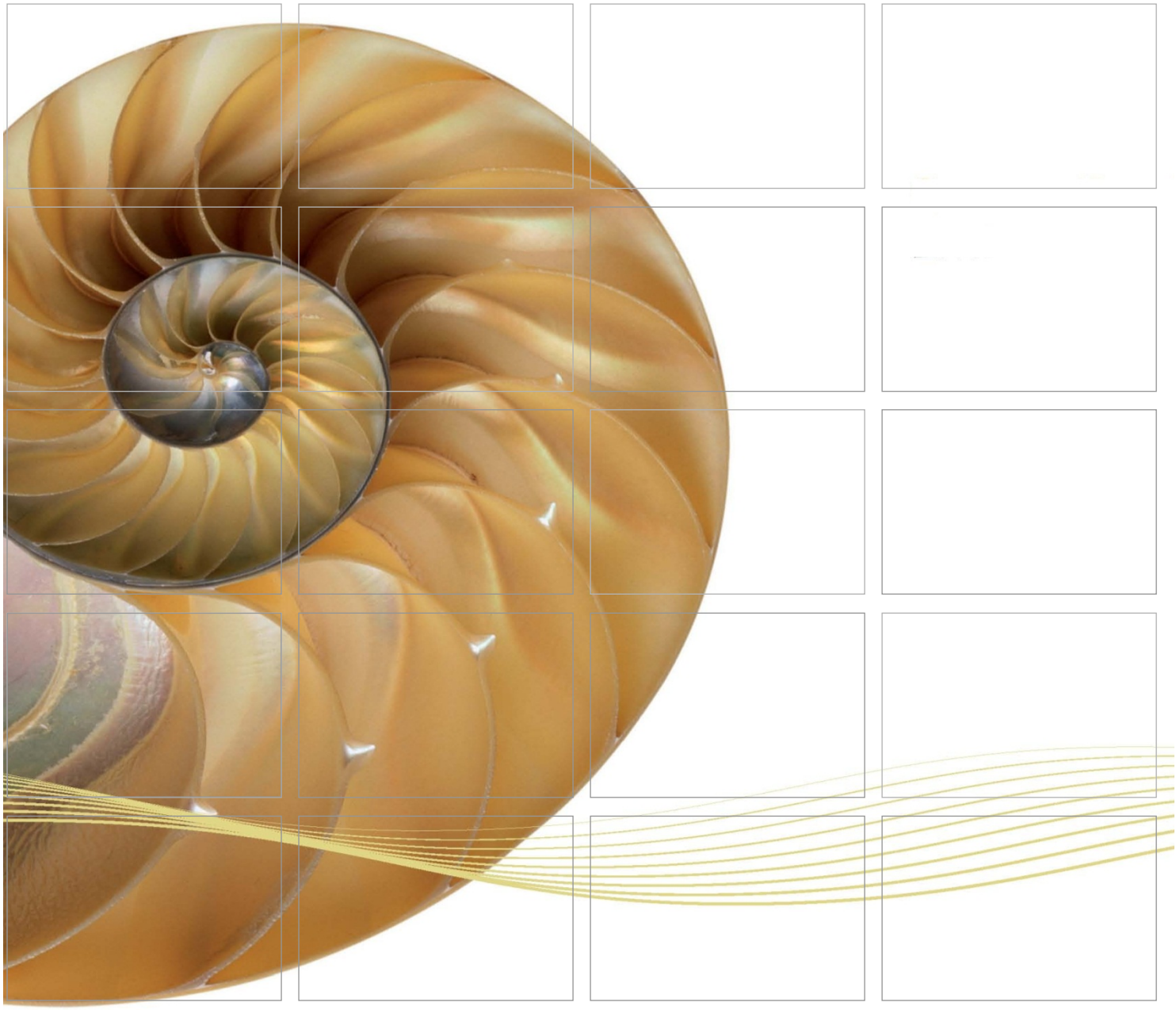
Report



Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section

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

26 May 2017

Environmental Resources Management
16/F, Berkshire House
25 Westlands Road
Quarry Bay, Hong Kong
Telephone 2271 3000
Facsimile 2723 5660

www.erm.com

ERM

The business of sustainability

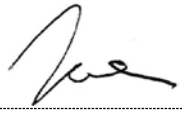
Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section

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

Environmental Resources Management

16/F, Berkshire House
25 Westlands Road
Quarry Bay, Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 2723 5660
E-mail: post.hk@erm.com
http://www.erm.com

Document Code:
0215660_3rd annual EM&A_20170526.docx

Client:	Project No:
Gammon	0215660
Summary: This document presents the Third Annual EM&A Report for Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section.	Date: 26 May 2017 Approved by:  *Mr Craig Reid* *Partner* Certified by:  *Mr Jovy Tam* *ET Leader*

Revision	Description	By	Checked	Approved	Date
	3rd Annual EM&A Report	MM	JT	CAR	26/05/17

Distribution

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☒ Public

☐ Confidential

RAMBOLL ENVIRON

Ref.: HYDHZMBEEM00_0_5449L.17 07 June 2017

AECOM By Fax (3691 2899) and By Post
Supervising Officer's Representative's Office
780 Cheung Tung Road, Lantau, N.T.

Attention: Mr. Daniel Ip

Dear Mr. Ip,

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

Contract No. HY/2012/07 TM-CLKL Southern Connection Viaduct Section
Third Annual EM&A Report (November 2015 – October 2016)

Reference is made to the Third Annual Environmental Monitoring and Audit (EM&A) Report (Nov. 2015 – Oct. 2016) (ET's ref.: 0215660_3rd annual EM&A_20170526.docx dated 26 May 2017) certified by the ET Leader and provided to us via e-mail on 7 June 2017.

Please be advised that we have no further comment on the captioned Annual EM&A Report at this stage. However, as mentioned in our verification letters for the first and second annual reports (Ref. No. HYDHZMBEEM00_04105L.16 dated 25 April 2016 and HYDHZMBEEM00_0_4358L.16 dated 14 July 2017), we would like to draw your attention that the ET shall supplement the Report with respect to the following observation:

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

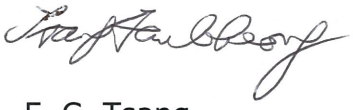
Thank you for your attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y. H. Hui should you have any queries.

Q:\Projects\HYDHZMBEEM00\02_Proj_Mgt\02_Corr\2017\HYDHZMBEEM00_0_5449L.17.docx

Ramboll Environ Hong Kong Limited 英環香港有限公司
21/F, BEA Harbour View Centre, 56 Gloucester Road, Wan Chai, Hong Kong Tel: 852.3465 2888 Fax: 852.3465 2899
www.Ramboll-Environ.com

RAMBOLL ENVIRON

Yours sincerely,



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

c.c. HyD – Mr. Stephen Chan (By Fax: 3188 6614)
HyD – Mr. Vico Cheung (By Fax: 3188 6614)
AECOM – Mr. Conrad Ng (By Fax: 3922 9797)
ERM – Mr. Jovy Tam (By Fax: 2723 5660)
Gammon – Mr. Roy Leung (By Fax: 3520 0486)

Internal: DY, YH, PSC, ENPO Site

Ramboll Environ Hong Kong Limited 英環香港有限公司
21/F, BEA Harbour View Centre, 56 Gloucester Road, Wan Chai, Hong Kong Tel: 852.3465 2888 Fax: 852.3465 2899
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EXECUTIVE SUMMARY

Under *Contract No. HY/2012/07*, Gammon Construction Limited (GCL) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Southern Connection Viaduct Section of the Tuen Mun – Chek Lap Kok Link Project (TM-CLK Link Project) while AECOM Asia Company Limited was appointed by HyD as the Supervising Officer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET). Ramboll Environ Hong Kong Ltd. was employed by the HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) in accordance with *Environmental Permit No. EP-354/2009/A*. Further applications for variation of environmental permit (VEP), *EP-354/2009/B*, *EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

The southern landfall of TM-CLK Link lies alongside the Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) where a reclamation area is constructed by *Contract No. HY/2010/02* under *Environmental Permit No. EP-353/2009/K* and *EP-354/2009/D*. Upon the agreement and confirmation between the Supervising Officer Representatives and Contractors of *HY/2010/02* and *HY/2012/07* in September 2015, part of the reclamation area for southern landfall under *EP-353/2009/K* and *EP-354/2009/D* was handed-over to *Contract No. HY/2012/07*. Another part of the southern landfall area under *EP-354/2009/D* was handed-over to *Contract No. HY/2012/07* after completion of reclamation works by *Contract No. HY/2010/02* in June 2016.

The construction phase of the Contract commenced on 31 October 2013 and will be tentatively completed by 2018. The impact monitoring of the EM&A programme, including air quality, noise, water quality and marine ecological monitoring as well as environmental site inspections, commenced on 31 October 2013.

This is the Third Annual EM&A Report presenting the EM&A works carried out during the period from 1 November 2015 to 31 October 2016 for the Southern Connection Viaduct Section in accordance with the Updated EM&A Manual of the TM-CLK Link Project. As informed by the Contractor, major activities in the reporting period included:

Marine-based Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation;

- Installation of deck segment and pier head segment; and
- Construction of marine section of berth at Southern Landfall.

Land-based Works

- Construction and installation of pile caps;
- Pier construction;
- Re-alignment of Cheung Tung Road;
- Predrilling at Viaduct F;
- Additional land ground investigation (GI), trial pits and laboratory testing;
- Installation of pier head and deck segments;
- Slope work of Viaducts A, B & C;
- Construction of land section of berth at Southern Landfall;
- Relocation of MTRC fence; and
- Road works along North Lantau Highway

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

24-hour TSP monitoring	68 sessions at ASR8A
	68 sessions at ASR9
1-hour TSP monitoring	68 sessions at ASR8A
	68 sessions at ASR9
Noise monitoring	68 sessions at NSR1A
Water quality monitoring	153 sessions
Dolphin monitoring	24 sessions
Joint Environmental site inspection	52 sessions

Breaches of Action and Limit Levels for Air Quality

No exceedance of Action and Limit Levels was recorded for 1-hour or 24-hour monitoring in the reporting period.

Breaches of Action and Limit Levels for Noise

No exceedance of Action and Limit Levels was recorded for construction noise monitoring in the reporting period.

Breaches of Action and Limit Levels for Water Quality

No exceedance of Action and Limit Levels was recorded for water quality monitoring in the reporting.

Impact Dolphin Monitoring

Two (2) Action Level and three (3) Limit Level exceedances for both NEL and NWL regions were recorded for four (4) sets of quarterly dolphin monitoring data between November 2015 and October 2016. No unacceptable impact from the construction activities of the TM-CLKL Southern Connection Viaduct Section on Indo-Pacific humpback dolphin *Sousa chinensis* (i.e. Chinese White Dolphin) was noticeable from general observations during the dolphin monitoring in this reporting period.

Daily marine mammal exclusion zone monitoring was undertaken during the period of marine works under this Contract. No Passive Acoustic Monitoring (PAM) was implemented as the marine piling works were not carried out outside the daylight hours in this reporting period. No sighting of the Chinese White Dolphin was recorded in the monitoring period during the exclusion zone monitoring.

Environmental Complaints, Non-compliance & Summons

There was one (1) complaint received from EPD on 22 September 2016 regarding effluent discharge from flat top barge in the reporting period. Upon investigation, there was no adequate evidence to conclude that the complaint case was related to this Project.

There was no notification of summons or successful prosecution recorded in the reporting period.

Reporting Change

There was no reporting change in this reporting period.

Future Key Issues

Potential environmental impacts arising from the upcoming construction activities in the coming annual period are mainly associated with air quality, noise, marine water quality, marine ecology and waste management issue.

1 INTRODUCTION

1.1 BACKGROUND

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

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

Under *Contract No. HY/2012/07*, Gammon Construction Limited (GCL) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Southern Connection Viaduct Section of TM-CLKL ("the Contract") while AECOM Asia Company Limited was appointed by HyD as the Supervising Officer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET). Ramboll Environ Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) in accordance with *Environmental Permit No. EP-354/2009/A*. Further applications for variation of environmental permit (VEP), *EP-354/2009/B*, *EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

The southern landfall of TM-CLK Link lies alongside the Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) where a reclamation area is constructed by *Contract No. HY/2010/02* under *Environmental Permit No. EP-353/2009/K* and *EP-354/2009/D*. Upon the agreement and confirmation between the Supervising Officer Representatives and Contractors of *HY/2010/02* and *HY/2012/07* in September 2015, part of the reclamation area for southern landfall under *EP-353/2009/K* and *EP-354/2009/D* was handed-over to *Contract No. HY/2012/07*. Another part of the southern landfall area under *EP-354/2009/D* was handed-over to *Contract*

No. HY/2012/07 after completion of reclamation works by *Contract No. HY/2010/02* in June 2016.

The construction phase of the Contract commenced on 31 October 2013 and will be tentatively be completed by 2018. The impact monitoring phase of the EM&A programme, including air quality, noise, water quality and marine ecological monitoring as well environmental site inspections, commenced on 31 October 2013.

The general layout plan of the Contract components is presented in *Figures 1.1 & 1.2a to l.*

1.2 SCOPE OF THIS REPORT

This is the Third Annual EM&A Report under the Contract No. *HY/2012/07 Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section*. This report presents a summary of the environmental monitoring and audit works from 1 November 2015 to 31 October 2016.

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
HyD (Highways Department)	Project Coordinator	Stanley Chan	2762 3406	3188 6614
	Senior Engineer	Steven Shum	2762 4133	3188 6614
SOR (AECOM Asia Company Limited)	Chief Resident Engineer	Daniel Ip	3553 3800	2492 2057
	Resident Engineer	Kingman Chan	3691 3950	3691 2899
ENPO / IEC (Ramboll Environ Hong Kong Ltd.)	ENPO Leader	Y.H. Hui	3465 2850	3465 2899
	IEC	Dr. F.C. Tsang	3465 2851	3465 2899
Contractor (Gammon Construction Limited)	Environmental Manager	Brian Kam	3520 0387	3520 0486
	Environmental Officer	Roy Leung	3520 0387	3520 0486
	24-hour Complaint Hotline		9738 4332	
ET (ERM-HK)	ET Leader	Jovy Tam	2271 3113	2723 5660

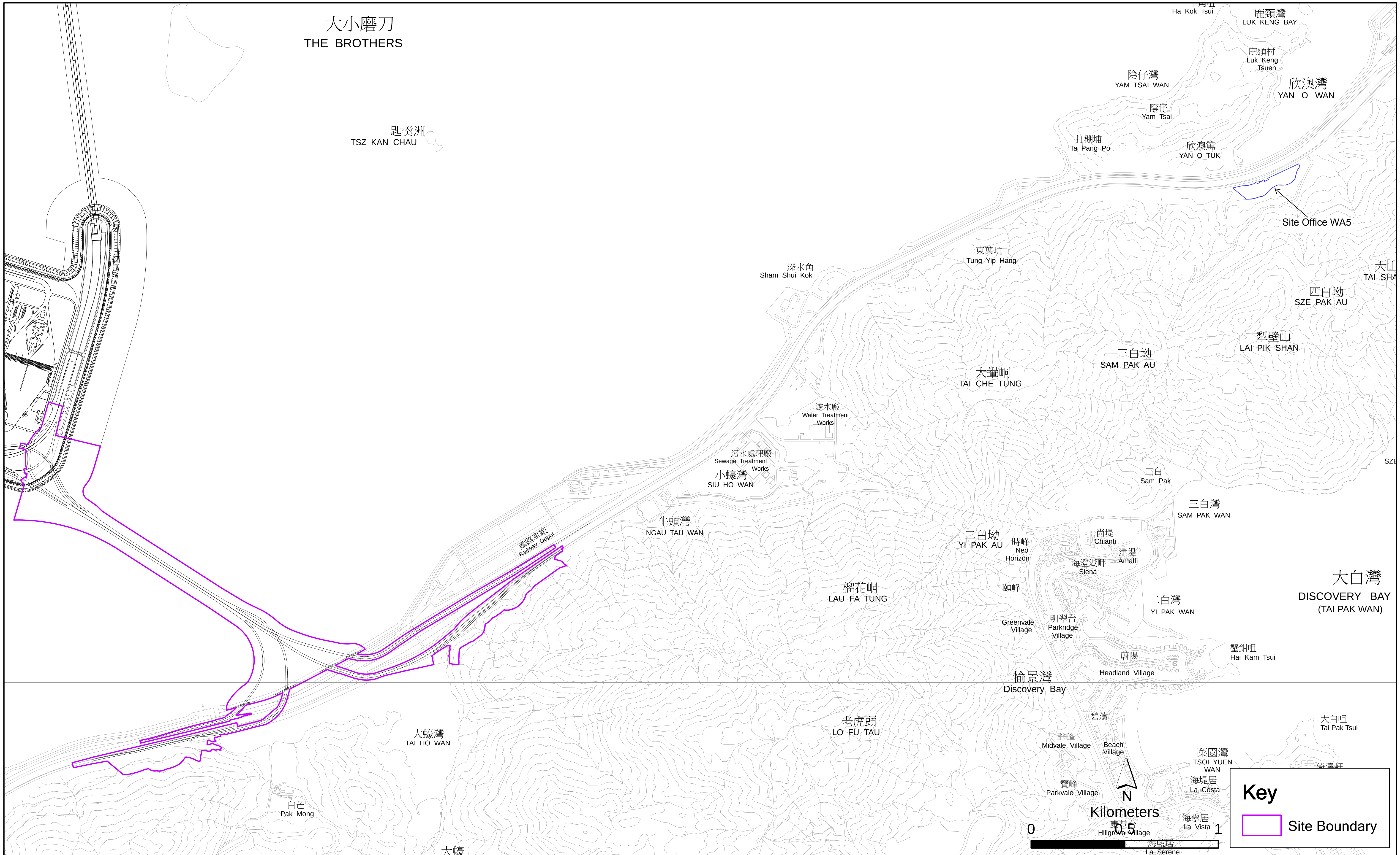

Figure 1.1

General Layout Plan of the Project

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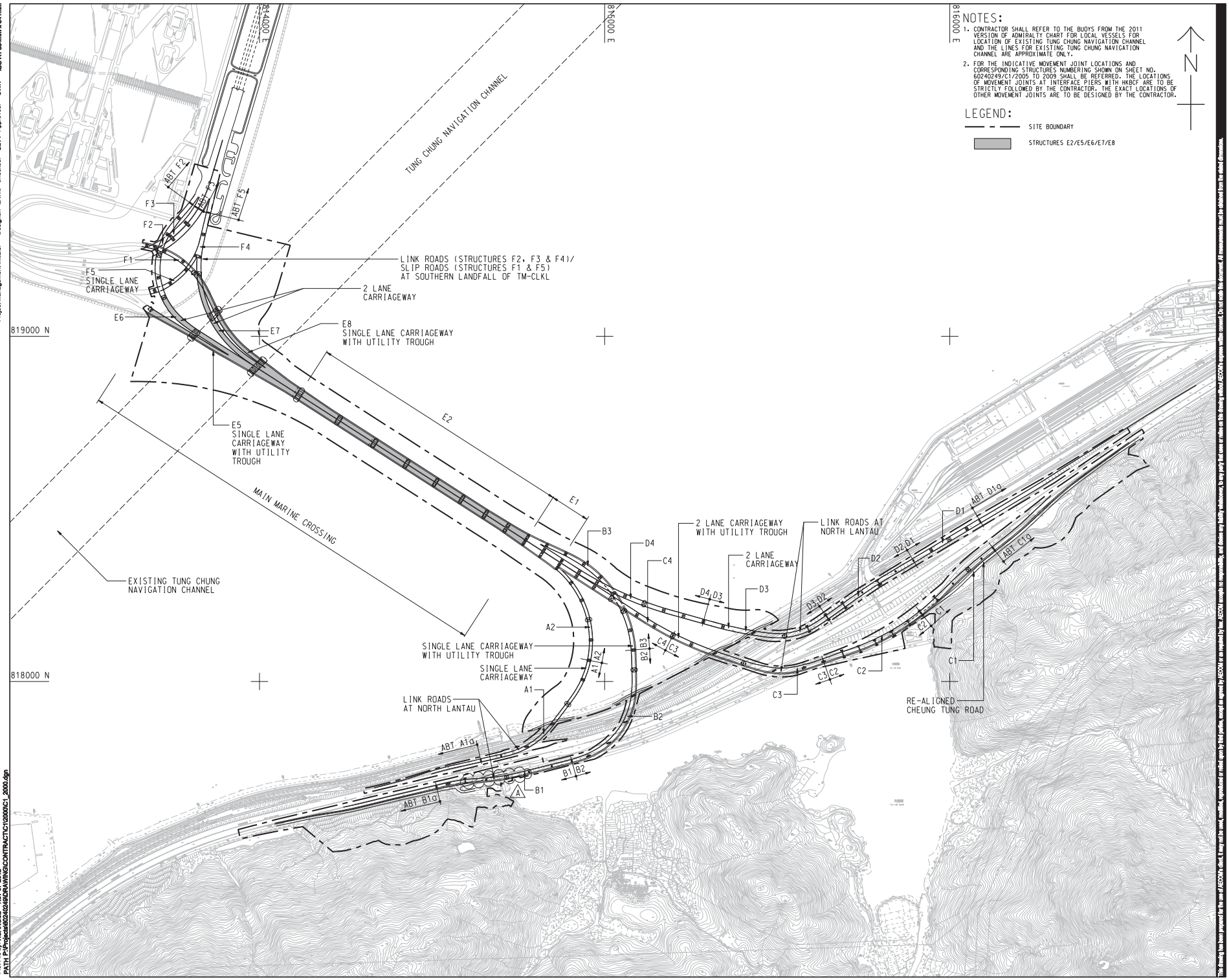
Environmental Resources Management

