level exceedance of 1-hour TSP and 24-hour TSP monitoring was recorded in this reporting period.

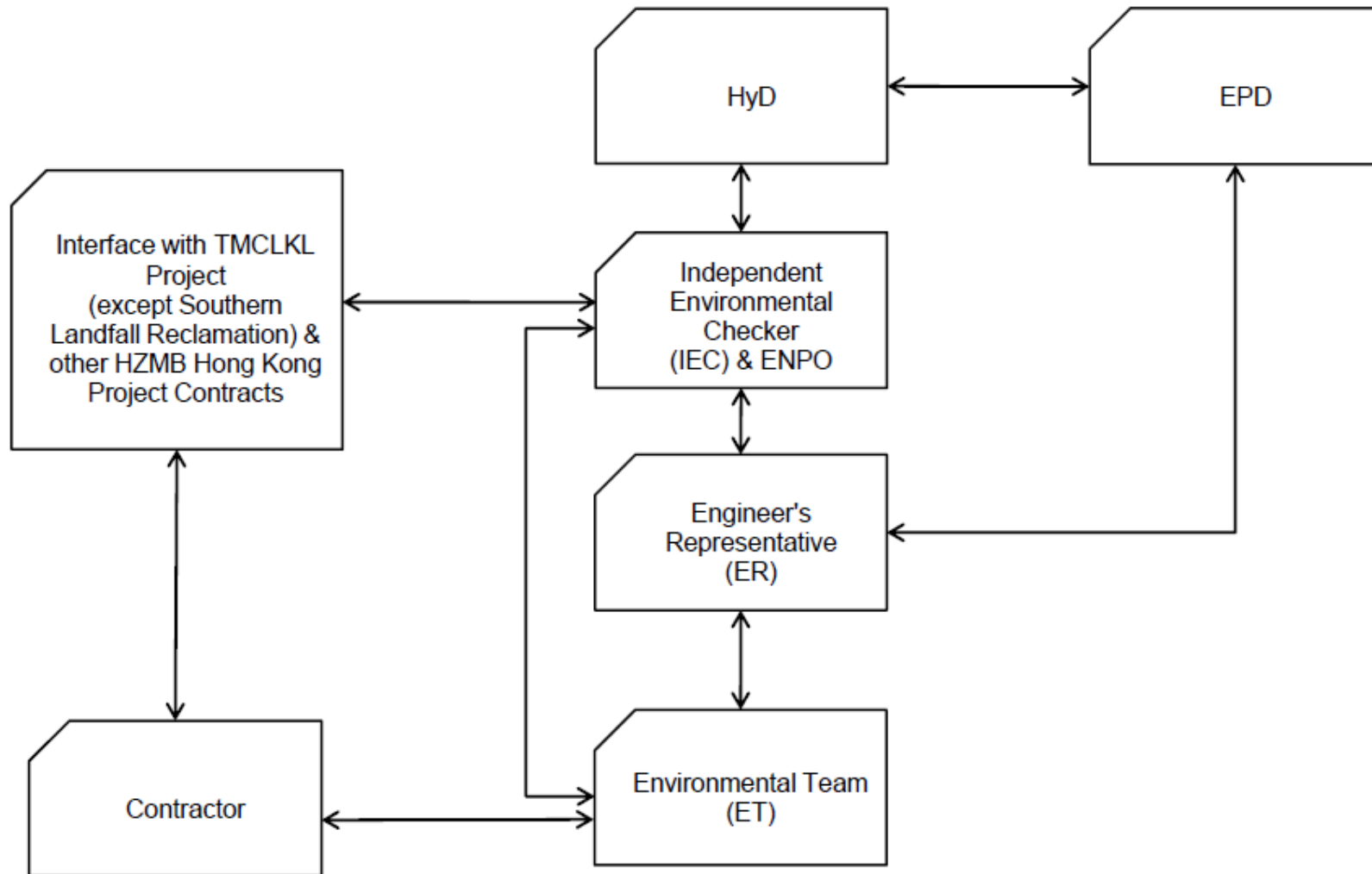
A total of four groups of 12 Chinese White Dolphins sightings were recorded during the six sets of surveys in this reporting quarter. All dolphin sightings were made during on-effort search and all dolphin groups were made on primary lines. One limit level exceedance was observed for the quarterly dolphin monitoring data between March and May 2021.

Three 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.

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.

Appendix A

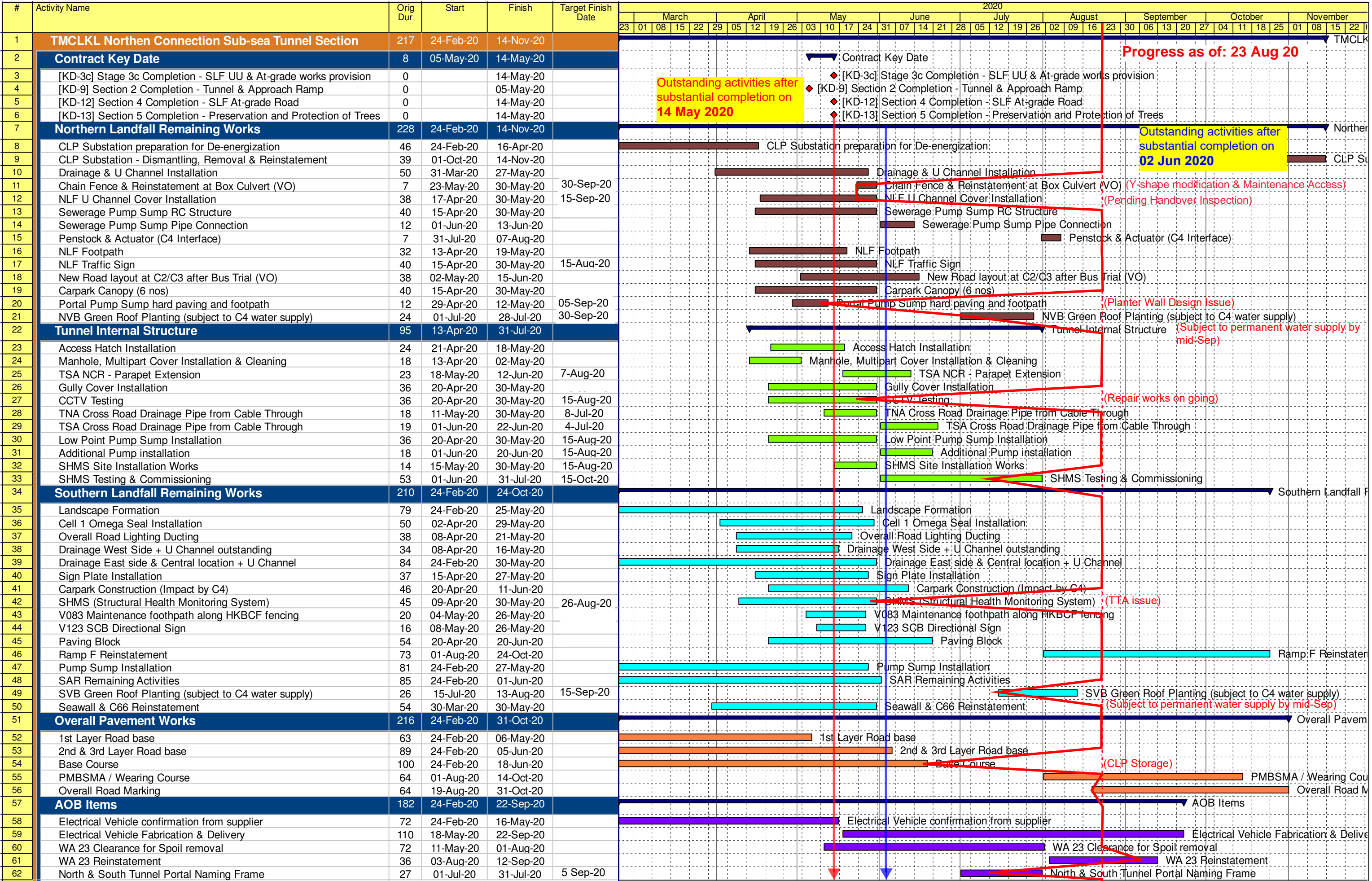
Project Organization for Environmental Works



↔ Line of Communication

Appendix B

Construction Programme



◆ Milestone
 Northern Landfall
 Internal Structure
 Southern Landfall
 Pavement
 AOB
 Summary

TMCLK Northern Connection Sub-sea Tunnel Section
 Programme of Remaining Works
 Forecast as of: 24 February 2020

Date	Revision	Checked	Approved
09-May-20	For Monitoring	SPa	DLo

Appendix C

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		N/A
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		N/A
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		N/A
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		N/A
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		N/A
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		N/A
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		N/A
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		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	
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		N/A
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		N/A
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		N/A
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		N/A
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		N/A
WATER QUALITY									
<i>Marine Works (Sequence A)</i>									
6.1 Figure 6.2a Appendix D6a	Annex A	Construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. The protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2a and detailed in Appendix D6a. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation;	All areas/ prior to dredging and backfilling works	Contractor	TM-EIAO		Y		N/A
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		N/A

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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	
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		N/A
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		N/A
	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		N/A
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		N/A
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		N/A
6.1	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		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	
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		N/A
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		N/A
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		N/A
<i>General Marine Works</i>									
6.1	-	Use of TBM 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		N/A
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		N/A
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		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	
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		N/A
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		N/A
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		N/A
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		N/A
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		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	
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		N/A
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		N/A
<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		N/A
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		N/A
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		N/A
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		N/A
6.1	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		N/A
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		N/A
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		N/A
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		N/A

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*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	
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		N/A
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		N/A
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		N/A
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		N/A
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		N/A
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		N/A
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
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		N/A
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		N/A

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Tuen Mun – Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.1	-	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		N/A
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		N/A
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	N/A
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		N/A
Water Quality Monitoring									
6.1	Section 5	Water quality monitoring shall be undertaken for suspended solids, turbidity, and dissolved oxygen. Nutrients and metal parameters shall also be measured for Mf sediment operations (only HKBCF and HKLR required handling of Mf sediment) during baseline, backfilling and post construction period. One year operation phase water quality monitoring at designated stations.	Designated monitoring stations as defined in EM&A Manual, Section 5/ Before, through-out marine construction period, post construction and monthly operational phase water quality monitoring for a year.	Contractor	EM&A Manual		Y	Y	Operational phase water quality monitoring commenced in June 2020 and completed in May 2021.
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		N/A
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		N/A
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		N/A

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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	
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
8.15	6.5	Audit coral translocation success	Post translocation	Contractor	TMEIA		Y		N/A
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		N/A
7.13	6.5	Avoid damage and disturbance to the remaining and surrounding natural habitat	All areas / Throughout construction period	Contractor	TMEIA		Y		N/A
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		N/A
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		N/A
7.13	6.5	Construction activities should be restricted to the proposed works boundary.	All areas / Throughout construction period	Contractor	TMEIA		Y		N/A
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		N/A
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		N/A
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		N/A
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		N/A

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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		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	TMELA, Works Branch Technical Circular No. 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material		Y		N/A

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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		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		N/A
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		N/A
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		N/A
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		N/A
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
12.6	8.1	No waste shall be burnt on site.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
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			N/A
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		N/A
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		N/A
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		N/A
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		N/A

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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	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		N/A
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		N/A
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		N/A
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
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: <i>f</i> suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed; <i>f</i> Having a capacity of <450L unless the specifications have been approved by the EPD; and w Chinese according to the instructions prescribed in Schedule 2 of the Regulations. <i>f</i> Clearly labelled and used solely for the storage of chemical wastes; <i>f</i> Enclosed with at least 3 sides; <i>f</i> 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; <i>f</i> Adequate ventilation;	All areas / throughout construction period	Contractor	TMEIA		Y		N/A

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Northern Connection Sub-sea Tunnel Section
Environmental Mitigation and Enhancement Measure Implementation Schedule*

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						D	C	O	
		f Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and f Incompatible materials are adequately separated.							
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
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		N/A
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
12.6	8.1	General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
12.6	8.1	All waste containers shall be in a secure area on hardstanding;	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
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		N/A
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		N/A
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		N/A
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

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	

▲ Non-compliance of Mitigation Measures but rectified by Contractor

△ Deficiency of Mitigation Measures but rectified by Contractor

N/A Not Applicable in Reporting Period

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Appendix D

Summary of Action and Limit Levels

Table D1 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 D2 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 D3 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 E

EM&A Monitoring Schedules

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
Air Quality Impact Monitoring Schedule - March 2021**

Air quality monitoring stations: ASR1, ASR5, ASR6, ASR10, AQMS1

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01-Mar	02-Mar	03-Mar	04-Mar	05-Mar	06-Mar
				1-hour TSP - 3 times 24-hour TSP - 1 time Impact AQM		
07-Mar	08-Mar	09-Mar	10-Mar	11-Mar	12-Mar	13-Mar
			1-hour TSP - 3 times 24-hour TSP - 1 time Impact AQM			
14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar
		1-hour TSP - 3 times 24-hour TSP - 1 time Impact AQM				
21-Mar	22-Mar	23-Mar	24-Mar	25-Mar	26-Mar	27-Mar
28-Mar	29-Mar	30-Mar	31-Mar			

HY/2012/08 - Tuen Mun - Chek Lap Kok Link - Northern Landfall
Operational Phase Marine Water Quality Monitoring (WQM) Schedule (March 2021)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1-Mar	2-Mar	3-Mar	4-Mar	5-Mar	6-Mar
7-Mar	8-Mar	9-Mar	10-Mar	11-Mar	12-Mar	13-Mar
14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar
21-Mar	22-Mar	23-Mar	24-Mar	25-Mar	26-Mar	27-Mar
					ebb tide 10:59 - 13:33 flood tide 15:23 - 18:53	
28-Mar	29-Mar	30-Mar	31-Mar			

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link - Northern Landfall
Operational Phase Marine Water Quality Monitoring (WQM) Schedule (April 2021)**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1-Apr	2-Apr	3-Apr
4-Apr	5-Apr	6-Apr	7-Apr	8-Apr	9-Apr	10-Apr
11-Apr	12-Apr	13-Apr	14-Apr	15-Apr	16-Apr	17-Apr
			ebb tide 12:39 - 16:09 flood tide 6:12 - 9:42			
18-Apr	19-Apr	20-Apr	21-Apr	22-Apr	23-Apr	24-Apr
25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr	

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link - Northern Landfall
Operational Phase Marine Water Quality Monitoring (WQM) Schedule (May 2021)**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1-May
2-May	3-May	4-May	5-May	6-May	7-May	8-May
9-May	10-May	11-May	12-May	13-May	14-May	15-May
16-May	17-May	18-May	19-May	20-May	21-May	22-May
					ebb tide 7:58 - 10:58 flood tide 12:27 - 15:57	
23-May	24-May	25-May	26-May	27-May	28-May	29-May
30-May	31-May					

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - March 2021**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01-Mar	02-Mar	03-Mar	04-Mar	05-Mar	06-Mar
			Operational Phase Dolphin Monitoring			
07-Mar	08-Mar	09-Mar	10-Mar	11-Mar	12-Mar	13-Mar
	Operational Phase Dolphin Monitoring					
14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar
			Operational Phase Dolphin Monitoring			
21-Mar	22-Mar	23-Mar	24-Mar	25-Mar	26-Mar	27-Mar
				Operational Phase Dolphin Monitoring		
28-Mar	29-Mar	30-Mar	31-Mar			

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - April 2021**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				01-Apr	02-Apr	03-Apr
04-Apr	05-Apr	06-Apr	07-Apr	08-Apr	09-Apr	10-Apr
				Operational Phase Dolphin Monitoring		
11-Apr	12-Apr	13-Apr	14-Apr	15-Apr	16-Apr	17-Apr
18-Apr	19-Apr	20-Apr	21-Apr	22-Apr	23-Apr	24-Apr
				Operational Phase Dolphin Monitoring		
25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr	
		Operational Phase Dolphin Monitoring		Operational Phase Dolphin Monitoring		

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - May 2021**

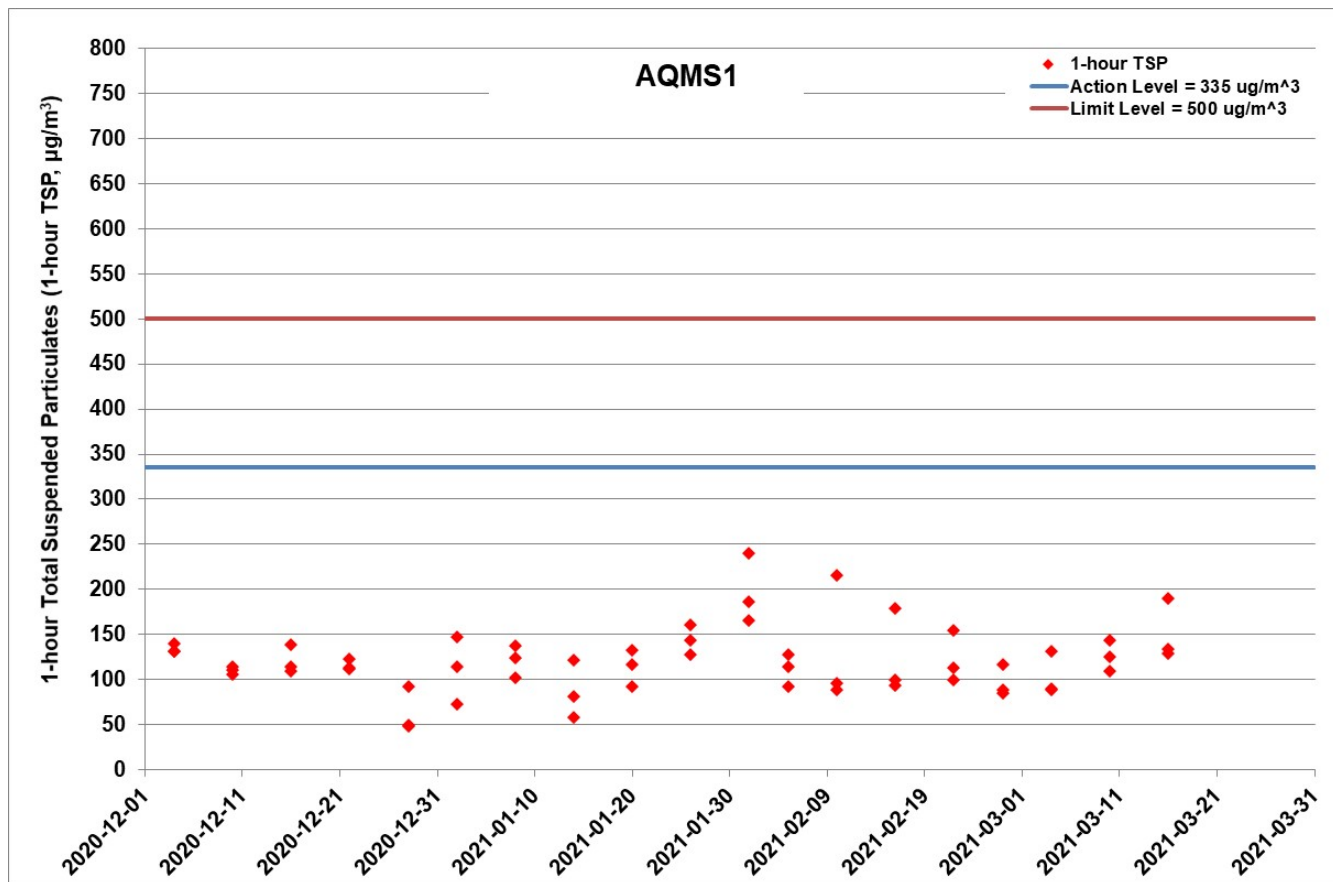
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						01-May
02-May	03-May	04-May	05-May	06-May	07-May	08-May
	Operational Phase Dolphin Monitoring					
09-May	10-May	11-May	12-May	13-May	14-May	15-May
		Operational Phase Dolphin Monitoring				
16-May	17-May	18-May	19-May	20-May	21-May	22-May
23-May	24-May	25-May	26-May	27-May	28-May	29-May
		Operational Phase Dolphin Monitoring	Operational Phase Dolphin Monitoring			
30-May	31-May					

