

**Agreement No. HMWSD 1/2021 (EP) Post-
Construction Monitoring of Chinese White
Dolphin (Line-transect Vessel Surveys) for
Tuen Mun - Chek Lap Kok Link in
Northeast and Northwest Lantau Survey
Area - Investigation**

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

22 September 2022

Environmental Resources Management
2509, 25/F One Harbourfront
18 Tak Fung Street
Hung Hom, Kowloon
Hong Kong
Telephone 2271 3000
Facsimile 3015 8052




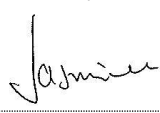
Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line- transect Vessel Surveys) for Tuen Mun - Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area - Investigation

**Environmental Resources
Management**

2509, 25/F One Harbourfront
18 Tak Fung Street
Hung Hom, Kowloon
Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 3015 8052
E-mail: post.hk@erm.com
http://www.erm.com

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

Document Code: 0611663_Annual EM&A_20220922.doc

Client: Highways Department		Project No: 0611663			
Summary: This document presents the Annual EM&A Report for Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area - Investigation		Date: 22 September 2022			
		Approved by:  Mr Craig Reid Partner			
		Certified by:  Dr Jasmine Ng ET Leader			
	Annual EM&A Report	VAR	JN	CAR	22/09/22
Revision	Description	By	Checked	Approved	Date

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.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

Distribution

Internal

Public

Confidential



Ref.: HYDHZMBEEM00_0_8858L.22

27 September 2022

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

By Fax (2293 6300) and By Post

Attention: Mr. K P Wong

Dear Mr. Wong,

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

**Agreement No. HMWSD 1/2021 (EP)
Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel
Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau
Survey Area – Investigation
Annual Environmental Monitoring & Audit (EM&A) Report**

Reference is made to the Annual EM&A Report (ET's ref.: "0611663_Annual
EM&A_20220922.doc" dated 22 September 2022) certified by the ET Leader and provided to
us via e-mail on 22 September 2022.

Please be informed that we have no further 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. Tony Wong (By Fax: 3188 6614)
HyD – Mr. Eric Wong (By Fax: 3188 6614)
ERM – Dr. Jasmine Ng (By Fax: 2723 5660)

Q:\Projects\HYDHZMBEEM00\02_Proj_Mgt\02_Corr\2022\HYDHZMBEEM00_0_8858L.22.docx

TABLE OF CONTENTS

	<i>EXECUTIVE SUMMARY</i>	<i>I</i>
<i>1</i>	<i>INTRODUCTION</i>	<i>1</i>
<i>1.1</i>	<i>BACKGROUND</i>	<i>1</i>
<i>1.2</i>	<i>SCOPE OF REPORT</i>	<i>2</i>
<i>1.3</i>	<i>ORGANIZATION STRUCTURE</i>	<i>2</i>
<i>2</i>	<i>EM&A RESULTS</i>	<i>3</i>
<i>2.1</i>	<i>DOLPHIN MONITORING</i>	<i>3</i>
<i>2.2</i>	<i>ENVIRONMENTAL LICENSES AND PERMITS</i>	<i>7</i>
<i>2.3</i>	<i>SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT</i>	<i>9</i>
<i>2.4</i>	<i>SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS</i>	<i>9</i>
<i>2.5</i>	<i>COMPARISON OF EM&A DATA WITH EIA PREDICTIONS</i>	<i>10</i>
<i>3</i>	<i>REVIEW OF EM&A PROGRAMME</i>	<i>11</i>
<i>3.1</i>	<i>SUMMARY OF RECOMMENDATIONS</i>	<i>11</i>
<i>4</i>	<i>CONCLUSIONS</i>	<i>12</i>

<i>APPENDIX A</i>	<i>PROJECT ORGANIZATION FOR ENVIRONMENTAL WORKS</i>
<i>APPENDIX B</i>	<i>EM&A MONITORING SCHEDULES</i>
<i>APPENDIX C</i>	<i>OPERATIONAL PHASE DOLPHIN MONITORING SURVEY</i>
<i>APPENDIX D</i>	<i>CUMULATIVE STATISTICS ON EXCEEDANCES, COMPLAINTS, NOTIFICATIONS OF SUMMONS AND SUCCESSFUL PROSECUTIONS</i>

EXECUTIVE SUMMARY

Under Agreement No. HMWSD 1/2021 (EP), ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET) by the Highways Department (HyD) to undertake the implementation of post-construction monitoring for the Chinese White Dolphin (CWD) in accordance with Environmental Permit No. EP-354/2009/D for the Tuen Mun – Chek Lap Kok Link Project (TM-CLK Link Project). AECOM Asia Company Limited was appointed by HyD as the Supervising Officer while Ramboll Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO).

The post-construction monitoring for the CWD commenced on June 2020 and completed in May 2022.

This is the Annual EM&A report presenting the EM&A works carried out during the period from 1 June 2021 to 31 May 2022 for the Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation (the “Contract”) in accordance with the Updated EM&A Manual of the TM-CLK Link Contract.

In order to fulfil the EP’s and EM&A Manual’s requirements for TM-CLKL Project, Agreement No. HMWSD 1/2021 (EP) took over the responsibility for implementation of operational phase dolphin monitoring from Contract No. HY/2012/08 from 1 September 2021 to 31 May 2022.

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

Operational Phase Dolphin Monitoring 24 sessions

Summary of Breaches of Action/Limit Levels

Four (4) Limit Level exceedances were recorded for the post-construction (operational) dolphin monitoring between June 2021 and May 2022.

Environmental Complaints, Non-compliance & Summons

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

Review of EM&A programme

The EM&A requirements have been reviewed and were considered as adequate and effective. No change to the requirements was considered to be necessary. The recommended environmental mitigation measures were also considered to be effective and efficient in reducing the potential

environmental impacts associated with the construction of the Contract. No change was thus considered necessary.

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 (VEPs), *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 *Agreement No. HMWSD 1/2021 (EP)*, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET) by the Highways Department (HyD) to undertake the implementation of post-construction monitoring for the Chinese White Dolphin (CWD) in accordance with *Environmental Permit No. EP-354/2009/D* for the Tuen Mun – Chek Lap Kok Link Project (TM-CLK Link Project). AECOM Asia Company Limited was appointed by HyD as the Supervising Officer while Ramboll Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO).

The post-construction monitoring for the CWD commenced on June 2021 and completed in May 2022.

In order to fulfil the EP's and EM&A Manual's requirements for TM-CLKL Project, *Agreement No. HMWSD 1/2021 (EP)* took over the responsibility for implementation of operational phase dolphin monitoring from Contract No. HY/2012/08 from 1 September 2021 to 31 May 2022.

1.2 SCOPE OF REPORT

This is the Annual EM&A Report under the Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation. This report presents a summary of the environmental monitoring and audit works from 1 June 2021 to 31 May 2022.

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	PC 16/SD	Sally W.M. Choi	2762 3643	3188 6614
SOR (AECOM Asia Company Limited)	Senior Resident Engineer	K P Wong	2293 6403	2293 6300
ENPO / IEC (Ramboll Hong Kong Ltd.)	ENPO Leader	Y.H. Hui	3465 2850	3465 2899
	IEC	Mr. Brian Tam ⁽¹⁾	9700 6767	3465 2899
ET (ERM-HK)	ET Leader	Jasmine Ng	2271 3311	2723 5660

Note: Role and responsibilities as the IEC of the Contract was taken up by Mr. Brian Tam from 25 July 2022.

The EM&A programme required environmental monitoring for marine ecology. The EM&A requirements and related findings for the component are summarized in the following sections.

2.1 DOLPHIN MONITORING

2.1.1 Monitoring Requirements

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

In order to fulfil the EM&A requirements and make good use of available resources, *Agreement No. HMWSD 1/2021 (EP)* has taken over the responsibility for implementation of dolphin monitoring from *HZMB HKLR Contract No. HY/2011/03* since October 2019 and *Contract No. HY/2012/08* since September 2021.

2.1.2 Monitoring Equipment

Table 2.1 summarize the equipment used for the impact and operational phase dolphin monitoring.

Table 2.1 Dolphin Monitoring Equipment

Equipment	Model
Global Positioning System (GPS)	<i>Garmin eTrex Legend</i>
Camera	<i>Canon EOS 7D model</i>
Laser Binocular	<i>Infinitor LRF 1000</i>
Marine Binocular	<i>7 x 50 Fujinon marine binoculars</i>
Vessel for Monitoring	15-m inboard vessel with an open upper deck (about 4.5 m above water surface)

2.1.3 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.

2.1.4 Monitoring Location

The operational phase dolphin monitoring was carried out in the NEL and NWL along the line transect as depicted in *Figure 2.1*. The co-ordinates of all transect lines are shown in *Table 2.2* below.

Table 2.2 *Impact and Operational Phase Dolphin Monitoring Line Transect Co-ordinates*

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

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

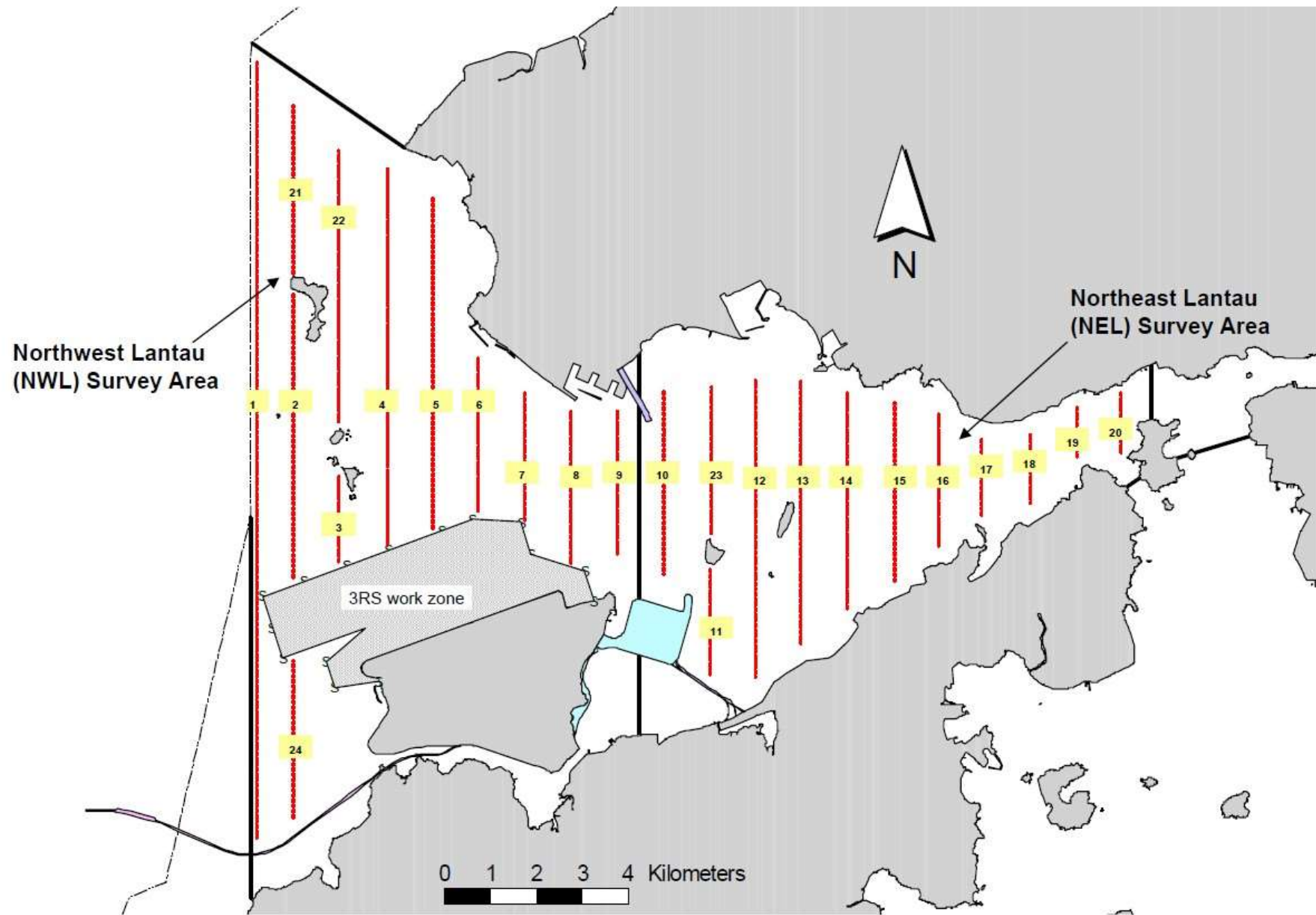


Figure 2.1

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

2.1.5 *Monitoring Schedule for the Reporting Period*

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

2.1.6 *Results & Observations*

Results of the operational phase dolphin monitoring between June 2021 and May 2022 were presented in this session.

A total of 3,378.22 km of survey effort was collected, with 99.89% of the total survey effort being conducted under favourable weather conditions (ie Beaufort Sea State 3 or below with good visibility) in the first year of operational phase monitoring. Amongst the two areas, 1,327.58 km and 2,050.64 km of survey effort were collected from NEL and NWL survey areas, respectively. The total survey effort conducted on primary and secondary lines were 2,341.24 km and 1,036.98 km, respectively. The survey efforts are summarized in *Appendix C*.

A total of 11 groups of 23 Chinese White Dolphin sightings were recorded during the 24 sets of surveys in the second year of operational phase monitoring. All sightings were made during on-effort search. Nine (9) on-effort sightings were made on primary lines, while two (2) other on-effort sightings were made on secondary lines. During this reporting year, all dolphin groups were sighted in NWL, while none of them were sighted in NEL.

Dolphin sighting distribution of the second year operational phase monitoring period June 2021 to May 2022 was compared to the ones during the baseline phase (February 2011 to January 2012), transitional phase (November 2012 to October 2013) and the first, second, third, fourth and fifth years of impact phase (November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016, November 2017 to October 2018 and November 2018 to October 2019 respectively) and first year operational phase monitoring period June 2020 to May 2021. As TMCLKL construction works commenced in November 2013, a 12-month period between baseline phase and impact phase is defined as transitional phase.

During the 12-month operational phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline and transitional phases as shown in *Table 2.3*.

Table 2.3 Average Daily Dolphin Encounter Rates

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Northeast Lantau	Northwest Lantau	Northeast Lantau	Northwest Lantau
Operational Phase (2021-22)	0.00	0.73 ± 1.24	0.00	1.46 ± 2.82
Operational Phase (2020-21)	0.00	1.31 ± 1.88	0.00	3.39 ± 5.73
Impact Phase (2018-19)	0.00	1.42 ± 1.80	0.00	3.62 ± 4.93
Impact Phase (2017-18)	0.00	2.68 ± 3.04	0.00	9.02 ± 14.63
Impact Phase (2016-17)	0.00	2.35 ± 2.62	0.00	8.57 ± 11.05
Impact Phase (2015-16)	0.00	2.10 ± 1.83	0.00	8.54 ± 8.53
Impact Phase (2014-15)	0.11 ± 0.54	2.54 ± 2.49	0.11 ± 0.54	11.64 ± 14.04
Impact Phase (2013-14)	0.22 ± 0.74	6.93 ± 4.08	0.76 ± 2.59	26.31 ± 17.56
Transitional Phase (2012-13)	1.70 ± 2.26	7.68 ± 4.36	4.75 ± 7.61	27.51 ± 18.06
Baseline Phase (2011-12)	6.05 ± 5.04	7.75 ± 5.69	19.91 ± 21.30	29.57 ± 26.96

Note: Comparison of average daily dolphin encounter rates from the first, second, third, fourth, fifth and sixth years of impact phase (November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016, November 2016 to October 2017, November 2017 to October 2018 and November 2018 to October 2019 respectively), transitional phase (November 2012 - October 2013), baseline phase monitoring periods (February 2011 - January 2012) and operational phase monitoring period (June 2020 - May 2022). ± denotes the standard deviation of the value.