ERM



AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

CONTRACT TITLE
TUEN MUN - CHEK LAP KOK LINK - SOUTHERN CONNECTION VIADUCT SECTION

CLIENT
路政署 HIGHWAYS DEPARTMENT
港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

Figure 1.2a

ISSUE/REVISION

IR	DATE	DESCRIPTION	CHK.
A	NOV. 12	TENDER ADDENDUM NO. 1	CWN
-	OCT. 12	TENDER DRAWING	CWN

STATUS

SCALE: A1 1 : 5000
DIMENSION UNIT: METRES

KEY PLAN

PROJECT NO.: 60240249
CONTRACT NO.: HY/2012/07

SHEET TITLE
SOUTHERN CONNECTION GENERAL LAYOUT PLAN

SHEET NUMBER
60240249/C1/2000A

Project Management Initials: Designer: LKWB Checked: SLYY Approved: CWN ISO A1 594mm x 841mm CWN

Plot File by: HUANGC2 Nov-07-2012
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KEY PLAN

NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. J3518/P/OAP/04/1000 AND OTHER RELEVANT DRAWINGS.

LEGEND

- SITE BOUNDARY
- GF1 FAULT

EXISTING G.I.STATIONS :

- BOREHOLE BY GIU DATA EXCLUDING VC
- BOREHOLE BY GCL CONTRACT HY/2012/04
- BOREHOLE BY GCL CONTRACT NL8/97
- BOREHOLE BY GCL CONTRACT HY/2009/23
- TRIAL PIT BY GCL CONTRACT HY/2012/04
- SLOPE STRIPPING BY GCL CONTRACT HY/2012/04

PROPOSED G.I.STATIONS :

- PBH01 PROPOSED BOREHOLE
- TP01 PROPOSED TRIAL PIT
- CH01 PROPOSED COREHOLE
- SS01 SS02 PROPOSED SLOPE STRIPPING

MATCH LINE
FOR CONTINUATION
SEE DRG J3518/P/OAP/04/01101

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B	SUBMISSION	RC	07/13				
C	SUBMISSION	RC	09/13				

Drawn: RL — Date: 07/13
Checked: DS — Approved: DOP
Scale: 1:1000 @ A1 / 1:2000 @ A3

Client: 路政署 HIGHWAYS DEPARTMENT, Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

Project Title: Contract No. HY/2012/07
Tuen Mun - Chek Lap Kok Link
Southern Connection Viaduct Section

Drawing title: **Figure 1.2b**

Drawing no. J3518/P/OAP/04/01100 Rev. C

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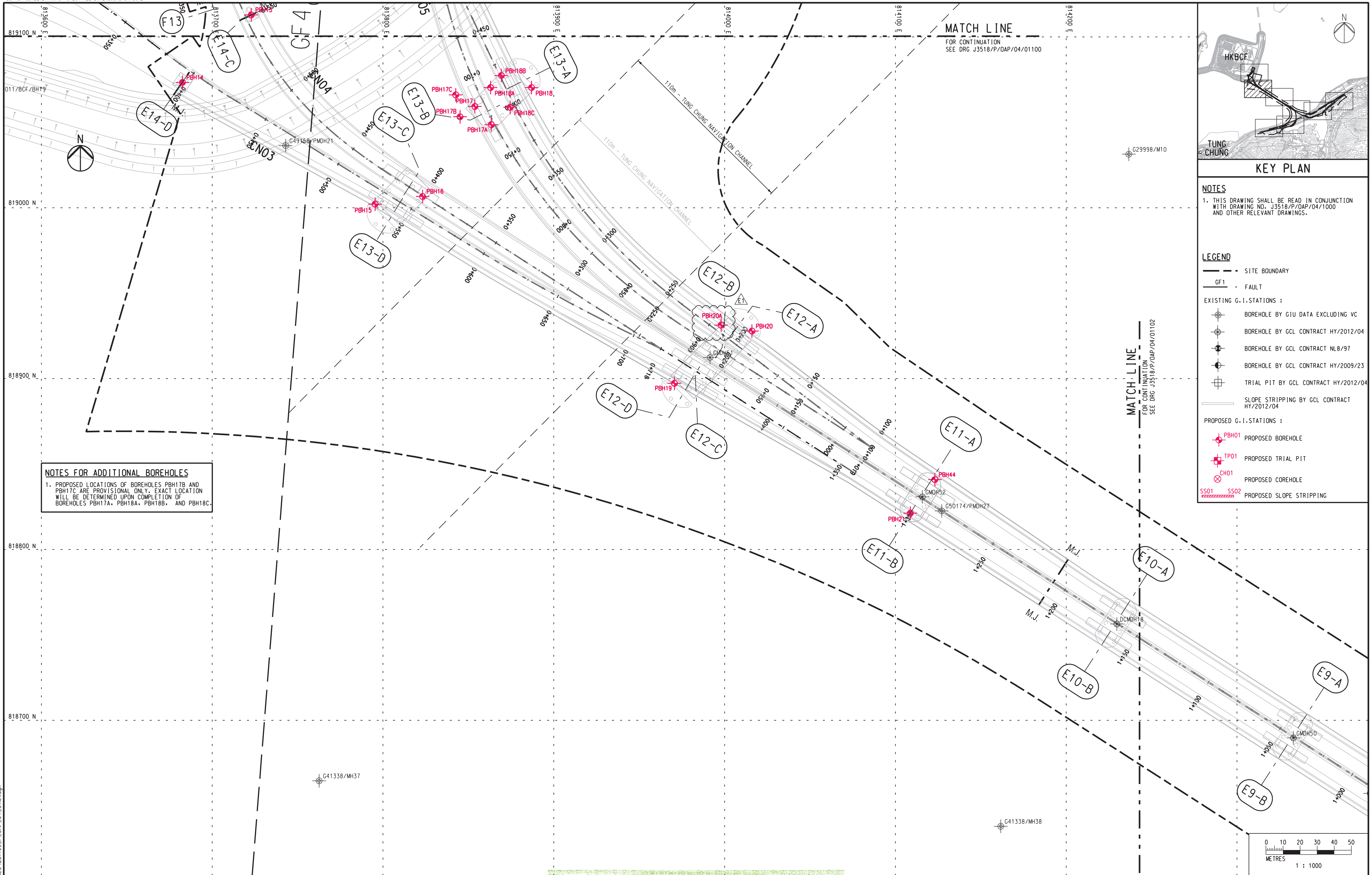

NOTES FOR ADDITIONAL BOREHOLES

1. PROPOSED LOCATIONS OF BOREHOLES PBH17B AND PBH17C ARE PROVISIONAL ONLY. EXACT LOCATION WILL BE DETERMINED UPON COMPLETION OF BOREHOLES PBH17A, PBH18A, PBH18B, AND PBH18C.

NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. J3518/P/OAP/04/1000 AND OTHER RELEVANT DRAWINGS.

LEGEND

- SITE BOUNDARY
- GF1 FAULT

EXISTING G.I.STATIONS :

- BOREHOLE BY GIU DATA EXCLUDING VC
- BOREHOLE BY GCL CONTRACT HY/2012/04
- BOREHOLE BY GCL CONTRACT NL8/97
- BOREHOLE BY GCL CONTRACT HY/2009/23
- TRIAL PIT BY GCL CONTRACT HY/2012/04
- SLOPE STRIPPING BY GCL CONTRACT HY/2012/04

PROPOSED G.I.STATIONS :

- PBH01 PROPOSED BOREHOLE
- TP01 PROPOSED TRIAL PIT
- CH01 PROPOSED COREHOLE
- SS01 SS02 PROPOSED SLOPE STRIPPING

Rev	Description	By	Date
A	SUBMISSION	RC	07/13
B	SUBMISSION	RC	07/13
C	SUBMISSION	RC	09/13
D	SUBMISSION	RC	10/13
E1	FOR INTERNAL REVIEW	RC	11/13

Drawn	Date	Checked	Approved	Scale
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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Project Title: Contract No. HY/2012/07
Tuen Mun - Chek Lap Kok Link
Southern Connection Viaduct Section

Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

Drawing title

Figure 1.2c

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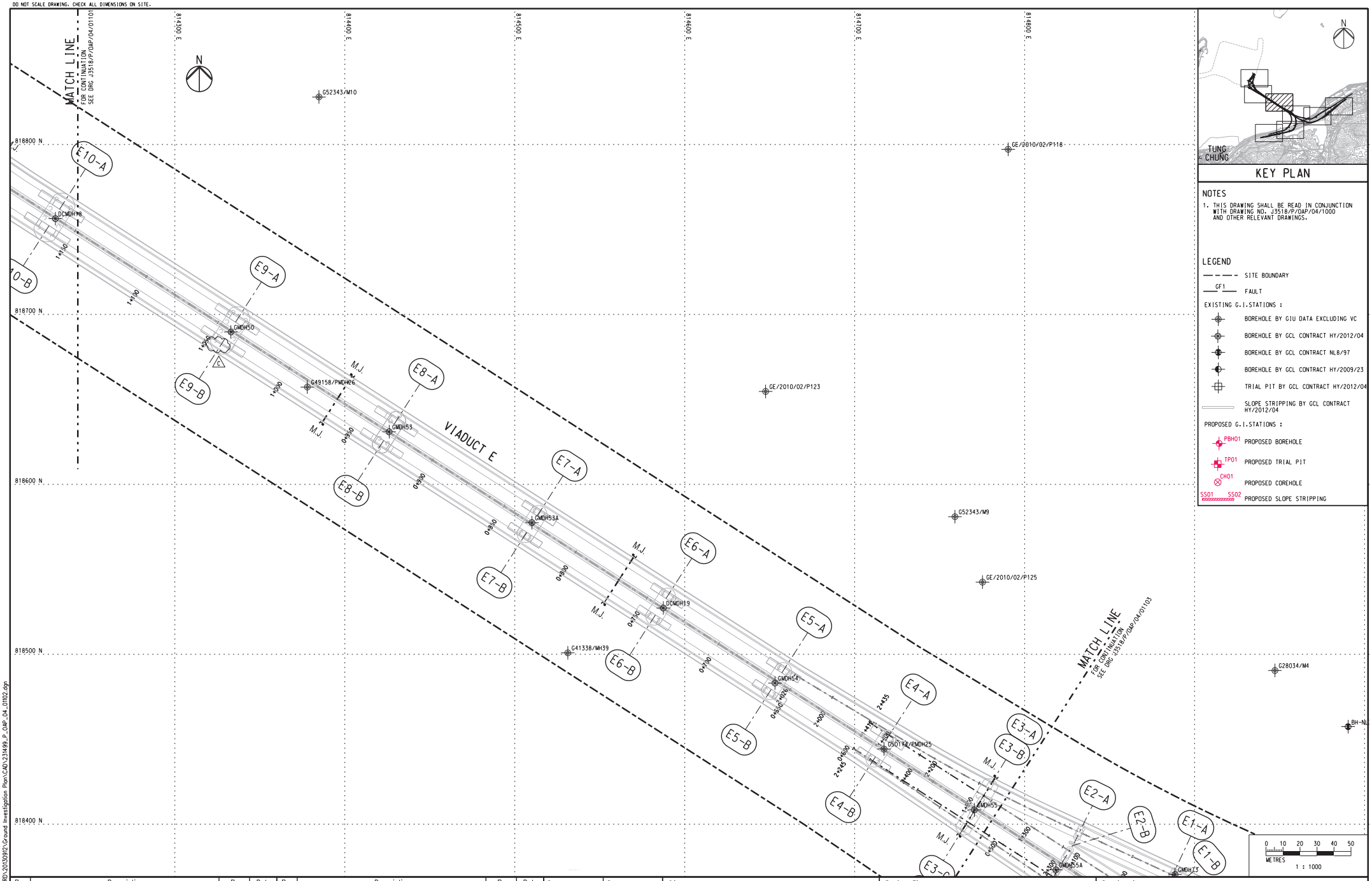

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C	SUBMISSION	RC	09/13				

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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office

Project Title: Contract No. HY/2012/07
Tuen Mun - Chek Lap Kok Link
Southern Connection Viaduct Section

Supervising Officer: AECOM
Contractor: Gammon
Originator: ARUP

Drawing title: **Figure 1.2d**

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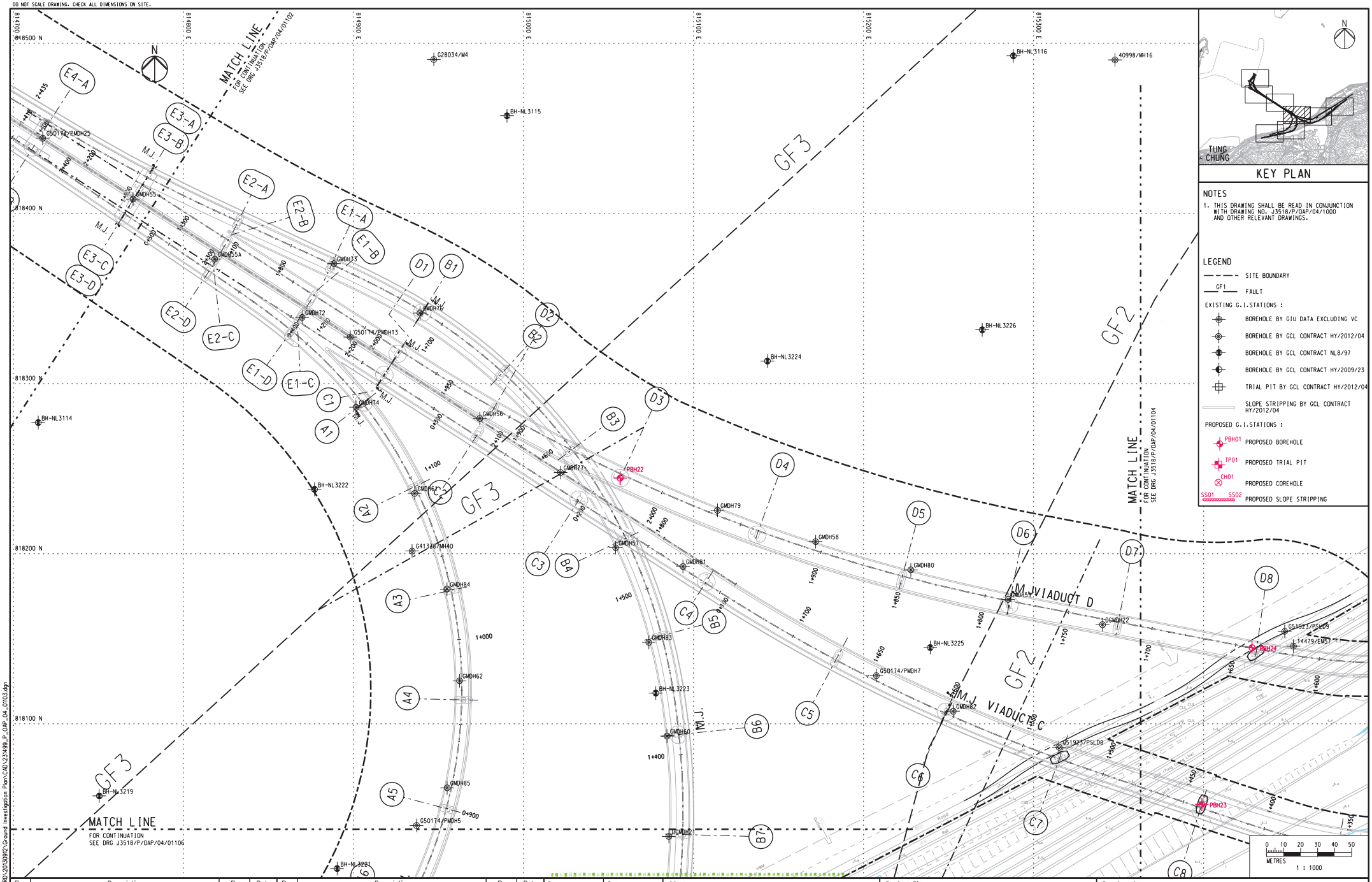

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B	SUBMISSION	RC	07/13				
C	SUBMISSION	RC	09/13				

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Checked: DS | Approved: DOP
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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Project Title: Contract No. HY/2012/07 Tuen Mun - Chek Lap Kok Link Southern Connection Viaduct Section