Appendix F

Impact Air Quality Monitoring Results

Appendix F

Impact Air Quality Monitoring Results



- Figure F.1 Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at AQMS1 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



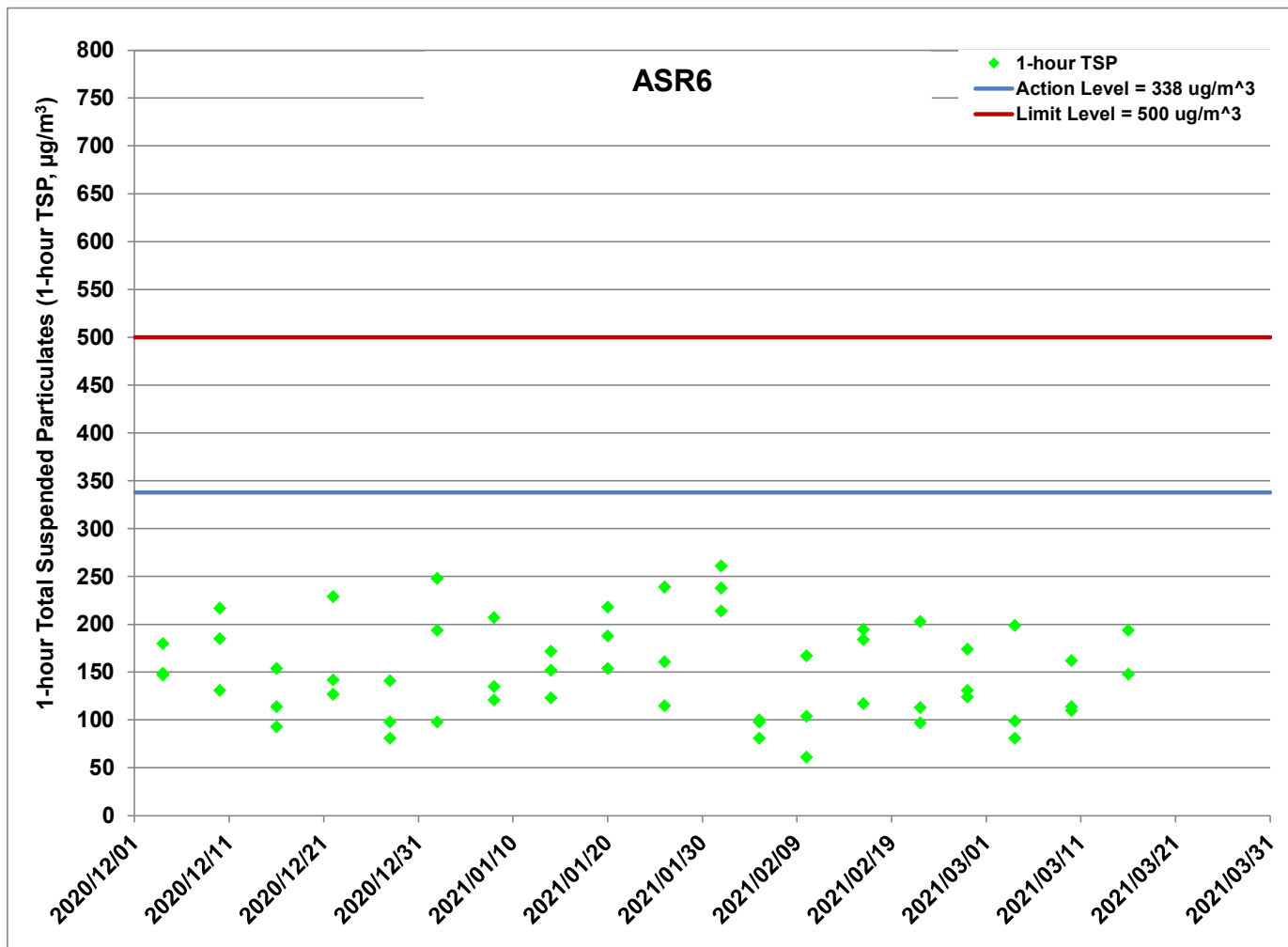


Figure F.2 Impact Monitoring - 1-hour Total Suspended Particulates (µg/m³) at ASR6 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



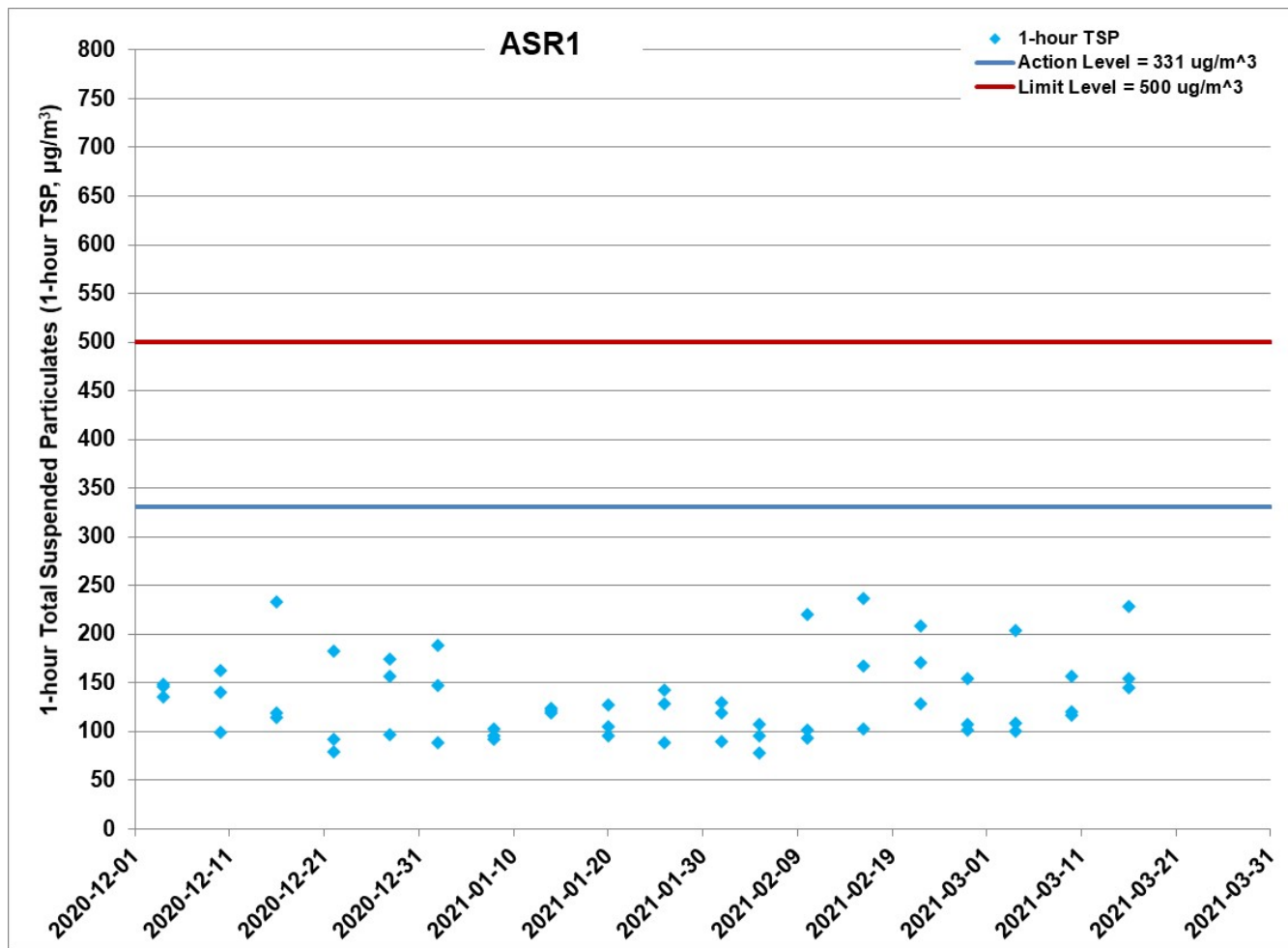


Figure F.3 Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR1 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



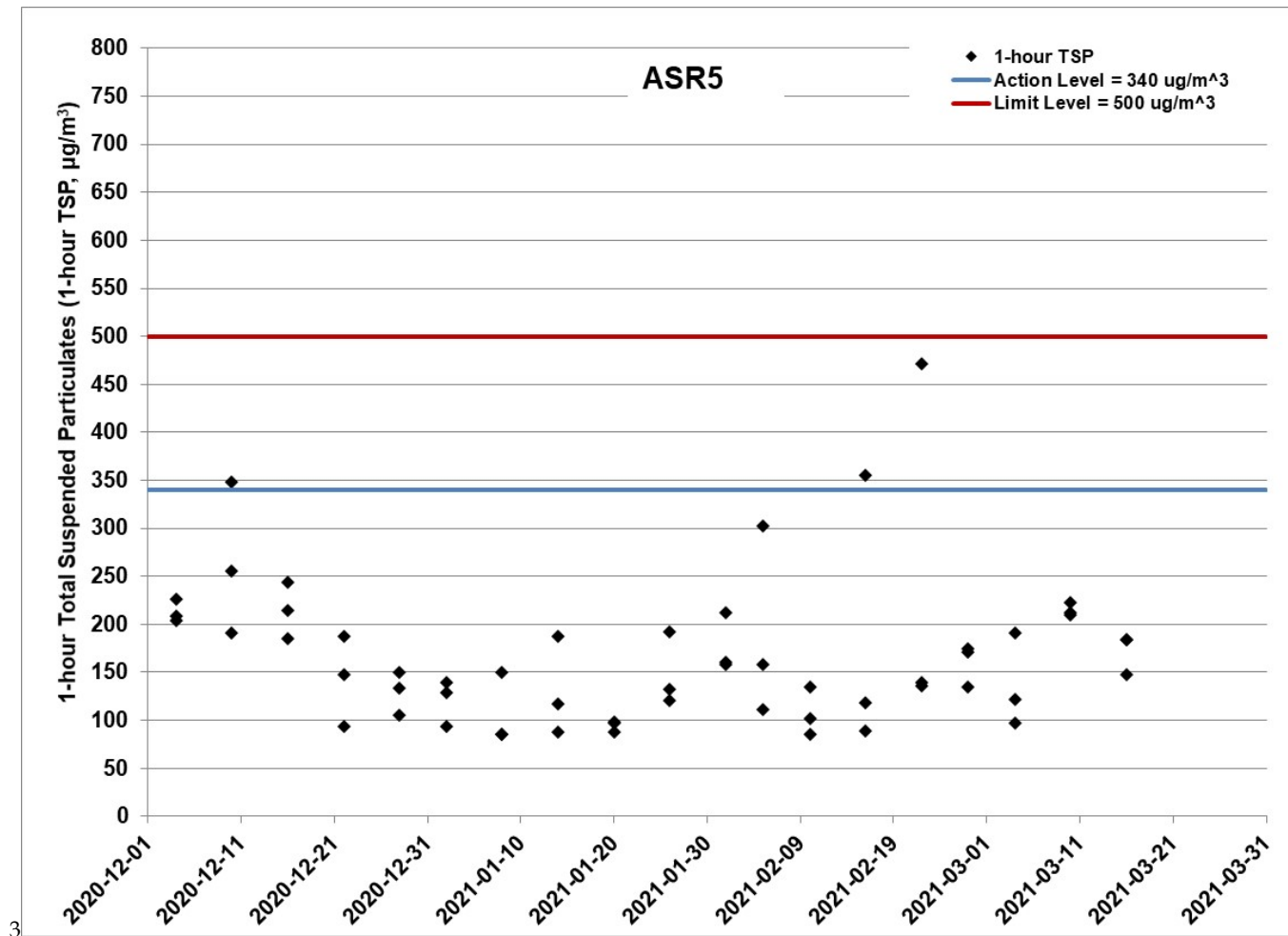


Figure F.4 Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR5 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



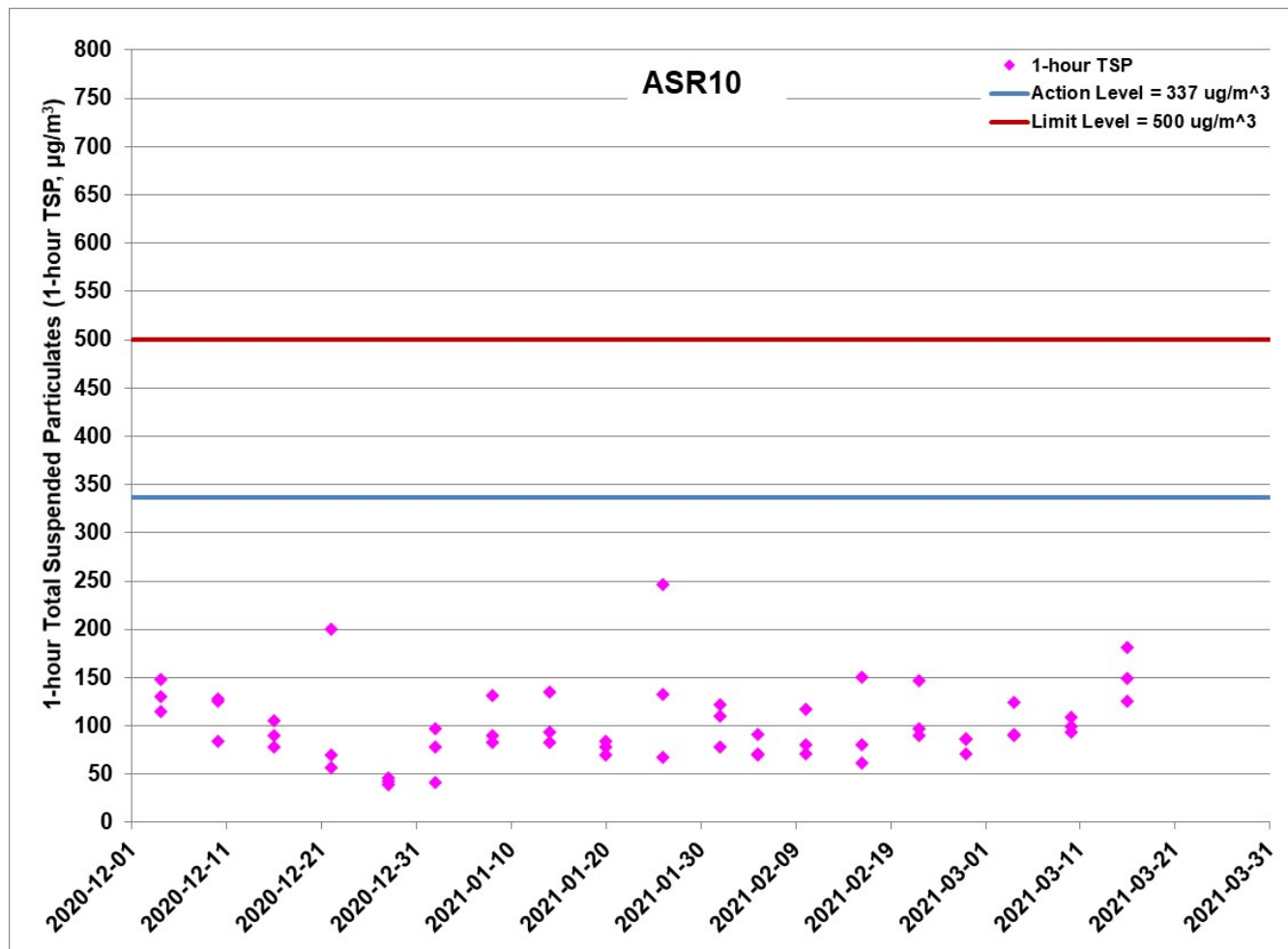


Figure F.5 Impact Monitoring - 1-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR10 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



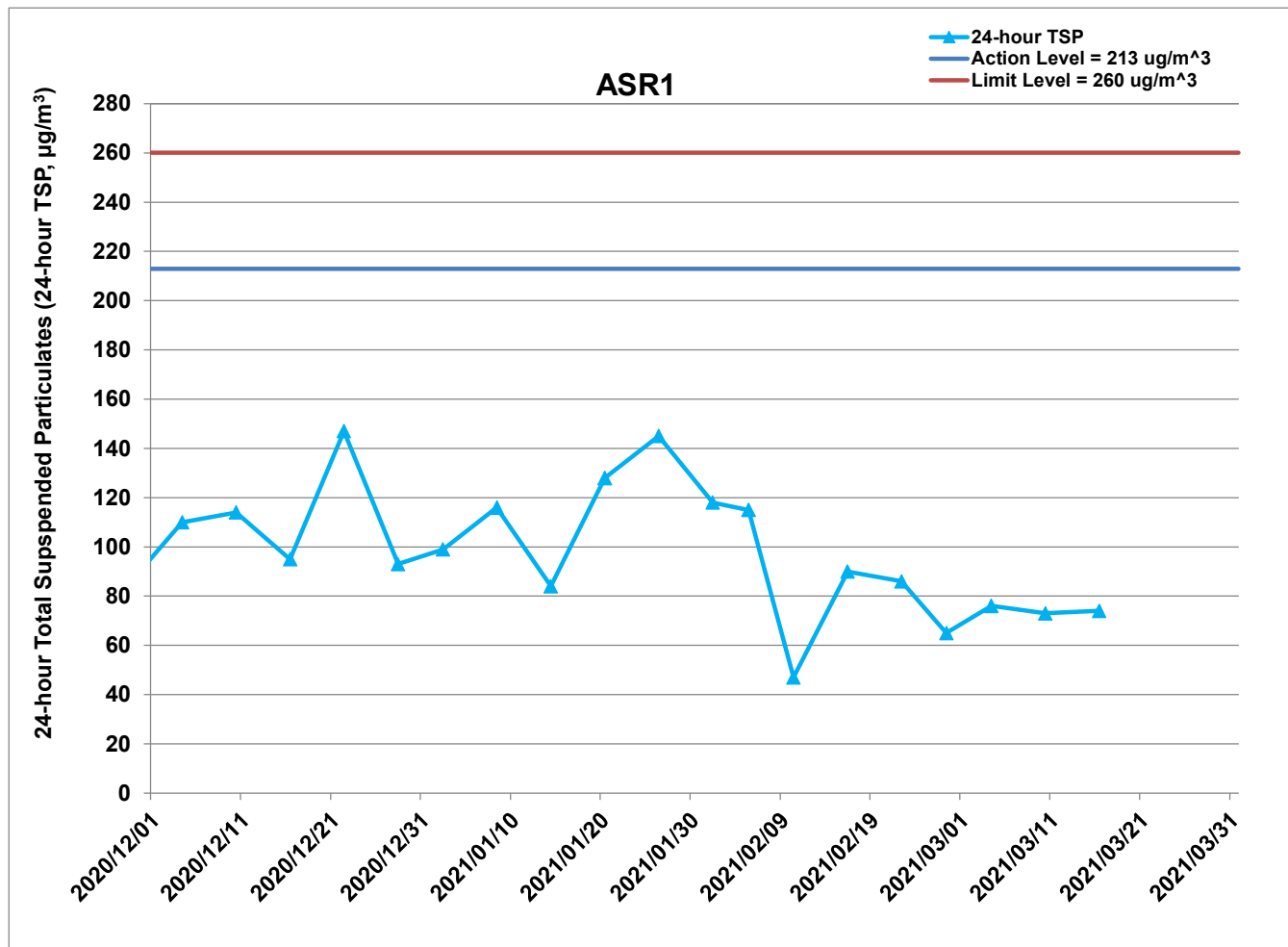


Figure F.6 Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR1 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