Group size of Chinese White Dolphins ranged from one to six (1-6) individuals per group in North Lantau region during June 2021 - May 2022. The average dolphin group sizes from the 12-month operational phase monitoring period between June 2021 and May 2022 were compared with the ones deduced from baseline and transitional phases and 12-month operational phase monitoring period between June 2020 and May 2021, as shown in *Table 2.4*.

Table 2.4 Comparison of Average Dolphin Group Sizes from Operational Monitoring Period, Impact Monitoring Period and Baseline Monitoring Period

	Average Dolphin Group Size		
	Overall	Northeast Lantau	Northwest Lantau
Operational Phase (2021-22)	2.09 ± 1.64 (n = 11)	0.00	2.09 ± 1.64 (n = 11)
Operational Phase (2020-21)	2.64 ± 2.08 (n = 22)	0.00	2.64 ± 2.08 (n = 22)
Impact Phase (2018-19)	2.52 ± 1.45 (n = 27)	0.00	2.52 ± 1.45 (n = 27)
Impact Phase (2017-18)	3.12 ± 2.86 (n = 42)	0.00	3.12 ± 2.86 (n = 42)
Impact Phase (2016-17)	3.51 ± 2.68 (n = 43)	0.00	3.51 ± 2.68 (n = 43)
Impact Phase (2015-16)	3.73 ± 3.14 (n = 45)	1.00 (n = 1)	3.80 ± 3.14 (n = 44)
Impact Phase (2014-15)	4.24 ± 3.15 (n = 54)	1.00 (n = 1)	4.30 ± 3.15 (n = 53)
Impact Phase (2013-14)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

Note: Comparison of average dolphin group sizes from the first, second, third, fourth, fifth and sixth years of impact phase (November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016, November 2016 to October 2017, November 2017 to October 2018 and November 2018 to October 2018 respectively), transitional phase (November 2012 – October 2013), baseline phase monitoring periods (February 2011 – January 2012) and operational phase monitoring period (June 2020 – May 2021) and operational phase monitoring period (June 2020 – May 2022). (± denotes the standard deviation of the average value)

Whilst four (4) Limit Level exceedances were observed for the post-construction (operational) dolphin monitoring data between June 2021 and May 2022.

2.2 ENVIRONMENTAL LICENSES AND PERMITS

The status of environmental licensing and permit is summarized in *Table 2.5* below.

Table 2.5 *Summary of Environmental Licensing and Permit Status*

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Environmental Permit	EP-354/2009/D	13-Mar-15	Throughout the Contract	HyD	Application for VEP on 3 March 2015 to supersede EP-354/2009/C

Notes:

HyD = Highways Department

DBJV = Dragages - Bouygues Joint Venture

VEP = Variation of Environmental Permit

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

There were a total of four (4) Limit Level exceedances recorded for post-construction (operational) dolphin monitoring data between June 2021 and May 2022.

Detailed investigation findings are presented in *the First to Third Quarterly EM&A Reports* under this Contract and *Thirty-First Quarterly EM&A Reports* under *Contract No. HY/2012/08 Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section*.

Cumulative statistics are provided in *Appendix D*.

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

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

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

2.5 *COMPARISON OF EM&A DATA WITH EIA PREDICTIONS*

2.5.1 *Marine Ecology*

During the operational phase monitoring period in 2021-22, the most heavily utilized habitats by Chinese White Dolphins were only found on both northwestern end of the North Lantau region, mainly to the northern portion of Sha Chau and Lung Kwu Chau Marine Park. Dolphin usage of NWL waters declined during the present and previous phase monitoring periods. The monitoring results in this reporting period are considered to be in line with the EIA predictions.

3 *REVIEW OF EM&A PROGRAMME*

3.1 *SUMMARY OF RECOMMENDATIONS*

The post-construction monitoring for the CWD commenced on June 2021 and completed in May 2022. The EM&A programme has been reviewed and was considered as adequate and effective. No change to the EM&A programme was considered to be necessary.

CONCLUSIONS

This Annual EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 June 2021 to 31 May 2022, in accordance with the Updated EM&A Manual and the requirements of *EP-354/2009/D*.

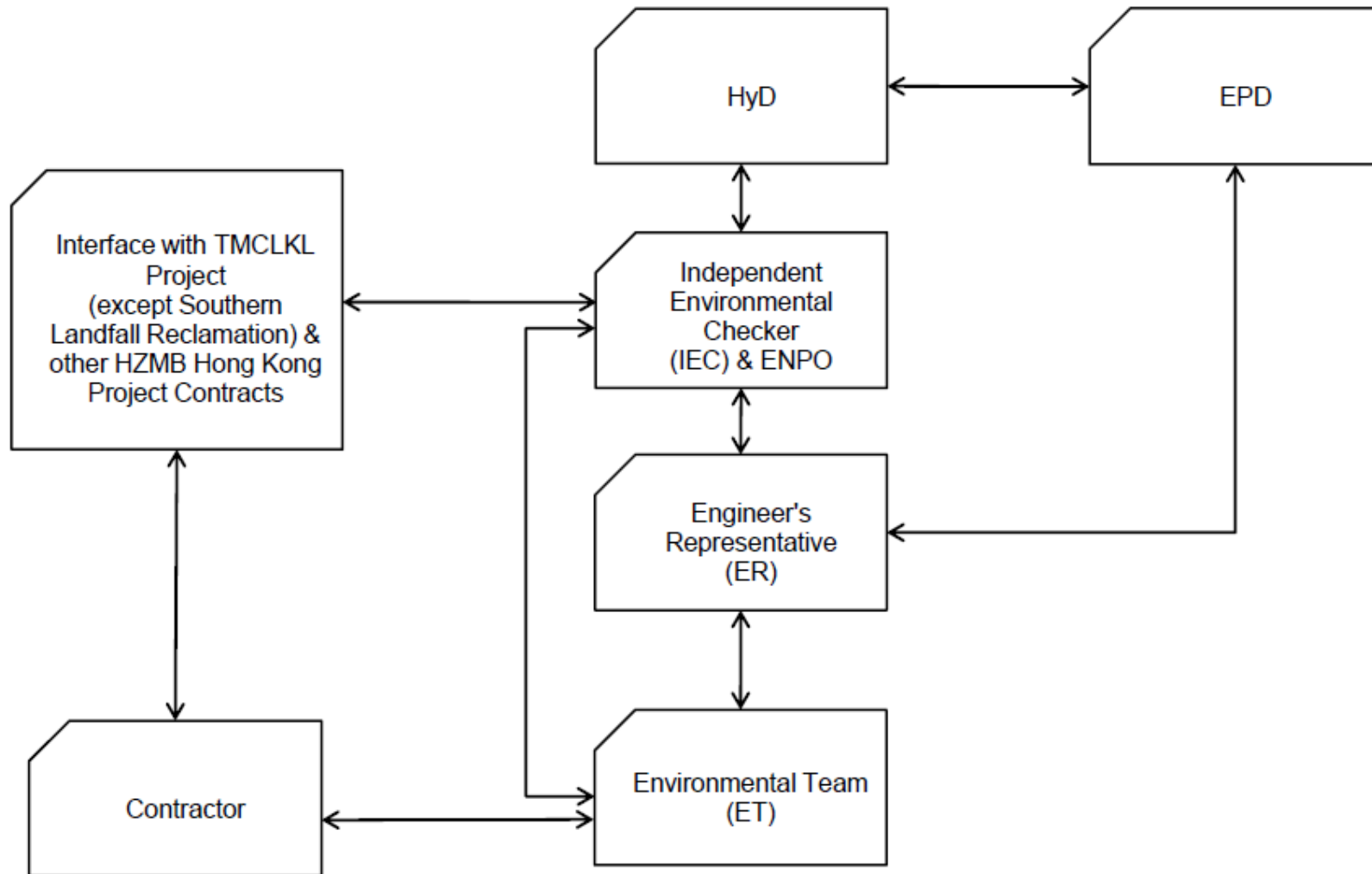
A total of 11 groups of 23 Chinese White Dolphin sightings were recorded during the 24 sets of surveys in the second year of operational phase monitoring. Four (4) Limit Level exceedances were recorded for the post-construction (operational) dolphin monitoring data between June 2021 and May 2022.

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

The monitoring programme has been reviewed and was considered as adequate and effective. No change to the EM&A programme was considered to be necessary.

Appendix A

Project Organization for Environmental Works



↔ Line of Communication

Appendix B

EM&A Monitoring Schedules

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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		01-Jun	02-Jun	03-Jun	04-Jun	05-Jun
06-Jun	07-Jun	08-Jun	09-Jun	10-Jun	11-Jun	12-Jun
13-Jun	14-Jun	15-Jun	16-Jun	17-Jun	18-Jun	19-Jun
				Operational Phase Dolphin Monitoring		
20-Jun	21-Jun	22-Jun	23-Jun	24-Jun	25-Jun	26-Jun
				Operational Phase Dolphin Monitoring		
27-Jun	28-Jun	29-Jun	30-Jun			
	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 - July 2021**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				01-Jul	02-Jul	03-Jul
04-Jul	05-Jul	06-Jul	07-Jul	08-Jul	09-Jul	10-Jul
11-Jul	12-Jul	13-Jul	14-Jul	15-Jul	16-Jul	17-Jul
		Operational Phase Dolphin Monitoring				
18-Jul	19-Jul	20-Jul	21-Jul	22-Jul	23-Jul	24-Jul
			Operational Phase Dolphin Monitoring			
25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul
		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 - August 2021**

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

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - September 2021**

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

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Tentative Operational Phase Dolphin Monitoring Survey Monitoring Schedule - October 2021**

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

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Tentative Operational Phase Dolphin Monitoring Survey Monitoring Schedule - November 2021**

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

The schedule is subject to agreement from the EPD on the monitoring times. The schedule will be revised in view of adverse(safety,weather etc) conditions.

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Tentative Operational Phase Dolphin Monitoring Survey Monitoring Schedule - December 2021**

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

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - January 2022**

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

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Tentative Operational Phase Dolphin Monitoring Survey Monitoring Schedule - February 2022**

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

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - March 2022**

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

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - April 2022**

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	11-Apr	12-Apr	13-Apr	14-Apr	15-Apr	16-Apr
		Operational Phase Dolphin Monitoring	Operational Phase Dolphin Monitoring			
17-Apr	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr	23-Apr
				Operational Phase Dolphin Monitoring		
24-Apr	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr
	Operational Phase Dolphin Monitoring					

**Agreement No. HMWSD 1/2021 (EP) Post-Construction Monitoring of Chinese White Dolphin (Line-transect Vessel Surveys) for Tuen Mun – Chek Lap Kok Link in Northeast and Northwest Lantau Survey Area – Investigation
Operational Phase Dolphin Monitoring Survey Monitoring Schedule - May 2022**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
01-May	02-May	03-May	04-May	05-May	06-May	07-May
		Operational Phase Dolphin Monitoring		Operational Phase Dolphin Monitoring		
08-May	09-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
		Operational Phase Dolphin Monitoring		Operational Phase Dolphin Monitoring		
22-May	23-May	24-May	25-May	26-May	27-May	28-May
29-May	30-May	31-May				

Appendix C

Operational Phase Dolphin Monitoring Survey

AGREEMENT NO. HMWSD 1/2021 (EP)
Post-Construction Monitoring of Chinese White Dolphin for
Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link

Second Annual Progress Report (June 2021 – May 2022)
submitted to ERM Hong Kong Ltd.

Submitted by
Hong Kong Cetacean Research Project

7 July 2022

1. Introduction

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

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

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

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

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

Table 1 Co-ordinates of transect lines

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

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

2.1.2. The survey teams used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2021). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* marine binoculars.

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

the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

- 2.1.5. During on-effort survey periods, the survey team recorded effort data including time, positions (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS.
- 2.1.6. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.7. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.
- 2.1.8. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as “primary” survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as “secondary” survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese White Dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

2.2. Photo-identification Work

- 2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.
- 2.2.2. A professional digital camera (*Canon EOS 7D* model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.
- 2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.

- 2.2.4. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000).
- 2.2.5. All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

2.3. *Data Analysis*

- 2.3.1. The following analyses were performed utilizing the dolphin monitoring data collected during the second year of TMCLKL post-construction dolphin monitoring from June 2021 to May 2022.
- 2.3.2. Furthermore, these analyses were also conducted for the one-year baseline phase (one year before commencement of HZMB construction works; i.e. February 2011 to January 2012); the one-year of transitional phase (one year after the commencement of HZMB construction works (HKBCF and HKLR works), but before the commencement of TMCLKL construction works; i.e. November 2012 to October 2013); the first to sixth years of TMCLKL construction (i.e. November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016; November 2016 to October 2017; November 2017 to October 2018; and November 2018 to October 2019); and the first year after TMCLKL construction being completed (i.e. June 2020 to May 2021).
- 2.3.3. Along with the analyzed results from the baseline, transitional and impact phase as well as the first year of the post-construction phase, results from the second year of post-construction phase can then be interpreted from the examination of any temporal changes before, during and after the construction activities of TMCLKL (with a total of ten 12-month periods) on dolphin usage in North Lantau waters. Notably, for the baseline phase, both baseline monitoring data collected under HZMB contract as well as the AFCD long-term dolphin monitoring data were included to increase the sample size in order to match the similar amount of survey effort in transitional and impact phases.

Distribution analysis

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

Encounter rate analysis

- 2.3.5. Encounter rates of Chinese White Dolphins (number of on-effort sightings per 100 km of survey effort, and total number of dolphins sighted on-effort per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort

conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for the encounter rate analyses. Dolphin encounter rates during the post-construction phase were calculated in two ways for comparisons with different phases of HZMB monitoring results as well as to the AFCD long-term marine mammal monitoring results.

- 2.3.6. Firstly, for the comparison with the HZMB monitoring results, the encounter rates were calculated using primary survey effort alone. The average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) were deduced based on the encounter rates from the 24 events during the present 12-month study period (i.e. 24 sets of line-transect surveys in North Lantau), which was also compared with the ones deduced from the events during the first year of post-construction phase, six years of impact phase as well as the transitional and baseline phases.
- 2.3.7. Secondly, the encounter rates were also calculated using both primary and secondary survey effort as in AFCD long-term monitoring study. The encounter rate of sightings and dolphins were deduced by dividing the total number of on-effort sightings (STG) and total number of dolphins (ANI) by the amount of survey effort for the present 12-month study period.

Quantitative grid analysis on habitat use

- 2.3.8. To conduct quantitative grid analysis of habitat use, positions of on-effort sightings of Chinese White Dolphins collected during the 12-month post-construction phase monitoring period were plotted onto 1-km² grids among NWL and NEL survey areas on GIS. Sighting densities (number of on-effort sightings per km²) and dolphin densities (total number of dolphins from on-effort sightings per km²) were then calculated for each 1 km by 1 km grid with the aid of GIS.
- 2.3.9. Sighting density grids and dolphin density grids were then normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent on each grid was calculated by examining the survey coverage on each line-transect survey to determine how many times the grid was surveyed during the study period. For example, when the survey boat traversed through a specific grid 50 times, 50 units of survey effort were counted for that grid. With the amount of survey effort calculated for each grid, the sighting density and dolphin density of each grid were then normalized (i.e. divided by the unit of survey effort).
- 2.3.10. 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

Behavioural analysis

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

Ranging pattern analysis

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

3. Monitoring Results

3.1. Summary of survey effort and dolphin sightings

- 3.1.1. During the second year of TMCLKL post-construction phase monitoring from June 2021 to May 2022, a total of 24 sets of systematic line-transect vessel surveys were conducted to cover all transect lines in NWL and NEL survey areas twice per month.
- 3.1.2. From these surveys, a total of 3,378.22 km of survey effort was collected, with 99.89% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility). Among the two areas, 1,327.58 km and 2,050.64 km of survey effort were conducted in NEL and NWL survey areas respectively.
- 3.1.3. Within the 12-month study period, the total survey effort conducted on primary lines was 2,341.24 km, while the effort on secondary lines was 1,036.98 km. The survey effort conducted on primary and secondary lines were both considered on-effort survey data. Summary table of the survey effort is shown in Appendix I.
- 3.1.4. From the 24 sets of 2021-22 monitoring surveys, a total of 11 groups of 23 Chinese White Dolphins were sighted. All dolphin groups were sighted in NWL during on-effort search, with nine made on primary lines, and the other two made on secondary lines. No dolphin was sighted at all in NEL. A summary table of the dolphin sightings is shown in

Appendix II.