Supervising Officer: AECOM
Contractor: Gammon
Originator: ARUP

Drawing title: **Figure 1.2e**

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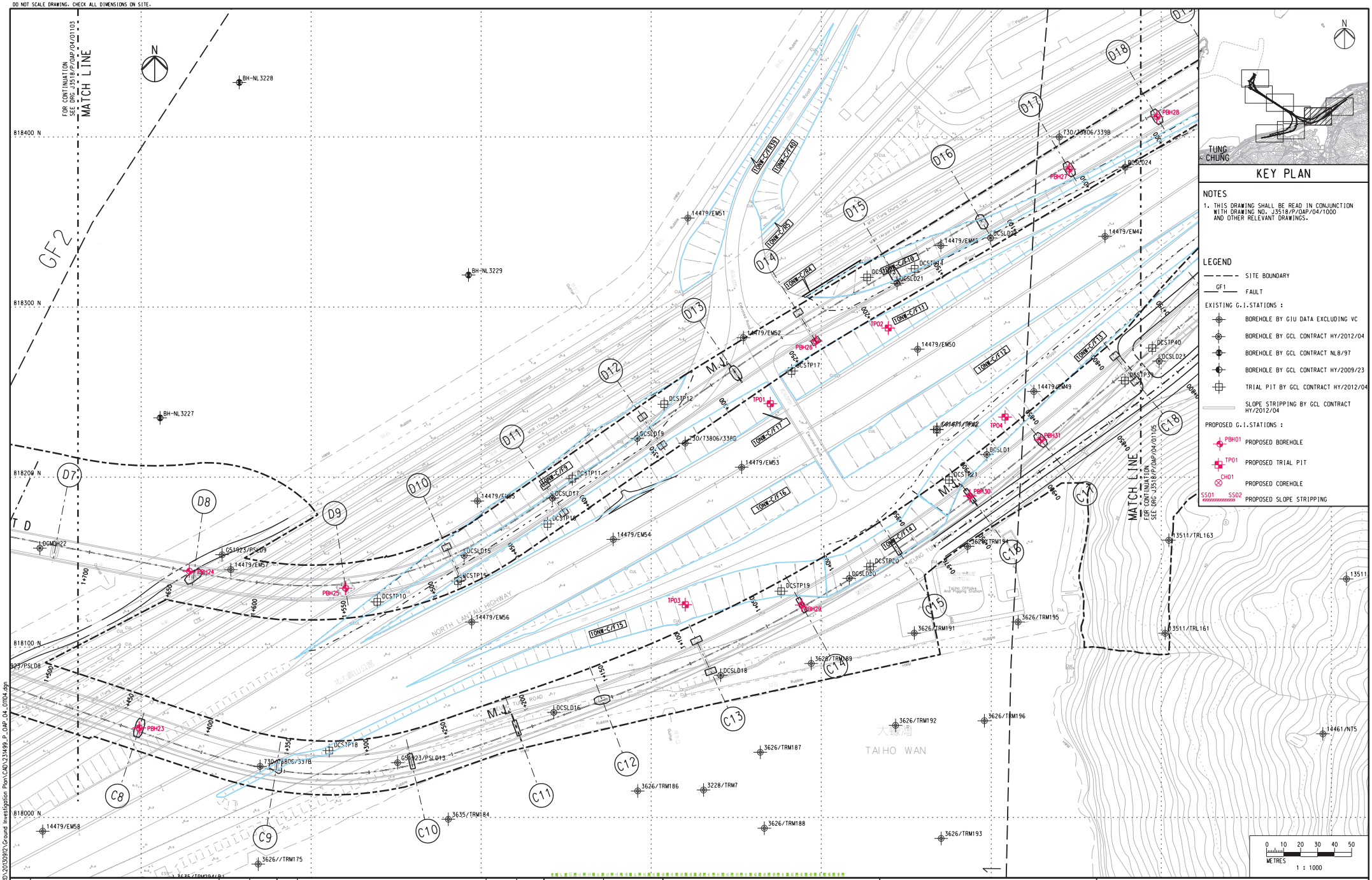

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B	SUBMISSION	RC	07/13				
C	SUBMISSION	RC	09/13				

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Checked	DS
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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Project Title: Contract No. HY/2012/07 Tuen Mun - Chek Lap Kok Link Southern Connection Viaduct Section

Supervising Officer: AECOM

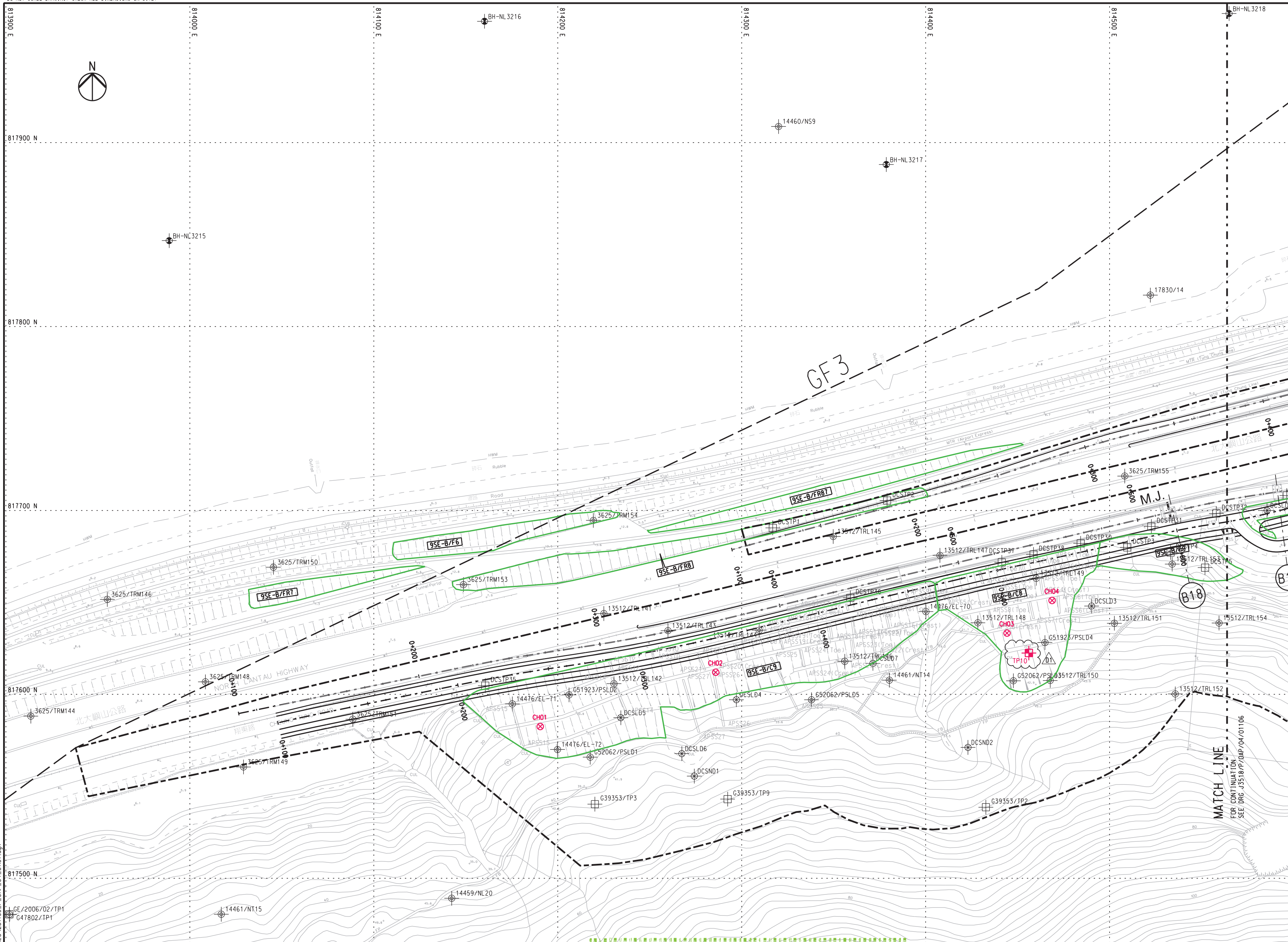
Contractor: Gammon

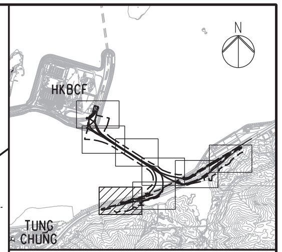
Originator: ARUP

Drawing title: **Figure 1.2f**

Drawing no. J3518/P/OAP/04/01104 Rev. C

DO NOT SCALE DRAWING. CHECK ALL DIMENSIONS ON SITE.





KEY PLAN

NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. J3518/P/OAP/04/1000 AND OTHER RELEVANT DRAWINGS.

LEGEND

- SITE BOUNDARY
- GF1 FAULT
- EXISTING G.I. STATIONS :
  - BOREHOLE BY GIU DATA EXCLUDING VC
  - BOREHOLE BY GCL CONTRACT HY/2012/04
  - BOREHOLE BY GCL CONTRACT NL8/97
  - BOREHOLE BY GCL CONTRACT HY/2009/23
  - TRIAL PIT BY GCL CONTRACT HY/2012/04
  - SLOPE STRIPPING BY GCL CONTRACT HY/2012/04
- PROPOSED G.I. STATIONS :
  - PBH01 PROPOSED BOREHOLE
  - TP01 PROPOSED TRIAL PIT
  - CH01 PROPOSED COREHOLE
  - SS01 SS02 PROPOSED SLOPE STRIPPING

0 10 20 30 40 50 METRES 1 : 1000

Rev	Description	By	Date	Rev	Description	By	Date
A	SUBMISSION	RC	07/13				
B	SUBMISSION	RC	07/13				
C	SUBMISSION	RC	09/13				
D1	FOR INTERNAL REVIEW	RC	11/13				

Drawn: RL | Date: 07/13
Checked: DS | Approved: DOP
Scale: 1:1000 @ A1 / 1:2000 @ A3

Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Project Title: Contract No. HY/2012/07 Tuen Mun - Chek Lap Kok Link Southern Connection Viaduct Section

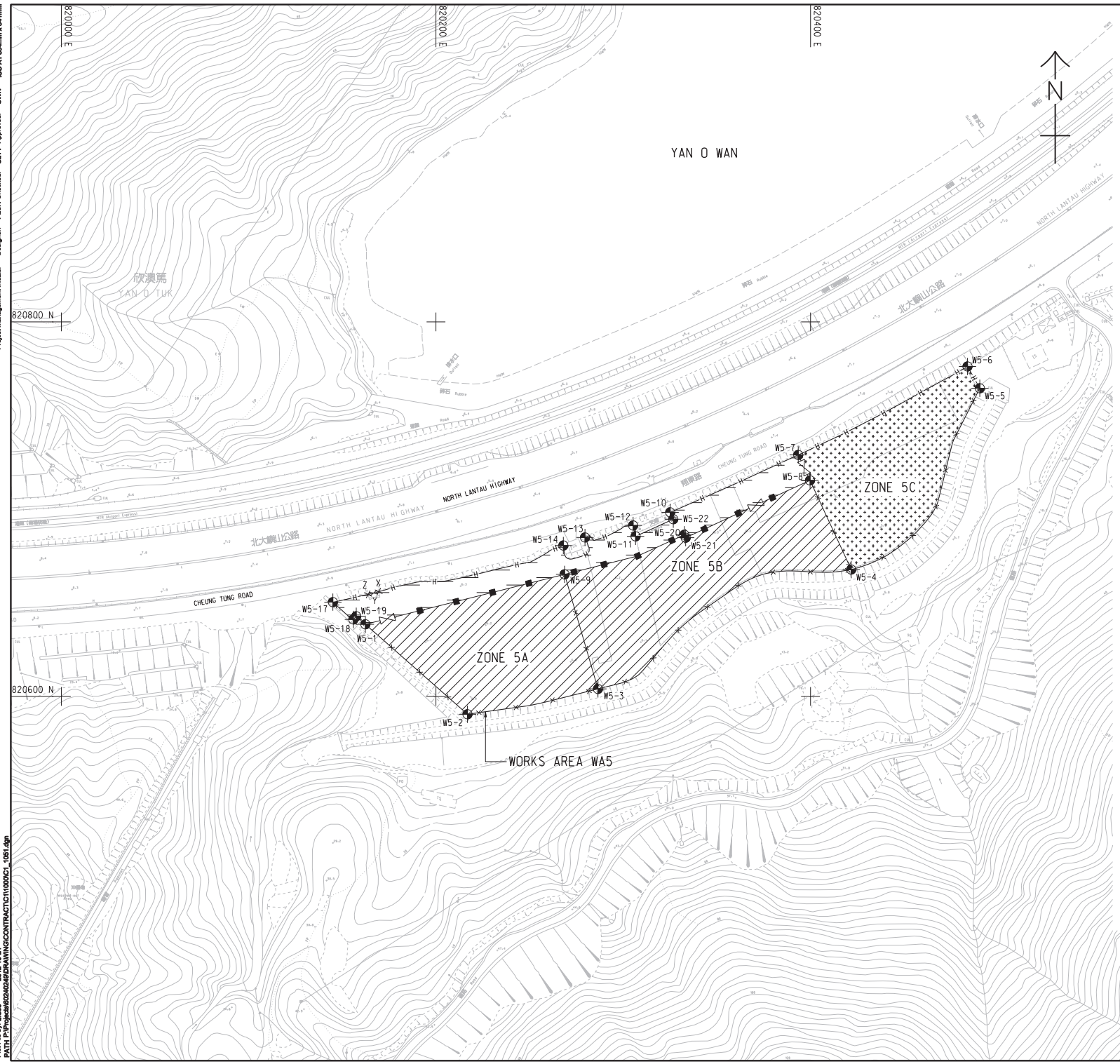
Supervising Officer: AECOM
Contractor: Gammon
Originator: ARUP

Drawing title

Figure 1.2g

Drawing no. J3518/P/OAP/04/01107 Rev. D1

Printed by : 07/11/2013
Filename : J:\231499\ARUP\GEO\231499_P_OAP_04_01107.dgn



NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE WORKS AREA KEY PLAN IN SHEET NO. 60240249/C1/1000.
2. THE SETTING OUT INFORMATION AND WORKS AREA CONDITIONS SHOWN IN THIS DRAWING ARE FOR REFERENCE ONLY. THE WORKS AREA BOUNDARY SHALL BE IN ACCORDANCE WITH THE ENGINEERING CONDITIONS FOR TEMPORARY GOVERNMENT LAND ALLOCATION NO. TIS 619. IN CASE OF DISCREPANCY BETWEEN THE BOUNDARY SHOWN ON THIS DRAWING AND THE BOUNDARY INDICATED ON THE ENGINEERING CONDITIONS, THE LATTER SHALL PREVAIL.
3. DEMARCATION OF THE WORKS AREA SHALL BE DETERMINED ON SITE.
4. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NOS. H6110 AND H6111 FOR DETAILS OF HOARDING.
5. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NOS. H6121 AND H6122 FOR DETAILS OF CHAIN LINK FENCE.
6. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NO. H6121 FOR DETAILS OF GATE.
7. CHAIN LINK FENCE SHALL BE ERECTED ALONG THE WORKS AREA BOUNDARY. THE ALIGNMENT AND EXTENT OF CHAIN LINK FENCE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
8. THE LOCATION AND WIDTH OF GATE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
9. NO STRUCTURES SHALL BE ERECTED OTHER THAN SUCH STRUCTURES NOT EXCEEDING TWO STOREYS IN HEIGHT, WHICH ARE APPROVED BY THE DISTRICT LANDS OFFICER AS BEING APPROPRIATE FOR THE USE OF THE SITE AS A WORKS AREA.
10. THE TENTATIVE OCCUPATION PERIOD SHALL BE REFERRED TO EMPLOYER'S REQUIREMENTS PART 2 AND PART 14 SECTION 1 CLAUSE 1.45A.
11. THE WORKS AREAS SHOWN ON THIS DRAWING ARE TO BE SHARE-USED AMONG THE CONTRACTS OF TM-CLKL RELATED CONTRACTS.THE AREAS HATCHED WITH ▨ ARE TENTATIVELY ALLOCATED FOR THE USE BY THIS CONTRACT.
12. THE COMMON AREA SHALL BE CONCRETE PAVED BY THE CONTRACTOR.

LEGEND:

- WORKS AREA UNDER THIS CONTRACT
- COMMON AREA (MAINTAINED UNDER THIS CONTRACT) TO BE SHARE-USED WITH OTHER CONTRACTS
- WORKS AREA FOR THIS CONTRACT TO BE EARLY HANDED OVER BY THE CONTRACTOR.
- H — HOARDING AND GATE (TO BE ERECTED AND MAINTAINED UNDER THIS CONTRACT)
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED BY OTHERS)
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED UNDER THIS CONTRACT)

SETTING OUT COORDINATES OF WORKS AREA WA5

POINT	COORDINATES	
	EASTING	NORTHING
W5-1	820162.308	820638.492
W5-2	820216.839	820590.455
W5-3	820286.496	820603.985
W5-4	820421.757	820667.742
W5-5	820490.425	820764.554
W5-6	820483.839	820776.180
W5-7	820393.451	820728.958
W5-8	820399.746	820715.343
W5-9	820268.674	820665.173
W5-10	820325.075	820698.276
W5-11	820306.587	820685.458
W5-12	820305.269	820691.287
W5-13	820279.580	820684.863
W5-14	820268.027	820680.572
X	820169.407	820655.859
Y	820166.601	820655.172
Z	820163.794	820654.484
W5-17	820144.957	820650.334
W5-18	820155.899	820641.093
W5-19	820157.432	820642.788
W5-20	820332.642	820686.314
W5-21	820333.350	820684.738
W5-22	820326.723	820694.608

AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

CONTRACT TITLE
TUEN MUN - CHEK LAP KOK LINK - SOUTHERN CONNECTION VIADUCT SECTION

CLIENT
HIGHWAYS DEPARTMENT
路政署
Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

ISSUE/REVISION

VR	DATE	DESCRIPTION	CHK.
-	OCT. 12	TENDER DRAWING	CWN

STATUS

SCALE: A1 1 : 1000
DIMENSION UNIT: METRES

KEY PLAN

Figure 1.2h

PROJECT NO.: 60240249
CONTRACT NO.: HY/2012/07

SHEET TITLE
WORKS AREA AND HOARDING PLAN

SHEET 1 OF 2

SHEET NUMBER
60240249/C1/1051

Project Management Initials: Designer: PLCK Checked: SLYY Approved: CWN ISO A1 594mm x 841mm

Plot File by: LIUJ3 2012-10-24
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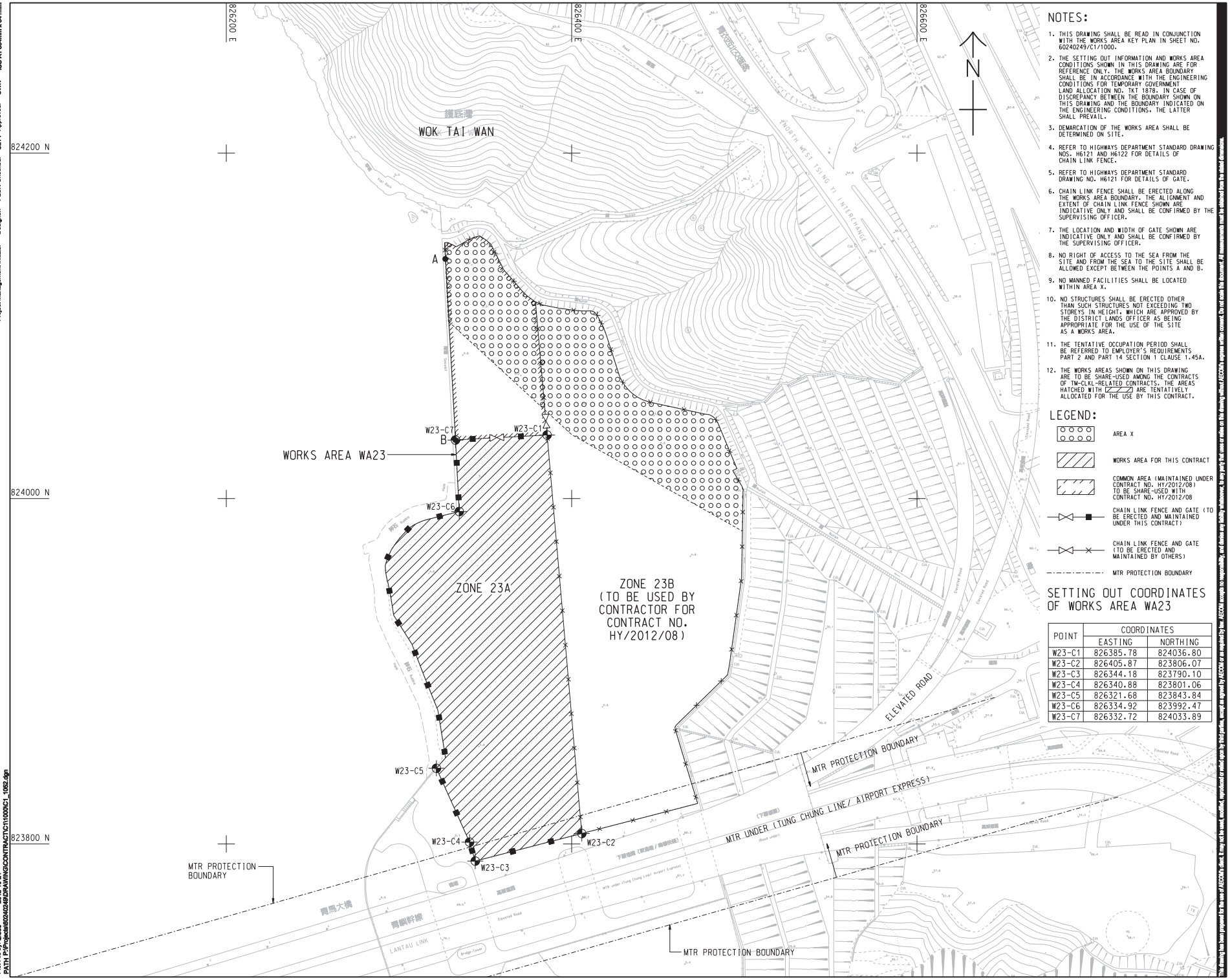