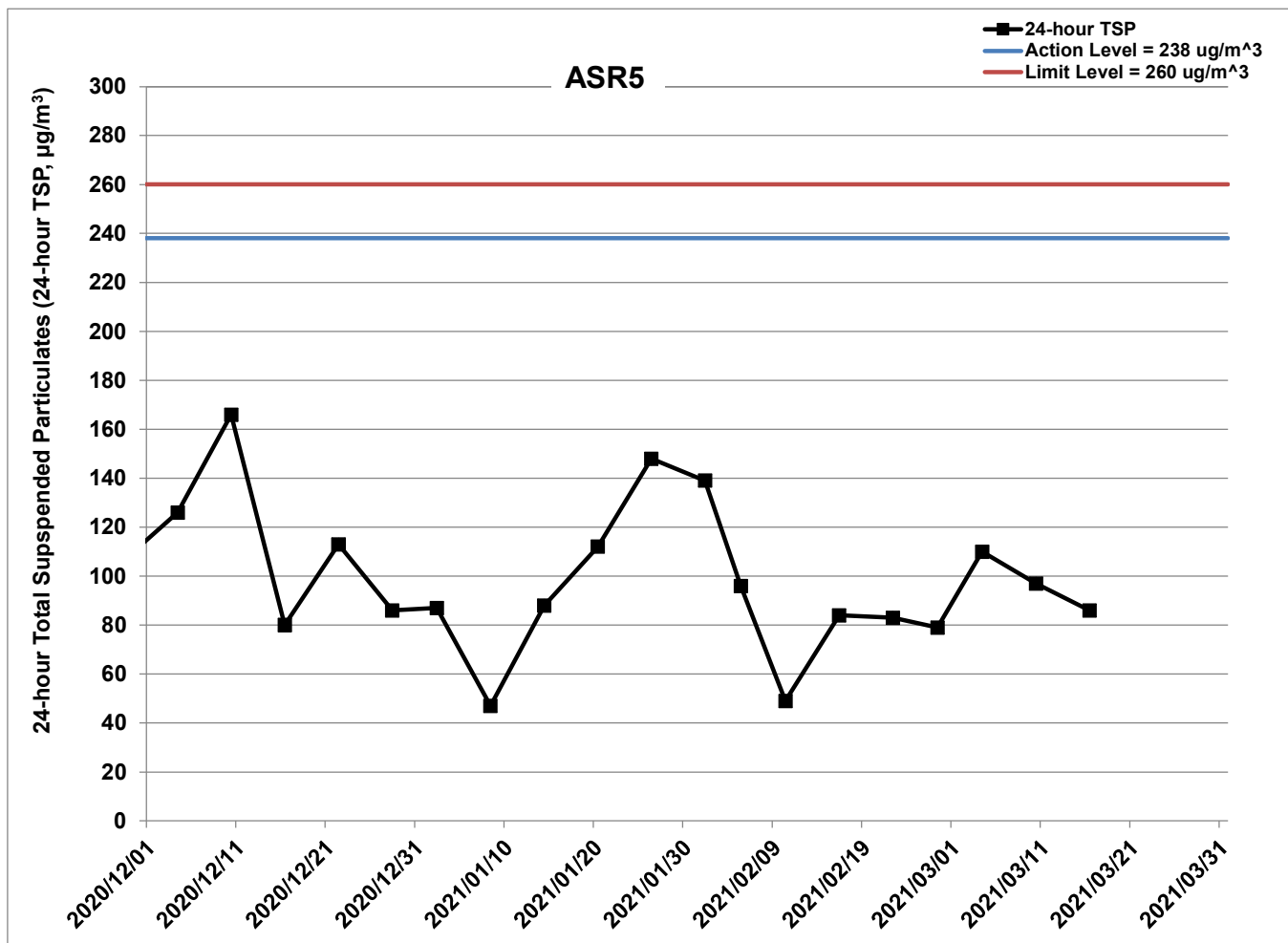


Figure F.7 Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR5 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



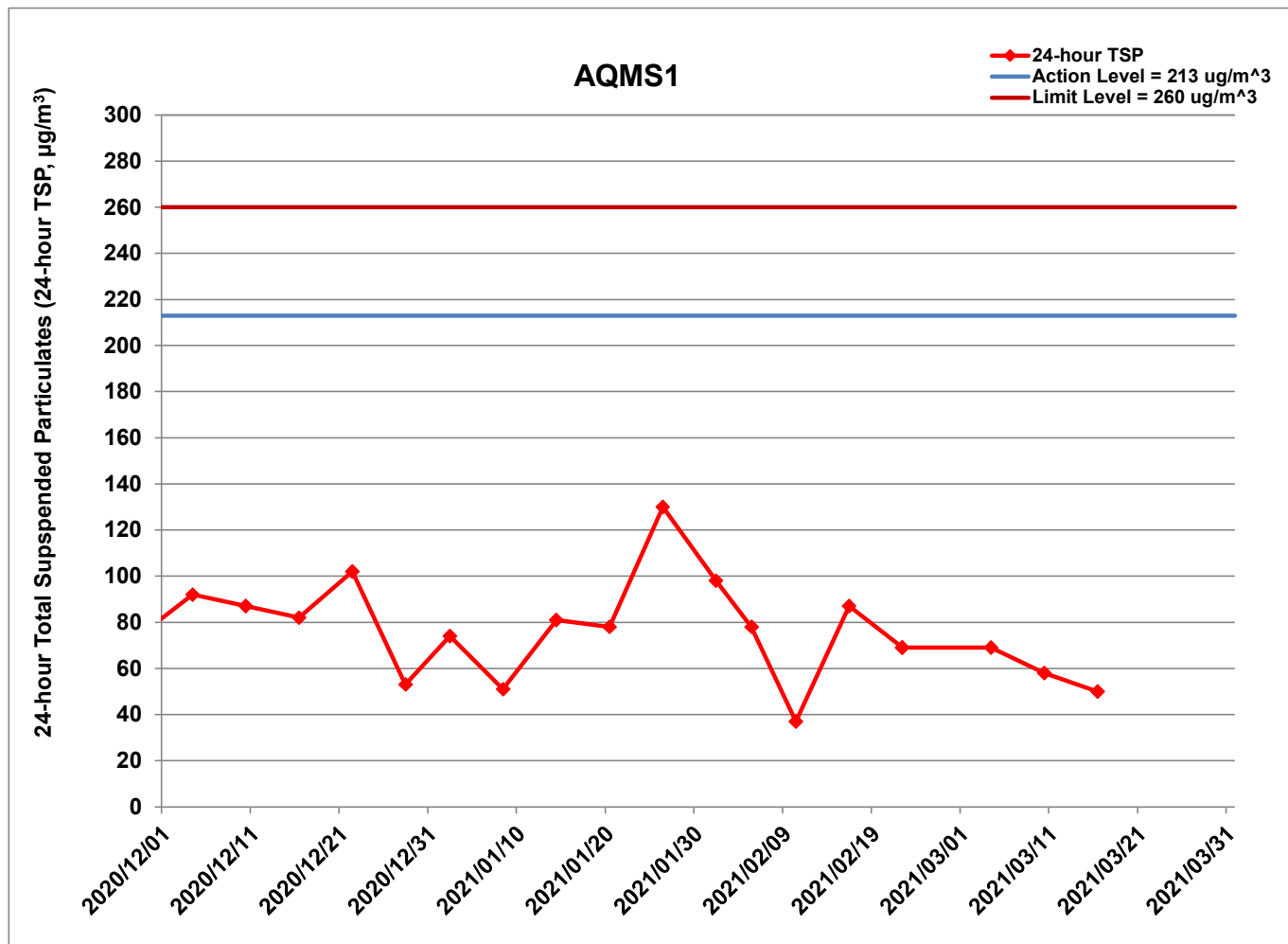


Figure F.8 Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at AQMS1 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



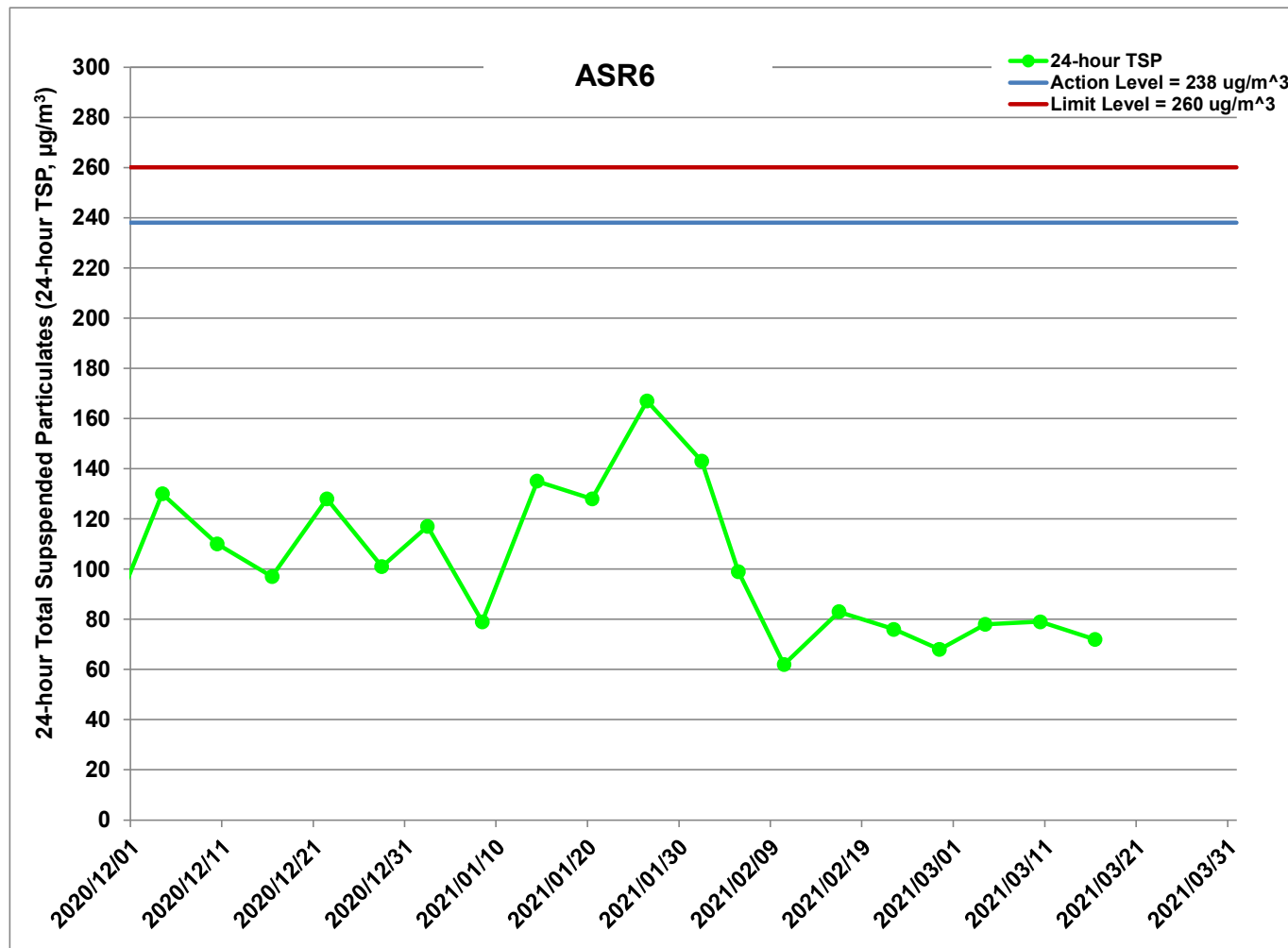


Figure F.9 Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR6 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



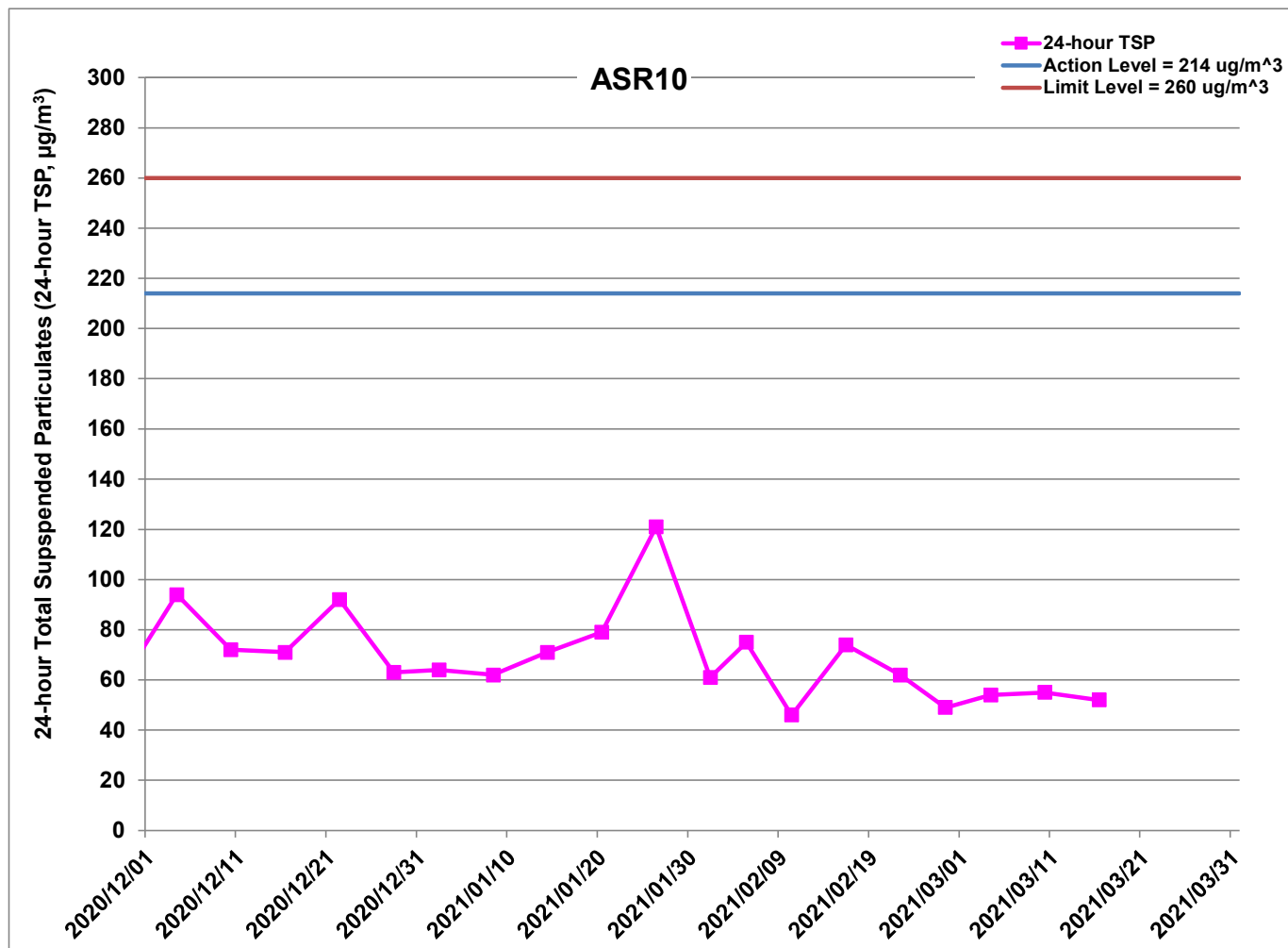


Figure F.10 Impact Monitoring - 24-hour Total Suspended Particulates ($\mu\text{g}/\text{m}^3$) at ASR10 between 1 December 2020 and 19 March 2021 during impact monitoring period. The weather conditions during the monitoring period were sunny and hazy. No major land-based construction activities was conducted in the reporting period (1/12/2020 - 19/3/2021)

Ref: 0212330_Impact AQM graphs_March 2021.xlsx



Appendix G

Operational Phase Water
Quality Monitoring Results

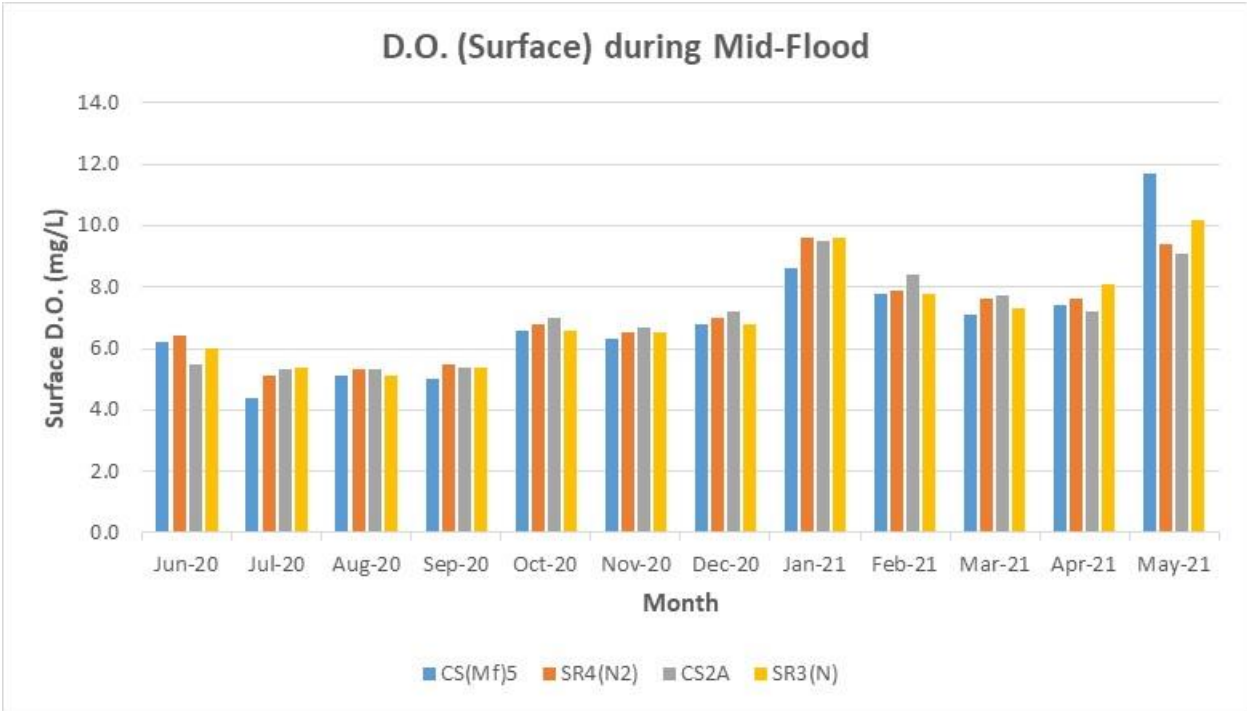
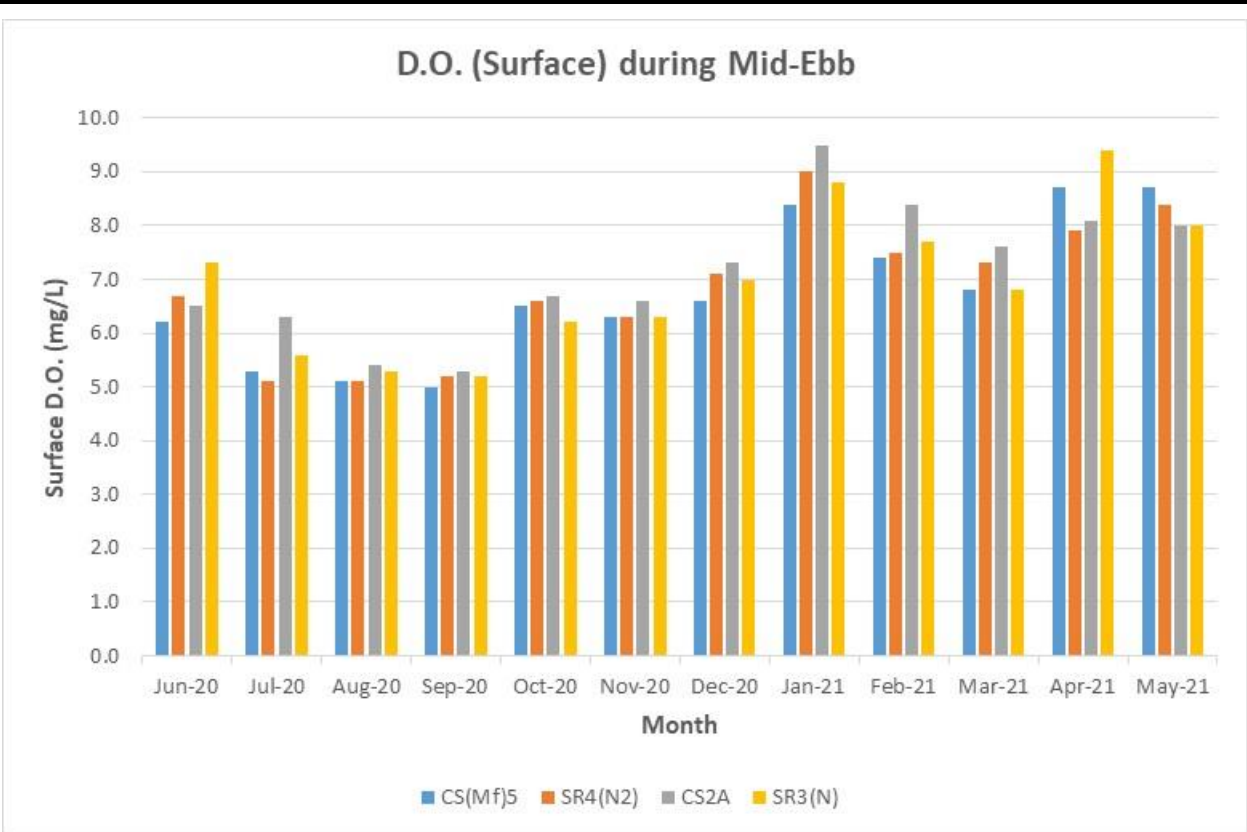


Figure G1 Operational Phase Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 June 2020 and 31 May 2021. The weather conditions during the monitoring period varied mostly from sunny to cloudy.