3.2. *Distribution*

- 3.2.1. Distribution of dolphin sightings made during the second year of TMCLKL post-construction monitoring surveys is shown in Figure 1. Almost all of these sightings were concentrated at the western end of the North Lantau region, and mainly clustered at the northern portion of the Sha Chau and Lung Kwu Chau Marine Park (Figure 1). A few sightings were also made to the east of Sha Chau as well as near the HKLR09 alignment to the west of the airport platform.
- 3.2.2. Notably, none of the dolphin groups were sighted in the vicinity of the entire alignment of TMCLKL as well as the reclamation sites of HKLR03 and HKBCF (Figure 1). In general, dolphins appeared to have mostly avoided the construction areas of HZMB works during the present monitoring period, which was consistent with the dolphin distribution patterns observed throughout the TMCLKL EM&A programme.
- 3.2.3. Dolphin sighting distribution of the present post-construction monitoring period in 2021-22 was compared with the ones during the baseline phase in 2011-12, the transitional phase in 2012-13, the six years of impact phase (2013-14, 2014-15, 2015-16, 2016-17, 2017-18, and 2018-19), as well as the first year of post-construction phase in 2020-21. In 2021-22, dolphin distribution was quite similar to the five impact phase periods from 2014-19 and the first year of post-construction phase, with dolphins being largely vacated from the eastern and central portions of NL region, and mainly concentrated their occurrence around the northwestern portion of the region (Figure 2).
- 3.2.4. This was in stark contrast to their very frequent occurrence around the Brothers Islands, Shum Shui Kok, the waters between Pillar Point and airport platform, and the vicinity of HZMB-associated work sites during the baseline period (Figure 2). Even in the transitional phase, dolphins still utilized these waters in a moderate extent, but such usage has progressively diminished during the six annual periods during the TMCLKL construction as well as the two annual periods after the construction (Figure 2).
- 3.2.5. The only area where dolphin occurrence was relatively consistent across the ten annual periods was around the Lung Kwu Chau area, but even so, such occurrence has been diminishing progressively in the past eight annual periods. Such decline in dolphin usage was even more evident in the past three annual periods in 2108-19, 2020-21 and 2021-22, with much lower occurrences in this area during the most recent period (Figure 2).

3.3. *Encounter rate*

- 3.3.1. During the present 12-month post-construction phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline, transitional and six years of impact phases (Table 2).
- 3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the same 12-month study period using both primary and

secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 0.54 sightings and 1.12 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both nil with no on-effort sighting being made there in 2021-22.

Table 2. Comparison of average daily dolphin encounter rates from the two years of post-construction phase, six years of impact phase, transitional phase and baseline phase monitoring periods (Note: encounter rates deduced were calculated based on survey and on-effort sighting data made along the primary transect lines under favourable conditions; \pm denotes the standard deviation of the average encounter rates).

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Northeast Lantau	Northwest Lantau	Northeast Lantau	Northwest Lantau
Post-Construction Phase (2021-22)	0.00	0.73 \pm 1.24	0.00	1.46 \pm 2.82
Post-Construction Phase (2020-21)	0.00	1.31 \pm 1.88	0.00	3.39 \pm 5.73
Impact Phase (2018-19)	0.00	1.42 \pm 1.80	0.00	3.62 \pm 4.93
Impact Phase (2017-18)	0.00	2.68 \pm 3.04	0.00	9.02 \pm 14.63
Impact Phase (2016-17)	0.00	2.35 \pm 2.62	0.00	8.57 \pm 11.05
Impact Phase (2015-16)	0.00	2.10 \pm 1.83	0.00	8.54 \pm 8.53
Impact Phase (2014-15)	0.11 \pm 0.54	2.54 \pm 2.49	0.11 \pm 0.54	11.64 \pm 14.04
Impact Phase (2013-14)	0.22 \pm 0.74	6.93 \pm 4.08	0.76 \pm 2.59	26.31 \pm 17.56
Transitional Phase (2012-13)	1.70 \pm 2.26	7.68 \pm 4.36	4.75 \pm 7.61	27.51 \pm 18.06
Baseline Phase (2011-12)	6.05 \pm 5.04	7.75 \pm 5.69	19.91 \pm 21.30	29.57 \pm 26.96

3.3.3. In NEL, the dolphin encounter rates (both STG and ANI) during the second year of post-construction monitoring period were nil as in the previous five periods in 2015-16, 2016-17, 2017-18, 2018-19 and 2020-21, and these were in stark contrast to the higher averages during the baseline and transitional phases (Table 2). Such progressive decline in dolphin encounter rates actually existed in this area since the transitional phase in 2012-13 (i.e. well before the TMCLKL construction works commenced), with such averages being much lower than the ones in the baseline phase (with reductions of 71.9% for ER(STG) and 76.1% for ER(ANI)). Since then, dolphin occurrence diminished further to an extremely low level during the first and second impact phase periods of TMCLKL construction works, and then to complete absences in the subsequent annual periods (Table 2).

3.3.4. On the other hand, the average dolphin encounter rates (STG and ANI) in NWL during the present post-construction phase monitoring period were drastically lower (with reductions of 90.6% and 95.1% for ER(STG) and ER(ANI) respectively) than the ones recorded in the baseline period (Table 2), indicating a dramatic decline in dolphin usage of this survey area. Notably, those annual encounter rates remained at consistently low

levels in the past six consecutive periods since 2014-15, and there was still a decline between the two years of post-construction period in 2020-21 and 2021-22.

- 3.3.5. It should also be noted that the encounter rates in NWL during the first year of impact phase (2013-14) were only slightly lower than the baseline and transitional phases, but such decline has quickly accelerated during the subsequent annual periods during the impact and post-construction phases. The dramatic drop in dolphin occurrences between 2013-14 and 2014-15 at the peak of HZMB construction works signaled a further widespread of declining usage from NEL waters to the entire North Lantau region with no sign of recovery, even though most marine works associated with the HZMB construction has already been completed.
- 3.3.6. A two-way ANOVA with repeated measures of variance and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the ten monitoring periods throughout baseline, transitional, impact and post-construction phases. The two variables that were examined included the different periods and the two locations (i.e. NEL and NWL).
- 3.3.7. Such comparison revealed that the p-value for the differences in average dolphin encounter rates of STG and ANI were both 0.000000 and 0.000000 respectively. Even if the alpha value is set at 0.00001, significant differences were detected among the different periods in both dolphin encounter rates of STG and ANI.
- 3.4. *Group size*
- 3.4.1. Group size of Chinese White Dolphins ranged from singletons to six individuals per group in NL region during the second post-construction monitoring period in 2021-22. The average dolphin group sizes in the present monitoring period were compared with the ones deduced from different phases of TMCLKL construction, as shown in Table 3.

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

	Average Dolphin Group Size		
	Overall	Northeast Lantau	Northwest Lantau
Post-construction Phase (2021-22)	2.09 \pm 1.64 (n = 11)	0.00	2.09 \pm 1.64 (n = 11)
Post-construction Phase (2020-21)	2.64 \pm 2.08 (n = 22)	0.00	2.64 \pm 2.08 (n = 22)
Impact Phase (2018-19)	2.52 \pm 1.45 (n = 27)	0.00	2.52 \pm 1.45 (n = 27)
Impact Phase (2017-18)	3.12 \pm 2.86 (n = 42)	0.00	3.12 \pm 2.86 (n = 42)
Impact Phase (2016-17)	3.51 \pm 2.68 (n = 43)	0.00	3.51 \pm 2.68 (n = 43)
Impact Phase (2015-16)	3.73 \pm 3.14 (n = 45)	1.00 (n = 1)	3.80 \pm 3.14 (n = 44)
Impact Phase (2014-15)	4.24 \pm 3.15 (n = 54)	1.00 (n = 1)	4.30 \pm 3.15 (n = 53)
Impact Phase (2013-14)	3.76 \pm 2.57 (n = 136)	5.00 \pm 2.71 (n = 4)	3.73 \pm 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 \pm 2.98 (n = 186)	2.64 \pm 2.38 (n = 22)	3.47 \pm 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 \pm 2.86 (n = 288)	2.80 \pm 2.35 (n = 79)	3.52 \pm 3.01 (n = 209)

- 3.4.2. The average dolphin group size in NWL waters (and also the entire North Lantau region as no dolphin was sighted in NEL waters) during the present post-construction phase monitoring period was the lowest among all annual periods of the baseline, transitional, construction and post-construction phases (Table 3). There was also a clear decline in average dolphin group size in recent annual periods.
- 3.4.3. Among the 11 dolphin groups sighted in 2021-22, ten of them were composed of 1-4 individuals only, while only one group was moderate in size with six animals (Appendix II), which was located to the east of Sha Chau (Figure 3).
- 3.4.4. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present monitoring period is shown in Figure 3, with comparison to the ones from the first year of post-construction phase, six years of impact phase as well as the transitional and baseline phases.
- 3.4.5. Throughout the six impact phases as well as the two post-construction phases, distribution of these slightly larger groups has been consistently confined to the northwestern portion of the North Lantau region. Such limited distribution was drastically different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many of them also sighted in NEL waters (Figure 3). The dramatic decline in occurrences of larger dolphin groups was most evident in the past seven annual periods since 2014-15.
- 3.5. *Habitat use*
- 3.5.1. During the present post-construction phase monitoring period in 2021-22, only 11 grids recorded dolphin densities (each with only one on-effort sighting), and all of these grids were with very low densities, except a grid to the east of Sha Chau with moderately low density (Figures 4a and 4b). Moreover, all grids near the HKLR03 and HKBCF reclamation sites as well as the entire alignment of TMCLKL did not record any presence of dolphins in the present monitoring period in 2021-22 (Figures 4a and 4b).
- 3.5.2. When compared with the habitat use patterns during the baseline phase, dolphin usage in NEL has progressively diminished during the transitional phase and the subsequent six periods of impact phase as well as the two periods of post-construction phase (Figure 5). During the baseline period, a number of grids between Siu Mo To and Shum Shui Kok recorded moderately high to high dolphin densities, and most grids in NEL recorded dolphin usage. This was in stark contrast to the complete absence of dolphin in this area during the last four construction phase periods and the two post-construction phase periods (Figure 5).
- 3.5.3. Moreover, dolphin usage of NWL waters has also declined dramatically in recent years (including the most recent one in 2021-22) (Figure 5). This is in contrast to a more evenly spread usage in NWL during the baseline phase, transitional phase and the first year of impact phase monitoring. Apparently, there has been a more widespread decline of dolphin usage throughout the North Lantau waters in recent years of impact phase monitoring as well as the entire post-construction monitoring period, falling to the lowest

level in the most recent period (Figure 5).

3.6. *Mother-calf pairs*

3.6.1. During the second year of post-construction monitoring, no mother-calf pair was spotted at all among the 11 dolphin groups (Figure 6). Notably, the absence of young calves was consistent with their extremely low occurrences in recent impact phase monitoring periods as well as the first year of post-construction period, ranging from 0% in 2015-16 and 2017-18 to 1.5% in 2018-19 and 1.7% in 2020-21. This is in stark contrast to the higher percentages recorded during the first impact phase monitoring period in 2013-14 (5.7%), the transitional phase (6.7%) and the baseline phase (4.5%).

3.6.2. The extremely rare occurrence of young calves in NL region in the past seven monitoring periods was drastically different from the distribution patterns observed during the baseline phase, transitional phase and first year of impact phase when young calves were sighted throughout the region (Figure 6).

3.7. *Activities and associations with fishing boats*

3.7.1. Only one of the 11 dolphin groups was associated with feeding activity during the 2021-22 monitoring period, which was located to the east of Sha Chau (Figure 7). On the other hand, none of them was associated with any socializing, traveling or resting/milling activity.

3.7.2. The comparison in distribution of dolphins engaged in different activities during different monitoring phases revealed that feeding activities were more frequently sighted during the baseline and transitional periods along the Urmston Road, within the Sha Chau and Lung Kwu Chau Marine Park, to the west of the airport platform and around the Brothers Islands, while the socializing activities were more scattered throughout the North Lantau region for these periods (Figure 7). However, it is evident that the “hotspots” where dolphins engaged in different activities were considerably different between the baseline, transitional, impact phases as well as the post-construction phase, with drastic decline in frequency of such occurrences.

3.7.3. Notably, none of the 11 dolphin groups sighted during the present monitoring period in 2021-22 was found to be associated with any operating fishing vessel. The extremely rare events of fishing boat associations by the dolphins in recent years of TMCLKL monitoring (including the two post-construction periods in 2020-21 and 2021-22) were very different from the baseline period when 14 of 288 dolphin groups were associated with fishing boats.

3.8. *Summary of photo-identification works*

3.8.1. During the present post-construction phase monitoring period in 2021-22, a total of 14 individuals sighted 21 times altogether were identified (see Appendix III). All of these re-sightings were made in NWL.

3.8.2. Most of these identified individuals were sighted only once or twice, but one individual was sighted more than twice. This individual dolphin, NL123, was sighted four times in 2021-22 among the 11 dolphin sightings made during the period. Its relatively more

frequent occurrences during the second year of post-construction phase monitoring indicated slightly stronger reliance of NWL waters as part of its home range, while most identified individuals rarely ventured into NWL waters.

3.8.3. Notably, none of the individual dolphins was accompanied with any young calf during their re-sightings recorded in 2021-22 monitoring period.

3.9. *Individual range use*

3.9.1. Ranging patterns of the 14 individuals identified during the 12-month post-construction phase monitoring period in 2021-22 were determined by fixed kernel method, and are shown in Appendix IV.

3.9.2. The individual range use analysis revealed that only five of the 14 identified dolphins sighted in NWL waters within this 12-month period have been utilizing their ranges primarily in North Lantau in the past and present. On the contrary, five individuals split their range use between North and West Lantau waters in the past, while the other four individuals had their ranges primarily centered in WL and SWL waters but have infrequently ventured into NWL waters during the present post-construction monitoring period (Appendix IV).

3.9.3. Notably, all dolphins identified in 2021-22 have avoided the NEL waters, the area where many individual dolphins have utilized as their core areas of activities before the HZMB construction.

4. References

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.

Hung, S. K. 2021. Monitoring of marine mammals in Hong Kong waters: final report (2020-21). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government, 154 pp.