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE WORKS AREA KEY PLAN IN SHEET NO. 60240249/C1/1000.
2. THE SETTING OUT INFORMATION AND WORKS AREA CONDITIONS SHOWN IN THIS DRAWING ARE FOR REFERENCE ONLY. THE WORKS AREA BOUNDARY SHALL BE IN ACCORDANCE WITH THE ENGINEERING CONDITIONS FOR TEMPORARY GOVERNMENT LAND ALLOCATION NO. TKT 1878. IN CASE OF DISCREPANCY BETWEEN THE BOUNDARY SHOWN ON THIS DRAWING AND THE BOUNDARY INDICATED ON THE ENGINEERING CONDITIONS, THE LATTER SHALL PREVAIL.
3. DEMARCATION OF THE WORKS AREA SHALL BE DETERMINED ON SITE.
4. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NOS. H6121 AND H6122 FOR DETAILS OF CHAIN LINK FENCE.
5. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NO. H6121 FOR DETAILS OF GATE.
6. CHAIN LINK FENCE SHALL BE ERECTED ALONG THE WORKS AREA BOUNDARY. THE ALIGNMENT AND EXTENT OF CHAIN LINK FENCE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
7. THE LOCATION AND WIDTH OF GATE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
8. NO RIGHT OF ACCESS TO THE SEA FROM THE SITE AND FROM THE SEA TO THE SITE SHALL BE ALLOWED EXCEPT BETWEEN THE POINTS A AND B.
9. NO MANNED FACILITIES SHALL BE LOCATED WITHIN AREA X.
10. NO STRUCTURES SHALL BE ERECTED OTHER THAN SUCH STRUCTURES NOT EXCEEDING TWO STOREYS IN HEIGHT, WHICH ARE APPROVED BY THE DISTRICT LANDS OFFICER AS BEING APPROPRIATE FOR THE USE OF THE SITE AS A WORKS AREA.
11. THE TENTATIVE OCCUPATION PERIOD SHALL BE REFERRED TO EMPLOYER'S REQUIREMENTS PART 2 AND PART 14 SECTION 1 CLAUSE 1.45A.
12. THE WORKS AREAS SHOWN ON THIS DRAWING ARE TO BE SHARE-USED AMONG THE CONTRACTS OF TM-CLKL-RELATED CONTRACTS. THE AREAS HATCHED WITH ▨ ARE TENTATIVELY ALLOCATED FOR THE USE BY THIS CONTRACT.

LEGEND:

- AREA X
- WORKS AREA FOR THIS CONTRACT
- COMMON AREA (MAINTAINED UNDER CONTRACT NO. HY/2012/08) TO BE SHARE-USED WITH CONTRACT NO. HY/2012/08
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED UNDER THIS CONTRACT)
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED BY OTHERS)
- MTR PROTECTION BOUNDARY

SETTING OUT COORDINATES OF WORKS AREA WA23

POINT	COORDINATES	
	EASTING	NORTHING
W23-C1	826385.78	824036.80
W23-C2	826405.87	823806.07
W23-C3	826344.18	823790.10
W23-C4	826340.88	823801.06
W23-C5	826321.68	823843.84
W23-C6	826334.92	823992.47
W23-C7	826332.72	824033.89

AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

CONTRACT TITLE
TUEN MUN - CHEK LAP KOK LINK - SOUTHERN CONNECTION VIADUCT SECTION

CLIENT
HIGHWAYS DEPARTMENT
Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

ISSUE/REVISION

VR	DATE	DESCRIPTION	CHK.
-	OCT. 12	TENDER DRAWING	CWN

STATUS

SCALE: A1 1 : 1000
DIMENSION UNIT: METRES

KEY PLAN

Figure 1.2i

PROJECT NO.: 60240249
CONTRACT NO.: HY/2012/07

SHEET TITLE
WORKS AREA AND HOARDING PLAN

SHEET 2 OF 2

SHEET NUMBER
60240249/C1/1052

Project Management Initials: Designer: PLCK Checked: SLYY Approved: CWN ISO A1 594mm x 841mm

Plot File by: LIUJ3 2012-10-24
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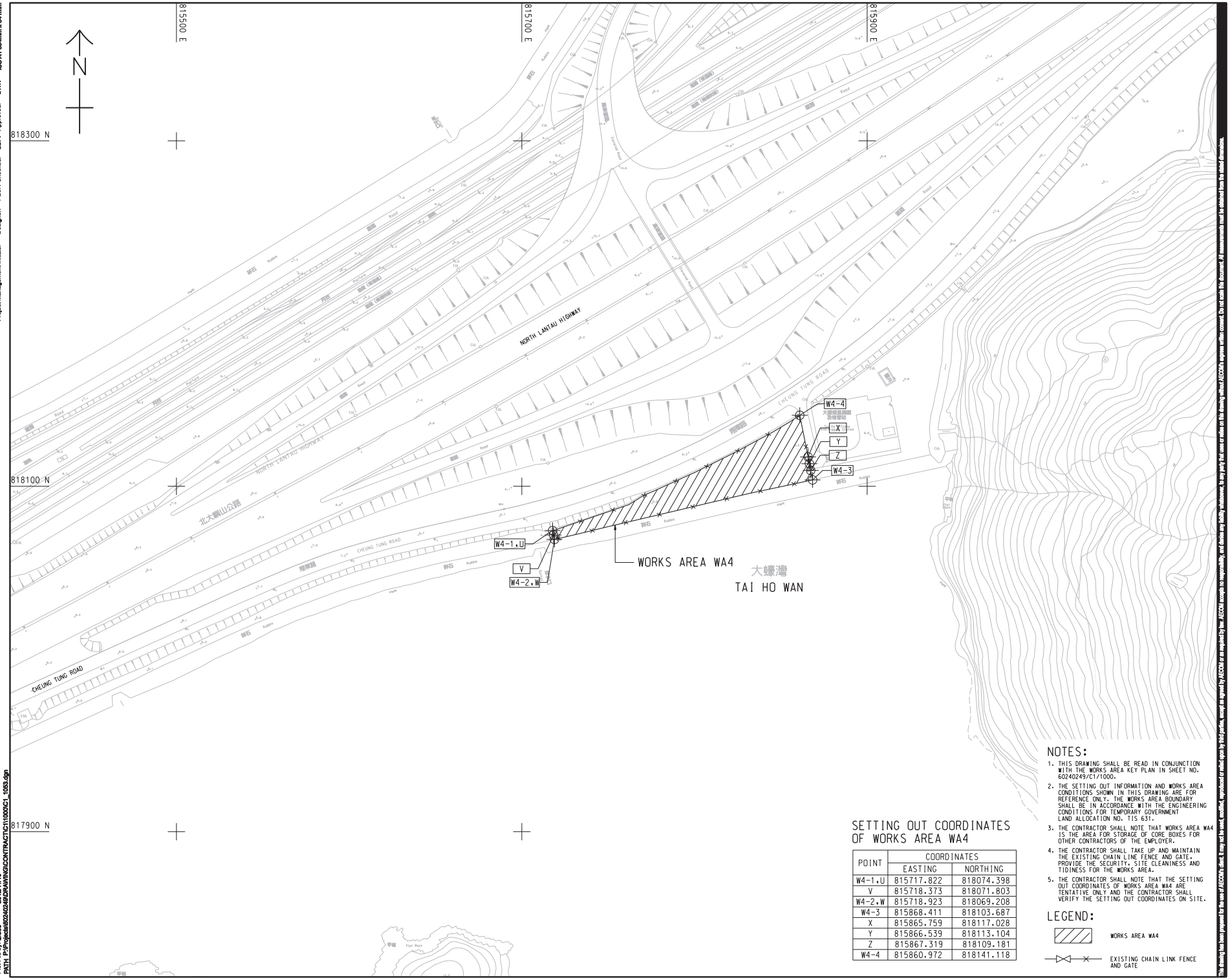


SETTING OUT COORDINATES OF WORKS AREA WA4

POINT	COORDINATES	
	EASTING	NORTHING
W4-1,U	815717.822	818074.398
V	815718.373	818071.803
W4-2,W	815718.923	818069.208
W4-3	815868.411	818103.687
X	815865.759	818117.028
Y	815866.539	818113.104
Z	815867.319	818109.181
W4-4	815860.972	818141.118

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE WORKS AREA KEY PLAN IN SHEET NO. 60240249/C1/1000.
2. THE SETTING OUT INFORMATION AND WORKS AREA CONDITIONS SHOWN IN THIS DRAWING ARE FOR REFERENCE ONLY. THE WORKS AREA BOUNDARY SHALL BE IN ACCORDANCE WITH THE ENGINEERING CONDITIONS FOR TEMPORARY GOVERNMENT LAND ALLOCATION NO. TIS 631.
3. THE CONTRACTOR SHALL NOTE THAT WORKS AREA WA4 IS THE AREA FOR STORAGE OF CORE BOXES FOR OTHER CONTRACTORS OF THE EMPLOYER.
4. THE CONTRACTOR SHALL TAKE UP AND MAINTAIN THE EXISTING CHAIN LINE FENCE AND GATE. PROVIDE THE SECURITY, SITE CLEANINESS AND TIDINESS FOR THE WORKS AREA.
5. THE CONTRACTOR SHALL NOTE THAT THE SETTING OUT COORDINATES OF WORKS AREA WA4 ARE TENTATIVE ONLY AND THE CONTRACTOR SHALL VERIFY THE SETTING OUT COORDINATES ON SITE.

LEGEND:

WORKS AREA WA4

EXISTING CHAIN LINK FENCE AND GATE

AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

CONTRACT TITLE
TUEN MUN - CHEK LAP KOK LINK - SOUTHERN CONNECTION VIADUCT SECTION

CLIENT
HIGHWAYS DEPARTMENT
Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

Figure 1.2j

ISSUE/REVISION

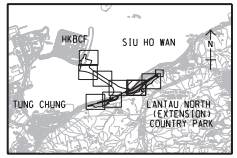
VR	DATE	DESCRIPTION	CHK.
-	NOV. 12	TENDER ADDENDUM NO. 1	CWN

STATUS

SCALE: A1 1 : 1000

DIMENSION UNIT: METRES

KEY PLAN



PROJECT NO.: 60240249

CONTRACT NO.: HY/2012/07

SHEET TITLE
WORKS AREA WA4

SHEET NUMBER
60240249/C1/1053

Project Management Initials: Designer: PLCK Checked: SLYY Approved: CWN ISO A1 594mm x 841mm

Plot File by: LIUJ3 2012/11/16
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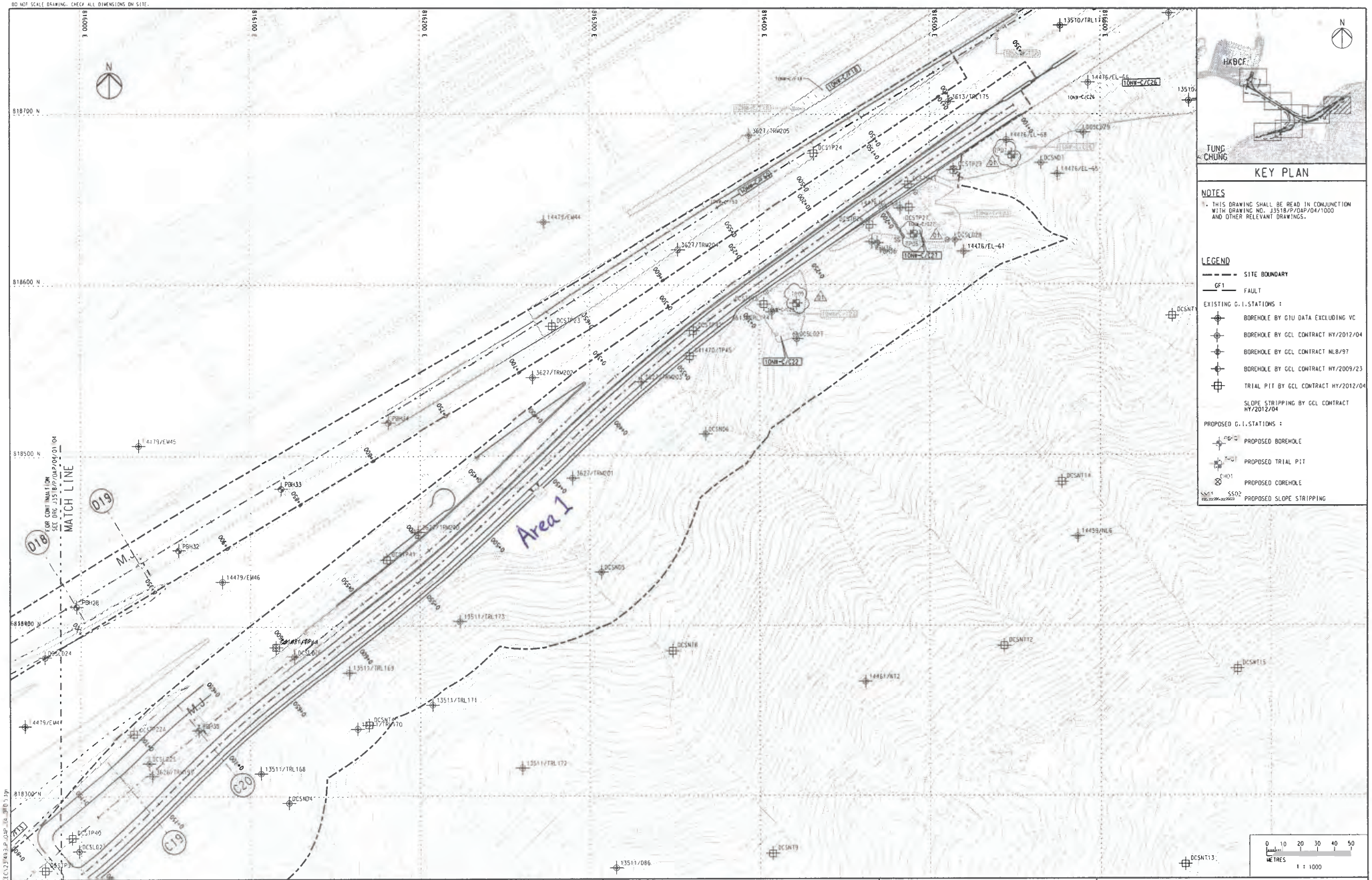

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B	[illegible]	RL	07/13				
C	[illegible]	RL	09/13				
D1	ETA INTERNAL REVIEW	RL	10/13				

Drawn: RL	Date: 07/13
Checked: DS	Approved: DOP
Scale: 1:1000 @ A1 / 1:2000 @ A3	

Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Project Title: Contract No. HY/2012/07 Tuen Mun - Chek Lap Kok Link Southern Connection Viaduct Section

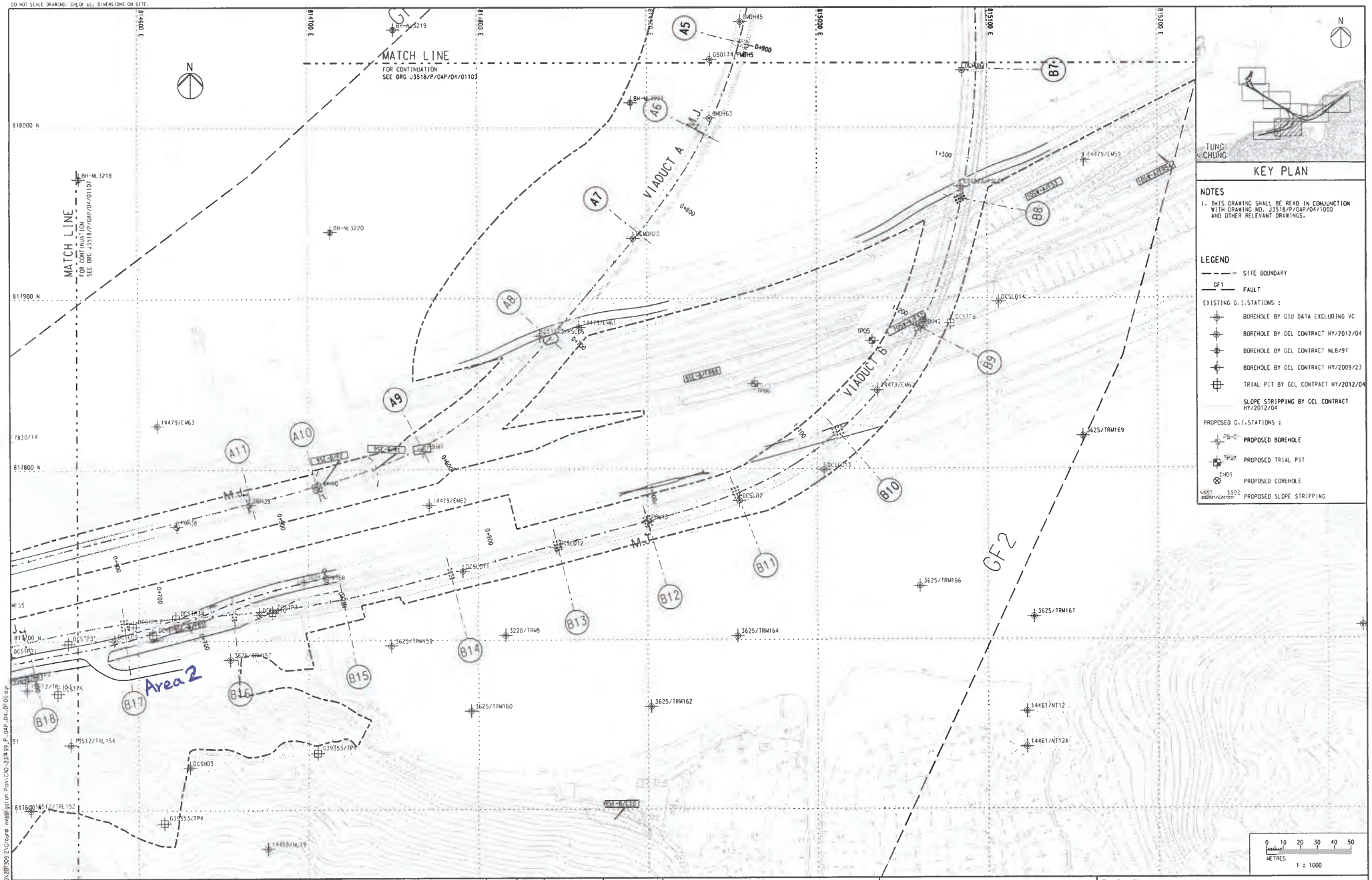
Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

Drawing title: **Figure 1.2k**

Drawing no. J3518/P/OAP/04/01105 Rev. D1



Rev	Description	By	Date
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B	[illegible]	RC	07/13
C	[illegible]	RC	09/13

Drawn	RL
Date	07/13
Checked	DS
Approved	DOP
Scale	1:1000 @ A1 / 1:2000 @ A3

Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Project Title: Contract No. HY/2012/07 Tuen Mun - Chek Lap Kok Link Southern Connection Viaduct Section

Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

Drawing title: **Figure 1.2I**

Drawing no. J3518/P/OAP/04/01106 Rev C

Plotted by [illegible] on 19/07/2013
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1.4 SUMMARY OF CONSTRUCTION WORKS

As informed by the Contractor, details of the major works carried out in this reporting period are listed below:

Marine-based Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation;
- Installation of deck segment and pier head segment; and
- Construction of marine section of berth at Southern Landfall.