Ref: 0212330_Impact-WQM_May 2021_graphs_Rev a.xls



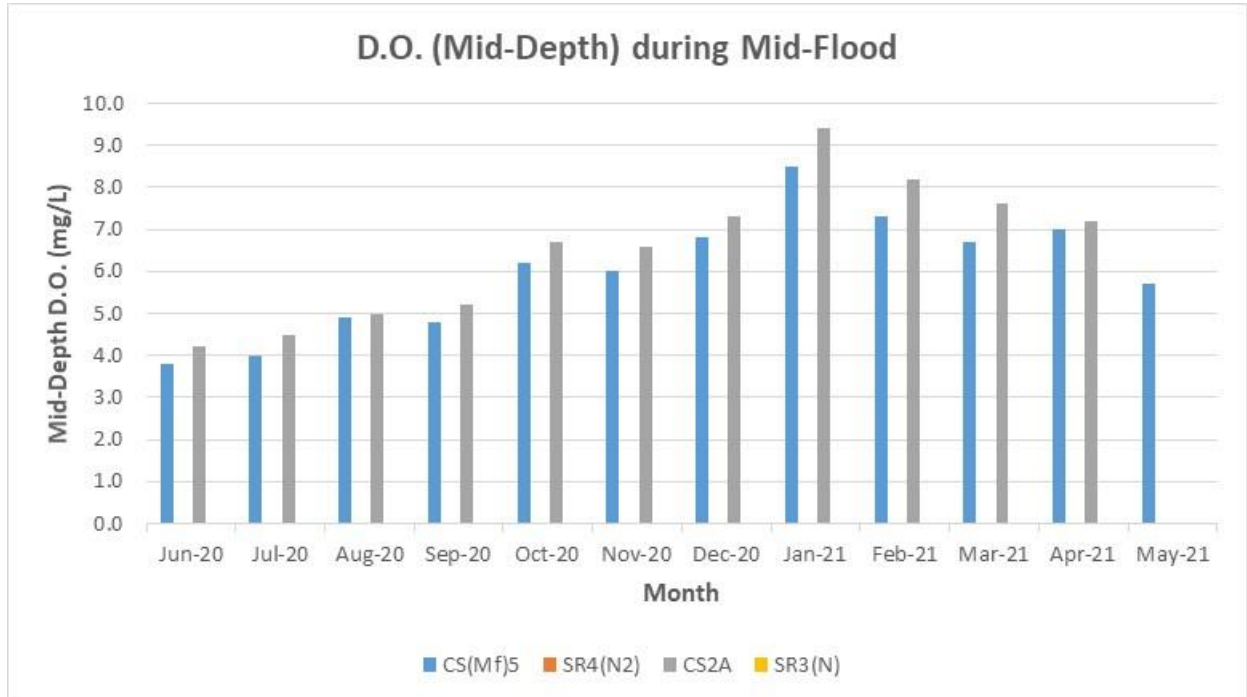
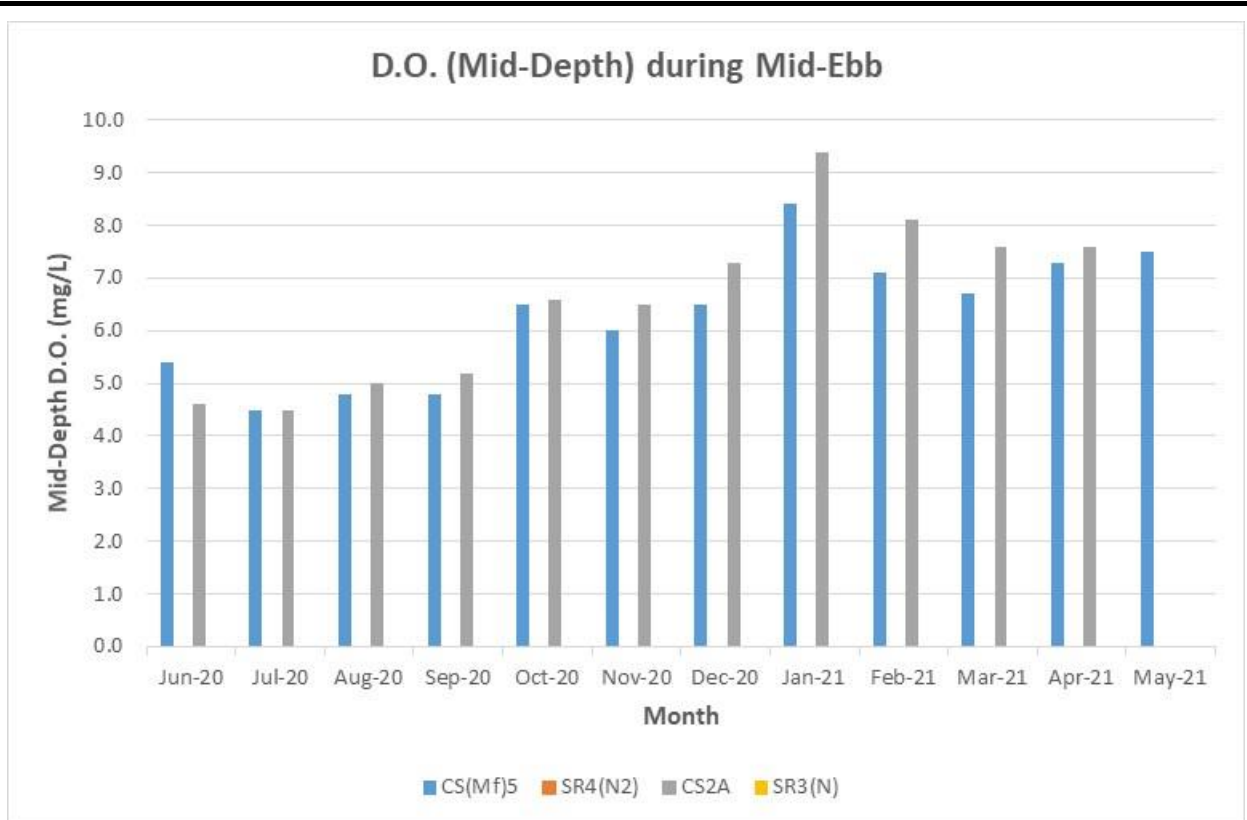


Figure G2 Operational Phase Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 June 2020 and 31 May 2021. The weather conditions during the monitoring period varied mostly from sunny to cloudy.

Ref: 0212330_Impact-WQM_May 2021_graphs_Rev a.xls



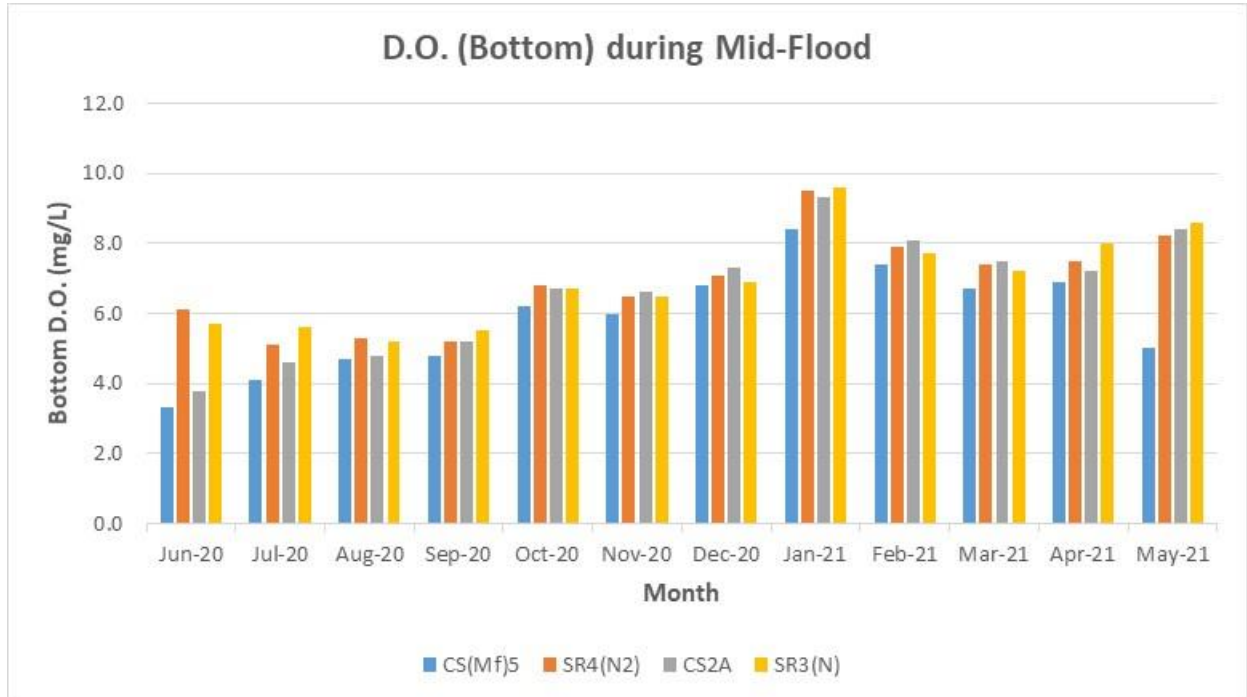
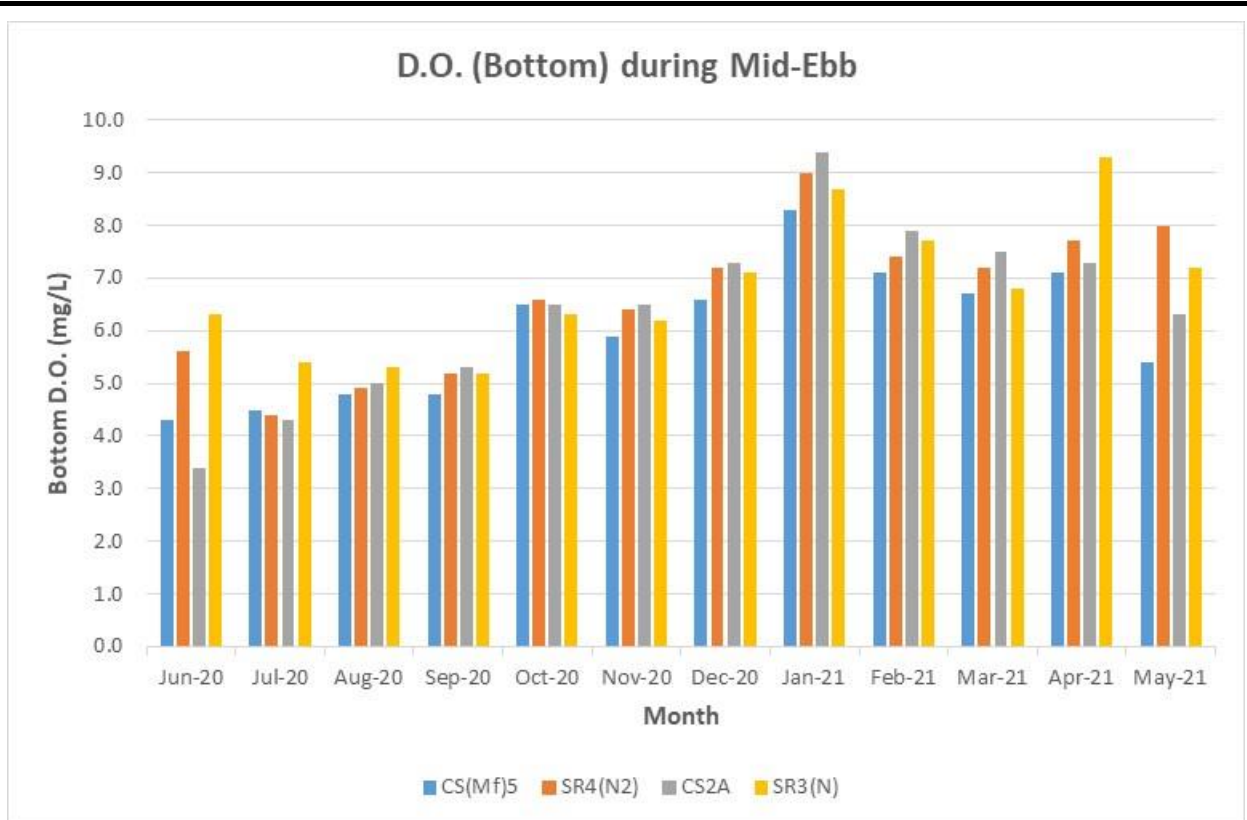


Figure G3 Operational Phase Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters between 1 June 2020 and 31 May 2021. The weather conditions during the monitoring period varied mostly from sunny to cloudy.

Ref: 0212330_Impact-WQM_May 2021_graphs_Rev a.xls



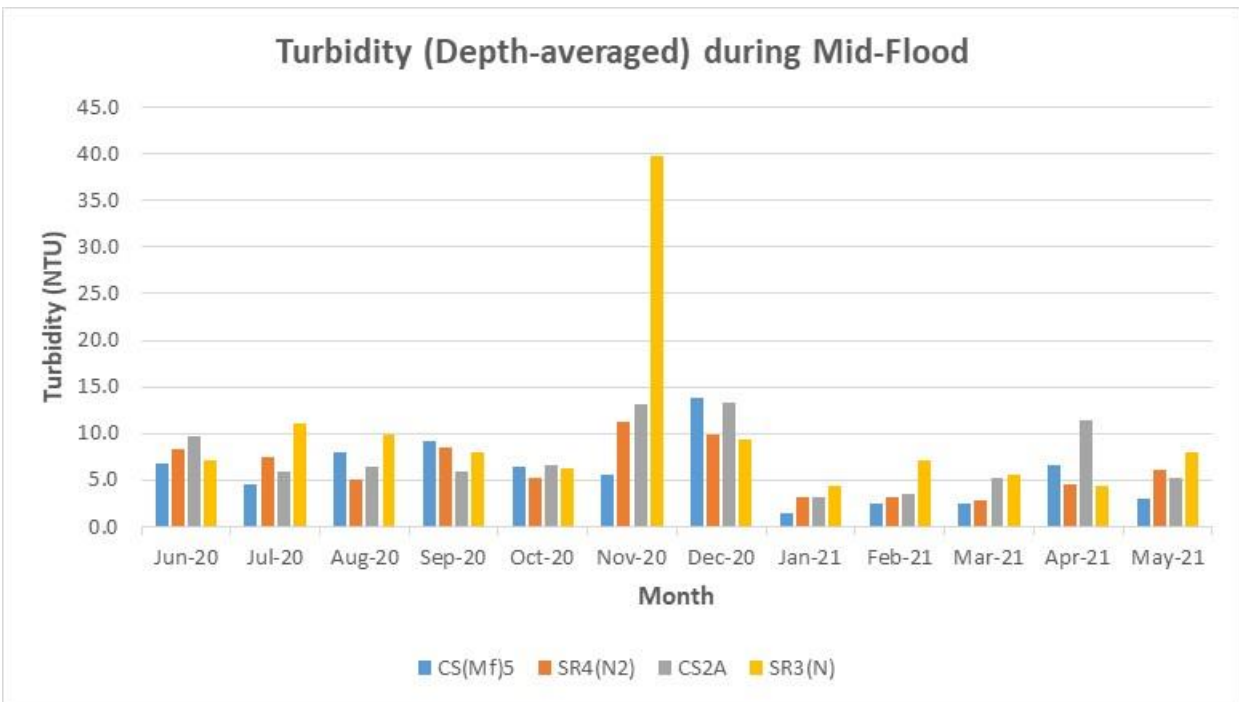
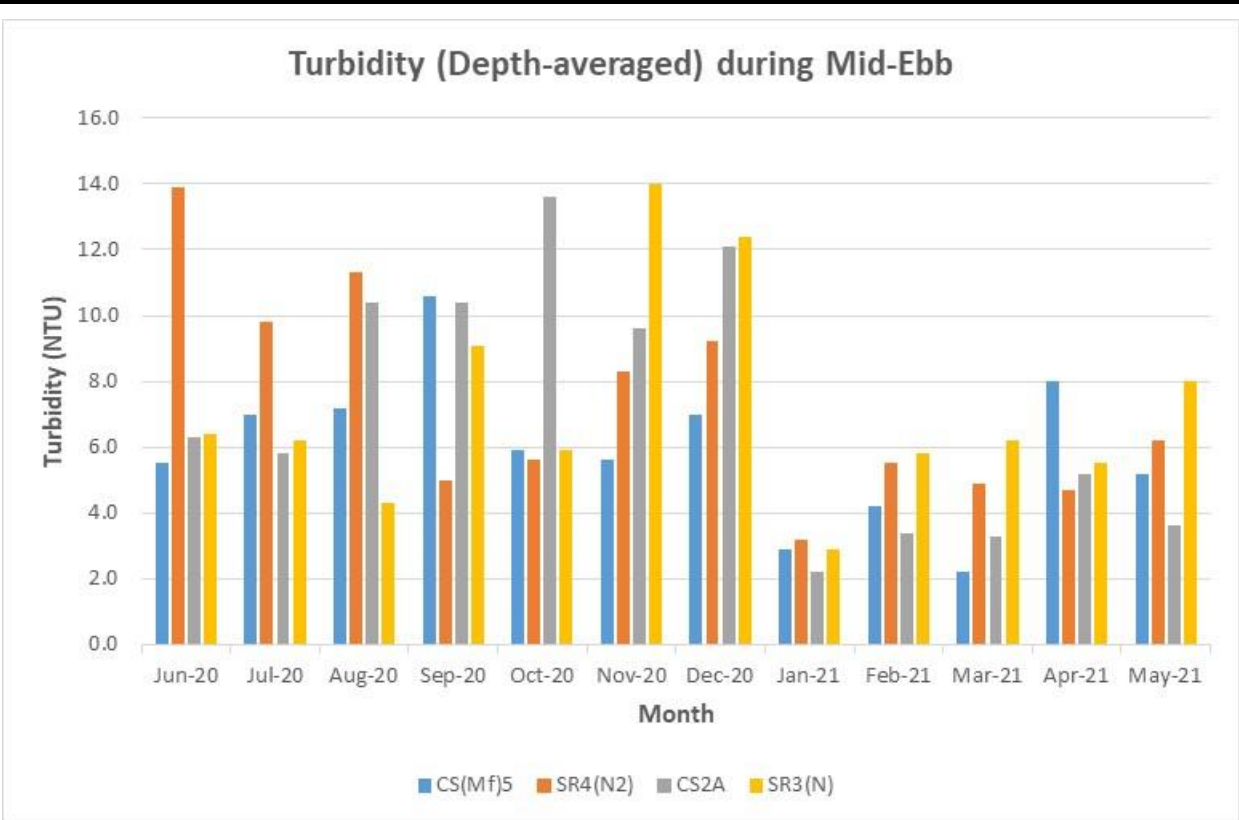


Figure G4 Operational Phase Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 June 2020 and 31 May 2021. The weather conditions during the monitoring period varied mostly from sunny to cloudy.