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

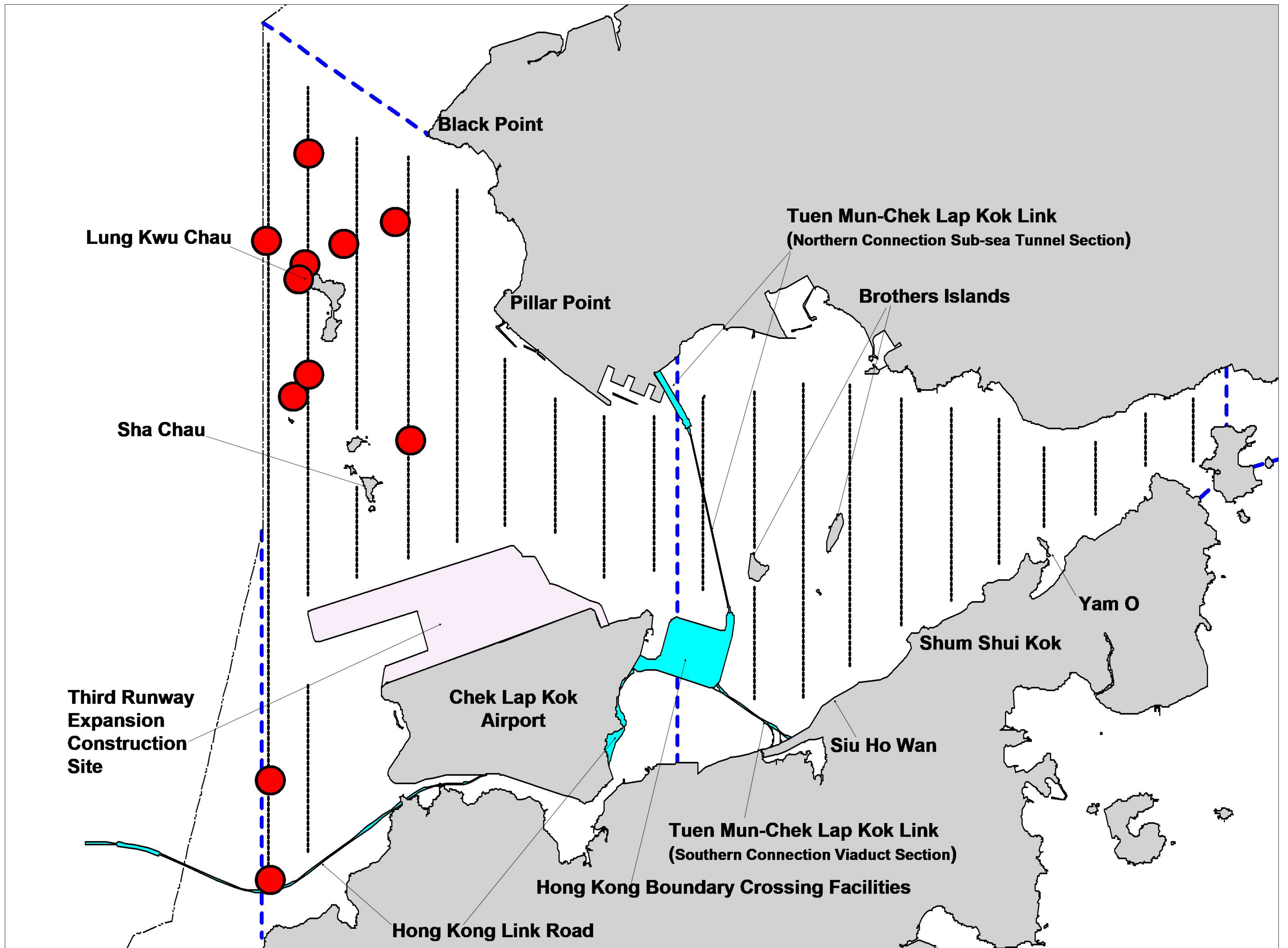
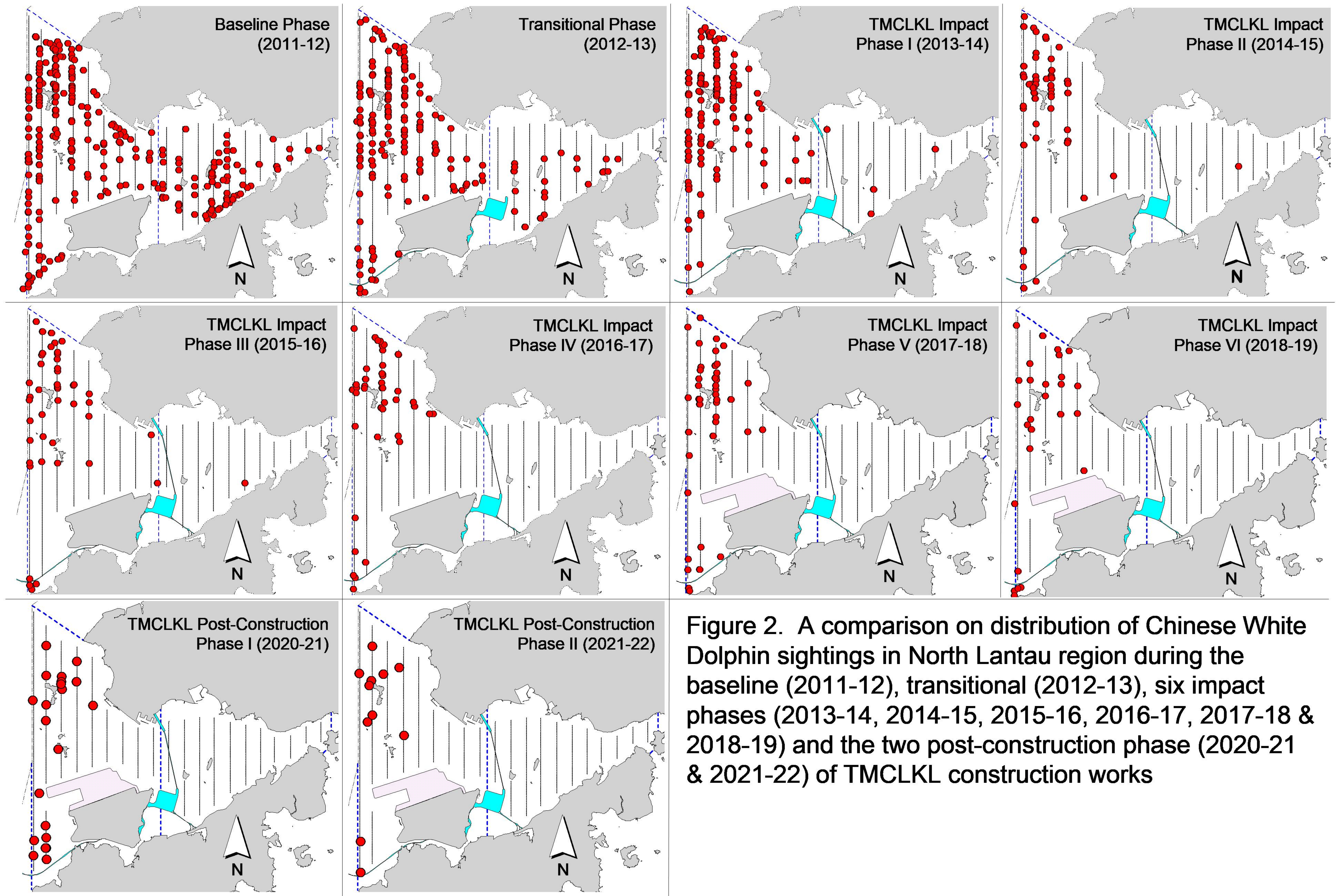


Figure 1. Distribution of Chinese White Dolphin sightings in North Lantau region during the second year of TMCLKL post- construction monitoring period from June 2021 to May 2022



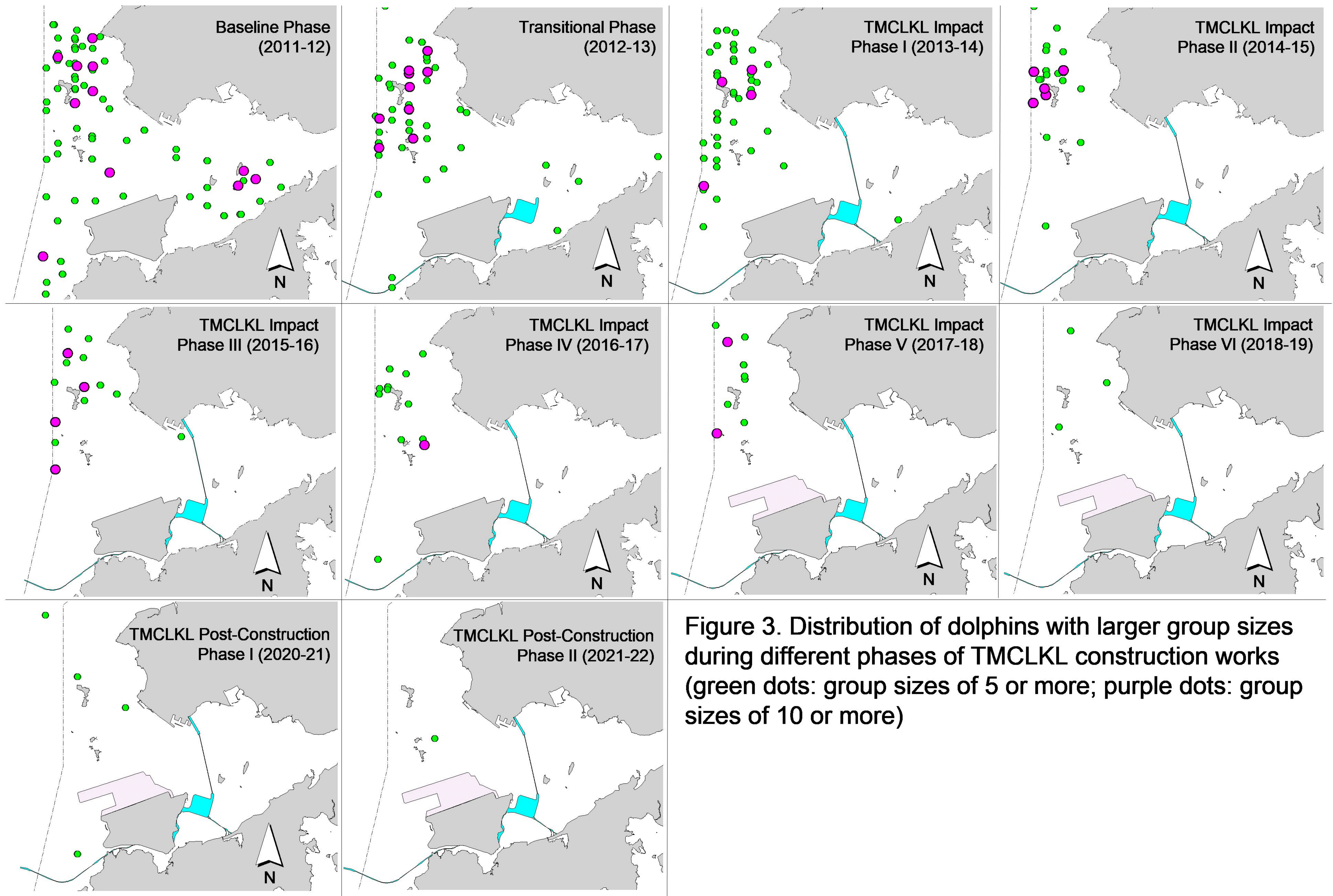


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

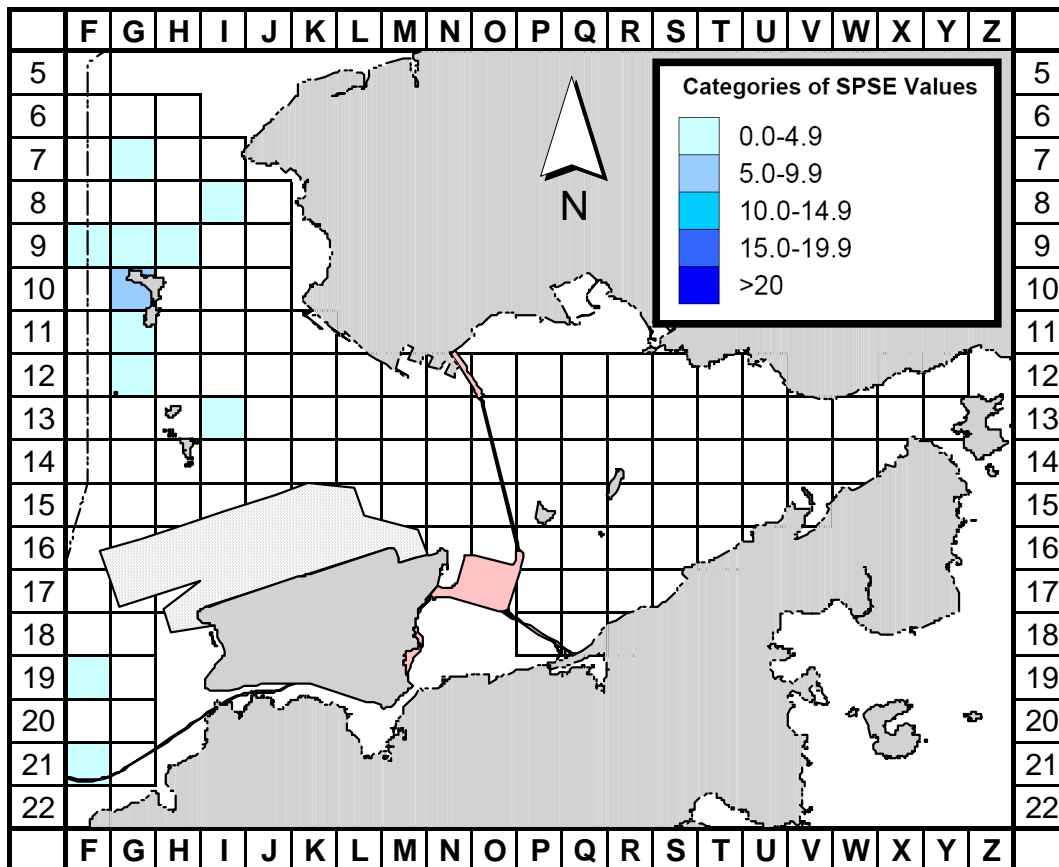


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during the TMCLKL post-construction monitoring period in June 21-May 22 (SPSE = no. of on-effort sightings per 100 units of survey effort)

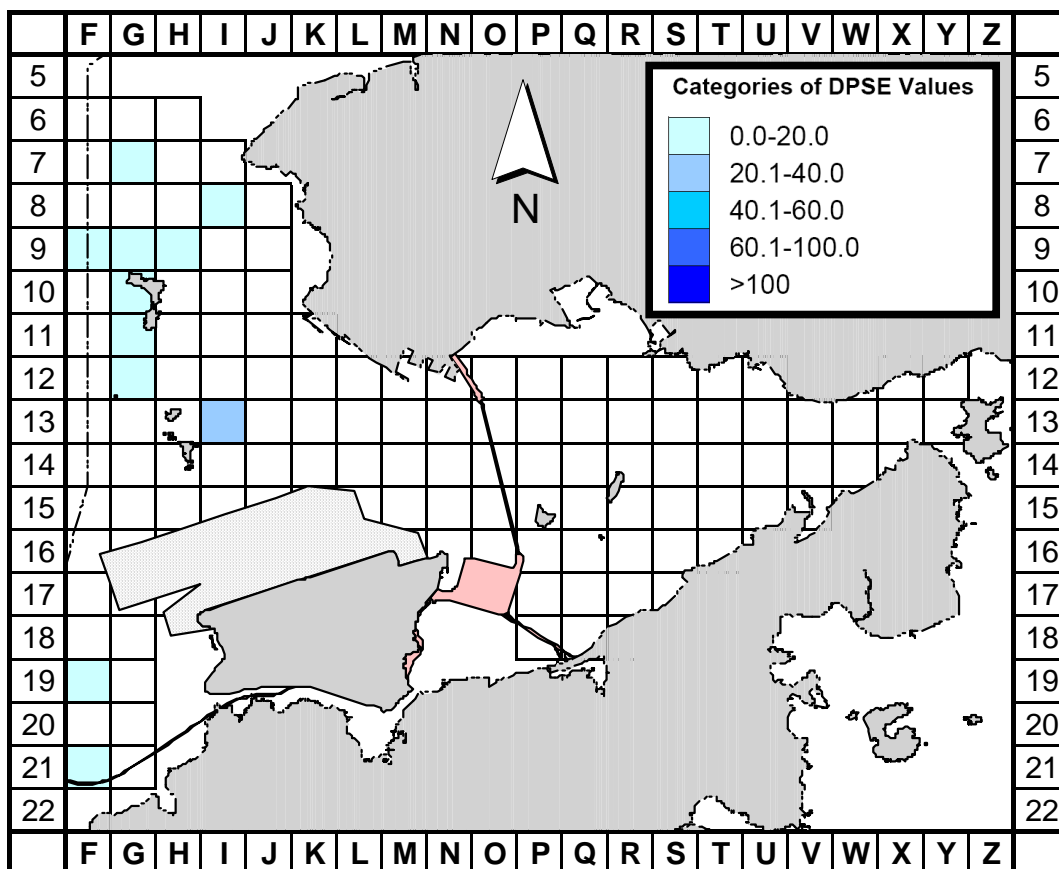


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during the TMCLKL post-construction monitoring period in June 21-May 22 (DPSE = no. of dolphins per 100 units of survey effort)