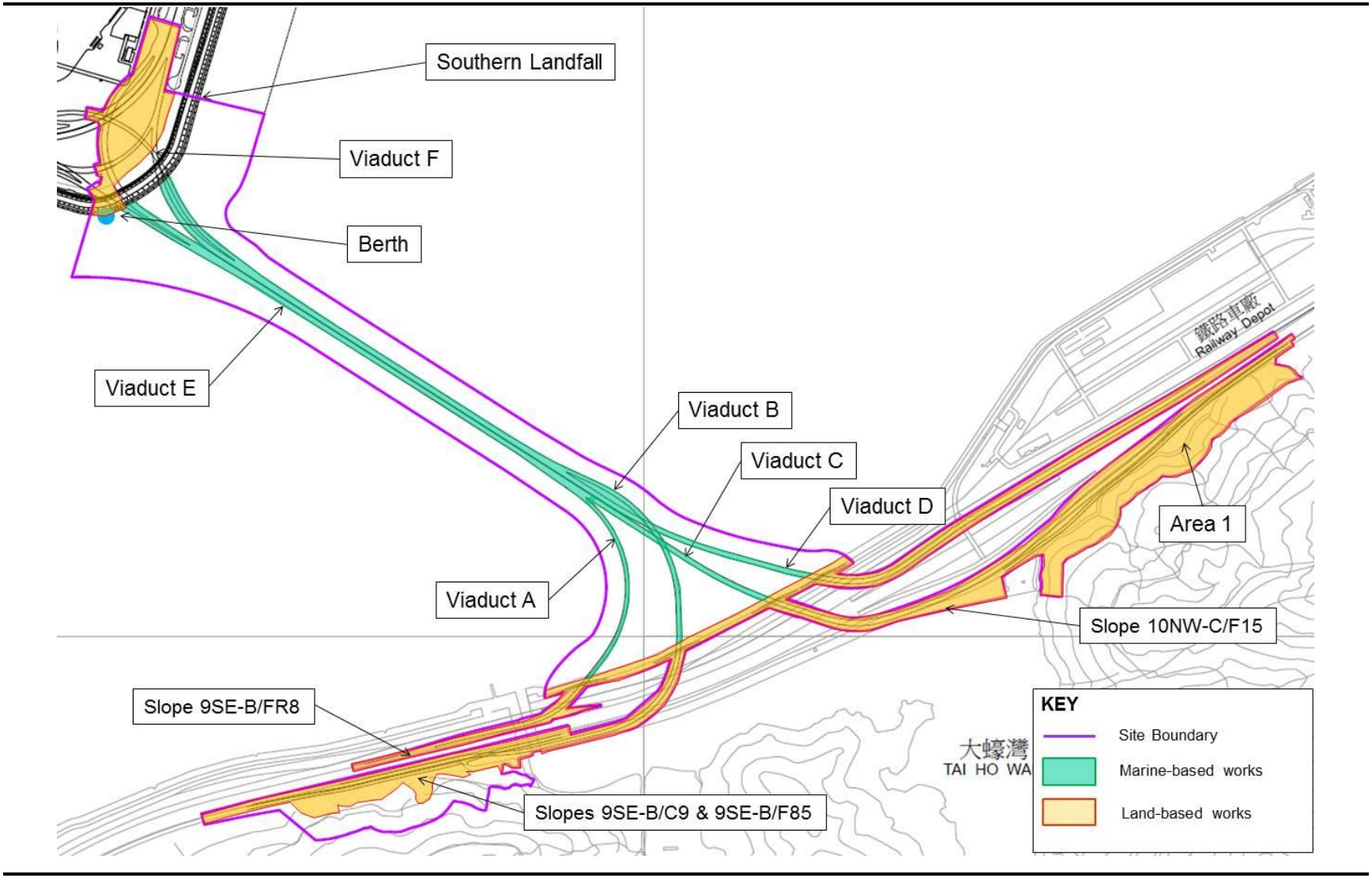
Land-based Works

- Construction and installation of pile caps;
- Pier construction;
- Re-alignment of Cheung Tung Road;
- Predrilling at Viaduct F;
- Additional land Ground Investigation (GI), trial pits and laboratory testing;
- Installation of pier head and deck segments;
- Slope work of Viaducts A, B & C;
- Construction of land section of berth at Southern Landfall;
- Relocation of MTRC fence; and
- Road works along North Lantau Highway

The locations of the construction activities are shown in *Figure 1.3*. The Environmental Sensitive Receivers in the vicinity of the Project are shown in *Figure 1.4*.

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

Figure 1.3 Locations of Construction Activities in the Reporting Period



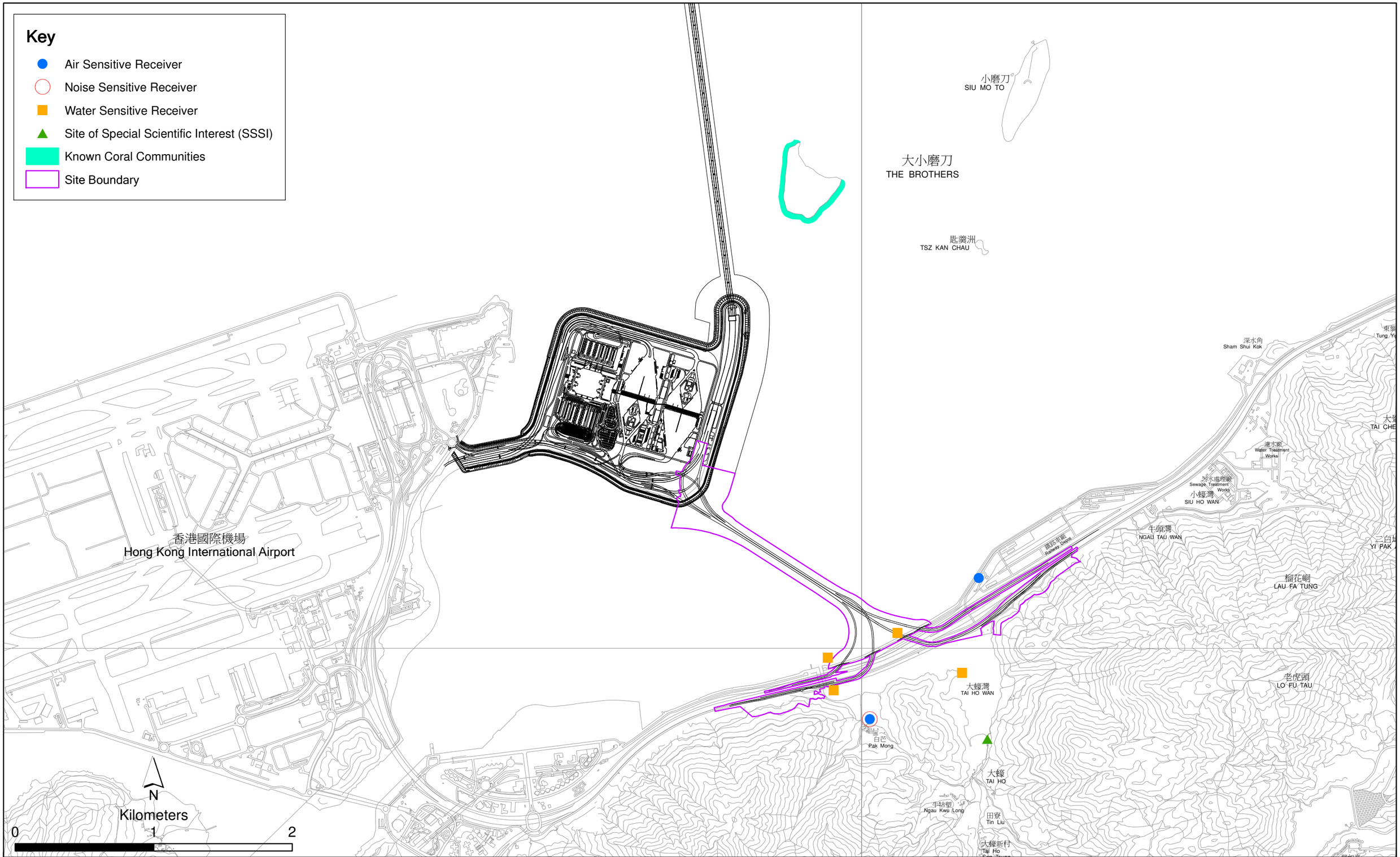


Figure 1.4

Environmental Sensitive Receivers in the Vicinity of Contract No. HY/2012/07
Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section

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Date: 18/5/2015

Environmental Resources Management

ERM

1.5 SUMMARY OF EM&A PROGRAMME REQUIREMENTS

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

- Monitoring parameters;
- Action and Limit levels for all environmental parameters;
- Event Action Plan;
- Tested environmental impact hypotheses;
- Environmental mitigation measures, as recommended in the approved EIA Report; and
- Environmental requirement in contract documents.

2 *EM&A RESULTS*

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

2.1 AIR QUALITY

The baseline air quality monitoring undertaken by the Hong Kong – Zhuhai – Macao Bridge Hong Kong Projects (HKZMB) during October 2011 included the two monitoring stations ASR9A and ASR9C for this Project[1] . Thus, the baseline monitoring results and Action/ Limit Level presented in HKZMB Baseline Monitoring Report [2] are adopted for this Project.

2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual, impact 1-hour TSP monitoring was conducted three (3) times in every six (6) days and impact 24-hour TSP monitoring was carried out once in every six (6) days when the highest dust impact was expected.

1-hour TSP and 24-hour TSP monitoring were conducted at two alternative air quality monitoring stations, ASR8A (Area 4) and ASR9 (Entrance of MTR Depot) during the reporting period in accordance with the requirement stipulated in the Updated EM&A Manual. Details of the monitoring stations are provided in *Figure 2.1* and *Table 2.1*.

High Volume Samplers (HVSs) were installed at two alternative air quality monitoring stations for carrying out 1-hour and 24-hour TSP monitoring in the

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

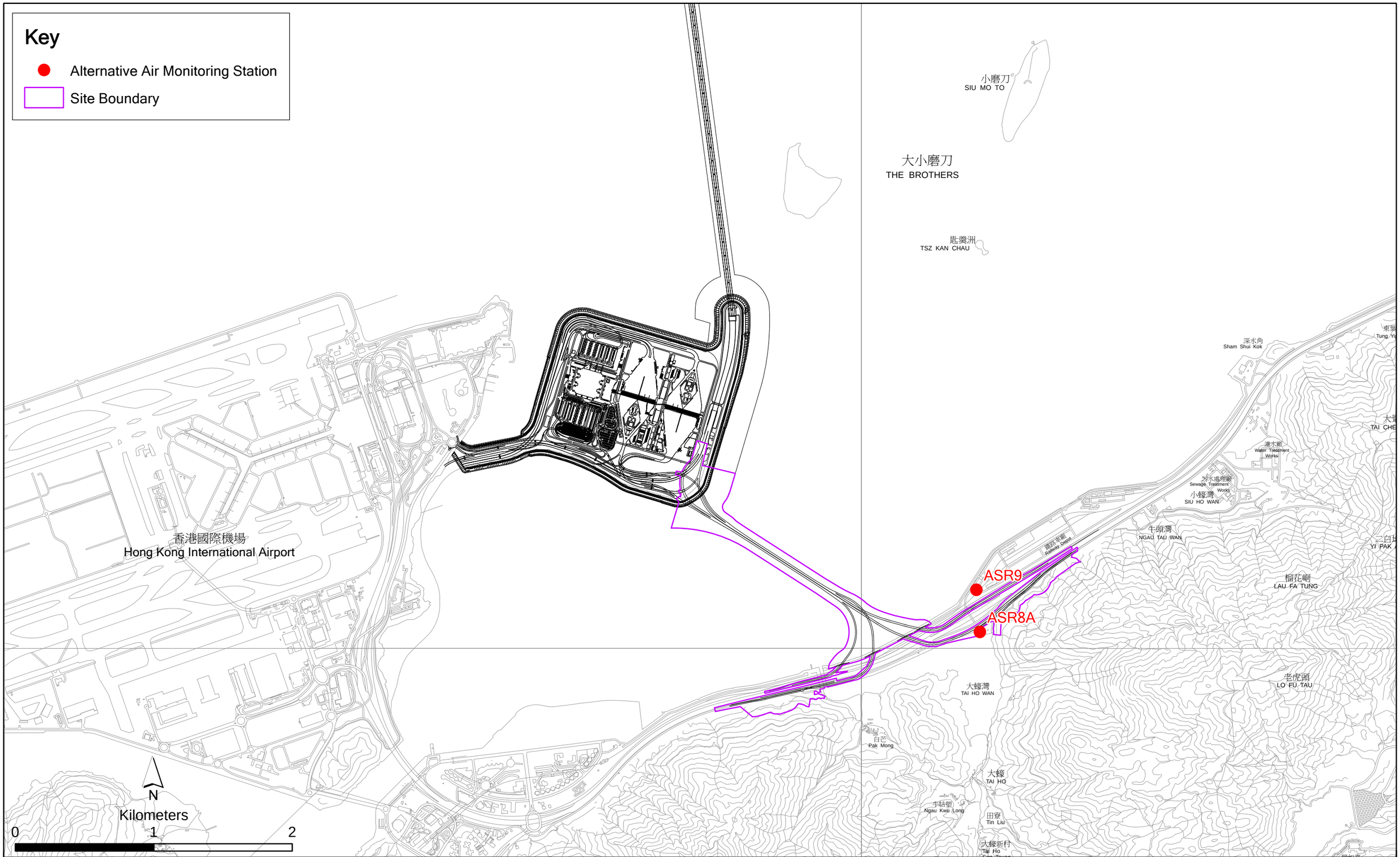

Figure 2.1

Locations of Air Quality Monitoring Stations

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Date: 7/1/2015

Environmental Resources Management

ERM

reporting period. The wind sensor was installed at ASR8A (Area 4) for logging wind speed and wind direction in the reporting period. Details of the equipment deployed in air quality monitoring are provided in *Table 2.2*.

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

Monitoring Station (1)	Monitoring Period	Location	Description	Parameters & Frequency
ASR8A	From 1 November 2015 to 31 October 2016	Area 4	On ground at the Area 4	• 1-hour Total Suspended Particulates (1-hour TSP, µg/m^3), 3 times per day every 6 days
ASR9	From 1 November 2015 to 31 October 2016	Entrance of MTRC Depot	On ground at the entrance	• TSP, µg/m^3), daily for 24-hour every 6 days

Note:

(1) Air Quality Monitoring Stations ASR9A and ASR9C at Siu Ho Wan MTRC Depot proposed in accordance with the Updated EM&A were relocated to ASR9 and ASR8A respectively.

Table 2.2 Air Quality Monitoring Equipment

Equipment	Brand and Model
High Volume Sampler (1-hour TSP and 24-hour TSP)	Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Sampler (Model No. TE-5170)
Wind Sensor	Global Water (Wind Speed Sensor: WE550; Wind Direction Sensor: WE570)
Wind Anemometer for calibration	Lutron (Model No. AM-4201)

2.1.2 Action & Limit Levels

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

2.1.3 Monitoring Schedule for the Reporting Period

The schedules for air quality monitoring in the reporting period were presented in the approved *Twenty-fifth to Thirty-sixth Monthly EM&A Reports*.

Air Quality Monitoring on 20 October 2016 was postponed to 26 October 2016 due to adverse weather conditions.

2.1.4 Results and Observations

The major dust sources in the reporting period included construction activities under the Contract as well as nearby traffic emissions.

A total of 68 events were undertaken at ASR8A and ASR9 in the reporting period. Neither Action nor Limit Level exceedance was recorded for 1-hour TSP and 24-hour TSP monitoring, thus no action was required to be taken in accordance with the Event Action Plan.

The impact monitoring results for 1-hour TSP and 24-hour TSP in the reporting period are summarized in *Tables 2.3* and *2.4,* respectively. Baseline and impact monitoring are presented graphically in *Appendix D.* The detailed impact monitoring data and meteorological information were reported in the *Twenty-fifth to Thirty-sixth Monthly EM&A Reports*.

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

Month	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
Nov 2015	ASR 8A	91	54 - 157	394	500
	ASR 9	105	53 - 181	393	500
Dec 2015	ASR 8A	92	62 - 131	394	500
	ASR 9	94	57 – 145	393	500
Jan 2016	ASR 8A	71	49 - 118	394	500
	ASR 9	63	45 - 111	393	500
Feb 2016	ASR 8A	89	39 - 153	394	500
	ASR 9	105	39 – 172	393	500
Mar 2016	ASR 8A	129	58 - 259	394	500
	ASR 9	106	65 - 182	393	500
Apr 2016	ASR 8A	100	44 - 224	394	500
	ASR 9	86	62 - 129	393	500
May 2016	ASR 8A	82	44 - 187	394	500
	ASR 9	95	62 – 146	393	500
Jun 2016	ASR 8A	58	48 - 69	394	500
	ASR 9	59	48 – 87	393	500
Jul 2016	ASR 8A	57	47 - 69	394	500
	ASR 9	68	44 - 107	393	500
Aug 2016	ASR 8A	61	41 - 116	394	500
	ASR 9	75	45 - 114	393	500
Sept 2016	ASR 8A	84	48 - 177	394	500
	ASR 9	110	53 - 205	393	500
Oct 2016	ASR 8A	77	43 - 107	394	500
	ASR 9	82	54 - 122	393	500

Month	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)

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

Month	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
Nov 2015	ASR 8A	64	51 - 91	178	260
	ASR 9	74	55 - 98	178	260
Dec 2015	ASR 8A	64	54 – 81	178	260
	ASR 9	78	65 - 113	178	260
Jan 2016	ASR 8A	54	47 - 64	178	260
	ASR 9	56	49 - 64	178	260
Feb 2016	ASR 8A	64	51 – 100	178	260
	ASR 9	73	55 – 114	178	260
Mar 2016	ASR 8A	76	59 – 112	178	260
	ASR 9	73	56 – 111	178	260
Apr 2016	ASR 8A	57	43 – 81	178	260
	ASR 9	59	51 – 73	178	260
May 2016	ASR 8A	55	44 – 71	178	260
	ASR 9	60	50 – 73	178	260
Jun 2016	ASR 8A	45	40 – 50	178	260
	ASR 9	46	40 – 56	178	260
Jul 2016	ASR 8A	46	43 – 50	178	260
	ASR 9	55	42 – 102	178	260
Aug 2016	ASR 8A	48	44 – 53	178	260
	ASR 9	59	45 – 101	178	260
Sept 2016	ASR 8A	60	44 – 83	178	260
	ASR 9	71	50 – 106	178	260
Oct 2016	ASR 8A	49	43 - 52	178	260
	ASR 9	59	48 - 67	178	260

As shown in *Table 2.5*, the annual-averaged 1-hour TSP and 24-hour TSP levels in the reporting period were lower than the corresponding average baseline levels at all monitoring stations.