Ref: 0212330_Impact-WQM_May 2021_graphs_Rev a.xls



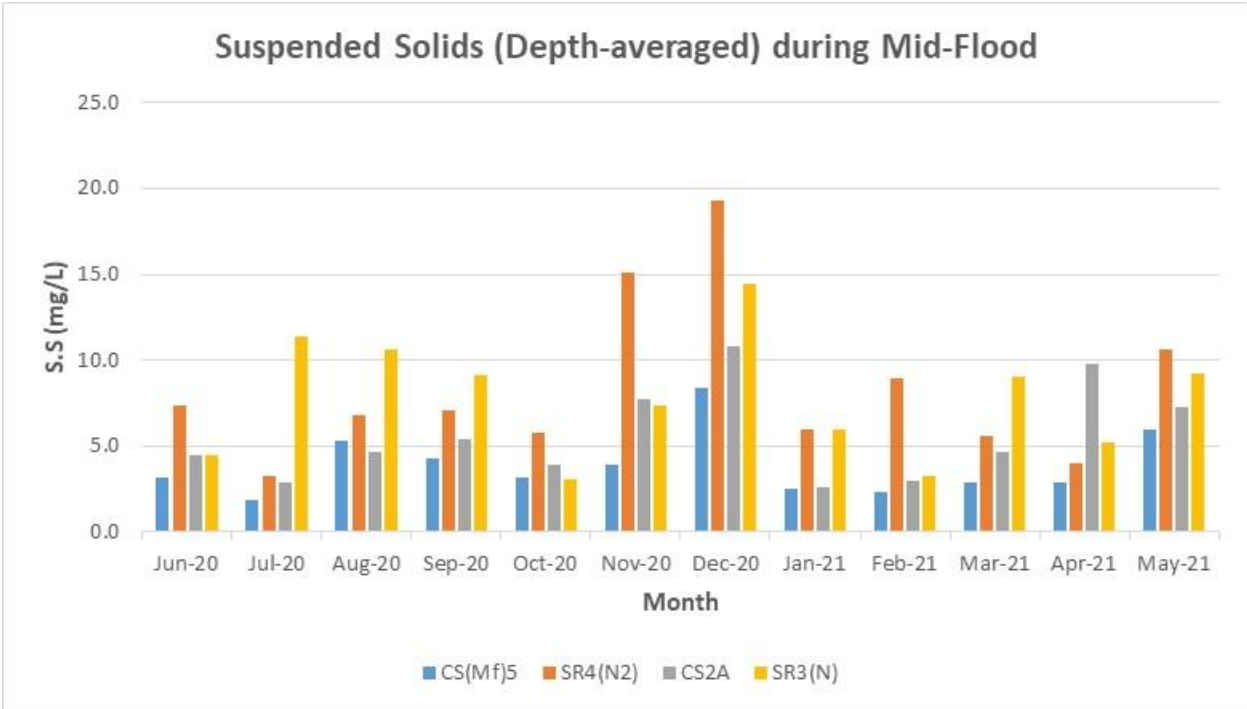
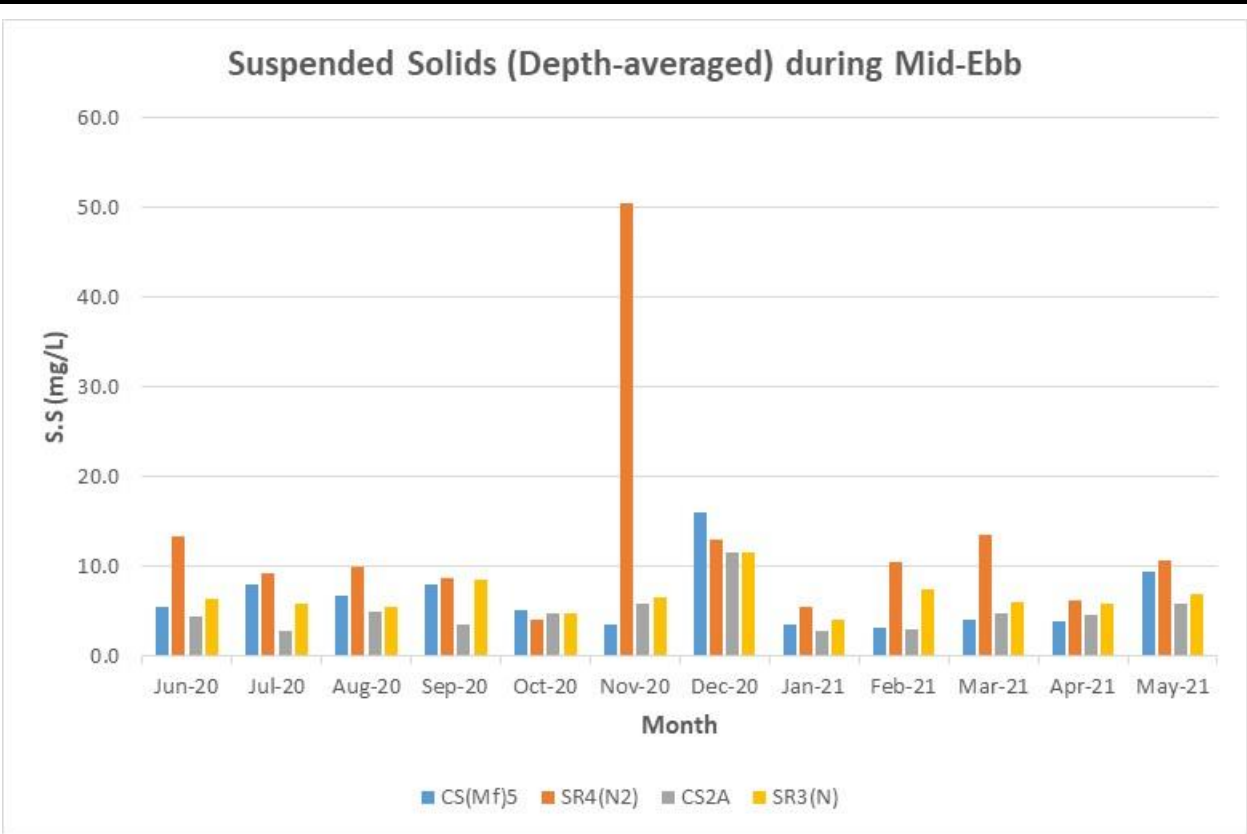


Figure G5 Operational Phase Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 June 2020 and 31 May 2021. The weather conditions during the monitoring period varied mostly from sunny to cloudy.

Ref: 0212330_Impact-WQM_May 2021_graphs_Rev a.xls



Appendix H

Post Construction
(Operational) 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**

4th Quarterly Progress Report (March-May 2021)

submitted to Dragages – Bouygues Joint Venture & ERM Hong Kong Ltd.

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

9 June 2021

1. Introduction

- 1.1. As part of the Hong Kong-Zhuhai-Macao Bridge, the Tuen Mun-Chek Lap Kok Link (TM-CLKL) Northern Connection Sub-sea Tunnel Section (Contract no. HY/2012/08) comprises the sub-sea TBM tunnels (two tubes with cross passages) across the Urmston Road to connect Tuen Area 40 and Hong Kong Boundary Crossing Facilities (HKBCF) of approximately 4 km in length with dual 2-lane carriageway, the tunnels at both the southern landfall and the northern landfall for construction of approach roads to the sub-sea TBM tunnels of approximately 1.5 km in length, as well as the northern landfall reclamation of approximately 16.5 hectares and about 20.km long seawalls. Dragages – Bouygues Joint Venture (hereinafter called the “Contractor”) was awarded as the main contractor for the Northern Connection Sub-sea Tunnel Section, and ERM Hong Kong Limited would serve as the Environmental Team to implement the Environmental Monitoring and Audit (EM&A) programme.
- 1.2. According to the updated EM&A Manual (for TM-CLKL), monthly line-transect vessel surveys for Chinese White Dolphin should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas as in AFCD annual marine mammal monitoring programme. Between 2013 and 2019, as such surveys have already been undertaken by the HKLR03 and HKBCF projects in the survey same areas of NEL and NWL, a combined monitoring approach was recommended by the Highways Department, that the TM-CLKL EM&A project can utilize the monitoring data collected by HKLR03 or HKBCF project to avoid any redundancy in monitoring effort. Such exemption for the dolphin monitoring has ended in September 2019 as the dolphin monitoring works carried out by HKLR03 and HKBCF contract have been completed. Starting in October 2019, TMCLKL08 contract takes over the dolphin monitoring works by conducting the regular vessel-based line-transect surveys during the construction phase. And as the construction works for the TMCLKL08 contract has also been completed in May 2020, the post-construction dolphin monitoring works have subsequently commenced in June 2020.

- 1.3. Since November 2013, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by ERM Hong Kong Limited as the dolphin specialist for the TMCLKL Northern Connection Sub-sea Tunnel Section EM&A project. He is responsible for the dolphin monitoring study, including the data collection on Chinese White Dolphins during the construction phase (i.e. impact period) as well as the post-construction phase of the TMCLKL project in Northwest Lantau (NWL) and Northeast Lantau (NEL) survey areas. During both phases, the dolphin specialist is responsible to utilize the collected monitoring data in order to examine any potential impacts on the dolphins during and after the TMCLKL construction works.
- 1.4. This report is the fourth quarterly progress report under the TM-CLKL post-construction phase dolphin monitoring programme submitted to the Contractor, which summarizes the results of the survey findings during the period of March 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 construction and post-construction monitoring period. The co-ordinates of all transect lines are shown in Table 1.

Table 1 Co-ordinates of transect lines conducted by TMCLKL08 project

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 TMCLKL08 survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 22 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2020). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.
- 2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270° 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.
- 2.1.4. During on-effort survey periods, the survey team recorded effort data including time, positions (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).
- 2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

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

2.2. Photo-identification Work

- 2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the TMCLKL08 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. Distribution Analysis – The line-transect survey data was integrated with the Geographic Information System (GIS) in order to visualize and interpret different spatial and temporal patterns of dolphin distribution using sighting positions. Location data of dolphin groups were plotted on map layers of Hong Kong using a desktop GIS (ArcView[®] 3.1) to examine their distribution patterns in details. The dataset was also stratified into different subsets to examine distribution patterns of dolphin groups with different categories of group sizes, young calves and activities.

2.3.2. 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 collect under Beaufort 3 or below condition would be used for the encounter rate analyses. Dolphin encounter rates were calculated in two ways for comparisons with the HZMB baseline monitoring results as well as to AFCD long-term marine mammal monitoring results.

Firstly, for the comparison with the HZMB baseline 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 six events during the present quarter (i.e. six sets of line-transect surveys in North Lantau), which was also compared with the one deduced from the six events during the baseline period (i.e. six sets of line-transect surveys in North Lantau).

Secondly, the encounter rates were calculated using both primary and secondary survey effort collected under Beaufort 3 or below condition 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 quarterly period.

2.3.3. Quantitative grid analysis on habitat use – To conduct quantitative grid analysis of habitat use, positions of on-effort sightings of Chinese White Dolphins collected during the quarterly 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.

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

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:

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

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

- 2.3.4. Behavioural analysis – 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. Distribution of sightings 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.
- 2.3.5. Ranging pattern analysis – Location data of individual dolphins that occurred during the 3-month impact phase monitoring period were obtained from the dolphin sighting database and photo-identification catalogue. To deduce home ranges for individual dolphins using the fixed kernel methods, the program Animal Movement Analyst Extension, was loaded as an extension with ArcView[®] 3.1 along with another extension Spatial Analyst 2.0. Using the fixed kernel method, the program calculated kernel density estimates based on all sighting positions, and provided an active interface to display kernel density plots. The kernel estimator then calculated and displayed the overall ranging area at 95% UD level.

3. Monitoring Results

3.1. Summary of survey effort and dolphin sightings

- 3.1.1. During the period of March to May 2021, six sets of systematic line-transect vessel surveys were conducted under the TMCLKL08 post-construction dolphin monitoring works to cover all transect lines in NWL and NEL survey areas twice per month.
- 3.1.2. From these TMCLKL08 surveys, a total of 764.33 km of survey effort was collected, with 100% 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, 279.60 km and 484.73 km of survey effort were conducted in NEL and NWL survey areas respectively.
- 3.1.3. The total survey effort conducted on primary lines was 565.74 km, while the effort on secondary lines was 198.59 km. Survey effort conducted on both primary and secondary lines were considered to be on-effort survey data. A summary table of the survey effort is shown in Appendix I.
- 3.1.4. During the six sets of TMCLKL08 monitoring surveys conducted between March and May 2021, a total of four groups of 12 Chinese White Dolphins were sighted. All

dolphin sightings were made on primary lines during on-effort search in this quarter. A summary table of dolphin sightings is shown in Appendix II.

3.1.5. In this quarterly period, all four dolphin groups were sighted in NWL, and no dolphin was sighted at all in NEL. In fact, since August 2014, only two sightings of two lone dolphins were made respectively in NEL during the HKLR03/TMCLKL08 monitoring surveys, and none was sighted there since June 2016.

3.2. *Distribution*

3.2.1. Distribution of dolphin sightings made during the TMCLKL08 monitoring surveys from March to May 2021 is shown in Figure 1. Among the four dolphin sightings, two were made within the Urmston Road section between Lung Kwu Chau and Lung Kwu Tan, while the other two occurred at the southwestern corner of NWL survey area, or just to the north of Shum Wat near the HKLR09 alignment (Figure 1). As consistently recorded in previous monitoring quarters in recent years, the dolphins were completely absent from the central and eastern portions of North Lantau waters (Figure 1).

3.2.2. Notably, all dolphin sightings made during this quarterly period were located far away from the TMCLKL alignment as well as the HKBCF and HKLR03 reclamation sites (Figure 1). However, two sightings were made just 1-2 km to the north of the HKLR09 alignment as mentioned above.

3.2.3. Sighting distribution of dolphins during the present post-construction monitoring period was drastically different from the one during the baseline monitoring period (Figure 1). In the present quarter, dolphins have disappeared from the NEL region, which was in stark contrast to their frequent occurrence around the Brothers Islands, near Shum Shui Kok and in the vicinity of HKBCF reclamation site during the baseline period (Figure 1). The nearly complete abandonment of NEL region by the dolphins has been consistently recorded in the past seven years of HKLR03/TMCLKL08 dolphin monitoring, which has resulted in zero to extremely low encounter rates in this area.

3.2.4. In NWL survey area, dolphin occurrences were also drastically different between the baseline and the present post-construction monitoring periods. During the present quarter, the dolphin sightings were confined to the western portion of the North Lantau region, which was in contrary to their frequent occurrences throughout the area during the baseline period (Figure 1). Furthermore, dolphins were completely absent around Lung Kwu Chau during the present quarter, where dolphins occurred regularly during the baseline period (Figure 1).

3.2.5. Another comparison in dolphin distribution was made between six quarterly periods of spring months in 2016-21 (Figure 2). With the exception of one sighting made near HKBCF in spring 2016, almost all dolphin sightings made throughout the past spring periods were at the western end of the North Lantau region (Figure 2). Moreover, dolphins were completely absent from the Sha Chau and Lung Kwu Chau Marine Park in the recent two spring periods in 2020 and 2021, where they occurred regularly in the past. Notably, the dolphins were consistently absent from the NEL survey area throughout the six spring periods.

3.3. Encounter rate

3.3.1. During the present quarterly period, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data from the primary transect lines under favourable conditions (Beaufort 3 or below) for each set of the TMCLKL08 surveys in NEL and NWL are shown in Table 2. The average encounter rates deduced from the six sets of surveys were also compared with the ones deduced from the baseline monitoring period (September-November 2011) (Table 3).

Table 2. Dolphin encounter rates (sightings per 100 km of survey effort) during March-May 2021

SURVEY AREA	DOLPHIN MONITORING DATES	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)
		Primary Lines Only	Primary Lines Only
Northeast Lantau	Set 1 (3 & 8 Mar 2021)	0.00	0.00
	Set 2 (17 & 25 Mar 2021)	0.00	0.00
	Set 3 (8 & 22 Apr 2021)	0.00	0.00
	Set 4 (27 & 29 Apr 2021)	0.00	0.00
	Set 5 (3 & 11 May 2021)	0.00	0.00
	Set 6 (25 & 26 May 2021)	0.00	0.00
Northwest Lantau	Set 1 (3 & 8 Mar 2021)	3.31	8.28
	Set 2 (17 & 25 Mar 2021)	1.65	3.30
	Set 3 (8 & 22 Apr 2021)	0.00	0.00
	Set 4 (27 & 29 Apr 2021)	0.00	0.00
	Set 5 (3 & 11 May 2021)	1.81	9.06
	Set 6 (25 & 26 May 2021)	0.00	0.00

Table 3. Comparison of average dolphin encounter rates from the present post-construction monitoring period (March-May 2021) and baseline monitoring period (September-November 2011) (Note: encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions; ± denotes the standard deviation of the average encounter rates)

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	March – May 2021	September – November 2011	March – May 2021	September – November 2011
Northeast Lantau	0.0	6.00 ± 5.05	0.0	22.19 ± 26.81
Northwest Lantau	1.13 ± 1.37	9.85 ± 5.85	3.44 ± 4.26	44.66 ± 29.85

- 3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the present quarter using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 0.83 sightings and 2.48 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both nil for this quarter.
- 3.3.3 In NEL, the average dolphin encounter rates (both STG and ANI) in the present quarterly post-construction monitoring period were both zero with no on-effort sighting being made, and such complete absence of dolphins in NEL have been consistently recorded during the same spring quarters throughout the HKLR03/TMCLKL08 dolphin monitoring in the past seven consecutive years (Table 4).

Table 4. Comparison of average dolphin encounter rates in Northeast Lantau survey area from the same spring quarters of HKLR03/TMCLKL08 impact and post-construction monitoring periods since 2013 and the baseline monitoring period (September-November 2011) (Note: encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort 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)
September-November 2011 (Baseline)	6.00 \pm 5.05	22.19 \pm 26.81
March-May 2013 (Impact)	0.42 \pm 1.03	0.42 \pm 1.03
March-May 2014 (Impact)	0.00	0.00
March-May 2015 (Impact)	0.00	0.00
March-May 2016 (Impact)	0.00	0.00
March-May 2017 (Impact)	0.00	0.00
March-May 2018 (Impact)	0.00	0.00
March-May 2019 (Impact)	0.00	0.00
March-May 2020 (Impact)	0.00	0.00
March-May 2021 (Post-Construction)	0.00	0.00

- 3.3.4. On the other hand, the average dolphin encounter rates (STG and ANI) in NWL during the present quarterly period were only small fractions of the ones recorded during the three-month baseline period (with reductions of 88.5% and 92.3% respectively), indicating a dramatic decline in dolphin usage of this survey area during the present quarterly period as compared to the baseline period in 2011 (Table 5).
- 3.3.5. When comparing to the past eight spring quarters in 2013-20, both quarterly counter rates in STG and ANI have been consistently low since 2015, besides a small rebound occurred in spring 2018 (Table 5). The dramatic drop in dolphin occurrence in NWL after the spring period in 2015 raises serious concerns, and the temporal trend would need to be closely monitoring in upcoming quarters when all construction activities of HZMB works

have been completed.