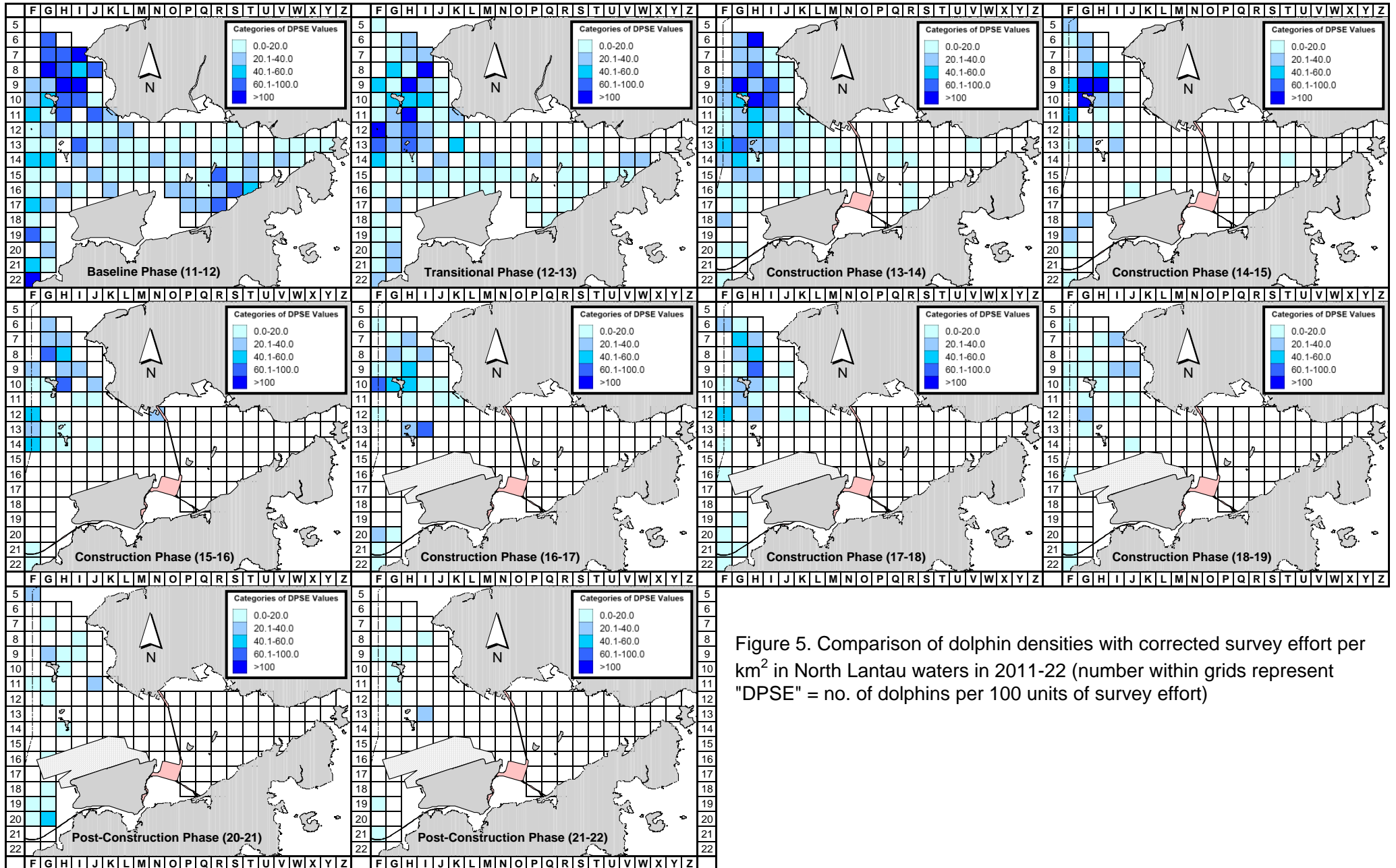


Figure 5. Comparison of dolphin densities with corrected survey effort per km^2 in North Lantau waters in 2011-22 (number within grids represent "DPSE" = no. of dolphins per 100 units of survey effort)

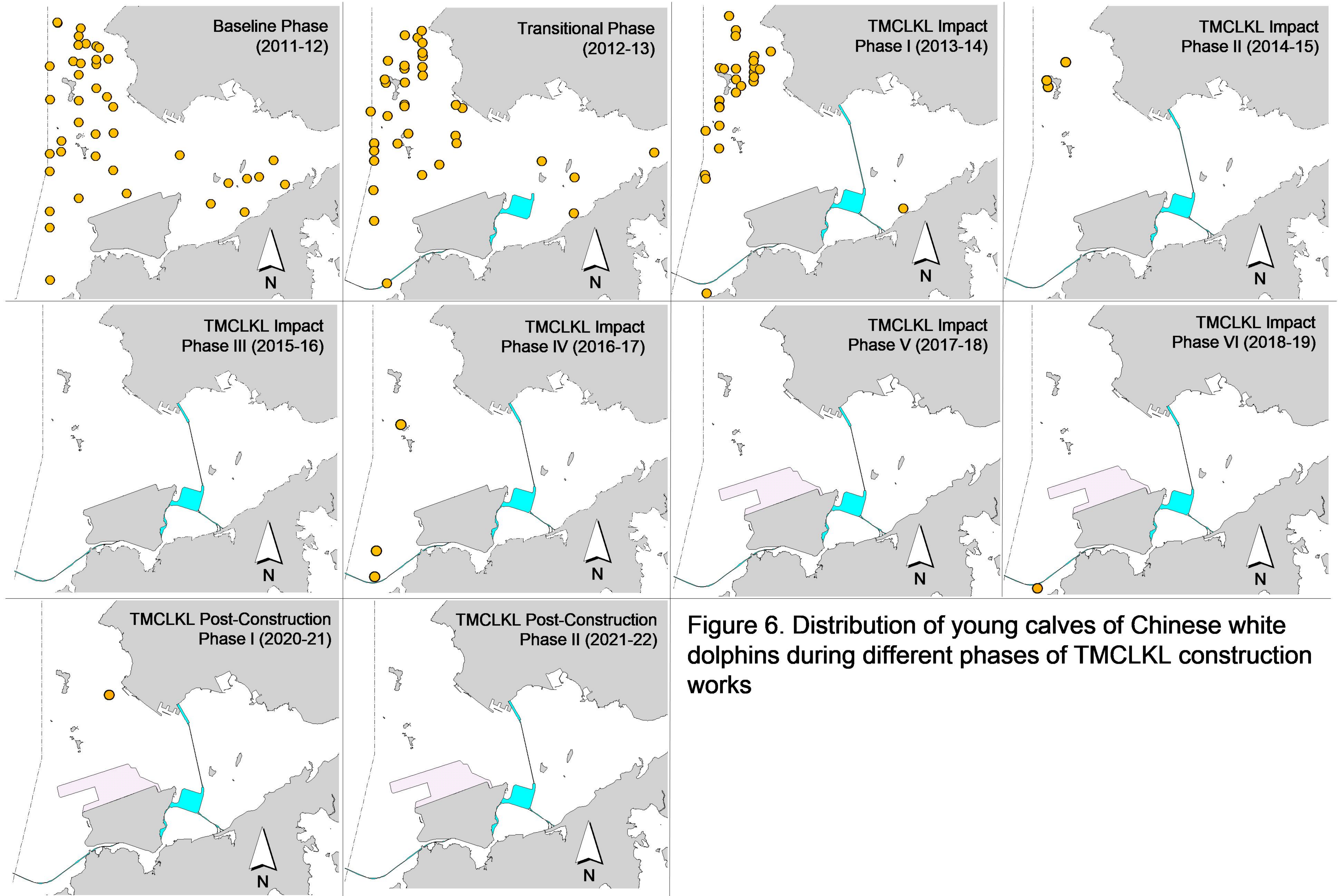


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works

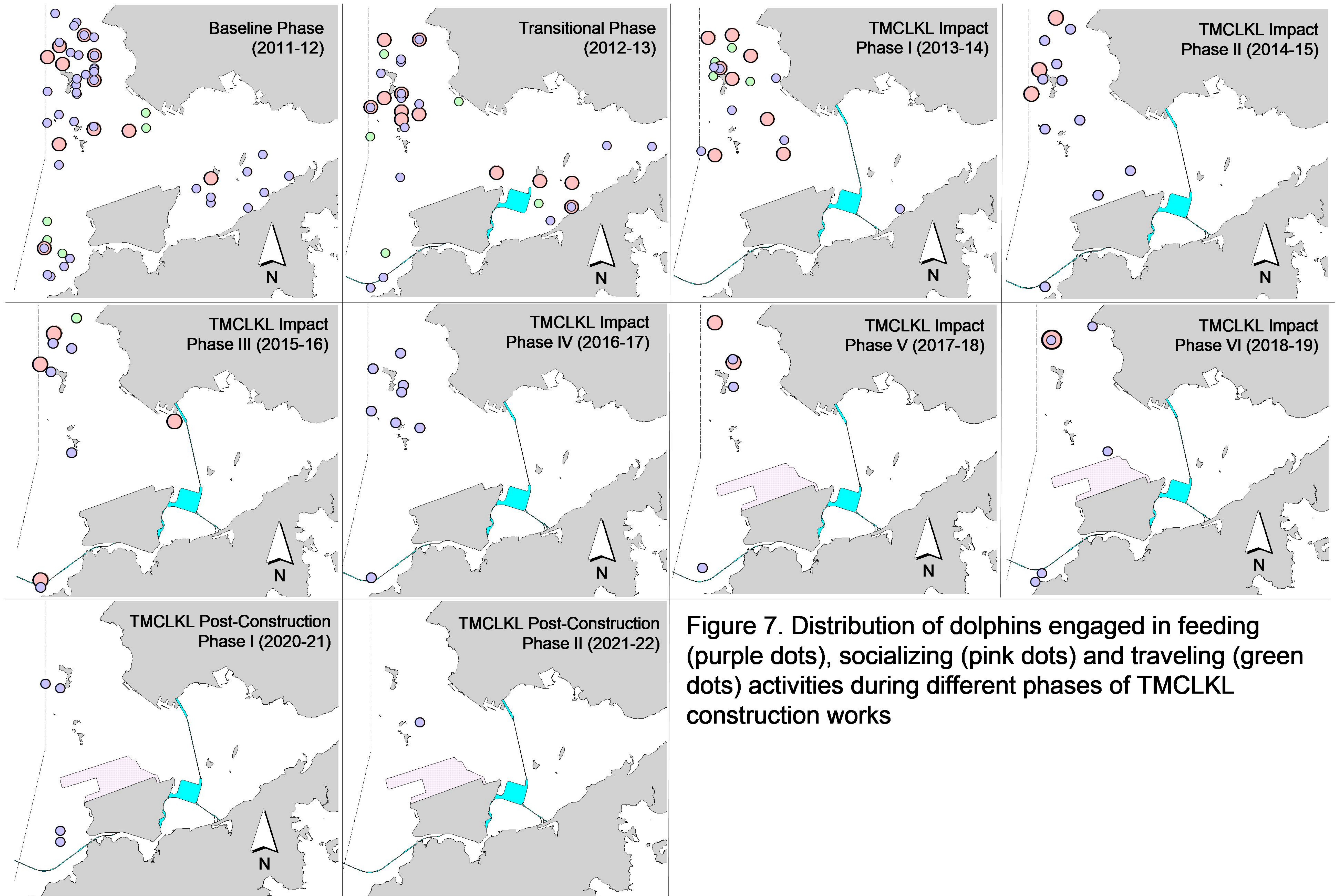


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works

Appendix I. TMCLKL Survey Effort Database (June 2021 - May 2022)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
17-Jun-21	NW LANTAU	2	10.99	SUMMER	STANDARD138716	TMCLKL	P
17-Jun-21	NW LANTAU	3	24.81	SUMMER	STANDARD138716	TMCLKL	P
17-Jun-21	NW LANTAU	3	13.60	SUMMER	STANDARD138716	TMCLKL	S
17-Jun-21	NE LANTAU	2	10.21	SUMMER	STANDARD138716	TMCLKL	P
17-Jun-21	NE LANTAU	3	4.40	SUMMER	STANDARD138716	TMCLKL	P
17-Jun-21	NE LANTAU	2	11.29	SUMMER	STANDARD138716	TMCLKL	S
24-Jun-21	NW LANTAU	1	4.00	SUMMER	STANDARD138716	TMCLKL	P
24-Jun-21	NW LANTAU	2	22.55	SUMMER	STANDARD138716	TMCLKL	P
24-Jun-21	NW LANTAU	1	0.70	SUMMER	STANDARD138716	TMCLKL	S
24-Jun-21	NW LANTAU	2	8.35	SUMMER	STANDARD138716	TMCLKL	S
24-Jun-21	NE LANTAU	1	6.20	SUMMER	STANDARD138716	TMCLKL	P
24-Jun-21	NE LANTAU	2	10.36	SUMMER	STANDARD138716	TMCLKL	P
24-Jun-21	NE LANTAU	3	2.70	SUMMER	STANDARD138716	TMCLKL	P
24-Jun-21	NE LANTAU	1	4.20	SUMMER	STANDARD138716	TMCLKL	S
24-Jun-21	NE LANTAU	2	6.24	SUMMER	STANDARD138716	TMCLKL	S
28-Jun-21	NW LANTAU	2	30.81	SUMMER	STANDARD138716	TMCLKL	P
28-Jun-21	NW LANTAU	3	4.10	SUMMER	STANDARD138716	TMCLKL	P
28-Jun-21	NW LANTAU	2	14.19	SUMMER	STANDARD138716	TMCLKL	S
28-Jun-21	NE LANTAU	2	11.99	SUMMER	STANDARD138716	TMCLKL	P
28-Jun-21	NE LANTAU	3	3.60	SUMMER	STANDARD138716	TMCLKL	P
28-Jun-21	NE LANTAU	2	8.91	SUMMER	STANDARD138716	TMCLKL	S
28-Jun-21	NE LANTAU	3	1.30	SUMMER	STANDARD138716	TMCLKL	S
29-Jun-21	NW LANTAU	2	1.77	SUMMER	STANDARD36826	TMCLKL	P
29-Jun-21	NW LANTAU	3	21.57	SUMMER	STANDARD36826	TMCLKL	P
29-Jun-21	NW LANTAU	4	2.32	SUMMER	STANDARD36826	TMCLKL	P
29-Jun-21	NW LANTAU	3	9.09	SUMMER	STANDARD36826	TMCLKL	S
29-Jun-21	NW LANTAU	4	1.30	SUMMER	STANDARD36826	TMCLKL	S
29-Jun-21	NE LANTAU	2	17.57	SUMMER	STANDARD36826	TMCLKL	P
29-Jun-21	NE LANTAU	3	1.85	SUMMER	STANDARD36826	TMCLKL	P
29-Jun-21	NE LANTAU	2	10.58	SUMMER	STANDARD36826	TMCLKL	S
13-Jul-21	NW LANTAU	1	3.60	SUMMER	STANDARD36826	TMCLKL	P
13-Jul-21	NW LANTAU	2	32.90	SUMMER	STANDARD36826	TMCLKL	P
13-Jul-21	NW LANTAU	2	13.50	SUMMER	STANDARD36826	TMCLKL	S
13-Jul-21	NE LANTAU	1	3.80	SUMMER	STANDARD36826	TMCLKL	P
13-Jul-21	NE LANTAU	2	13.70	SUMMER	STANDARD36826	TMCLKL	P
13-Jul-21	NE LANTAU	2	8.80	SUMMER	STANDARD36826	TMCLKL	S
21-Jul-21	NW LANTAU	2	20.30	SUMMER	STANDARD138716	TMCLKL	P
21-Jul-21	NW LANTAU	3	5.40	SUMMER	STANDARD138716	TMCLKL	P
21-Jul-21	NW LANTAU	2	10.60	SUMMER	STANDARD138716	TMCLKL	S
21-Jul-21	NE LANTAU	2	11.47	SUMMER	STANDARD138716	TMCLKL	P
21-Jul-21	NE LANTAU	3	8.19	SUMMER	STANDARD138716	TMCLKL	P
21-Jul-21	NE LANTAU	2	10.04	SUMMER	STANDARD138716	TMCLKL	S
27-Jul-21	NW LANTAU	1	32.40	SUMMER	STANDARD36826	TMCLKL	P
27-Jul-21	NW LANTAU	2	5.50	SUMMER	STANDARD36826	TMCLKL	P
27-Jul-21	NW LANTAU	1	11.10	SUMMER	STANDARD36826	TMCLKL	S
27-Jul-21	NW LANTAU	2	2.20	SUMMER	STANDARD36826	TMCLKL	S
27-Jul-21	NE LANTAU	1	10.70	SUMMER	STANDARD36826	TMCLKL	P
27-Jul-21	NE LANTAU	2	6.57	SUMMER	STANDARD36826	TMCLKL	P
27-Jul-21	NE LANTAU	1	4.02	SUMMER	STANDARD36826	TMCLKL	S
27-Jul-21	NE LANTAU	2	5.41	SUMMER	STANDARD36826	TMCLKL	S
29-Jul-21	NW LANTAU	1	10.90	SUMMER	STANDARD138716	TMCLKL	P
29-Jul-21	NW LANTAU	2	17.54	SUMMER	STANDARD138716	TMCLKL	P