In order to determine any significant air quality impacts caused by construction activities from this Contract, One-way ANOVA (with α set at 0.05) was conducted to examine any significant difference in average TSP levels between the impact monitoring in this reporting period and the baseline monitoring before commencement of construction activities. The annual-averaged levels of TSP level are presented in *Table 2.5* and the statistical results are presented in *Table 2.6*.

For 1-hour TSP and 24-hour TSP at ASR8A and 1-hour TSP at ASR9, the TSP levels in the reporting period were significantly lower than the baseline levels.

There was no significant difference in 24-hour TSP levels at ASR9 between baseline and impact monitoring.

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

Monitoring Station	Average Baseline Monitoring	Average Impact Monitoring
ASR9 (1-hour TSP)	220	88
ASR9 (24-hour TSP)	74	64
ASR8A (1-hour TSP)	222	83
ASR8A (24-hour TSP)	74	57

Table 2.6 ***One-way ANOVA Results for annual-averaged level of TSP level Comparison between Impact and Baseline Periods***

Monitoring Station	F ratio	p-value
ASR9 (1-hour TSP)	$F_{1,244} = 244$	<0.01
ASR9 (24-hour TSP)	$F_{1,80} = 3.8$	0.05
ASR8A (1-hour TSP)	$F_{1,244} = 234$	<0.01
ASR8A (24-hour TSP)	$F_{1,80} = 11.9$	<0.01

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

In addition, linear regression was conducted to examine any relationship between TSP levels and time during this yearly monitoring period at each monitoring station. Linear regression analysis makes assumptions of equal variance and normal distribution of data. Therefore, the significance level of the test was set at 1 % (i.e. p = 0.01) to reduce the chance of committing a Type 1 error. If a significant regression relationship was found between TSP level and time (i.e. $p < 0.01$), r^2 value from the analysis would be further assessed. This value represents the proportion of the total variation in the dependent

variable (i.e. TSP level) that is accounted for by the fitted regression line and is referred to as the coefficient of determination. An r^2 value of 1 indicates a perfect relationship (or fit) whereas a value of 0 indicates that there is no relationship (or no fit) between the dependent and independent variables. As there are no specific criteria to indicate how meaningful an r^2 value is, for the purposes of this EM&A programme a value of 0.60 was adopted to indicate a meaningful regression. If $r^2 < 0.60$ then it was considered that there was a weak relationship between TSP level and time or none at all. If the regression analysis indicated $r^2 > 0.60$ then it had been interpreted that there was in fact a strong relationship between the dependent and independent variables (i.e. a strong temporal trend of increasing / decreasing TSP level with time).

As shown in *Table 2.7*, results of the regression analysis indicated that there was no significant relationship between TSP level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing / decreasing TSP level in this monitoring period.

Table 2.7 Linear Regression Result of TSP Monitoring

Parameter	Station	R^2	F-ratio	p-value	Intercept	Coefficient
1-hour TSP	ASR8A	0.048	10.3	<0.001	159	-0.084
	ASR9	0.015	3.1	<0.001	123	-0.039
24-hour TSP	ASR8A	0.123	9.3	<0.001	102	-0.049
	ASR9	0.064	4.5	<0.001	104	-0.044

Note:

1. Dependent variable is set as TSP levels (in μg/m3) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

2.2 NOISE MONITORING

The baseline noise monitoring undertaken by the HKZMB Projects during the period of 18 October to 1 November 2011 included the monitoring station NSR1 for this Project. Thus, the baseline monitoring results and Action/

Limit Level presented in *HKZMB Baseline Monitoring Report* [1] are adopted for this Project.

2.2.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual, impact noise monitoring was conducted once per week during the construction phase of the Contract.

Noise monitoring was conducted at the alternative noise monitoring station, NSR1A (Pak Mong Village Pavilion) during the reporting period in accordance with the requirement stipulated in the Updated EM&A Manual. Details of the monitoring stations are provided in *Figure 2.2* and *Table 2.8.*

Noise monitoring was performed by sound level meter in compliance with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications at the designated monitoring station. Details of the equipment deployed in noise monitoring are provided in *Table 2.9*.

Table 2.8 Location of Impact Noise Monitoring Station and Monitoring Dates in this Reporting Period

Monitoring Station	Monitoring Period	Location	Parameters & Frequency
NSR1A	From 1 November 2015 to 31 October 2016	Entrance of Pak Mong Village	• 30-mins measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). L_{eq}, L_{10} and L_{90} would be recorded. • At least once a week

Note:

(1) Noise Monitoring Station NSR1 at Pak Mong Village proposed in accordance with the Updated EM&A was relocated to NSR1A.

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

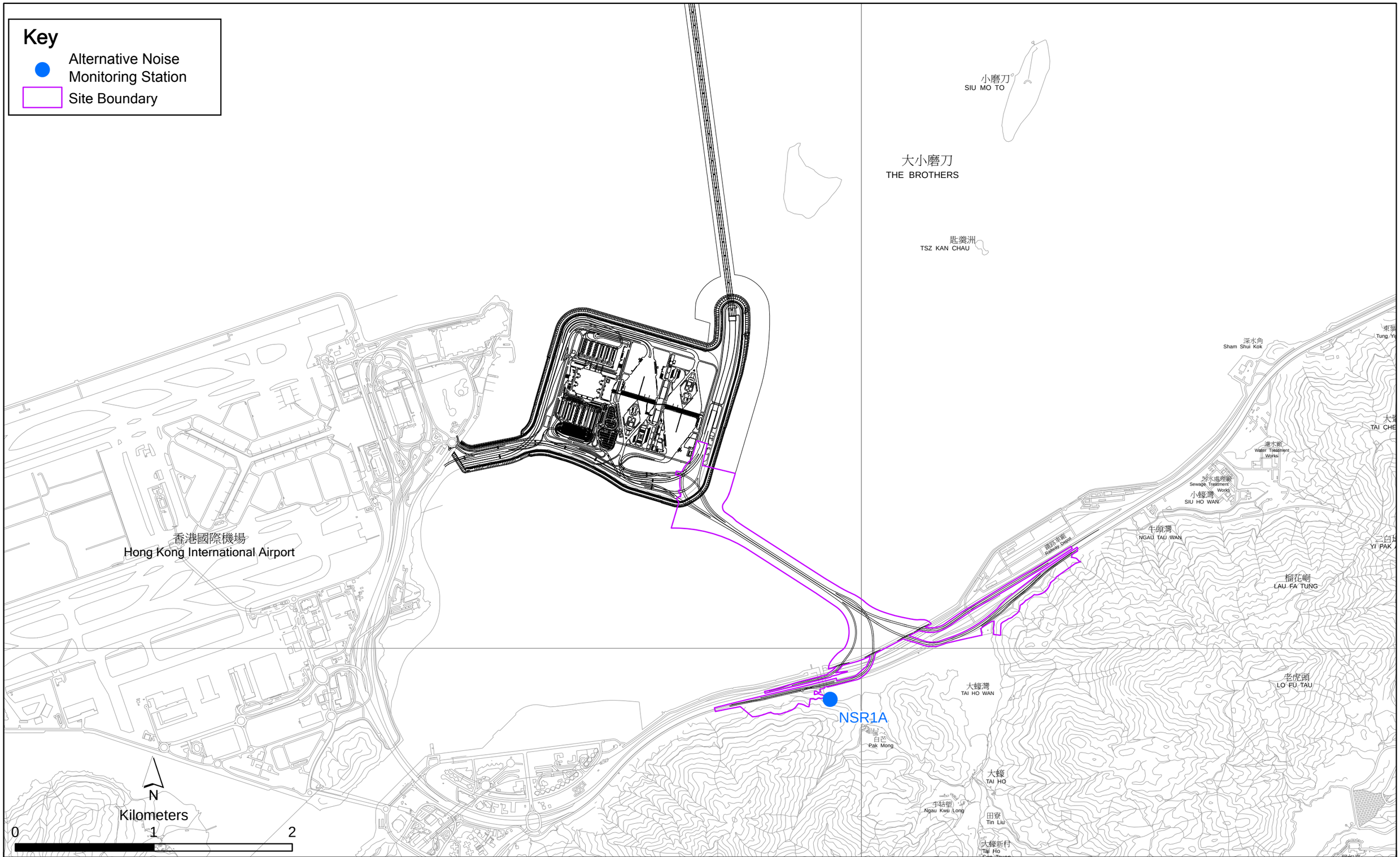

Figure 2.2

Location of Noise Monitoring Station

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Date: 7/1/2015

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Table 2.9 Noise Monitoring Equipment

Equipment	Brand and Model
Integrated Sound Level Meter	Rion NL-31
Acoustic Calibrator	Rion NC-73

2.2.2 Action and Limit Levels

The Action and Limit levels of the noise monitoring are provided in *Appendix C*. The Event Action Plan is presented in *Appendix H*.

2.2.3 Monitoring Schedule for the Reporting Period

The schedules for noise monitoring in the reporting period are provided in the *Twenty-fifth to Thirty-sixth Monthly EM&A Reports*. Noise Monitoring on 20 October 2016 was postponed to 26 October 2016 due to adverse weather conditions.

2.2.4 Results and Observations

Major noise sources during the noise monitoring included construction activities, nearby traffic noise and aircraft noise.

A total of sixty-eight (68) monitoring events were undertaken in the reporting period with no Action Level and Limit Level exceedance recorded at the monitoring stations in the reporting period, thus no action was required to be taken in accordance with the Event Action Plan.

The impact monitoring results for noise monitoring in the reporting period are summarized in *Table 2.10*. Baseline and impact monitoring are presented graphically in *Appendix E*. The detailed impact monitoring data was reported in the *Twenty-fifth to Thirty-sixth Monthly EM&A Reports*.

Table 2.10 *Summary of Construction Noise Monitoring Results at NSR1A in the Reporting Period*

Month	Average , dB(A), L_{eq} (30mins)	Range, dB(A), L_{eq} (30mins)	Limit Level, dB(A), L_{eq} (30mins)
Nov 2015	59	57 – 60	75
Dec 2015	60	59 – 62	75
Jan 2016	61	59 – 62	75
Feb 2016	60	58 – 63	75
Mar 2016	59	58 – 61	75
Apr 2016	59	58 – 61	75
May 2016	60	59 – 61	75
Jun 2016	59	59 - 60	75
Jul 2016	59	56 - 60	75
Aug 2016	60	58 - 62	75
Sep 2016	60	58 - 62	75
Oct 2016	61	60 - 62	75

Note:
Noise Monitoring Station NSR1 was relocated to NSR1A since December 2014.

As shown in *Table 2.11*, the annual-averaged noise level in the reporting period was higher than the average baseline levels at the monitoring station.

In order to determine any significant noise impacts caused by construction activities from this Contract, One-way ANOVA (with α set at 0.05) was conducted to examine any significant difference in average noise levels between the impact monitoring in this reporting period and the baseline monitoring before commencement of construction activities. The statistical results are presented in *Tables 2.12.* Difference in noise level between reporting and baseline monitoring periods was significant, in which the annual-averaged noise level in the reporting period was slightly higher than average baseline level. However, all monitoring results in the reporting period complied with the Action/Limit Levels. In general, noise levels recorded in the reporting period were mostly comparable to the results obtained during the baseline monitoring period. No specific trend of the noise monitoring results or existence of persistent noise impact from the Contract during the impact monitoring period was noticeable. The ET will keep track on the future noise monitoring results during construction phase.

Table 2.11 ***Summary of Average Levels of Noise Level of Baseline Monitoring and Reporting Period (in dB(A))***

Monitoring Station	Average Baseline Monitoring	Average Impact Monitoring
NSR1A	56	60

Table 2.12 ***One-way ANOVA Results for Annual-averaged Level of Noise Level Comparison between Impact and Baseline Periods***

Monitoring Station	F ratio	p-value
NSR1A	$F_{1,354} = 139$	<0.01

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

In addition, linear regression was conducted to examine any relationship between noise levels and time during this yearly monitoring period at the designated noise monitoring station. The method of data interpretation followed the same method as indicated in *Section 2.1.4* for TSP monitoring. As shown in *Table 2.13*, results of the regression analysis indicated that there was no significant relationship between noise level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing / decreasing noise level during this yearly monitoring period.

Table 2.13 ***Linear Regression Result of Noise Monitoring***

Parameter	Station	R^2	F-ratio	p-value	Intercept	Coefficient
$L_{eq\ 30min}$	NSR1A	<u>0.007</u>	0.482	<0.001	59	0.001

Note:

1. Dependent variable is set as Leq 30min (in dB(A)) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

2.3 WATER QUALITY MONITORING

The baseline water quality monitoring undertaken by the HKZMB Projects between 6 and 31 October 2011 included all monitoring stations except SR4a

for the Project. Thus, the baseline monitoring results except for station SR4a and Action/Limit Level presented in HKZMB Baseline Monitoring Report [1] are adopted for this Project. Baseline water quality monitoring was conducted at station SR4a from 29 August to 24 September 2013.

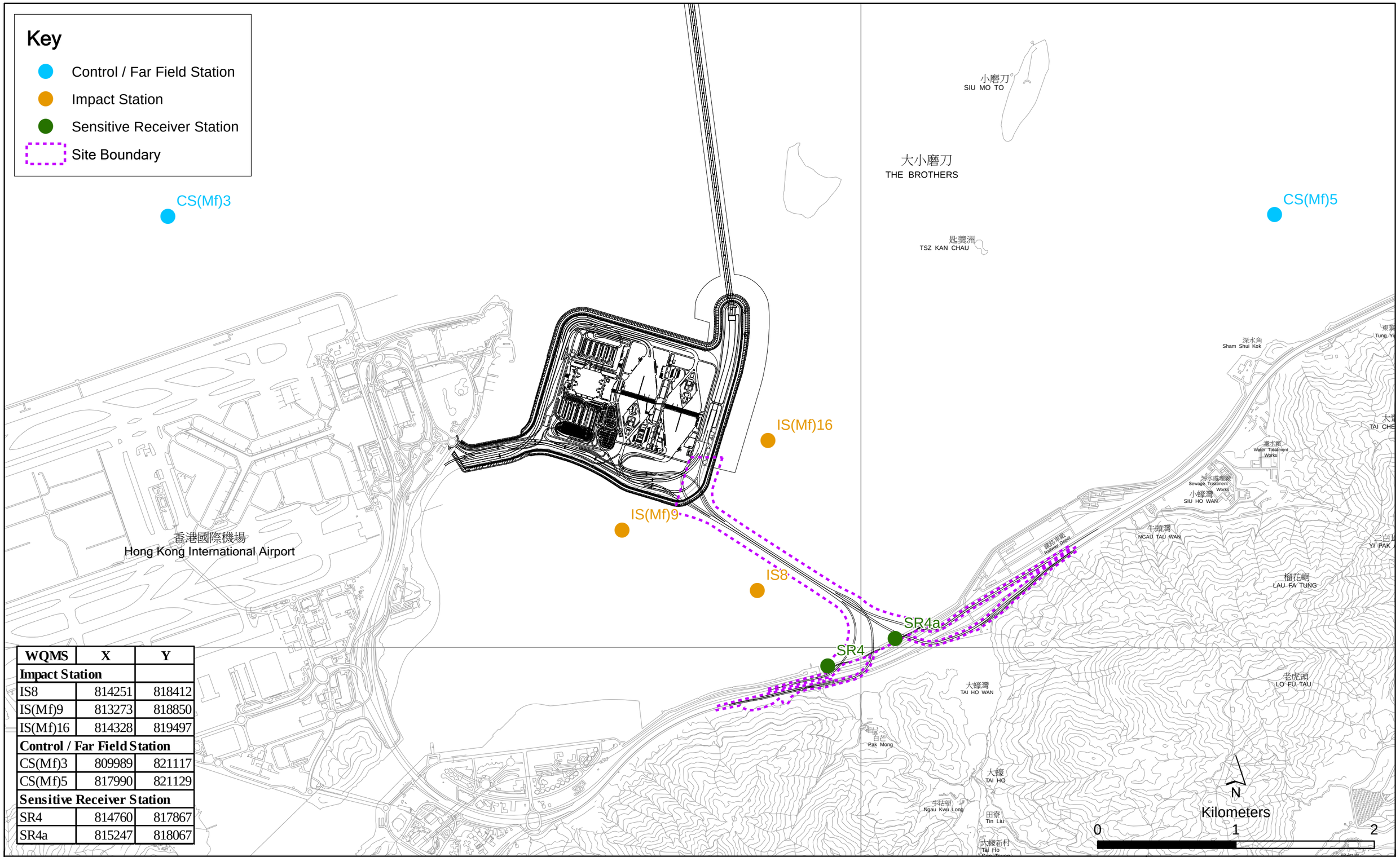
2.3.1 Monitoring Requirements and Equipment

Impact water quality monitoring was carried out to ensure that any deterioration of water quality was detected, and that timely action could be taken to rectify the situation. Impact water quality monitoring was undertaken three days per week during mid-ebb and mid-flood tides in the construction period at seven water quality monitoring stations in accordance with the Updated EM&A Manual. Details of monitoring stations are provided in *Figure 2.3* and *Table 2.14*.

Table 2.14 Locations of Water Quality Monitoring Stations and the Corresponding Monitoring Requirements

Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850	• Temperature(°C) • pH(pH unit) • Turbidity (NTU) • Water depth (m) • Salinity (ppt) • Dissolved Oxygen (DO) (mg/L and % of saturation) • Suspended Solid (SS) (mg/L)	3 water depths: 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth	Impact monitoring: 3 days per week, at mid-flood and mid-ebb tides during the construction period of the Contract.
IS(Mf)16	Impact Station (Close to HKBCF construction site)	814328	819497			

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



WQMS	X	Y
Impact Station		
IS8	814251	818412
IS(Mf)9	813273	818850
IS(Mf)16	814328	819497
Control / Far Field Station		
CS(Mf)3	809989	821117
CS(Mf)5	817990	821129
Sensitive Receiver Station		
SR4	814760	817867
SR4a	815247	818067

Figure 2.3

Locations of Water Quality Monitoring Stations

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Date: 6/12/2013

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Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS8	Impact Station(Close to HKBCF construction site)	814251	818412		sampling only. If water depth less than 6m, mid-depth may be omitted.	
SR4	Sensitive receiver (Tai Ho Inlet)	814760	817867			
SR4a	Sensitive receiver	815247	818067			
CS(Mf)3	Control Station	809989	821117			
CS(Mf)5	Control Station	817990	821129			

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

Details of the equipment deployed in water quality monitoring are provided in *Table 2.15.*

Table 2.15 Water Quality Monitoring Equipment

Equipment	Brand and Model
DO, Temperature meter and Salinity	YSI Pro2030
Turbidimeter	HACH Model 2100Q
pH meter	Thermo Scientific Orion 2 Star / HANNA HI8314
Positioning Equipment	Koden913MK2 with KBG-3 DGPS antenna
Water Depth Detector	Speedtech Instrument SM-5
Water Sampler	Kemmerer 1520 (1520-C25) 2.2L with messenger

2.3.2 *Action & Limit Levels*

The Action and Limit Levels of the water quality monitoring are provided in *Appendix C*. The Event Action Plan is presented in *Appendix H*.