Table 5. Comparison of average dolphin encounter rates in Northwest Lantau survey area from the same spring quarters of HKLR03/TMCLKL08 impact and post-construction monitoring periods since 2013 and the baseline monitoring period (September November 2011) (Note: encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort 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)
September-November 2011 (Baseline)	9.85 \pm 5.85	44.66 \pm 29.85
March-May 2013 (Impact)	7.75 \pm 3.96	24.23 \pm 18.05
March-May 2014 (Impact)	6.51 \pm 3.34	19.14 \pm 7.19
March-May 2015 (Impact)	0.47 \pm 0.73	2.36 \pm 4.07
March-May 2016 (Impact)	0.98 \pm 1.10	4.78 \pm 6.85
March-May 2017 (Impact)	0.93 \pm 1.03	5.25 \pm 9.53
March-May 2018 (Impact)	2.88 \pm 4.81	11.12 \pm 22.46
March-May 2019 (Impact)	1.13 \pm 1.39	2.54 \pm 3.00
March-May 2020 (Impact)	0.56 \pm 0.86	0.56 \pm 0.86
March-May 2021 (Post-Construction)	1.13 \pm 1.37	3.44 \pm 4.26

- 3.3.6. A two-way ANOVA with repeated measures and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the baseline and HKLR03/TMCLKL08 monitoring periods. The two variables that were examined included the two periods (baseline and impact/post-construction phases) and two locations (NEL and NWL).
- 3.3.7. For the comparison between the baseline period and the present quarter (the fourth quarter of the TMCLKL08 post-construction monitoring period being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were 0.0122 and 0.0425 respectively. If the alpha value is set at 0.05, significant differences were detected between the baseline period and present quarter in both the average dolphin encounter rates of STG and ANI.
- 3.3.8. For the comparison between the baseline period and the cumulative quarters of the HKLR03/TMCLKL08 monitoring period (i.e. the 34 quarters of the impact and post-construction phases being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were both 0.000000. Even if the alpha value is set at 0.00001, significant differences were still detected in both the average dolphin encounter rates of STG and ANI (i.e. between the cumulative periods and the locations).
- 3.3.9. As indicated in both dolphin distribution patterns and encounter rates, dolphin usage has

been significantly and dramatically reduced in both NEL and NWL survey areas during the present quarterly period, and such low occurrence of dolphins has also been consistently documented throughout the HKLR03/TMCLKL08 monitoring period.

3.3.10. Even though all marine works associated with the HZMB construction have already been completed, and the Brothers Marine Park has been established as a compensation measure for the permanent habitat loss in association with the HZMB reclamation works since late 2016, apparently there has been no sign of recovery of dolphin usage in North Lantau waters at all, while such usage has diminished to a very low level.

3.4. *Group size*

3.4.1. Group size of the four Chinese White Dolphin sightings ranged from two to five animals per group in the North Lantau region during March to May 2021. The average dolphin group sizes from these three months were compared with the ones deduced from the baseline period in September to November 2011, as shown in Table 6.

Table 6. Comparison of average dolphin group sizes from the present post-construction monitoring period (March – May 2021) and baseline monitoring period (September – November 2011) (Note: \pm denotes the standard deviation of the average group size)

	Average Dolphin Group Size	
	March – May 2021	September – November 2011
Overall	3.00 \pm 1.41 (n = 4)	3.72 \pm 3.13 (n = 66)
Northeast Lantau	---	3.18 \pm 2.16 (n = 17)
Northwest Lantau	3.00 \pm 1.41 (n = 4)	3.92 \pm 3.40 (n = 49)

3.4.2. The average dolphin group size in NWL waters during the present quarter was lower than the one recorded during the three-month baseline period, but it should also be noted that the sample size of four dolphin groups in the present quarter was only a tiny fraction of the 66 dolphin groups sighted during the baseline period (Table 6).

3.4.3. Notably, three of the four dolphin groups were small with only 2-3 individuals per group, while there was one medium-sized group of dolphins with five animals (Appendix II). This larger group was sighted within the Urmston Road between Lung Kwu Chau and Lung Kwu Tan in NWL survey area (Figure 3). This is in stark contrast to the baseline period when the larger groups were frequently sighted and evenly distributed throughout NWL waters, with a few also sighted in NEL waters (Figure 3).

3.5. *Habitat use*

3.5.1. From March to May 2021, only three grids in North Lantau waters recorded dolphin occurrences, and all of them were located at the western portion of the NWL survey area (Figures 4a and 4b). Two grids near Pillar Point and to the north of Shum Wat (near HKLR09 alignment) recorded higher dolphin densities, while the grid near Black Point had lower dolphin density. Notably, all grids near TMCLKL alignment did not record any presence of dolphins at all during on-effort search in the present quarterly period (Figures 4a and 4b).

- 3.5.2. It should be emphasized that the amount of survey effort collected in each grid during the three-month period was fairly low (6-12 units of survey effort for most grids), and therefore the habitat use pattern derived from the three-month dataset should be treated with caution.
- 3.5.3. When compared with the habitat use patterns during the baseline period, dolphin usage in NEL and NWL has drastically diminished in both areas during the present post-construction monitoring period (Figure 5). During the baseline period, many grids between Siu Mo To and Shum Shui Kok in NEL recorded moderately high to high dolphin densities, which was in stark contrast to the complete absence of dolphins there during the present quarter (Figure 5).
- 3.5.4. The density patterns were also very different in NWL between the baseline and present post-construction monitoring periods, with high dolphin usage throughout the area, especially around Sha Chau, near Black Point, to the west of the airport, as well as between Pillar Point and airport platform during the baseline period. On the contrary, the grids with dolphin occurrences were all distributed at the western portion of the NWL survey area with only a handful of grids recording higher dolphin densities during the present quarter (Figure 5).
- 3.6. *Mother-calf pairs*
- 3.6.1. During the present quarterly period, only one unspotted juvenile was sighted with its mother near Pillar Point (Figure 6). In fact, this is the first young calf sighted in NWL since the winter quarter of 2019-20.
- 3.6.2. It should be noted that the rare occurrence of young calves in the present quarter as well as in recent years of HKLR03/TMCLKL08 monitoring was very different from their regular occurrence in North Lantau waters during the baseline period (Figure 6).
- 3.7. *Activities and associations with fishing boats*
- 3.7.1. From March to May 2021, none of the four dolphin groups was engaged in any activities. Furthermore, none of them were not associated with any operating fishing vessel either during this post-construction monitoring period.
- 3.8. *Summary of photo-identification works*
- 3.8.1. About 500 digital photographs of Chinese White Dolphins were taken during the present post-construction monitoring period for the photo-identification work. In total, eight individuals sighted nine times were identified (see summary table in Appendix III and photographs of identified individuals in Appendix IV).
- 3.8.2. All of these re-sightings were made in NWL. With the exception of one individual (NL182) being re-sighted twice, the rest of the individuals were only re-sighted once during the quarterly monitoring period (Appendix III).
- 3.9. *Individual range use*
- 3.9.1. Ranging patterns of the eight individuals identified during the present quarterly period
-

were determined by fixed kernel method, and are shown in Appendix V.

- 3.9.2. All identified dolphins sighted in the present quarter were utilizing NWL waters only, but have completely avoided NEL waters where many of them have utilized as their core areas in the past (Appendix V). This is in contrary to the extensive movements between NEL and NWL survey areas observed in the earlier impact monitoring quarters as well as the baseline period.
- 3.9.3. Notably, five of the individuals have primarily centered their range use in North Lantau waters in the past, and were still re-sighted within their normal ranges during this quarterly period. On the contrary, three other individuals (WL79, WL179 and WL294) which have their primary ranges in West Lantau waters but have extended to NWL waters during the present quarterly period (Appendix V).

4. References

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- Hung, S. K. 2020. Monitoring of marine mammals in Hong Kong waters – data collection: final report (2019-20). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government, 138 pp.
- Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.

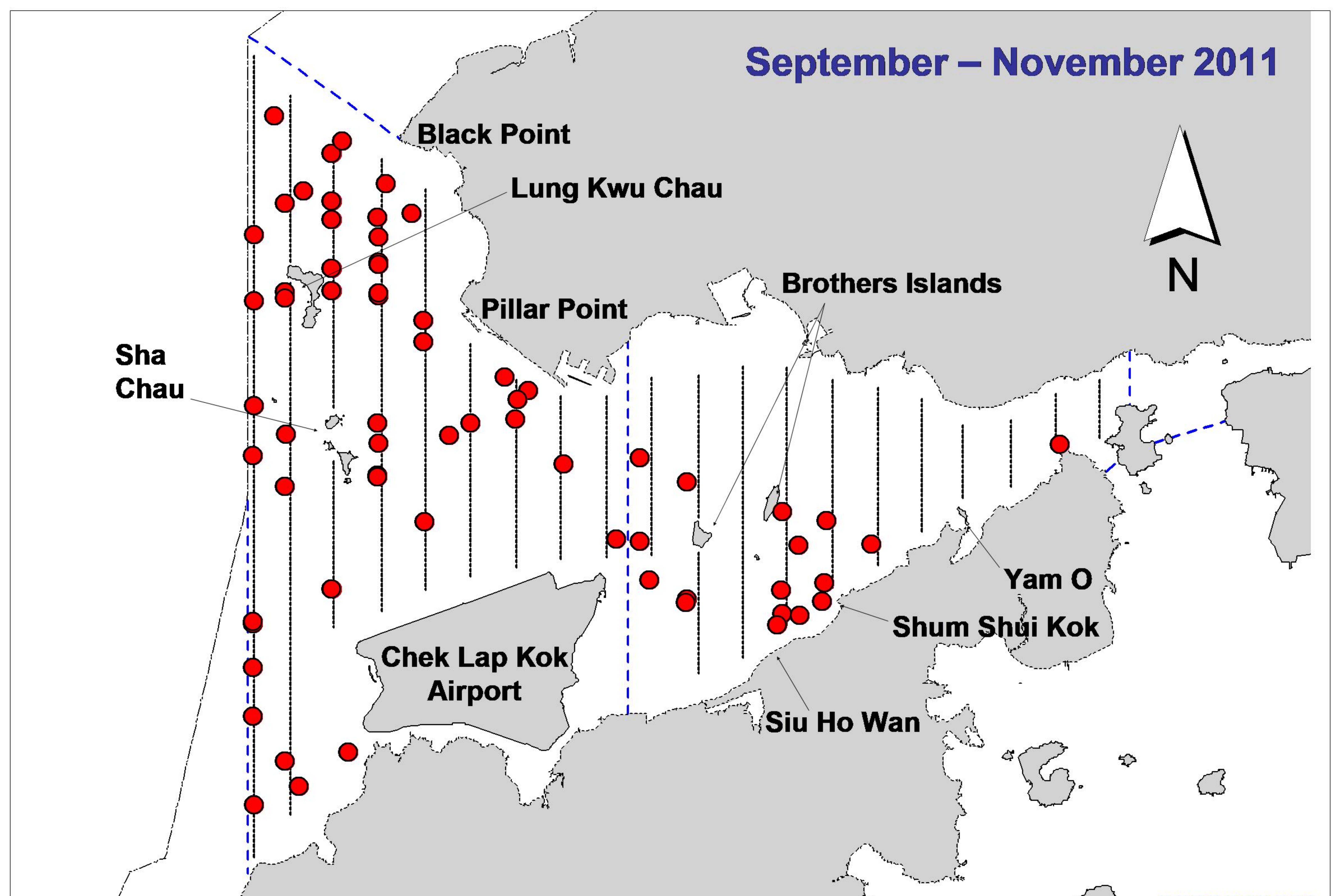
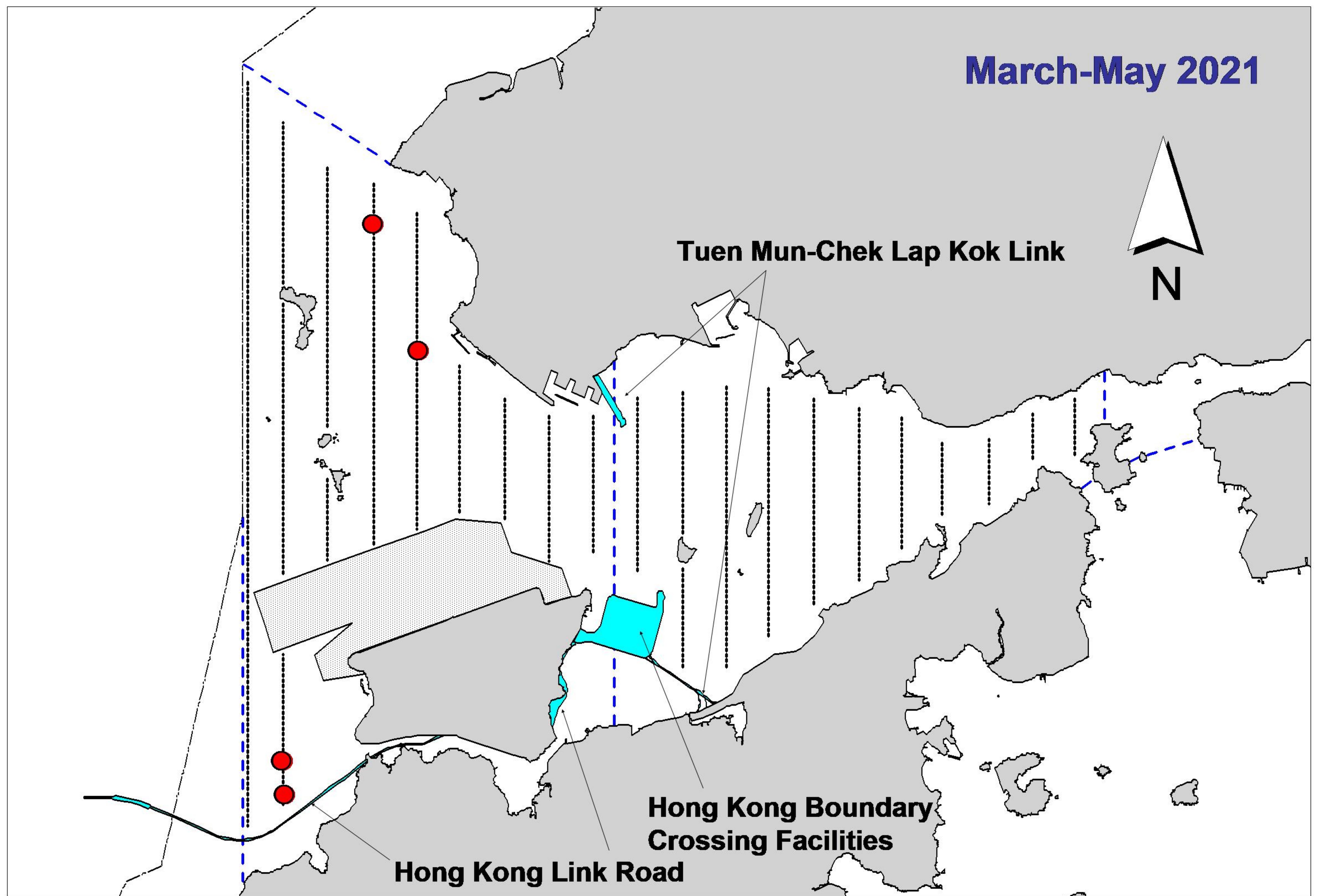


Figure 1. Distribution of Chinese white dolphin sighting in Northwest and Northeast Lantau during the present TMCLKL08 monitoring period (top) and baseline monitoring surveys (bottom)

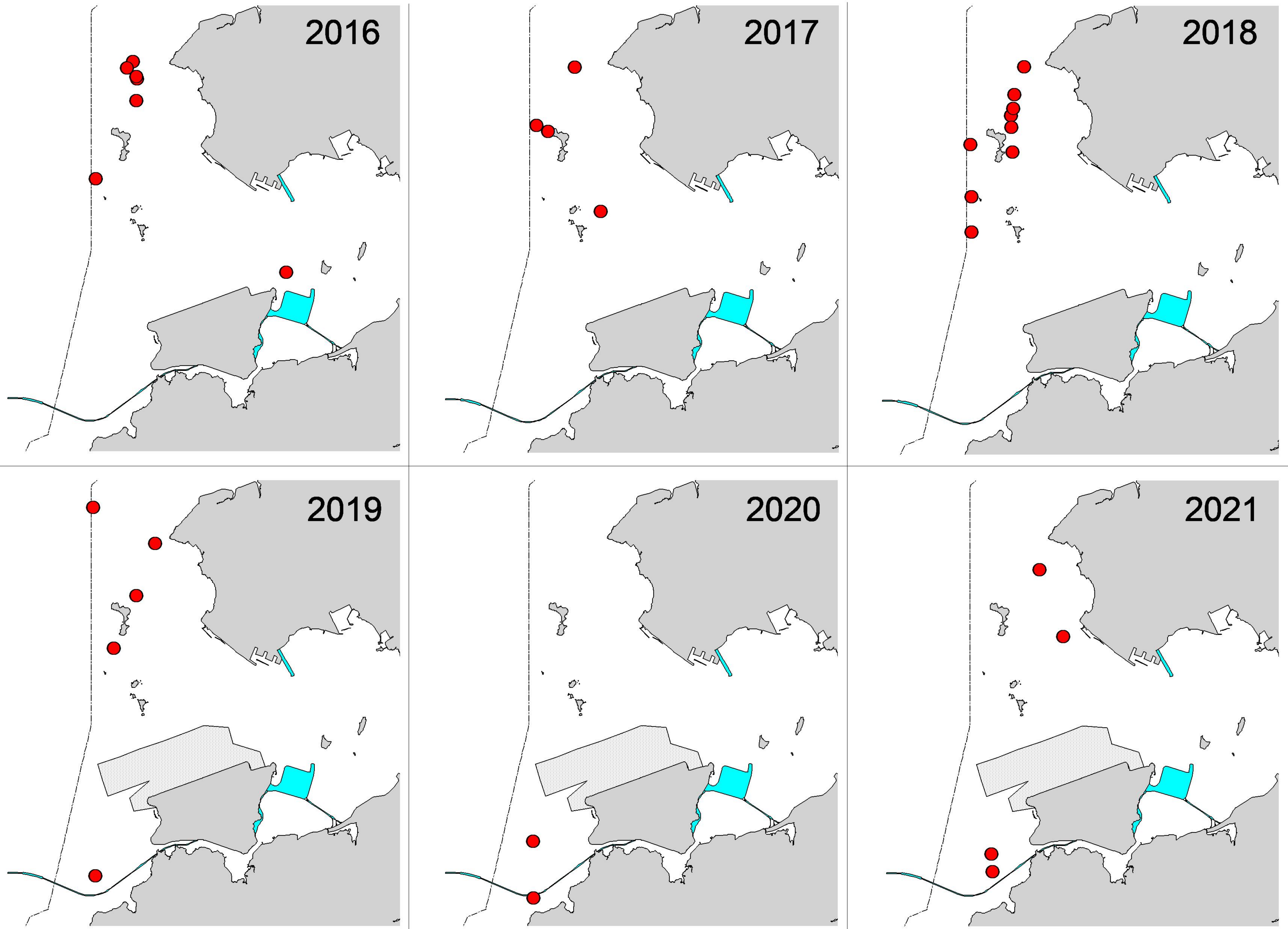


Figure 2. Distribution of Chinese white dolphin sightings in Northwest and Northeast Lantau during the past six spring quarters (March-May) of HKLR03/TMCLKL08 monitoring in 2016-21