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
29-Jul-21	NW LANTAU	1	2.10	SUMMER	STANDARD138716	TMCLKL	S
29-Jul-21	NW LANTAU	2	6.56	SUMMER	STANDARD138716	TMCLKL	S
29-Jul-21	NE LANTAU	1	5.11	SUMMER	STANDARD138716	TMCLKL	P
29-Jul-21	NE LANTAU	2	11.45	SUMMER	STANDARD138716	TMCLKL	P
29-Jul-21	NE LANTAU	3	2.83	SUMMER	STANDARD138716	TMCLKL	P
29-Jul-21	NE LANTAU	1	4.00	SUMMER	STANDARD138716	TMCLKL	S
29-Jul-21	NE LANTAU	2	4.72	SUMMER	STANDARD138716	TMCLKL	S
29-Jul-21	NE LANTAU	3	1.27	SUMMER	STANDARD138716	TMCLKL	S
3-Aug-21	NW LANTAU	1	1.10	SUMMER	STANDARD36826	TMCLKL	P
3-Aug-21	NW LANTAU	2	13.28	SUMMER	STANDARD36826	TMCLKL	P
3-Aug-21	NW LANTAU	3	23.12	SUMMER	STANDARD36826	TMCLKL	P
3-Aug-21	NW LANTAU	2	9.30	SUMMER	STANDARD36826	TMCLKL	S
3-Aug-21	NW LANTAU	3	2.60	SUMMER	STANDARD36826	TMCLKL	S
3-Aug-21	NE LANTAU	1	1.20	SUMMER	STANDARD36826	TMCLKL	P
3-Aug-21	NE LANTAU	2	13.39	SUMMER	STANDARD36826	TMCLKL	P
3-Aug-21	NE LANTAU	3	2.60	SUMMER	STANDARD36826	TMCLKL	P
3-Aug-21	NE LANTAU	1	1.40	SUMMER	STANDARD36826	TMCLKL	S
3-Aug-21	NE LANTAU	2	7.31	SUMMER	STANDARD36826	TMCLKL	S
5-Aug-21	NW LANTAU	2	2.90	SUMMER	STANDARD138716	TMCLKL	P
5-Aug-21	NW LANTAU	3	27.11	SUMMER	STANDARD138716	TMCLKL	P
5-Aug-21	NW LANTAU	2	1.20	SUMMER	STANDARD138716	TMCLKL	S
5-Aug-21	NW LANTAU	3	4.09	SUMMER	STANDARD138716	TMCLKL	S
5-Aug-21	NE LANTAU	2	7.89	SUMMER	STANDARD138716	TMCLKL	P
5-Aug-21	NE LANTAU	3	10.89	SUMMER	STANDARD138716	TMCLKL	P
5-Aug-21	NE LANTAU	2	2.10	SUMMER	STANDARD138716	TMCLKL	S
5-Aug-21	NE LANTAU	3	8.42	SUMMER	STANDARD138716	TMCLKL	S
9-Aug-21	NW LANTAU	2	16.60	SUMMER	STANDARD138716	TMCLKL	P
9-Aug-21	NW LANTAU	3	18.90	SUMMER	STANDARD138716	TMCLKL	P
9-Aug-21	NW LANTAU	1	2.20	SUMMER	STANDARD138716	TMCLKL	S
9-Aug-21	NW LANTAU	2	6.30	SUMMER	STANDARD138716	TMCLKL	S
9-Aug-21	NW LANTAU	3	3.90	SUMMER	STANDARD138716	TMCLKL	S
9-Aug-21	NE LANTAU	2	17.30	SUMMER	STANDARD138716	TMCLKL	P
9-Aug-21	NE LANTAU	2	6.30	SUMMER	STANDARD138716	TMCLKL	S
9-Aug-21	NE LANTAU	3	1.30	SUMMER	STANDARD138716	TMCLKL	S
24-Aug-21	NW LANTAU	2	28.93	SUMMER	STANDARD36826	TMCLKL	P
24-Aug-21	NW LANTAU	2	7.97	SUMMER	STANDARD36826	TMCLKL	S
24-Aug-21	NE LANTAU	1	5.95	SUMMER	STANDARD36826	TMCLKL	P
24-Aug-21	NE LANTAU	2	10.48	SUMMER	STANDARD36826	TMCLKL	P
24-Aug-21	NE LANTAU	3	2.70	SUMMER	STANDARD36826	TMCLKL	P
24-Aug-21	NE LANTAU	1	3.27	SUMMER	STANDARD36826	TMCLKL	S
24-Aug-21	NE LANTAU	2	7.10	SUMMER	STANDARD36826	TMCLKL	S
24-Aug-21	NE LANTAU	3	0.30	SUMMER	STANDARD36826	TMCLKL	S
7-Sep-21	NW LANTAU	1	0.40	AUTUMN	STANDARD36826	TMCLKL	P
7-Sep-21	NW LANTAU	2	32.70	AUTUMN	STANDARD36826	TMCLKL	P
7-Sep-21	NW LANTAU	3	4.00	AUTUMN	STANDARD36826	TMCLKL	P
7-Sep-21	NW LANTAU	1	1.10	AUTUMN	STANDARD36826	TMCLKL	S
7-Sep-21	NW LANTAU	2	6.70	AUTUMN	STANDARD36826	TMCLKL	S
7-Sep-21	NW LANTAU	3	5.50	AUTUMN	STANDARD36826	TMCLKL	S
7-Sep-21	NE LANTAU	2	12.16	AUTUMN	STANDARD36826	TMCLKL	P
7-Sep-21	NE LANTAU	3	3.69	AUTUMN	STANDARD36826	TMCLKL	P
7-Sep-21	NE LANTAU	2	6.02	AUTUMN	STANDARD36826	TMCLKL	S
7-Sep-21	NE LANTAU	3	3.33	AUTUMN	STANDARD36826	TMCLKL	S
13-Sep-21	NW LANTAU	2	25.31	AUTUMN	STANDARD138716	TMCLKL	P
13-Sep-21	NW LANTAU	2	10.49	AUTUMN	STANDARD138716	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
13-Sep-21	NE LANTAU	1	1.20	AUTUMN	STANDARD138716	TMCLKL	P
13-Sep-21	NE LANTAU	2	18.20	AUTUMN	STANDARD138716	TMCLKL	P
13-Sep-21	NE LANTAU	1	1.80	AUTUMN	STANDARD138716	TMCLKL	S
13-Sep-21	NE LANTAU	2	8.40	AUTUMN	STANDARD138716	TMCLKL	S
14-Sep-21	NW LANTAU	2	27.80	AUTUMN	STANDARD36826	TMCLKL	P
14-Sep-21	NW LANTAU	3	6.90	AUTUMN	STANDARD36826	TMCLKL	P
14-Sep-21	NW LANTAU	2	8.10	AUTUMN	STANDARD36826	TMCLKL	S
14-Sep-21	NW LANTAU	3	4.80	AUTUMN	STANDARD36826	TMCLKL	S
14-Sep-21	NE LANTAU	2	16.76	AUTUMN	STANDARD36826	TMCLKL	P
14-Sep-21	NE LANTAU	2	9.34	AUTUMN	STANDARD36826	TMCLKL	S
14-Sep-21	NE LANTAU	3	0.40	AUTUMN	STANDARD36826	TMCLKL	S
21-Sep-21	NW LANTAU	2	25.33	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-21	NW LANTAU	2	10.67	AUTUMN	STANDARD36826	TMCLKL	S
21-Sep-21	NE LANTAU	2	13.40	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-21	NE LANTAU	3	5.60	AUTUMN	STANDARD36826	TMCLKL	P
21-Sep-21	NE LANTAU	2	6.10	AUTUMN	STANDARD36826	TMCLKL	S
21-Sep-21	NE LANTAU	3	4.20	AUTUMN	STANDARD36826	TMCLKL	S
7-Oct-21	NW LANTAU	3	25.70	AUTUMN	STANDARD138716	TMCLKL	P
7-Oct-21	NW LANTAU	3	10.20	AUTUMN	STANDARD138716	TMCLKL	S
7-Oct-21	NE LANTAU	2	7.50	AUTUMN	STANDARD138716	TMCLKL	P
7-Oct-21	NE LANTAU	3	11.60	AUTUMN	STANDARD138716	TMCLKL	P
7-Oct-21	NE LANTAU	2	2.80	AUTUMN	STANDARD138716	TMCLKL	S
7-Oct-21	NE LANTAU	3	6.50	AUTUMN	STANDARD138716	TMCLKL	S
19-Oct-21	NW LANTAU	2	24.98	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-21	NW LANTAU	3	10.76	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-21	NW LANTAU	2	10.36	AUTUMN	STANDARD36826	TMCLKL	S
19-Oct-21	NW LANTAU	3	3.70	AUTUMN	STANDARD36826	TMCLKL	S
19-Oct-21	NE LANTAU	2	16.49	AUTUMN	STANDARD36826	TMCLKL	P
19-Oct-21	NE LANTAU	2	10.71	AUTUMN	STANDARD36826	TMCLKL	S
26-Oct-21	NW LANTAU	2	12.60	AUTUMN	STANDARD36826	TMCLKL	P
26-Oct-21	NW LANTAU	3	14.65	AUTUMN	STANDARD36826	TMCLKL	P
26-Oct-21	NW LANTAU	2	6.90	AUTUMN	STANDARD36826	TMCLKL	S
26-Oct-21	NW LANTAU	3	2.15	AUTUMN	STANDARD36826	TMCLKL	S
26-Oct-21	NE LANTAU	2	19.60	AUTUMN	STANDARD36826	TMCLKL	P
26-Oct-21	NE LANTAU	2	10.90	AUTUMN	STANDARD36826	TMCLKL	S
27-Oct-21	NW LANTAU	2	31.21	AUTUMN	STANDARD36826	TMCLKL	P
27-Oct-21	NW LANTAU	3	4.09	AUTUMN	STANDARD36826	TMCLKL	P
27-Oct-21	NW LANTAU	2	13.10	AUTUMN	STANDARD36826	TMCLKL	S
27-Oct-21	NE LANTAU	2	15.95	AUTUMN	STANDARD36826	TMCLKL	P
27-Oct-21	NE LANTAU	2	9.85	AUTUMN	STANDARD36826	TMCLKL	S
1-Nov-21	NW LANTAU	2	30.50	AUTUMN	STANDARD138716	TMCLKL	P
1-Nov-21	NW LANTAU	3	4.60	AUTUMN	STANDARD138716	TMCLKL	P
1-Nov-21	NW LANTAU	2	11.40	AUTUMN	STANDARD138716	TMCLKL	S
1-Nov-21	NW LANTAU	3	2.40	AUTUMN	STANDARD138716	TMCLKL	S
1-Nov-21	NE LANTAU	2	8.53	AUTUMN	STANDARD138716	TMCLKL	P
1-Nov-21	NE LANTAU	3	8.07	AUTUMN	STANDARD138716	TMCLKL	P
1-Nov-21	NE LANTAU	2	8.81	AUTUMN	STANDARD138716	TMCLKL	S
1-Nov-21	NE LANTAU	3	1.39	AUTUMN	STANDARD138716	TMCLKL	S
9-Nov-21	NW LANTAU	2	15.50	AUTUMN	STANDARD36826	TMCLKL	P
9-Nov-21	NW LANTAU	3	12.36	AUTUMN	STANDARD36826	TMCLKL	P
9-Nov-21	NW LANTAU	2	7.50	AUTUMN	STANDARD36826	TMCLKL	S
9-Nov-21	NW LANTAU	3	1.94	AUTUMN	STANDARD36826	TMCLKL	S
9-Nov-21	NE LANTAU	2	17.85	AUTUMN	STANDARD36826	TMCLKL	P
9-Nov-21	NE LANTAU	3	1.40	AUTUMN	STANDARD36826	TMCLKL	P