2.3.3 *Monitoring Schedule for the Reporting Period*

The schedules for water quality monitoring in the reporting period are provided in the *Twenty-fifth to Thirty-sixth Monthly EM&A Reports*. Water quality monitoring on 09 February 2016 was cancelled due to suspension of marine works during holiday. Water Quality Monitoring scheduled on 2 August 2016 and 18 October 2016 were canceled due to adverse weather conditions.

2.3.4 *Results and Observations*

Impact water quality monitoring was conducted at all designated monitoring stations in the reporting period. The detailed impact water quality monitoring data was reported in the *Twenty-fifth* to *Thirty-sixth Monthly EM&A Reports*.

In this reporting period, a total of 153 monitoring events were undertaken. Neither Action Level nor Limit Level exceedance was recorded at the monitoring stations in the reporting period. No action is thus required to be undertaken in accordance with the Event Action Plan.

In order to determine any significant water quality impacts caused by construction activities from this Contract, One-way ANOVA (with α set at 0.05) was conducted to examine any significant difference in average DO, Turbidity and SS levels between the impact monitoring in this reporting period and the baseline monitoring before commencement of construction activities. The annual-averaged levels of DO, Turbidity and SS are presented in *Tables 2.16 to 2.18* and the statistical results are presented in *Tables 2.19* to *2.21*. Baseline and impact monitoring results are presented graphically in *Appendix F*.

In the reporting period, most of the annual-averaged DO levels during both mid-ebb and mid-flood tides at all depth of the impact monitoring stations

were significantly higher than corresponding average baseline levels (see *Table 2.16* and *2.19*). The annual depth-averaged turbidity level recorded during the reporting period were mostly comparable to the results obtained during the baseline monitoring period *(see Table 2.17* and *2.20)*. In the reporting period, most of the annual-averaged SS levels recorded were comparable to the baseline monitoring results, except for IS(Mf)16 during mid-flood tide and SR4a during mid-ebb tide and mid-flood tide in which annual-averaged SS levels were significantly higher than the corresponding average baseline levels *(see Table 2.18* and *2.21)*. In general, DO, turbidity and SS levels were varied across sampling months (see *Appendix F*) and these variations were, however, not consistent throughout the reporting period. The graphical plots of the trends of the monitoring results suggested that there was no specific trend in the overall water quality monitoring.

Table 2.16 Summary of Annual Means of DO Level of Baseline Monitoring and Reporting Period (in mg/L)

Tide	Station	Depth	Annual mean of DO of baseline monitoring	Annual mean of DO of reporting period
Mid-ebb	IS(Mf)16	Surface	6.3	6.7
	IS(Mf)9	Surface	6.6	6.7
	IS8	Surface	6.4	6.6
	SR4	Surface	6.1	6.6
	SR4a	Surface	5.5	6.6
Mid-flood	IS(Mf)16	Surface	6.3	6.8
	IS(Mf)9	Surface	6.5	6.7
	IS8	Surface	6.4	6.7
	SR4	Surface	6.3	6.7
	SR4a	Surface	5.5	6.7
Mid-ebb	IS(Mf)16	Middle	6.3	6.6
Mid-flood	IS(Mf)16	Middle	6.1	6.6
Mid-ebb	IS(Mf)16	Bottom	5.9	6.4
	IS(Mf)9	Bottom	6.6	6.5
	IS8	Bottom	6.2	6.5
	SR4	Bottom	6.0	6.5

Tide	Station	Depth	Annual mean of DO of baseline monitoring	Annual mean of DO of reporting period
	SR4a	Bottom	5.3	6.5
Mid-flood	IS(Mf)16	Bottom	6.0	6.5
	IS(Mf)9	Bottom	6.7	6.6
	IS8	Bottom	6.3	6.6
	SR4	Bottom	6.2	6.5
	SR4a	Bottom	5.2	6.6

Table 2.17 Summary of Annual Means of Depth-averaged Turbidity Level of Baseline Monitoring and Reporting Period (in NTU)

Station	Station	Annual mean of depth-averaged turbidity of baseline monitoring	Annual mean of depth-averaged turbidity of reporting period
Mid-ebb	IS(Mf)16	8.9	9.4
	IS(Mf)9	8.2	9.2
	IS8	8.4	9.1
	SR4	8.9	9.1
	SR4a	8.9	9.1
Mid-flood	IS(Mf)16	11.3	9.1
	IS(Mf)9	10.2	8.9
	IS8	11.9	8.9
	SR4	10.3	8.8
	SR4a	7.8	8.9

Table 2.18 Summary of Annual Means of Depth-averaged SS Level of Baseline Monitoring and Reporting Period (in mg/L)

Station	Station	Annual mean of depth-averaged SS of baseline monitoring	Annual mean of depth-averaged SS of reporting period
Mid-ebb	IS(Mf)16	11.3	13.0
	IS(Mf)9	10.9	12.8
	IS8	11.3	12.7
	SR4	11.1	12.6

Station	Station	Annual mean of depth-averaged SS of baseline monitoring	Annual mean of depth-averaged SS of reporting period
	SR4a	9.1	12.7
Mid-flood	IS(Mf)16	10.4	12.6
	IS(Mf)9	14.7	12.4
	IS8	13.5	12.3
	SR4	12.2	12.3
	SR4a	9.8	12.3

Table 2.19 One-way ANOVA Results for DO Comparison between Impact and Baseline Periods

Tide	Station	Depth	F ratio	p-value
Mid-ebb	IS(Mf)16	Surface	$F_{1,163} = 9.6$	**0.002**
Mid-ebb	IS(Mf)9	Surface	$F_{1,163} = 0.1$	0.728
Mid-ebb	IS8	Surface	$F_{1,163} = 3.4$	0.068
Mid-ebb	SR4	Surface	$F_{1,163} = 21.0$	**<0.001**
Mid-ebb	SR4a	Surface	$F_{1,163} = 111.5$	**<0.001**
Mid-flood	IS(Mf)16	Surface	$F_{1,163} = 19.8$	**<0.001**
Mid-flood	IS(Mf)9	Surface	$F_{1,161} = 2.0$	0.155
Mid-flood	IS8	Surface	$F_{1,163} = 10.0$	**0.002**
Mid-flood	SR4	Surface	$F_{1,163} = 13.7$	**<0.001**
Mid-flood	SR4a	Surface	$F_{1,163} = 113.2$	**<0.001**
Mid-ebb	IS(Mf)16	Middle	$F_{1,158} = 2.5$	0.116
Mid-flood	IS(Mf)16	Middle	$F_{1,159} = 20.7$	**<0.001**
Mid-ebb	IS(Mf)16	Bottom	$F_{1,163} = 19.8$	**<0.001**
Mid-ebb	IS(Mf)9	Bottom	$F_{1,163} = 0.2$	0.628
Mid-ebb	IS8	Bottom	$F_{1,163} = 10.0$	**0.002**
Mid-ebb	SR4	Bottom	$F_{1,160} = 13.7$	**<0.001**
Mid-ebb	SR4a	Bottom	$F_{1,163} = 113.2$	**<0.001**
Mid-flood	IS(Mf)16	Bottom	$F_{1,163} = 19.9$	**<0.001**
Mid-flood	IS(Mf)9	Bottom	$F_{1,161} = 0.4$	0.546
Mid-flood	IS8	Bottom	$F_{1,163} = 6.0$	**0.015**
Mid-flood	SR4	Bottom	$F_{1,161} = 10.7$	**0.001**

Tide	Station	Depth	F ratio	p-value
Mid-flood	SR4a	Bottom	$F_{1,163} = 163.1$	**<0.001**

Note:

By setting α at 0.05, p-values <0.05 (significant difference) are bold.

Table 2.20 One-way ANOVA Results for Depth-averaged Turbidity Comparison between Impact and Baseline Periods

Tide	Station	F ratio	p-value
Mid-ebb	IS(Mf)16	$F_{1,163} = 0.5$	0.460
Mid-ebb	IS(Mf)9	$F_{1,163} = 1.8$	0.181
Mid-ebb	IS8	$F_{1,163} = 1.3$	0.252
Mid-ebb	SR4	$F_{1,163} < 0.1$	0.859
Mid-ebb	SR4a	$F_{1,163} < 0.1$	0.786
Mid-flood	IS(Mf)16	$F_{1,163} = 11.5$	**<0.001**
Mid-flood	IS(Mf)9	$F_{1,163} = 3.1$	0.081
Mid-flood	IS8	$F_{1,163} = 18.4$	**<0.001**
Mid-flood	SR4	$F_{1,163} = 4.8$	**0.030**
Mid-flood	SR4a	$F_{1,163} = 3.2$	0.076

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

Table 2.21 One-way ANOVA Results for Depth-averaged SS Comparison between Impact and Baseline Periods

Tide	Station	F ratio	p-value
Mid-ebb	IS(Mf)16	$F_{1,163} = 3.0$	0.085
Mid-ebb	IS(Mf)9	$F_{1,163} = 3.9$	0.051
Mid-ebb	IS8	$F_{1,163} = 2.1$	0.145
Mid-ebb	SR4	$F_{1,163} = 2.7$	0.105
Mid-ebb	SR4a	$F_{1,163} = 12.2$	**<0.001**
Mid-flood	IS(Mf)16	$F_{1,163} = 6.5$	**0.012**
Mid-flood	IS(Mf)9	$F_{1,163} = 5.4$	**0.021**
Mid-flood	IS8	$F_{1,163} = 1.7$	0.192
Mid-flood	SR4	$F_{1,163} < 0.1$	0.938
Mid-flood	SR4a	$F_{1,163} = 7.4$	**0.007**

Tide	Station	F ratio	p-value

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

In addition, linear regression was conducted to examine any significant relationship between DO / Turbidity / SS levels and time during this yearly monitoring period at each monitoring station. The method of data interpretation followed the same method as indicated in *Section 2.1.4* for TSP monitoring. As shown in *Tables 2.22* to 2.*24*, results of the regression analysis indicated that there was no significant relationship between DO / Turbidity / SS level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing or decreasing DO / Turbidity / SS levels in this reporting period.

Table 2.22 Linear Regression Result of DO

Parameter	Station	R^2	$F_{1,151}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb	IS(Mf)16	0.036	5.6	0.019	6.19	<0.001
Surface DO	IS(Mf)9	0.049	7.8	0.006	6.10	<0.001
	IS8	0.034	5.3	0.023	6.15	<0.001
	SR4	0.035	6.6	0.011	6.09	<0.001
	SR4a	0.033	5.2	0.024	6.14	<0.001
Mid-flood	IS(Mf)16	0.031	4.8	0.030	6.28	<0.001
surface DO	IS(Mf)9	0.038	5.9	0.016	6.21	<0.001
	IS8	0.027	4.2	0.043	6.24	<0.001
	SR4	0.032	5.0	0.026	6.21	<0.001
	SR4a	0.036	5.7	0.019	6.19	<0.001
Mid-ebb middle DO	IS(Mf)16	0.026	4.1	0.045	6.07	<0.001
Mid-flood middle DO	IS(Mf)16	0.026	4.0	0.047	6.16	<0.001
Mid-ebb	IS(Mf)16	0.043	6.7	0.010	5.84	<0.001
bottom DO	IS(Mf)9	0.032	4.9	0.028	6.03	<0.001
	IS8	0.042	6.7	0.011	5.92	<0.001
	SR4	0.050	7.9	0.006	5.85	<0.001

Parameter	Station	R^2	$F_{1,151}$	p-value	Intercept	Coefficient of days of construction
	SR4a	0.041	6.5	0.012	5.90	<0.001
Mid-flood	IS(Mf)16	0.039	6.1	0.015	5.93	<0.001
bottom DO	IS(Mf)9	0.023	3.6	0.059	6.16	<0.001
	IS8	0.125	3.4	0.066	6.12	<0.001
	SR4	0.113	4.3	0.040	6.06	<0.001
	SR4a	0.143	5.7	0.018	6.02	<0.001

Note:

1. Dependent variable is set as DO (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

Table 2.23 Linear Regression Result of Turbidity

Parameter	Station	R^2	$F_{1,151}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb	IS(Mf)16	0.030	4.6	0.033	12.59	-0.004
depth-averaged	IS(Mf)9	0.032	5.0	0.027	12.60	-0.004
turbidity	IS8	0.018	2.8	0.097	11.59	-0.003
	SR4	0.010	1.6	0.214	10.90	-0.002
	SR4a	0.022	3.4	0.068	11.61	-0.003
Mid-flood	IS(Mf)16	0.024	3.6	0.059	11.7	-0.003
depth-averaged	IS(Mf)9	0.020	3.1	0.082	11.4	-0.003
turbidity	IS8	0.010	1.5	0.222	10.5	-0.002
	SR4	0.006	1.0	0.328	10.1	-0.001
	SR4a	0.014	2.2	0.144	10.7	-0.002

Note:

1. Dependent variable is set as turbidity (in NTU) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

Table 2.24 Linear Regression Result of SS

Parameter	Station	R^2	$F_{1,151}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb	IS(Mf)16	0.050	8.0	0.088	18.95	-0.007
depth-averaged SS	IS(Mf)9	0.043	6.8	0.208	18.43	-0.006
	IS8	0.026	4.0	0.211	16.84	-0.005
	SR4	0.027	4.3	0.202	16.99	-0.005
	SR4a	0.037	5.8	0.108	17.22	-0.005
Mid-flood	IS(Mf)16	0.039	6.2	0.014	17.59	-0.005
depth-averaged SS	IS(Mf)9	0.028	4.3	0.039	16.58	-0.005
	IS8	0.014	2.1	0.148	14.98	-0.003
	SR4	0.021	3.3	0.072	15.82	-0.004
	SR4a	0.021	3.2	0.074	15.50	-0.004

Note:

1. Dependent variable is set as suspended solids (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

2.4 DOLPHIN MONITORING

2.4.1 Monitoring Requirements

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

2.4.2 Monitoring Equipment

Table 2.25 summarizes the equipment used for the impact dolphin monitoring.

Table 2.25 Dolphin Monitoring Equipment

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

2.4.3 Monitoring Parameter, Frequencies & Duration

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

2.4.4 Monitoring Location

The impact dolphin monitoring was carried out in the NEL and NWL along the line transect as depicted in *Figure 2.4*. The co-ordinates of all transect lines are shown in *Table 2.26* below.

Table 2.26 Impact 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	805475	815913	14	Start Point	817537	820220
2	End Point	805477	826654	14	End Point	817537	824613
3	Start Point	806464	819435	15	Start Point	818568	820735

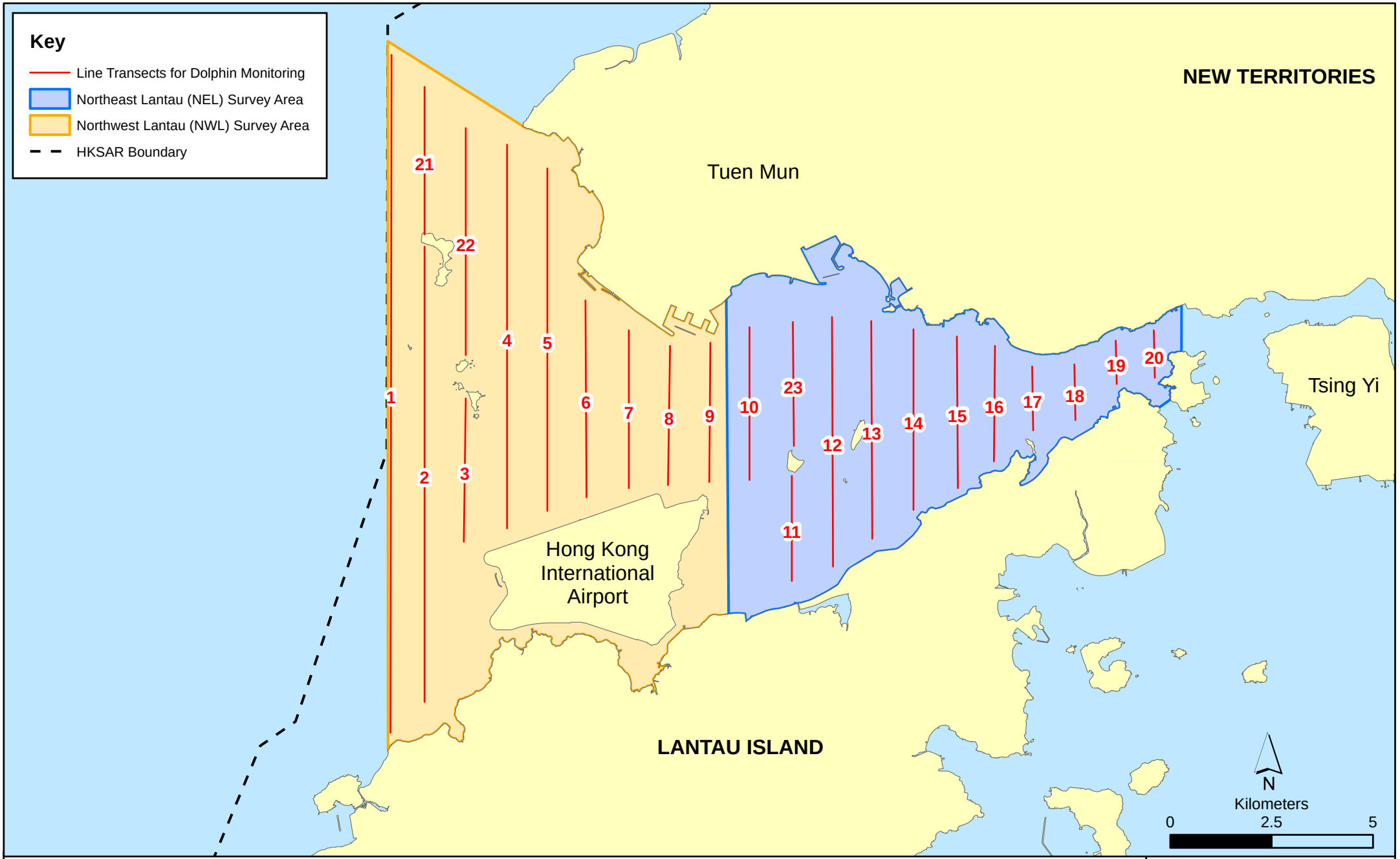

Figure 2.4

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

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Line No.		Easting	Northing	Line No.		Easting	Northing
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	819771	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	820220	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	820466	18	Start Point	821504	822371
6	End Point	809490	825352	18	End Point	821504	823761
7	Start Point	810499	820880	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	820872	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				
12	End Point	815542	824882				

2.4.5 *Action & Limit Levels*

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

2.4.6 *Monitoring Schedule for the Reporting Period*

The dolphin monitoring schedules for the reporting period are provided in the *Twenty-fifth* to *Thirty-sixth Monthly EM&A Reports*.

2.4.7 *Results & Observations*

A total of 3,598.07 km of survey effort was collected, with 92.7% 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,

1,373.63 km and 2,224.44 km of survey effort were conducted in NEL and NWL survey areas, respectively. The total survey effort conducted on primary lines was 2,609.11 km while the effort on secondary lines was 988.96 km. Both survey efforts conducted on primary and secondary lines were considered as on-effort survey data. The survey efforts are summarized in *Appendix G*.

During the twenty-four sets of monitoring surveys from November 2015 to October 2016, a total of 45 groups of 168 Chinese White Dolphins (CWDs) were sighted. In this 12-month period, all except seven (7) dolphin sightings were made during on-effort search. Thirty-three (33) out of 38 on-effort dolphin sightings were made on primary lines, while five (5) groups of dolphins were sighted on secondary lines. All sightings were made in NWL region except one (1), in which the sighting in NEL was a lone animal. No sighting was made in the proximity of the Project's alignment. Summary table of the dolphin sightings is shown in *Appendix II of Appendix G*.