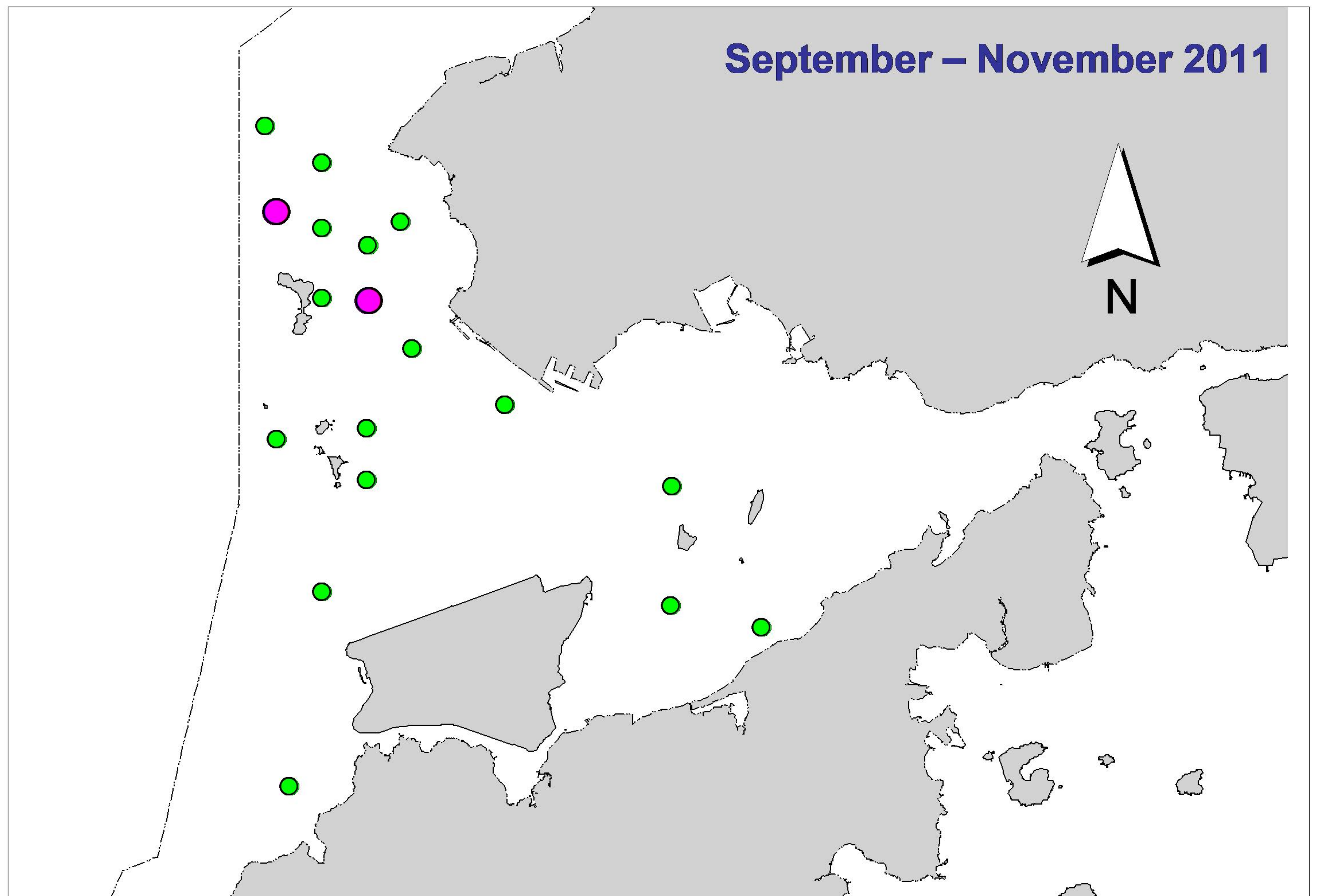
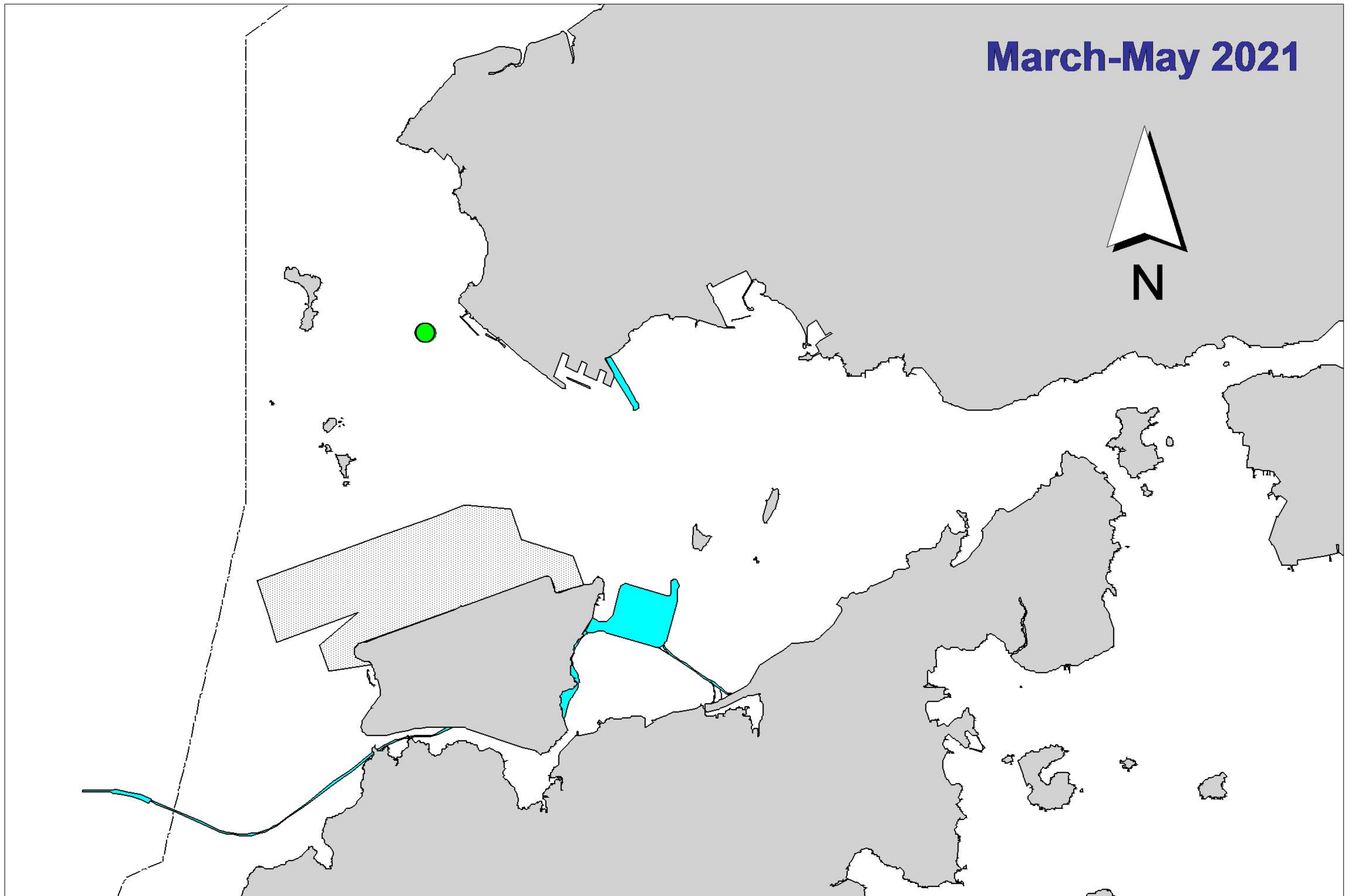


Figure 3. Distribution of Chinese white dolphins with larger group sizes during the present TMCLKL08 monitoring period (top) and baseline monitoring surveys (bottom) (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

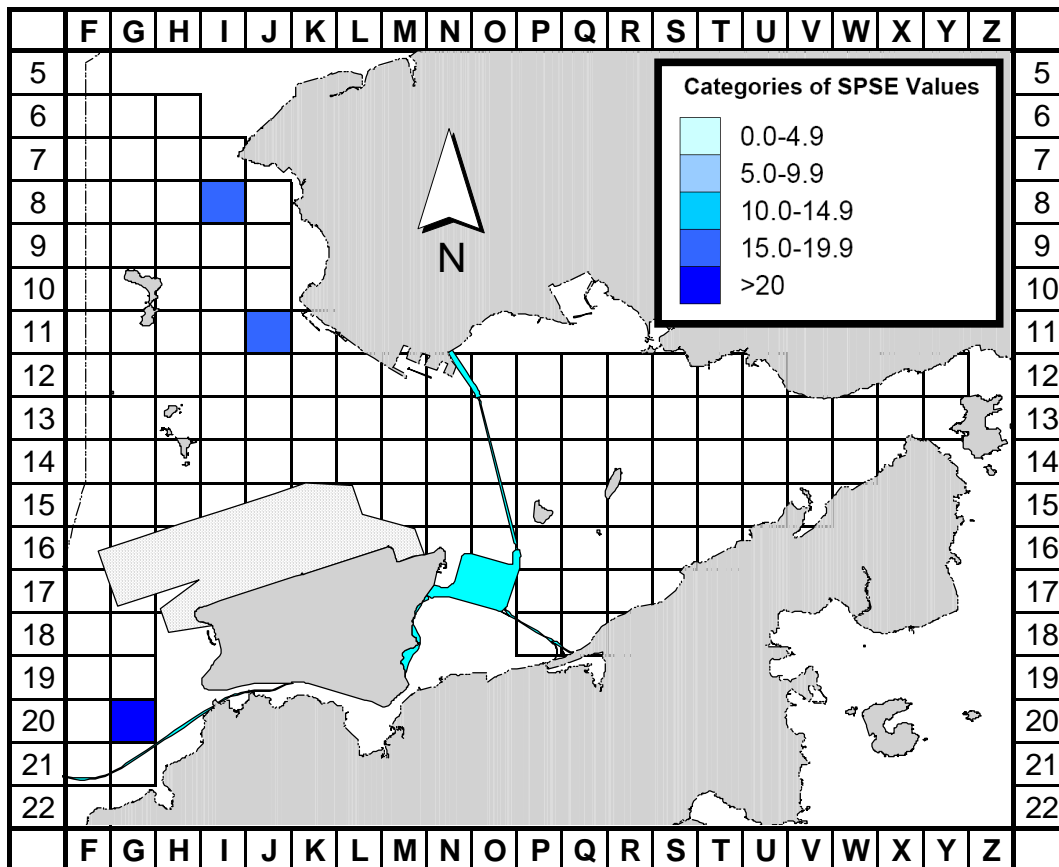


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during present TMCLKL08 monitoring period (March-May 2021) (SPSE = no. of on-effort sightings per 100 units of survey effort)

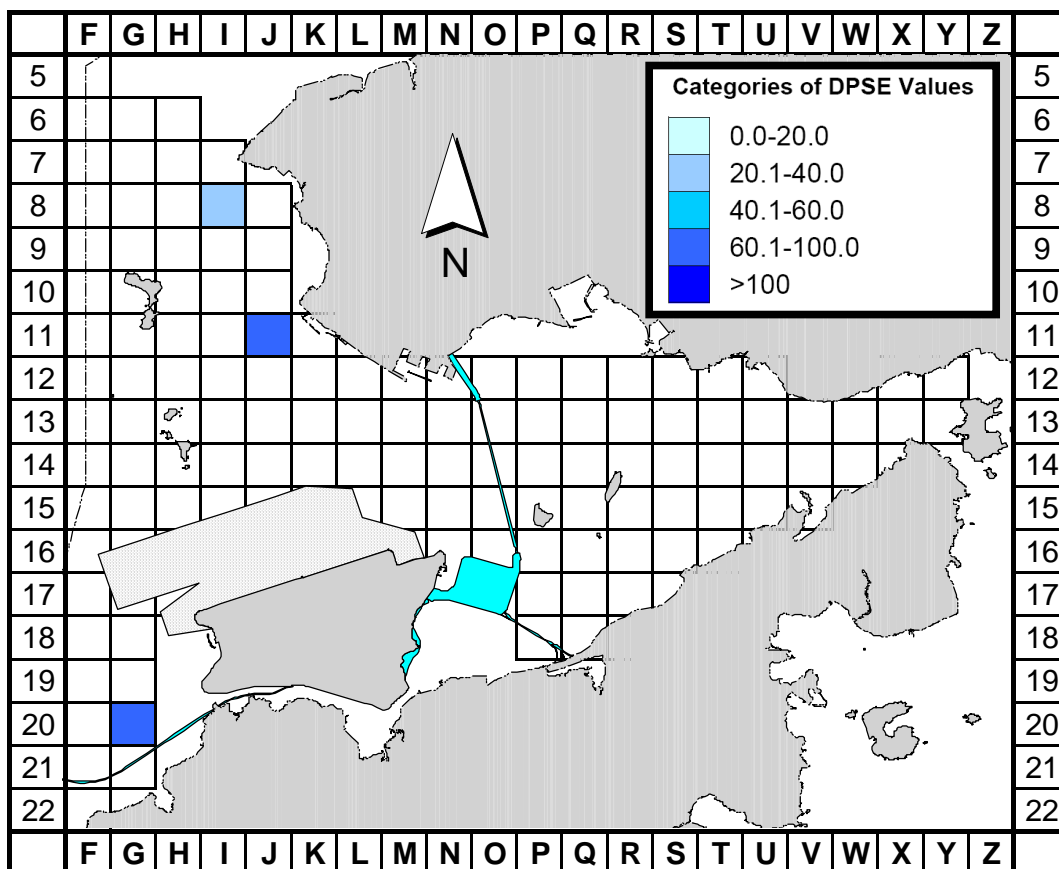


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during present TMCLKL08 monitoring period (March-May 2021) (DPSE = no. of dolphins per 100 units of survey effort)

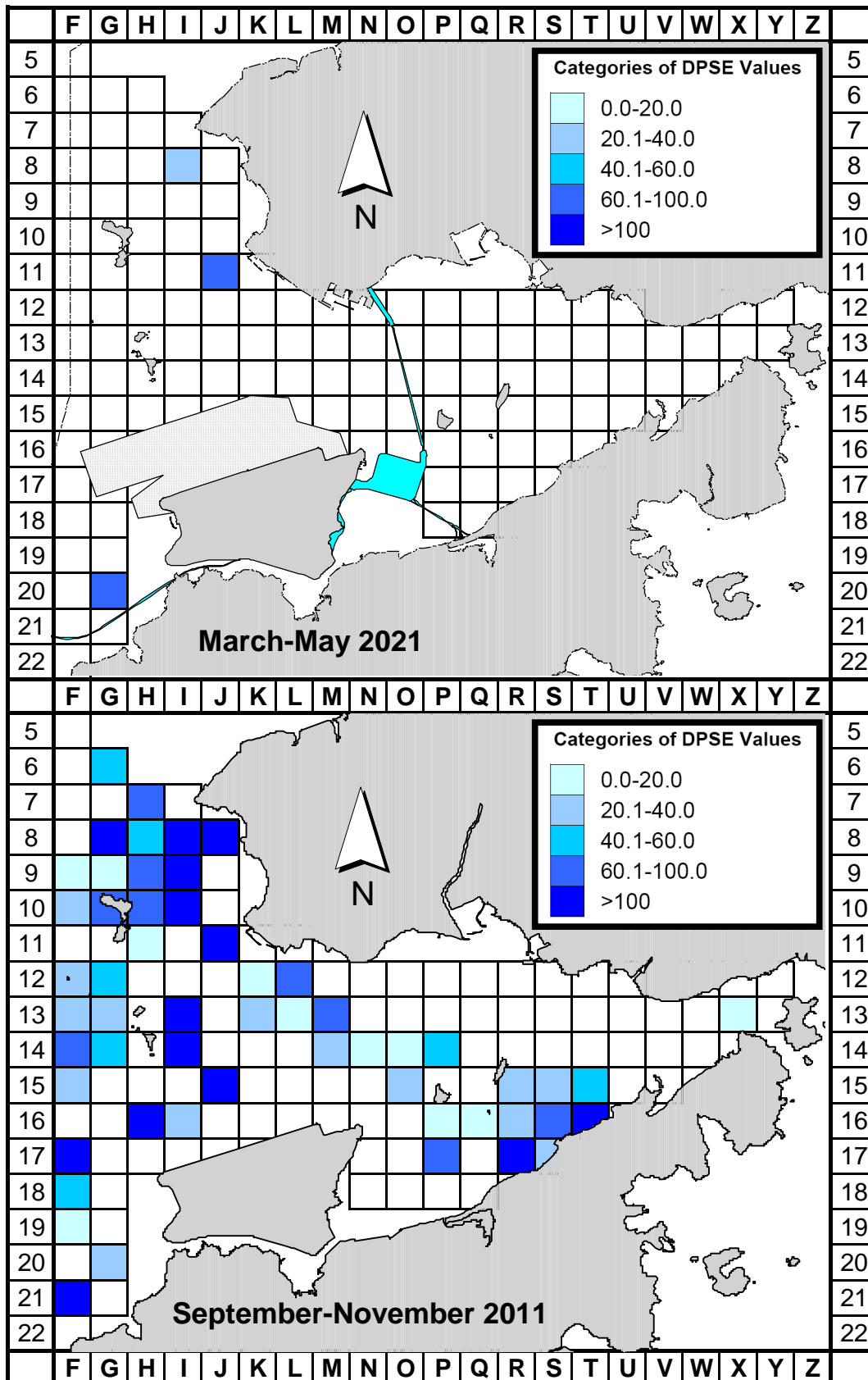


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km² in Northwest and Northeast Lantau survey area between present TMCLKL08 monitoring period (March-May 2021) and baseline monitoring period (September-November 2011) (DPSE = no. of dolphins per 100 units of survey effort)