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
9-Nov-21	NE LANTAU	2	10.45	AUTUMN	STANDARD36826	TMCLKL	S
16-Nov-21	NW LANTAU	2	11.17	AUTUMN	STANDARD36826	TMCLKL	P
16-Nov-21	NW LANTAU	3	25.75	AUTUMN	STANDARD36826	TMCLKL	P
16-Nov-21	NW LANTAU	2	6.00	AUTUMN	STANDARD36826	TMCLKL	S
16-Nov-21	NW LANTAU	3	7.00	AUTUMN	STANDARD36826	TMCLKL	S
16-Nov-21	NE LANTAU	2	12.07	AUTUMN	STANDARD36826	TMCLKL	P
16-Nov-21	NE LANTAU	3	2.30	AUTUMN	STANDARD36826	TMCLKL	P
16-Nov-21	NE LANTAU	2	12.13	AUTUMN	STANDARD36826	TMCLKL	S
17-Nov-21	NW LANTAU	2	22.62	AUTUMN	STANDARD138716	TMCLKL	P
17-Nov-21	NW LANTAU	3	1.93	AUTUMN	STANDARD138716	TMCLKL	P
17-Nov-21	NW LANTAU	2	10.85	AUTUMN	STANDARD138716	TMCLKL	S
17-Nov-21	NE LANTAU	1	4.20	AUTUMN	STANDARD138716	TMCLKL	P
17-Nov-21	NE LANTAU	2	15.37	AUTUMN	STANDARD138716	TMCLKL	P
17-Nov-21	NE LANTAU	1	1.80	AUTUMN	STANDARD138716	TMCLKL	S
17-Nov-21	NE LANTAU	2	8.33	AUTUMN	STANDARD138716	TMCLKL	S
2-Dec-21	NW LANTAU	2	16.61	WINTER	STANDARD138716	TMCLKL	P
2-Dec-21	NW LANTAU	3	19.19	WINTER	STANDARD138716	TMCLKL	P
2-Dec-21	NW LANTAU	2	8.40	WINTER	STANDARD138716	TMCLKL	S
2-Dec-21	NW LANTAU	3	5.10	WINTER	STANDARD138716	TMCLKL	S
2-Dec-21	NE LANTAU	2	15.98	WINTER	STANDARD138716	TMCLKL	P
2-Dec-21	NE LANTAU	2	10.62	WINTER	STANDARD138716	TMCLKL	S
3-Dec-21	NW LANTAU	2	2.60	WINTER	STANDARD138716	TMCLKL	P
3-Dec-21	NW LANTAU	3	24.09	WINTER	STANDARD138716	TMCLKL	P
3-Dec-21	NW LANTAU	2	2.70	WINTER	STANDARD138716	TMCLKL	S
3-Dec-21	NW LANTAU	3	8.21	WINTER	STANDARD138716	TMCLKL	S
3-Dec-21	NE LANTAU	2	17.85	WINTER	STANDARD138716	TMCLKL	P
3-Dec-21	NE LANTAU	3	1.50	WINTER	STANDARD138716	TMCLKL	P
3-Dec-21	NE LANTAU	2	7.55	WINTER	STANDARD138716	TMCLKL	S
3-Dec-21	NE LANTAU	3	2.40	WINTER	STANDARD138716	TMCLKL	S
14-Dec-21	NW LANTAU	2	16.31	WINTER	STANDARD36826	TMCLKL	P
14-Dec-21	NW LANTAU	3	10.60	WINTER	STANDARD36826	TMCLKL	P
14-Dec-21	NW LANTAU	2	6.99	WINTER	STANDARD36826	TMCLKL	S
14-Dec-21	NW LANTAU	3	2.00	WINTER	STANDARD36826	TMCLKL	S
14-Dec-21	NE LANTAU	2	14.67	WINTER	STANDARD36826	TMCLKL	P
14-Dec-21	NE LANTAU	3	4.10	WINTER	STANDARD36826	TMCLKL	P
14-Dec-21	NE LANTAU	2	4.23	WINTER	STANDARD36826	TMCLKL	S
14-Dec-21	NE LANTAU	3	6.10	WINTER	STANDARD36826	TMCLKL	S
15-Dec-21	NW LANTAU	2	34.20	WINTER	STANDARD138716	TMCLKL	P
15-Dec-21	NW LANTAU	2	14.30	WINTER	STANDARD138716	TMCLKL	S
15-Dec-21	NE LANTAU	2	16.72	WINTER	STANDARD138716	TMCLKL	P
15-Dec-21	NE LANTAU	2	9.98	WINTER	STANDARD138716	TMCLKL	S
3-Jan-22	NW LANTAU	1	3.14	WINTER	STANDARD36826	TMCLKL	P
3-Jan-22	NW LANTAU	2	21.72	WINTER	STANDARD36826	TMCLKL	P
3-Jan-22	NW LANTAU	2	11.14	WINTER	STANDARD36826	TMCLKL	S
3-Jan-22	NE LANTAU	2	14.45	WINTER	STANDARD36826	TMCLKL	P
3-Jan-22	NE LANTAU	3	4.81	WINTER	STANDARD36826	TMCLKL	P
3-Jan-22	NE LANTAU	2	10.34	WINTER	STANDARD36826	TMCLKL	S
4-Jan-22	NW LANTAU	2	20.76	WINTER	STANDARD36826	TMCLKL	P
4-Jan-22	NW LANTAU	3	14.76	WINTER	STANDARD36826	TMCLKL	P
4-Jan-22	NW LANTAU	2	6.94	WINTER	STANDARD36826	TMCLKL	S
4-Jan-22	NW LANTAU	3	6.70	WINTER	STANDARD36826	TMCLKL	S
4-Jan-22	NE LANTAU	2	9.20	WINTER	STANDARD36826	TMCLKL	P
4-Jan-22	NE LANTAU	3	7.30	WINTER	STANDARD36826	TMCLKL	P
4-Jan-22	NE LANTAU	2	6.53	WINTER	STANDARD36826	TMCLKL	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
4-Jan-22	NE LANTAU	3	3.47	WINTER	STANDARD36826	TMCLKL	S
21-Jan-22	NW LANTAU	2	17.36	WINTER	STANDARD36826	TMCLKL	P
21-Jan-22	NW LANTAU	3	9.05	WINTER	STANDARD36826	TMCLKL	P
21-Jan-22	NW LANTAU	2	10.49	WINTER	STANDARD36826	TMCLKL	S
21-Jan-22	NE LANTAU	2	14.56	WINTER	STANDARD36826	TMCLKL	P
21-Jan-22	NE LANTAU	3	4.79	WINTER	STANDARD36826	TMCLKL	P
21-Jan-22	NE LANTAU	2	10.75	WINTER	STANDARD36826	TMCLKL	S
25-Jan-22	NW LANTAU	2	28.02	WINTER	STANDARD36826	TMCLKL	P
25-Jan-22	NW LANTAU	3	7.68	WINTER	STANDARD36826	TMCLKL	P
25-Jan-22	NW LANTAU	2	13.80	WINTER	STANDARD36826	TMCLKL	S
25-Jan-22	NE LANTAU	1	6.55	WINTER	STANDARD36826	TMCLKL	P
25-Jan-22	NE LANTAU	2	8.92	WINTER	STANDARD36826	TMCLKL	P
25-Jan-22	NE LANTAU	1	5.59	WINTER	STANDARD36826	TMCLKL	S
25-Jan-22	NE LANTAU	2	4.24	WINTER	STANDARD36826	TMCLKL	S
10-Feb-22	NW LANTAU	2	21.03	WINTER	STANDARD36826	TMCLKL	P
10-Feb-22	NW LANTAU	3	5.70	WINTER	STANDARD36826	TMCLKL	P
10-Feb-22	NW LANTAU	2	7.32	WINTER	STANDARD36826	TMCLKL	S
10-Feb-22	NW LANTAU	3	1.55	WINTER	STANDARD36826	TMCLKL	S
10-Feb-22	NE LANTAU	2	18.50	WINTER	STANDARD36826	TMCLKL	P
10-Feb-22	NE LANTAU	2	10.40	WINTER	STANDARD36826	TMCLKL	S
11-Feb-22	NW LANTAU	2	10.84	WINTER	STANDARD36826	TMCLKL	P
11-Feb-22	NW LANTAU	3	24.96	WINTER	STANDARD36826	TMCLKL	P
11-Feb-22	NW LANTAU	2	11.10	WINTER	STANDARD36826	TMCLKL	S
11-Feb-22	NW LANTAU	3	2.60	WINTER	STANDARD36826	TMCLKL	S
11-Feb-22	NE LANTAU	2	16.21	WINTER	STANDARD36826	TMCLKL	P
11-Feb-22	NE LANTAU	2	9.39	WINTER	STANDARD36826	TMCLKL	S
24-Feb-22	NW LANTAU	2	18.70	WINTER	STANDARD36826	TMCLKL	P
24-Feb-22	NW LANTAU	3	16.54	WINTER	STANDARD36826	TMCLKL	P
24-Feb-22	NW LANTAU	2	8.70	WINTER	STANDARD36826	TMCLKL	S
24-Feb-22	NW LANTAU	3	5.16	WINTER	STANDARD36826	TMCLKL	S
24-Feb-22	NE LANTAU	2	7.92	WINTER	STANDARD36826	TMCLKL	P
24-Feb-22	NE LANTAU	3	7.07	WINTER	STANDARD36826	TMCLKL	P
24-Feb-22	NE LANTAU	2	8.90	WINTER	STANDARD36826	TMCLKL	S
24-Feb-22	NE LANTAU	3	1.11	WINTER	STANDARD36826	TMCLKL	S
25-Feb-22	NW LANTAU	2	16.14	WINTER	STANDARD36826	TMCLKL	P
25-Feb-22	NW LANTAU	3	9.58	WINTER	STANDARD36826	TMCLKL	P
25-Feb-22	NW LANTAU	2	7.22	WINTER	STANDARD36826	TMCLKL	S
25-Feb-22	NW LANTAU	3	3.36	WINTER	STANDARD36826	TMCLKL	S
25-Feb-22	NE LANTAU	2	17.97	WINTER	STANDARD36826	TMCLKL	P
25-Feb-22	NE LANTAU	3	1.00	WINTER	STANDARD36826	TMCLKL	P
25-Feb-22	NE LANTAU	2	7.73	WINTER	STANDARD36826	TMCLKL	S
25-Feb-22	NE LANTAU	3	2.60	WINTER	STANDARD36826	TMCLKL	S
8-Mar-22	NW LANTAU	2	20.79	SPRING	STANDARD36826	TMCLKL	P
8-Mar-22	NW LANTAU	3	5.50	SPRING	STANDARD36826	TMCLKL	P
8-Mar-22	NW LANTAU	2	9.11	SPRING	STANDARD36826	TMCLKL	S
8-Mar-22	NE LANTAU	2	7.98	SPRING	STANDARD36826	TMCLKL	P
8-Mar-22	NE LANTAU	3	10.90	SPRING	STANDARD36826	TMCLKL	P
8-Mar-22	NE LANTAU	2	4.22	SPRING	STANDARD36826	TMCLKL	S
8-Mar-22	NE LANTAU	3	6.40	SPRING	STANDARD36826	TMCLKL	S
11-Mar-22	NW LANTAU	2	28.90	SPRING	STANDARD36826	TMCLKL	P
11-Mar-22	NW LANTAU	3	6.30	SPRING	STANDARD36826	TMCLKL	P
11-Mar-22	NW LANTAU	2	8.90	SPRING	STANDARD36826	TMCLKL	S
11-Mar-22	NW LANTAU	3	4.60	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-Mar-22	NE LANTAU	2	16.52	SPRING	STANDARD36826	TMCLKL	P
11-Mar-22	NE LANTAU	2	9.08	SPRING	STANDARD36826	TMCLKL	S
14-Mar-22	NW LANTAU	2	26.50	SPRING	STANDARD36826	TMCLKL	P
14-Mar-22	NW LANTAU	2	9.50	SPRING	STANDARD36826	TMCLKL	S
14-Mar-22	NE LANTAU	2	18.38	SPRING	STANDARD36826	TMCLKL	P
14-Mar-22	NE LANTAU	2	10.92	SPRING	STANDARD36826	TMCLKL	S
15-Mar-22	NW LANTAU	2	34.30	SPRING	STANDARD36826	TMCLKL	P
15-Mar-22	NW LANTAU	3	1.30	SPRING	STANDARD36826	TMCLKL	P
15-Mar-22	NW LANTAU	2	13.00	SPRING	STANDARD36826	TMCLKL	S
15-Mar-22	NE LANTAU	2	15.31	SPRING	STANDARD36826	TMCLKL	P
15-Mar-22	NE LANTAU	2	9.89	SPRING	STANDARD36826	TMCLKL	S
12-Apr-22	NW LANTAU	2	36.20	SPRING	STANDARD36826	TMCLKL	P
12-Apr-22	NW LANTAU	2	13.10	SPRING	STANDARD36826	TMCLKL	S
12-Apr-22	NE LANTAU	2	13.65	SPRING	STANDARD36826	TMCLKL	P
12-Apr-22	NE LANTAU	3	1.50	SPRING	STANDARD36826	TMCLKL	P
12-Apr-22	NE LANTAU	2	9.95	SPRING	STANDARD36826	TMCLKL	S
13-Apr-22	NW LANTAU	2	26.55	SPRING	STANDARD36826	TMCLKL	P
13-Apr-22	NW LANTAU	2	10.25	SPRING	STANDARD36826	TMCLKL	S
13-Apr-22	NE LANTAU	2	19.84	SPRING	STANDARD36826	TMCLKL	P
13-Apr-22	NE LANTAU	2	9.46	SPRING	STANDARD36826	TMCLKL	S
21-Apr-22	NW LANTAU	2	36.80	SPRING	STANDARD36826	TMCLKL	P
21-Apr-22	NW LANTAU	2	11.60	SPRING	STANDARD36826	TMCLKL	S
21-Apr-22	NE LANTAU	2	16.33	SPRING	STANDARD36826	TMCLKL	P
21-Apr-22	NE LANTAU	2	9.07	SPRING	STANDARD36826	TMCLKL	S
25-Apr-22	NW LANTAU	2	22.55	SPRING	STANDARD36826	TMCLKL	P
25-Apr-22	NW LANTAU	3	2.90	SPRING	STANDARD36826	TMCLKL	P
25-Apr-22	NW LANTAU	2	6.63	SPRING	STANDARD36826	TMCLKL	S
25-Apr-22	NW LANTAU	3	3.82	SPRING	STANDARD36826	TMCLKL	S
25-Apr-22	NE LANTAU	2	14.73	SPRING	STANDARD36826	TMCLKL	P
25-Apr-22	NE LANTAU	3	3.58	SPRING	STANDARD36826	TMCLKL	P
25-Apr-22	NE LANTAU	2	9.66	SPRING	STANDARD36826	TMCLKL	S
25-Apr-22	NE LANTAU	3	0.43	SPRING	STANDARD36826	TMCLKL	S
3-May-22	NW LANTAU	2	18.19	SPRING	STANDARD36826	TMCLKL	P
3-May-22	NW LANTAU	3	8.05	SPRING	STANDARD36826	TMCLKL	P
3-May-22	NW LANTAU	2	8.96	SPRING	STANDARD36826	TMCLKL	S
3-May-22	NW LANTAU	3	1.30	SPRING	STANDARD36826	TMCLKL	S
3-May-22	NE LANTAU	2	18.33	SPRING	STANDARD36826	TMCLKL	P
3-May-22	NE LANTAU	2	10.67	SPRING	STANDARD36826	TMCLKL	S
5-May-22	NW LANTAU	2	22.38	SPRING	STANDARD140232	TMCLKL	P
5-May-22	NW LANTAU	3	13.82	SPRING	STANDARD140232	TMCLKL	P
5-May-22	NW LANTAU	2	8.60	SPRING	STANDARD140232	TMCLKL	S
5-May-22	NW LANTAU	3	5.10	SPRING	STANDARD140232	TMCLKL	S
5-May-22	NE LANTAU	2	6.01	SPRING	STANDARD140232	TMCLKL	P
5-May-22	NE LANTAU	3	9.43	SPRING	STANDARD140232	TMCLKL	P
5-May-22	NE LANTAU	2	7.06	SPRING	STANDARD140232	TMCLKL	S
5-May-22	NE LANTAU	3	2.70	SPRING	STANDARD140232	TMCLKL	S
17-May-22	NW LANTAU	2	20.06	SPRING	STANDARD138716	TMCLKL	P
17-May-22	NW LANTAU	3	6.73	SPRING	STANDARD138716	TMCLKL	P
17-May-22	NW LANTAU	2	7.30	SPRING	STANDARD138716	TMCLKL	S
17-May-22	NW LANTAU	3	2.51	SPRING	STANDARD138716	TMCLKL	S
17-May-22	NE LANTAU	2	15.98	SPRING	STANDARD138716	TMCLKL	P
17-May-22	NE LANTAU	3	2.78	SPRING	STANDARD138716	TMCLKL	P
17-May-22	NE LANTAU	2	10.09	SPRING	STANDARD138716	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
17-May-22	NE LANTAU	3	1.05	SPRING	STANDARD138716	TMCLKL	S
19-May-22	NW LANTAU	1	5.80	SPRING	STANDARD138716	TMCLKL	P
19-May-22	NW LANTAU	2	26.30	SPRING	STANDARD138716	TMCLKL	P
19-May-22	NW LANTAU	3	3.21	SPRING	STANDARD138716	TMCLKL	P
19-May-22	NW LANTAU	2	13.90	SPRING	STANDARD138716	TMCLKL	S
19-May-22	NE LANTAU	2	14.41	SPRING	STANDARD138716	TMCLKL	P
19-May-22	NE LANTAU	3	1.50	SPRING	STANDARD138716	TMCLKL	P
19-May-22	NE LANTAU	2	8.08	SPRING	STANDARD138716	TMCLKL	S
19-May-22	NE LANTAU	3	1.11	SPRING	STANDARD138716	TMCLKL	S

Appendix II. TMCLKL Chinese White Dolphin Sighting Database (June 2021 - May 2022)