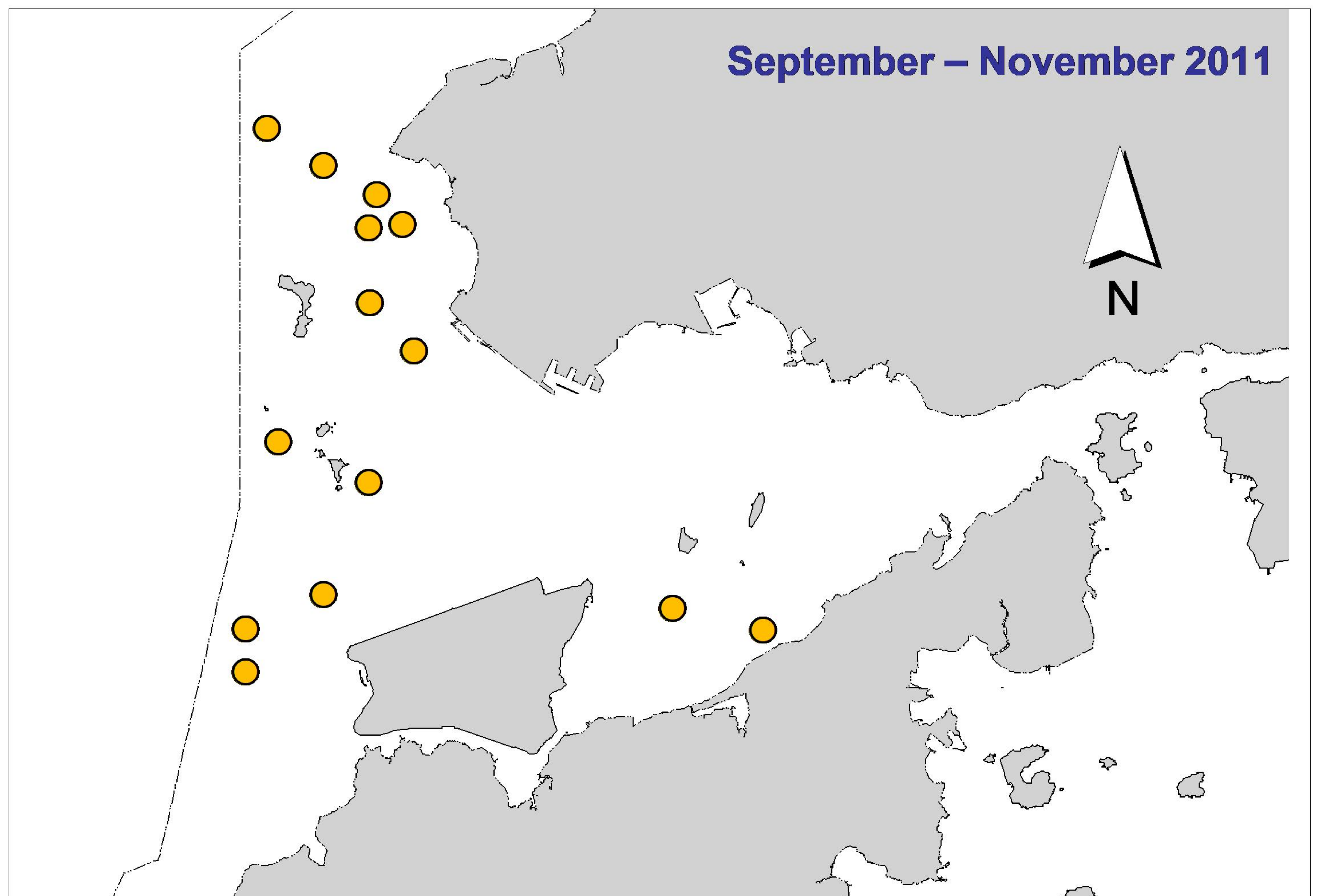
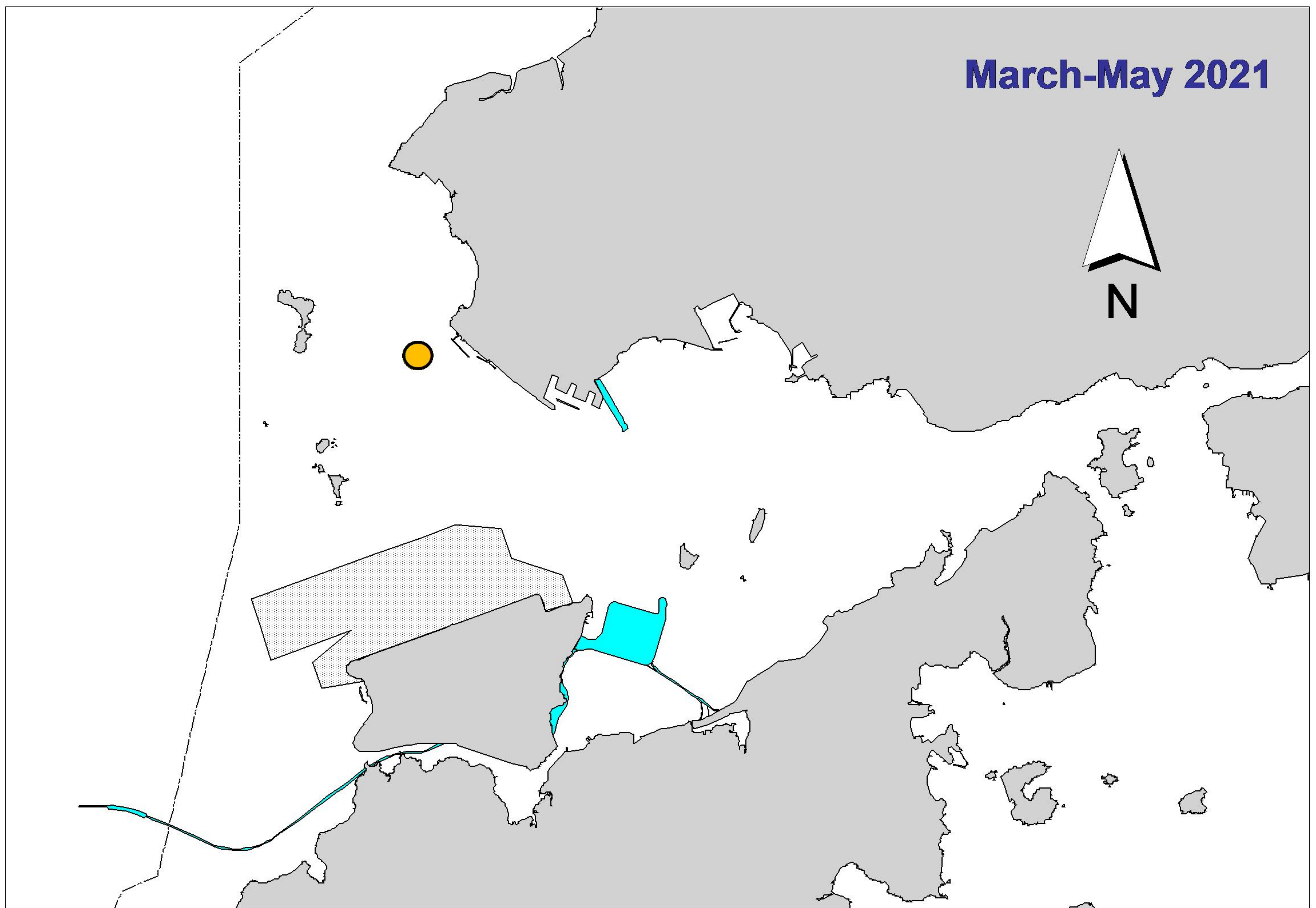


Figure 6. Distribution of young calves of Chinese white dolphins during the present TMCLKL08 monitoring period (top) and baseline monitoring surveys (bottom)

Appendix I. TMCLKL08 Survey Effort Database (March-May 2021)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/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
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

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
11-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. TMCLKL08 Chinese White Dolphin Sighting Database (March-May 2021)

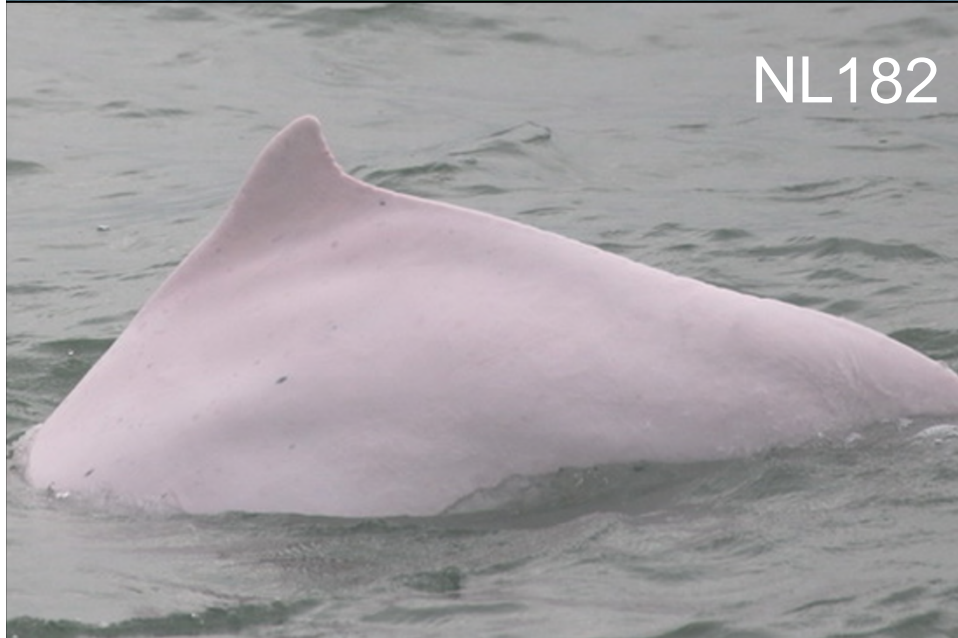
(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
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 TMCLKL08 monitoring surveys in March-May 2021

ID#	DATE	STG#	AREA
NL98	11/05/21	1	NW LANTAU
NL123	11/05/21	1	NW LANTAU
NL182	03/03/21	2	NW LANTAU
	11/05/21	1	NW LANTAU
NL202	03/03/21	2	NW LANTAU
NL272	11/05/21	1	NW LANTAU
WL79	03/03/21	1	NW LANTAU
WL179	03/03/21	1	NW LANTAU
WL294	03/03/21	1	NW LANTAU

Appendix IV. Eight individual dolphins that were identified between March and May 2021 during the TMCLKL08 monitoring surveys



Appendix IV. (cont'd)



NL272



WL79

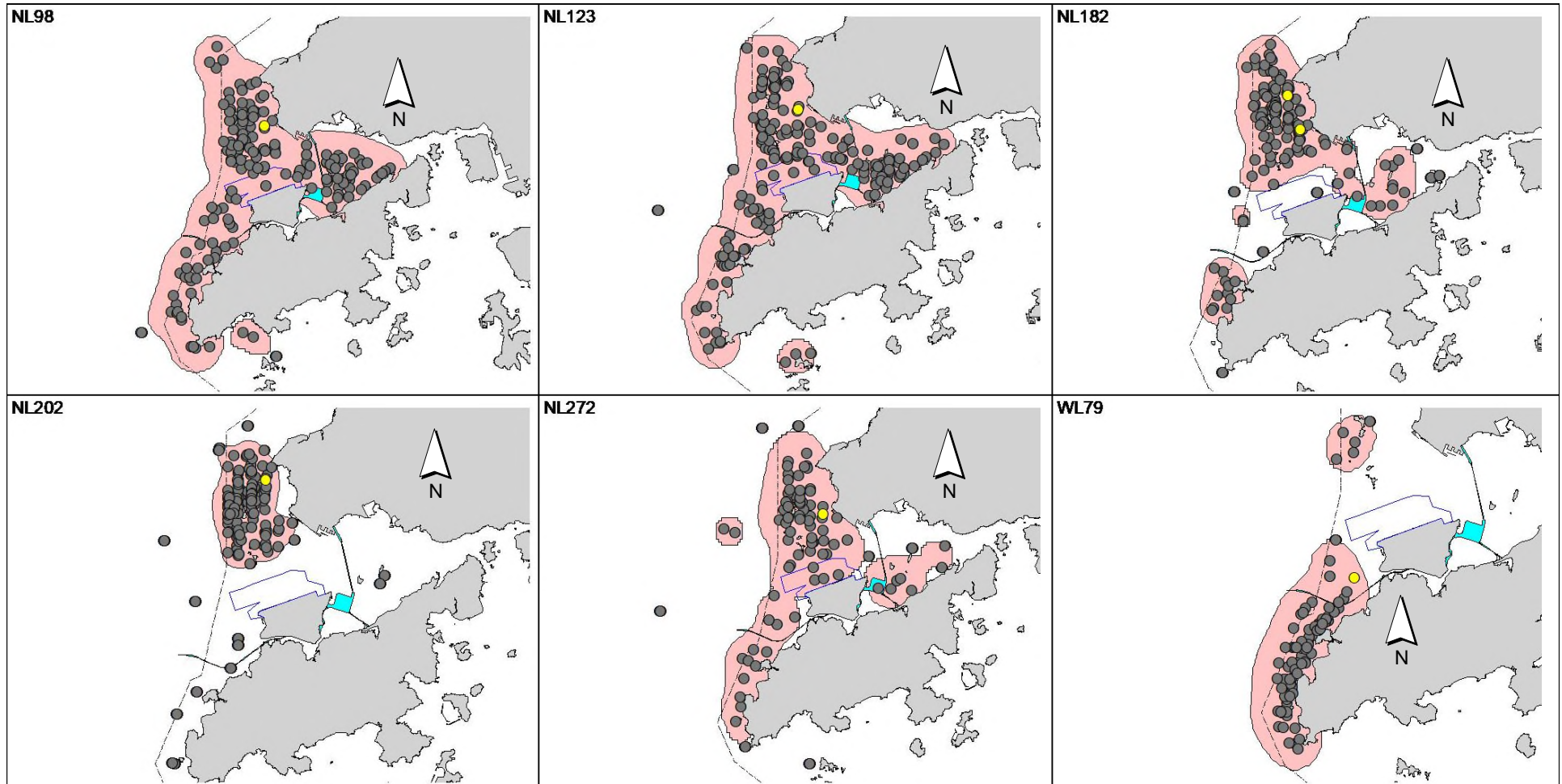


WL179

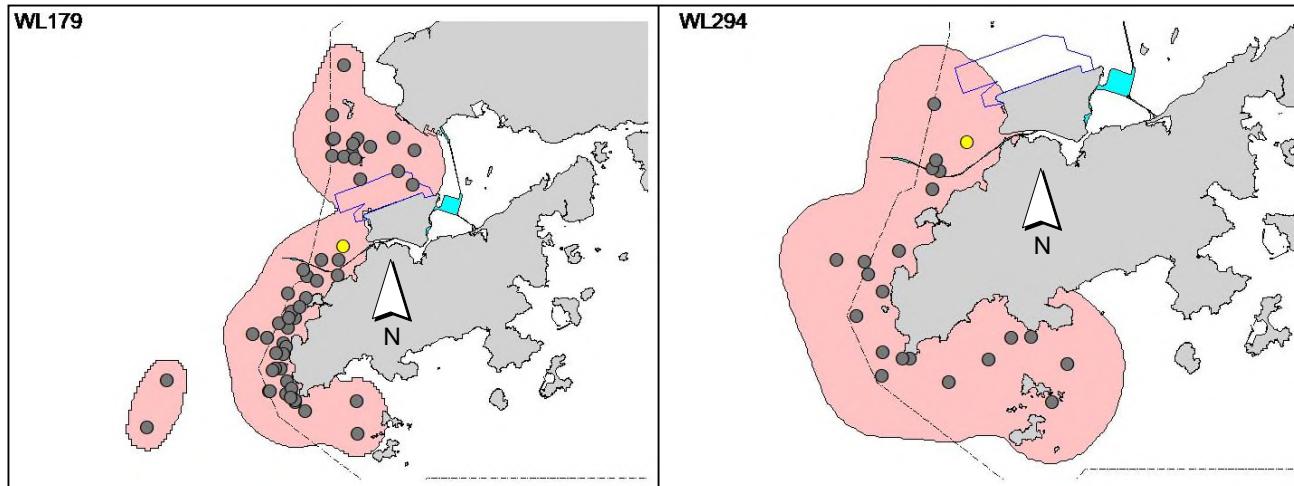


WL294

Appendix V. Ranging patterns (95% kernel ranges) of eight individual dolphins that were sighted during the present TMCLKL08 monitoring period (note: yellow dots indicate sightings made in March-May 2021 during TMCLKL08 monitoring surveys)



Appendix V. (cont'd)



Appendix I

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 	<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 	<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. 	<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

EVENT	ACTION			
	ET	IEC	SOR	Contractor
	<p>seasonal differences;</p> <ol style="list-style-type: none"> 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. 	<p>discuss with ET, SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</p> <ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 2. If SOR is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, 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. 	<p>monitoring and any other potential mitigation measures.</p> <ol style="list-style-type: none"> 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 J

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

Table J1 *Cumulative Statistics on Exceedances*

Monitoring Parameters	Action/Limit Level	Total No. recorded in this reporting quarter	Total No. recorded since Contract commencement
1-Hr TSP	Action	0	122
	Limit	0	15
24-Hr TSP	Action	0	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	1	4

Table J2 *Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions*

Reporting Period	Cumulative Statistics		
	Complaints	Notifications of Summons	Successful Prosecutions
This Reporting Period (March to May 2021)	0	0	0
Total No. received since Contract commencement	17	1	0

**Email
message**

**Environmental
Resources
Management**

To Ramboll Hong Kong, Limited (ENPO)

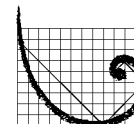
From ERM- Hong Kong, Limited

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

Subject Notification of Exceedance for Post Construction
(Operational) Dolphin Monitoring

Date 9 June 2021

2509, 25/F One Harbourfront
18 Tak Fung Street
Hung Hom, Kowloon
Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 3015 8052



ERM

Dear Sir or Madam,

Please find attached the Notification of Exceedance (NOE) of the following
Log no.:

0212330_March/May2021_dolphin_STG&ANI_NEL&NWL

A total of one limit level exceedance was recorded in the quarterly post
construction (operational) dolphin monitoring data between March and May
2021.

Regards,

A handwritten signature in black ink that reads "Jasmine".

Dr Jasmine Ng
Environmental Team Leader

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ERM-Hong Kong, Limited

CONTRACT NO. HY/2012/08

**TUEN MUN – CHEK LAP KOK LINK –
NORTHERN CONNECTION SUB-SEA TUNNEL SECTION**

**Post Construction Dolphin Monitoring
Notification of Exceedance**

Log No.	0212330_Mar/May2021_dolphin_STG&ANI_NEL&NWL [Total No. of Exceedances = 1 Limit Level Exceedance]	
Date	March – May 2021 (monitored) 9 June 2021 (results received by ERM)	
Monitoring Area	Northeast Lantau (NEL) and Northwest Lantau (NWL)	
Parameter(s) with Exceedance(s)	Quarterly encounter rate of dolphin sightings (STG) Quarterly encounter rate of total number of dolphins (ANI)	
Action Levels	North Lantau Social cluster	NEL: STG < 4.2 & ANI < 15.5 or NWL: STG < 6.9 & ANI < 31.3
Limit Levels		NEL: STG < 2.4 & ANI < 8.9 and NWL: STG < 3.9 & ANI < 17.9
Recorded Levels	NEL	STG = 0 & ANI = 0
	NWL	STG = 0.55 & ANI = 1.09
	One Limit Level Exceedance was recorded in the quarterly post construction dolphin monitoring at NEL and NWL between March and May 2021.	
Statistical Analyses	<p>Further to the review of the available and relevant dolphin monitoring data for TMCLKL project, statistical analyses were conducted as follows:</p> <ul style="list-style-type: none"> • A two-way ANOVA with repeated measures and unequal sample size was conducted using Period (2 levels: baseline vs present post construction quarter, June and August 2021) and Location (2 levels: NEL and NWL) as fixed factors to examine whether there were any significant differences in the average encounter rates between the baseline and present post construction monitoring quarter. By setting $\alpha = 0.01$ as the significance level in the statistical tests, significant differences in STG ($p = 0.0122$) and ANI ($p = 0.0425$) were detected between Periods. • A two-way ANOVA with repeated measures and unequal sample size was conducted using Cumulative Period (2 levels: the first 34 quarters of impact and post construction phases) and Location (2 levels: NEL and NWL) as fixed factors to examine whether there were any significant differences in the average encounter rates between the baseline and cumulative quarters. By setting $\alpha = 0.00001$ as the significance level in the statistical tests, significant difference in STG ($p = 0.000000$) and in ANI ($p = 0.000000$) between Cumulative Period and Location were detected. <p>*Note: The commencement date under <i>Contract No. HY/2012/08</i> is 1 November 2013 and the Proposal for operational phase dolphin monitoring was approved by EPD on 19 May 2020. Operational phase dolphin monitoring commenced in June 2020.</p>	

Works Undertaken (in the monitoring quarter)	<p>No marine works was undertaken in the reporting period under Contract No. HY/2012/08. Operational phase dolphin monitoring commenced in June 2020. 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.</p> <p>No marine works was undertaken in the reporting period under Contract No. HY/2012/07. Termination proposal for construction EM&A programme of Contract No. HY/2012/07 was approved by EPD on 16 March 2020. The construction phase EM&A programme of Contract No. HY/2012/07 has been terminated since 16 March 2020.</p>
Possible Reason for Action or Limit Level Exceedance(s)	<p>The exceedance recorded in the quarterly post construction dolphin monitoring is unlikely to be due to TMCLKL project, in view of the following:</p> <ul style="list-style-type: none"> • Marine works of TMCLKL project: Marine works were completed and no marine vessels will be deployed under Contract No. HY/2012/08 as per confirmed by SOR on 17 April 2020. The Proposal for operational phase dolphin monitoring was approved by EPD on 19 May 2020. Operational phase dolphin monitoring commenced in June 2020. 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. No marine works was undertaken in the reporting period under Contract No. HY/2012/07. Termination proposal for construction EM&A programme of Contract No. HY/2012/07 was approved by EPD on 16 March 2020. The construction phase EM&A programme of Contract No. HY/2012/07 has been terminated since 16 March 2020. During this quarter of dolphin monitoring, no adverse impact on CWD due to the activities under TMCLKL project was observed. • Impact on water quality: Marine works were completed and no marine vessels will be deployed under TMCLKL project. The Proposal for operational phase water quality monitoring was approved by EPD on 19 May 2020. Operational phase water quality monitoring commenced in June 2020 and completed in May 2021. • Provision of Marine Park: The Government has designated the Brothers Islands as a marine park in December 2016, with the aim to help better conserve the Chinese White Dolphins, their habitats and enhance the marine and fisheries resources therein. <p>In view of the above, no unacceptable impact on CWD or its habitat was associated with TMCLKL project in this quarter.</p>
Actions Taken / To Be Taken	<p>No marine works and vessels was undertaken/ deployed in the reporting period. The ET will monitor for future trends in exceedances.</p>
Remarks	<p>The results of post construction dolphin monitoring are documented in the approved <i>Eighty-Ninth to Ninety-First Monthly EM&A Reports</i>.</p>

Appendix K

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 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).