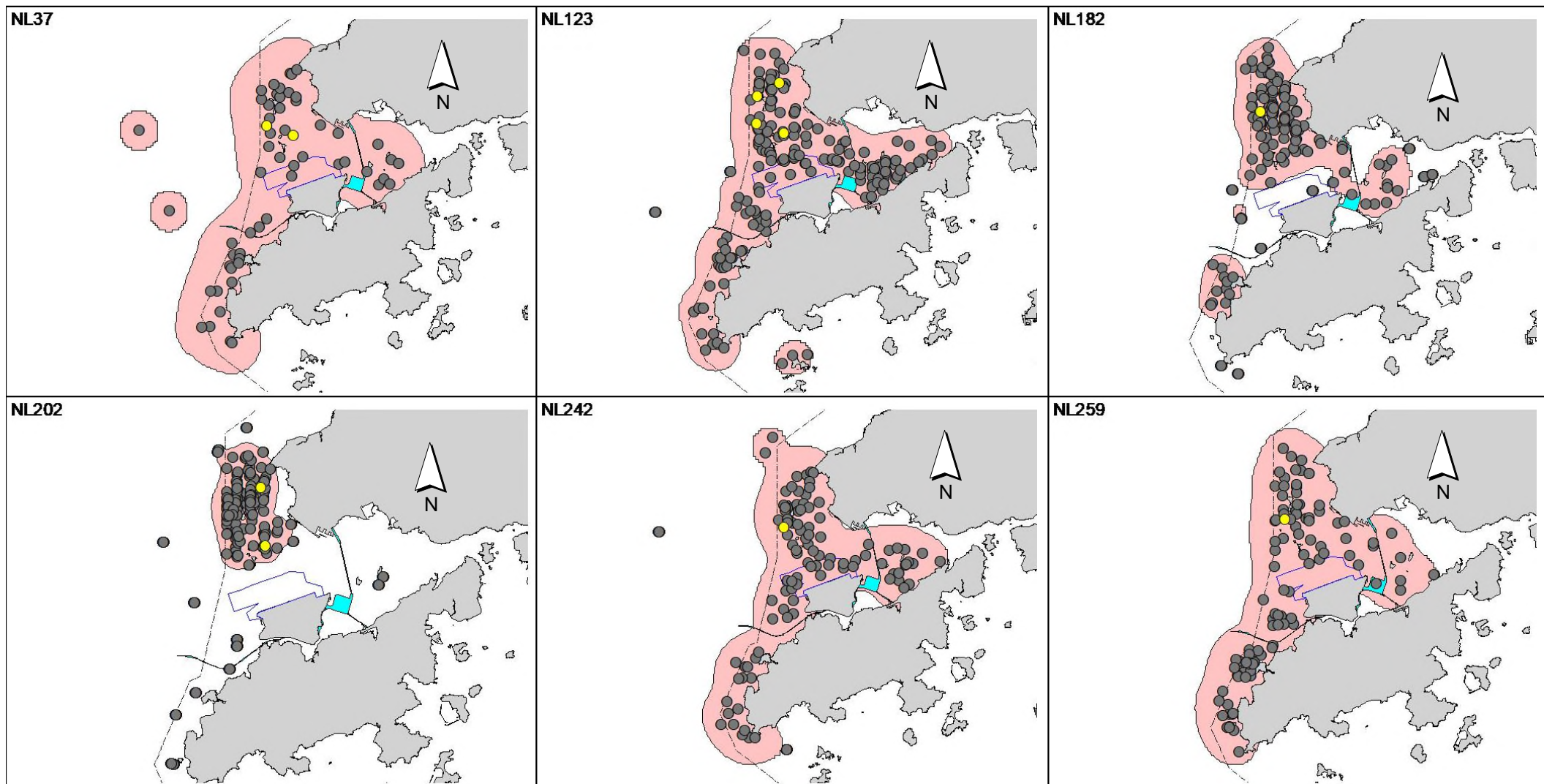
(Abbreviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
13-Sep-21	1	1053	1	NW LANTAU	2	3	ON	TMCLKL	827184	805396	AUTUMN	NONE	P
16-Nov-21	1	1023	1	NW LANTAU	2	238	ON	TMCLKL	817297	804676	AUTUMN	NONE	P
17-Nov-21	1	1125	3	NW LANTAU	2	152	ON	TMCLKL	828000	807231	AUTUMN	NONE	P
3-Jan-22	1	1104	1	NW LANTAU	2	142	ON	TMCLKL	826896	805262	WINTER	NONE	S
3-Jan-22	2	1116	2	NW LANTAU	2	392	ON	TMCLKL	827559	806169	WINTER	NONE	P
4-Jan-22	1	1020	2	NW LANTAU	2	28	ON	TMCLKL	815381	804682	WINTER	NONE	P
4-Jan-22	2	1205	4	NW LANTAU	2	1394	ON	TMCLKL	824649	805165	WINTER	NONE	S
21-Jan-22	1	1048	1	NW LANTAU	3	99	ON	TMCLKL	825047	805464	WINTER	NONE	P
10-Feb-22	1	1141	6	NW LANTAU	2	106	ON	TMCLKL	823813	807542	WINTER	NONE	P
24-Feb-22	1	1106	1	NW LANTAU	2	125	ON	TMCLKL	827629	804615	WINTER	NONE	P
25-Feb-22	1	1113	1	NW LANTAU	2	132	ON	TMCLKL	829288	805462	WINTER	NONE	P

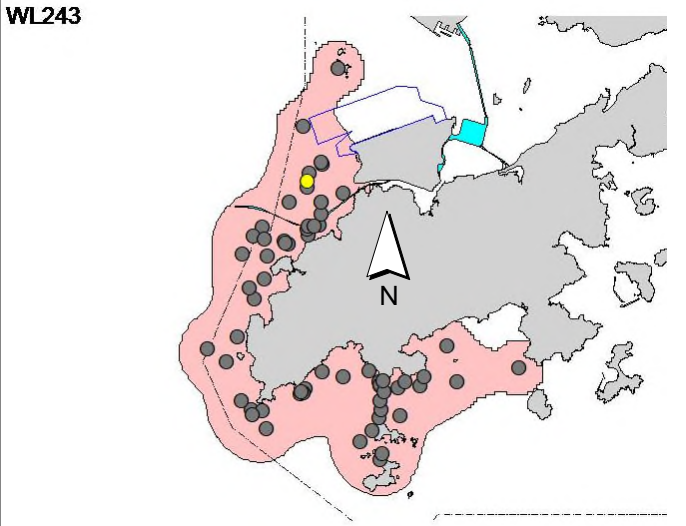
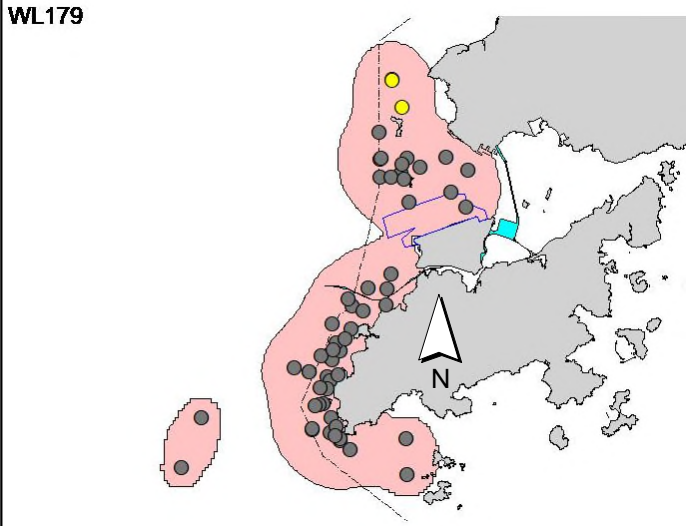
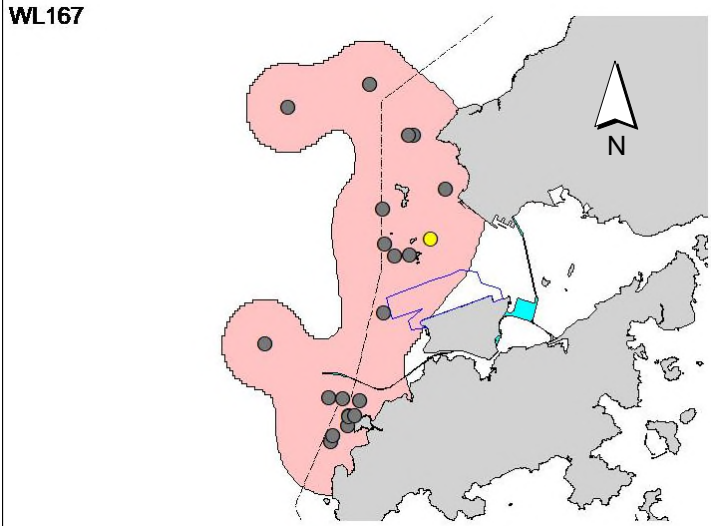
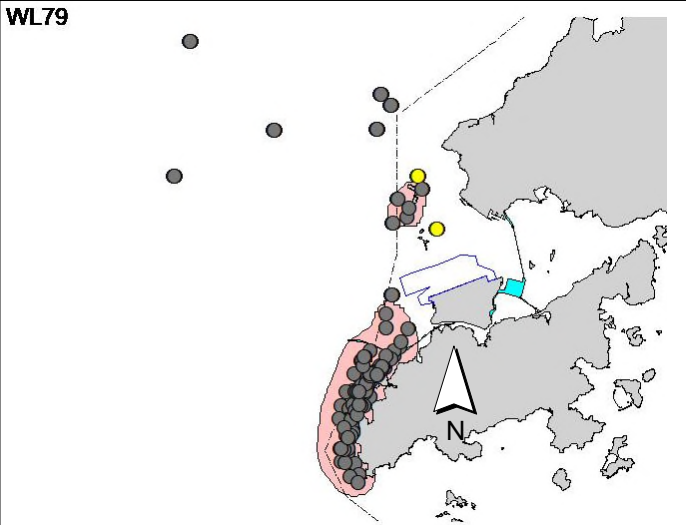
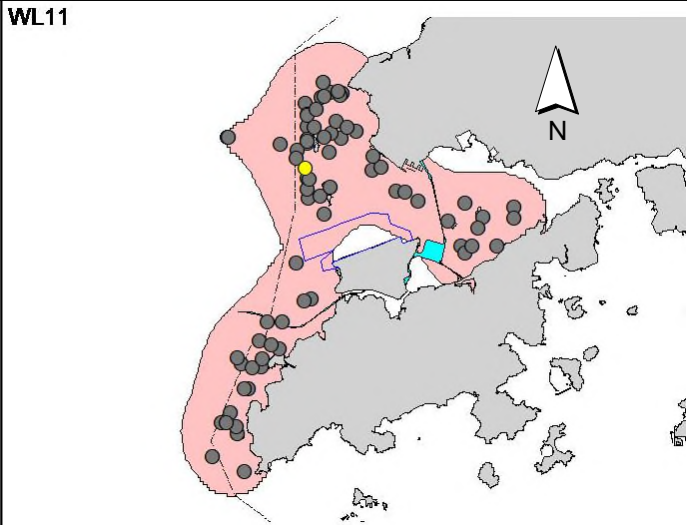
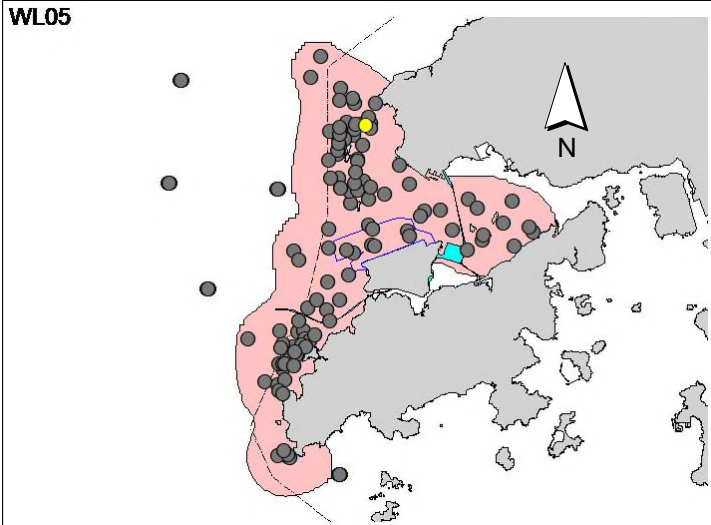
Appendix III. Individual dolphins identified during TMCLKL monitoring surveys conducted from June 2021 to May 2022

ID#	DATE	STG#	AREA
NL37	04/01/22	2	NW LANTAU
	10/02/22	1	NW LANTAU
NL123	17/11/21	1	NW LANTAU
	03/01/22	1	NW LANTAU
	04/01/22	2	NW LANTAU
	10/02/22	1	NW LANTAU
NL182	13/09/21	1	NW LANTAU
NL202	17/11/21	1	NW LANTAU
	10/02/22	1	NW LANTAU
NL242	04/01/22	2	NW LANTAU
NL259	21/01/22	1	NW LANTAU
WL05	17/11/21	1	NW LANTAU
WL11	04/01/22	2	NW LANTAU
WL79	03/01/22	2	NW LANTAU
	10/02/22	1	NW LANTAU
WL167	10/02/22	1	NW LANTAU
WL179	03/01/22	2	NW LANTAU
	25/02/22	1	NW LANTAU
WL243	16/11/21	1	NW LANTAU
WL254	10/02/22	1	NW LANTAU
WL294	04/01/22	1	NW LANTAU

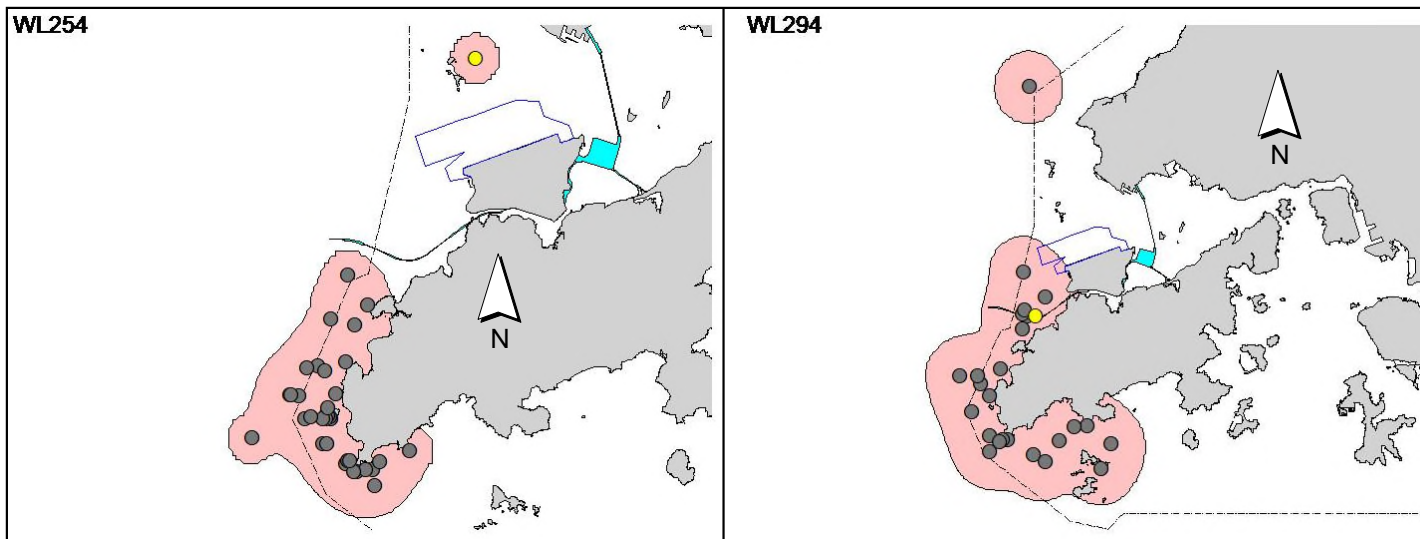
Appendix IV. Ranging patterns (95% kernel ranges) of 14 individual dolphins that were sighted during the first year of TMCLKL post-construction period, utilizing the TMCLKL08 monitoring data collected in 2021-22 (note: yellow dots indicates sightings made in June 2021 to May 2022)



Appendix IV. (cont'd)



Appendix IV. (cont'd)



Appendix D

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

Table D1 *Cumulative Statistics on Exceedances*

Monitoring Parameters	Action/Limit Level	Total No. recorded since Contract commencement
Post Construction (Operational) Dolphin Monitoring	Action Limit	0 8

Table D2 *Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions*

Reporting Period	Cumulative Statistics		
	Complaints	Notifications of Summons	Successful Prosecutions
Total No. received since Contract commencement	0	0	0