During the present 12-month impact phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline, transitional and first year of impact phases as shown in *Table 2.27*.

Table 2.27 Average Dolphin Encounter Rates

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		**Encounter rate (ANI)** (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Northeast Lantau	**Northwest Lantau**	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2015-16, this reporting period)	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

Comparison of average daily dolphin encounter rates from this impact phase (November 2015 – October 2016), the first two years of impact phases (November 2013 – October 2015), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012). (**±** denotes the standard deviation of the value)

Group size of Chinese White Dolphins ranged from 1-12 individuals per group in North Lantau region during November 2015 - October 2016. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline and transitional and first two years of impact phases, as shown in *Table 2.28.*

Table 2.28 Comparison of Average Dolphin Group Size

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2015-16, this reporting period)	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)

Comparison of average dolphin group size from this impact phase (November 2015– October 2016, the first two years of impact phases (November 2013 – October 2015), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012). (± denotes the standard deviation of the value)

Two (2) Action Level exceedances and three (3) Limit Level exceedances for both NEL and NWL regions were recorded for four (4) sets of quarterly dolphin monitoring data between November 2015 and October 2016. In this reporting period, no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from general observations. It is essential to continue monitoring the dolphin usage in North Lantau region for the rest of the impact phase monitoring period. Photo IDs of sighted dolphin are presented in *Appendix K of the Twenty-fifth to Thirty-sixth Monthly EM&A Report*.

2.4.8 Marine Mammal Exclusion Zone Monitoring

Daily marine mammal exclusion zone monitoring was undertaken during the period of marine works under this Contract. No sighting of Chinese White Dolphin was recorded in the monitoring period during the exclusion zone monitoring.

Passive Acoustic Monitoring (PAM) was not undertaken in this reporting period as no marine piling works was carried out outside the daylight hours since September 2015. Daytime marine mammal exclusion zone was still in effect to cater for temporary staging installation and uninstallation works.

2.5 *EM&A SITE INSPECTION*

Site inspections were carried out on weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures under the Contract. Fifty-two (52) site inspections were carried out in the reporting period. Key observations were summarized in the section of *EM&A Site Inspection* in the *Twenty-fifth to Thirty-sixth Monthly EM&A Reports*. The Contractor has rectified all of the observations identified during environmental site inspections in the reporting period.

2.6 *WASTE MANAGEMENT STATUS*

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

Wastes generated during this reporting period include mainly construction wastes (inert and non-inert), recyclable materials and chemical waste. Reference has been made to the waste flow table prepared by the Contractor (*Appendix I*). The quantities of different types of wastes are summarized in *Table 2.29*.

Table 2.29 Quantities of Different Waste Generated in the Reporting Period

Month/Year	Inert Construction Waste [a] (m^3)	Imported Fill (m^3)	Inert Construction Waste Re-used (m^3)	Non-inert Construction Waste [b] (tonnes)	Recyclable Materials [c] (kg)	Chemical Wastes (kg)	Marine Sediment (m^3)	
							Category L	Category M
Nov 2015	204	642	725	64,740	98	2,000	0	0
Dec 2015	198	0	516	66,000	0	0	0	0
Jan 2016	1,334	0	606	69,400	105	0	0	0
Feb 2016	692	0	92	85,890	112	0	0	0
Mar 2016	965	0	537	88,360	0	2,000	0	0
Apr 2016	565	0	789	79,580	8,724	3,000	0	0
May 2016	440	0	617	75,620	0	3,000	0	0
Jun 2016	383	0	116	103,270	105	0	0	0
Jul 2016	277	0	230	94,760	1,890	2,200	0	0
Aug 2016	610	0	684	116,990	9,888	0	0	0
Sept 2016	2,314	0	270	130,060	105	0	0	0
Oct 2016	2,183	0	156	141,300	28	0	0	0
Total	10,165	0	5,279	1,115,970	21,055	12,200	0	0

Notes:

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

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

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

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

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

2.7 ENVIRONMENTAL LICENSES AND PERMITS

The status of environmental licensing and permit is summarized in *Table 2.30* below.

Table 2.30 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-353/2009/K	11-Apr-16	N/A	HyD	Hong Kong Boundary Crossing Facilities
Environmental Permit	EP-354/2009/D	13-Mar-15	N/A	HyD	Tuen Mun- Chek Lap Kok Link
Environmental Permit	EP-353/2009/I	17-Jul-15	N/A	HyD	Hong Kong Boundary Crossing Facilities (effective from Septermber 2015)
Chemical Waste Registration	5213-951-G2380-17	12-Jun-14	N/A	GCL	Viaducts A, B, C, D & E
Chemical Waste Registration	5213-961-G2380-13	10-Oct-13	N/A	GCL	Chemical waste produced in Contract HY/2012/07 (Area 1 adjacent to Cheng Tung Road, Siu Ho Wan)
Chemical Waste Registration	5213-961-G2380-14	10-Oct-13	N/A	GCL	Chemical waste produced in Contract HY/2012/07 (Area 2 adjacent to Cheung Tung Road, Pak Mong Village)
Chemical Waste Registration	5213-974-G2588-03	04-Nov-13	N/A	GCL	Chemical waste produced in Contract HY/2012/07 (WA5 adjacent to Cheung Tung Road, Yam O)
Construction Dust Notification	361571	05-Jul-13	N/A	GCL	
Construction Dust Notification	362093	17-Jul-13	N/A	GCL	For Area 23
Construction Noise Permit for night works and works in general holidays	GW-RS0691-15	23-Jun-15	22-Dec-15	GCL	For Broad Permit
Construction Noise Permit for night works and works in general holidays	GW-RS1144-15	20-Oct-15	19-Feb-16	GCL	For Broad Permit
Construction Noise Permit for night works and works in general holidays	GW-RS0080-16	01-Feb-16	30-Apr-16	GCL	For Broad Permit
Construction Noise Permit for night works and works in general holidays	GW-RS0383-16	20-Apr-16	19-Oct-16	GCL	For Broad Permit

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Construction Noise Permit for night works and works in general holidays	GW-RS1045-16	14-Oct-16	13-Apr-17	GCL	For Broad Permit
Construction Noise Permit for night works and works in general holidays	GW-RS0809-15	29-Jul-15	29-Jan-16	GCL	For Plant mobilization using tractor with trailer
Construction Noise Permit for night works and works in general holidays	GW-RS0854-15	12-Aug-14	15-Feb-16	GCL	Pre-casted pile cap shell installation at E10-E13
Construction Noise Permit for night works and works in general holidays	GW-RS0109-16	05-Feb-16	14-Aug-16	GCL	Pre-casted pile cap shell installation at E10-E13
Construction Noise Permit for night works and works in general holidays	GW-RS0718-16	13-Jul-16	13-Jan-17	GCL	Pre-casted pile cap shell installation at E10-E13
Construction Noise Permit for night works and works in general holidays	GW-RS1044-16	14-Oct-16	13-Apr-17	GCL	Pre-casted pile cap shell installation at E8-E13
Construction Noise Permit for night works and works in general holidays	GW-RS0855-15	12-Aug-15	11-Feb-16	GCL	Pier construction at C7, D8, D9
Construction Noise Permit for night works and works in general holidays	GW-RS0911-15	27-Aug-15	26-Feb-16	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0056-16	1-Feb-16	31-Mar-16	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0279-16	29-Mar-16	30-May-16	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RW0504-16	25-May-16	31-Aug-16	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RW0707-16	11-Jul-16	30-Sep-16	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0958-16	15-Sep-16	30-Nov-16	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS1054-15	30-Sep-15	29-Mar-16	GCL	For Load unload at NLH near Viaduct D
Construction Noise Permit for night works and works in general holidays	GW-RS1086-15	07-Oct-15	15-Dec-15	GCL	TTA Case 009 Ch.2.1E-4.2E

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Construction Noise Permit for night works and works in general holidays	GW-RS1046-15	04-Jan-16	31-Jan-16	GCL	Erection of GT324, GT326-GT328 sign gantry leg
Construction Noise Permit for night works and works in general holidays	GW-RW0422-15	21-Aug-15	25-Jan-16	GCL	General works at WA5
Construction Noise Permit for night works and works in general holidays	GW-RW0045-16	27-Jan-16	25-Jul-16	GCL	General works at WA5
Construction Noise Permit for night works and works in general holiday	GW-RW0339-16	17-Jun-16	19-Dec-16	GCL	General works at WA5
Construction Waste Disposal Account	7017735	10-Jul-13	N/A	GCL	-
Construction Waste Disposal Account	7019470	03-Mar-14	N/A	GCL	Vessel CHIT Account
Marine Dumping Permit	EP/MD/16-102	13-Oct-15	16-Apr-16	GCL	For dumping Type I sediment
Marine Dumping Permit	EP/MD/16-138	10-Dec-15	13-Jun-16	GCL	For dumping Type I sediment
Marine Dumping Permit	EP/MD/17-037	14-Jun-16	13-Dec-16	GCL	For dumping Type I sediment
Marine Dumping Permit	EP/MD/17-115	20-Oct-16	31-Dec-16	GCL	For dumping Type I sediment
Marine Dumping Permit	EP/MD/16-112	22-Oct-15	29-Nov-15	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/16-134	27-Nov-15	29-Dec-15	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/16-147	18-Dec-15	29-Jan-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/16-166	25-Jan-16	29-Feb-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/16-186	26-Feb-16	31-Mar-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/16-203	29-Mar-16	30-Apr-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/17-028	31-May-16	30-Jun-16	GCL	For dumping Type I (Dedicated Site)

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
					and Type II sediment
Marine Dumping Permit	EP/MD/17-047	22-Jun-16	31-Jul-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/17-066	19-Jul-16	31-Aug-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/17-084	22-Aug-16	30-Sep-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/17-102	28-Sep-16	31-Oct-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Waste Water Discharge License	WT00019017-2014	13-May-14	31-May-19	GCL	Discharge for marine portion
Waste Water Discharge License	WT00019018-2014	13-May-14	31-May-19	GCL	Discharge for land portion

2.8 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

A summary of the Environmental Mitigation and Enhancement Measure Implementation Schedules (EMIS) is presented in *Appendix B*. The necessary mitigation measures were implemented properly for this Contract.

2.9 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT

There was no exceedance in 1-hour TSP, 24-hour TSP, construction noise and water quality in the reporting period

There were a total of five (5) Action and Limit Levels exceedances for impact dolphin monitoring in the reporting period, whereas both NEL and NWL regions each recorded one (1) Action Level exceedance and three (3) Limit Level exceedances. No unacceptable impact from the construction activities of the TM-CLKL Southern Connection Viaduct Section on Chinese White Dolphins was noticeable from general observations during the dolphin monitoring in this reporting period. Detailed investigation reports were presented in *Appendix L* of *Eighth to Eleventh Quarterly EM&A Reports*.

2.10 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

The Environmental Complaint Handling Procedure is provided in *Figure 2.5*.

One (1) complaint was received in the reporting period. The complaint was received from EPD in September 2016 regarding effluent discharge from flat top barge. Upon investigation, there was no adequate evidence to conclude that the complaint case was related to this Project. The detailed investigation report was presented in the *Appendix N* of the *Thirty-fifth Monthly EM&A Report*.

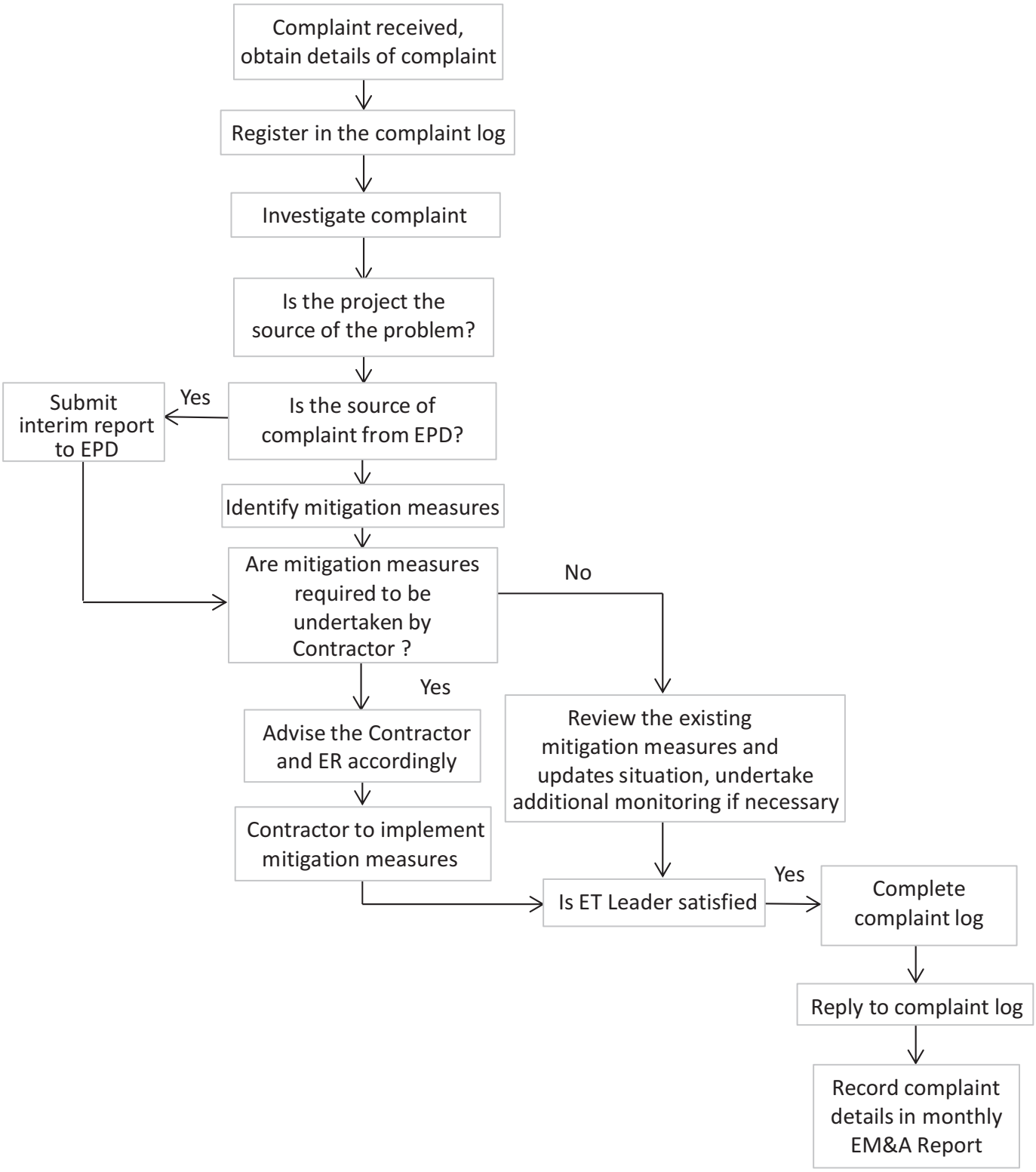

Figure 2.5 Environmental Complaint Handling Procedure

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No notification of summons or successful prosecution was received in the reporting period.

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

3 COMPARISON OF EM&A RESULTS WITH EIA PREDICTIONS AND BASELINE MONITORING RESULTS

The EM&A results in the reporting period are compared to the predictions from EIA Report and baseline monitoring result in order to review the validity of EIA predictions.

3.1 AIR QUALITY MONITORING

Air quality monitoring for this Contract was undertaken during the baseline and impact monitoring periods. As identified in the TM-CLKL EIA Report, key construction activities of this Contract include excavation works, road works, slope works and foundation works. Comparison of EM&A results with EIA predictions is presented in *Table 3.1*. Maximum 1-hour TSP and 24-hour TSP levels in this yearly impact monitoring were comparable to the baseline range, in which most of the impact and baseline TSP levels were higher than the levels predicted in the EIA Report. The average 1-hour TSP and 24-hour TSP levels measured in this yearly impact monitoring were lower than the corresponding TSP levels measured in the baseline monitoring at all stations and thus suggested that no noticeable deterioration of air quality was caused by the construction activities of this Contract during the impact monitoring period.

Table 3.1 Comparison of Impacts on Air Quality (in µg/m³) between EIA Prediction and Impact Monitoring Period

Monitoring Station	EIA Predicted Maximum	Maximum Baseline Monitoring	Maximum Impact Monitoring	Average Baseline Monitoring	Average Impact Monitoring
ASR8/ASR9 (1-hour TSP)	205 (1) /240	462	205	220	88
ASR8/ASR9 (24-hour TSP)	83 (1) / 108	113	114	74	64
ASR8A (1-hour TSP)	293 / 205 (1)	464	259	222	83
ASR8A (24-hour TSP)	105 /83 (1)	128	112	74	57

Note:

1. EIA prediction of maximum of ASR8 is presented for reference.

Monitoring Station	EIA Predicted Maximum	Maximum Baseline Monitoring	Maximum Impact Monitoring	Average Baseline Monitoring	Average Impact Monitoring

2. Scenario 1 of EIA prediction is adopted, in which north and south reclamations of TMCLKL were included in the modelling.
3. EIA predictions and baseline monitoring results of ASR9A and ASR9C are applied to ASR8A and ASR8/ASR9 respectively.

3.2 NOISE IMPACT MONITORING

Noise impact monitoring for this Contract was undertaken during the baseline and impact monitoring periods. Major noise sources of this Contract during the reporting period included construction activities, nearby traffic noise and aircraft noise. Construction Noise Permits (CNP), as recommended in the EIA Report, were applied and complied with when Power Mechanical Equipment (PME) was deployed for construction works during restricted hours. The EIA assessment has predicted that marginal impacts would be expected at the Pak Mong Village during construction phase. Comparison of EM&A results with EIA predictions is presented in *Table 3.2*. In general, the average impact noise monitoring results recorded in the reporting period were within the range of the predicted noise levels in the EIA Report and thus suggested that no unacceptable level of construction noise generated from the Contract during the impact monitoring period.

Table 3.2 Comparison of Impacts on Noise (in dB (A)) between EIA Prediction and Impact Monitoring Period

Monitoring Station	EIA Predicted Maximum	Maximum Impact Monitoring	Average Baseline Monitoring	Average Impact Monitoring
NSR1	74	63.0	56.8	59.6

Note:
1. EIA maximum noise level was predicted in SPL. Baseline and impact monitoring were measured in $L_{eq,30min}$.

3.3 WATER QUALITY MONITORING

Water quality monitoring for this Contract was undertaken during the baseline and impact monitoring periods. Major construction activities of this

Contract in the reporting period included marine platform erection, piling and pier construction works were undertaken in the monitoring period. According to EIA prediction, no SS exceedance is anticipated from this Project at the water sensitive receivers nearby the Contract works area (WSR 22a, WSR 22b and WSR 22c). The average baseline and impact monitoring results are presented in *Table 3.3*. It is noted that most of the annual-averaged SS levels recorded in the reporting period were comparable to the baseline monitoring results, except for IS(Mf)16 during mid-flood tide and SR4a during mid-ebb tide and mid-flood tide in which annual-averaged SS levels were significantly higher than the corresponding average baseline levels, including upstream control stations (i.e. CS(Mf)3 and CS(Mf)5 in both tides). However, all recorded levels of depth-averaged SS were below Action and Limit Levels. Thus, no exceedance of Action and Limit Levels on depth-averaged SS was recorded in the reporting period. The impact monitoring results are considered influenced by fluctuation of background regional water quality and no unacceptable impacts on marine water was observed caused by this Project.

Table 3.3 ***Comparison of Depth-averaged SS (in mg/L) between Baseline and Impact Monitoring Period***

Monitoring Station	Tide	Baseline monitoring	Impact Monitoring of this Reporting Period
CS(Mf)3	Mid-ebb	8.8	13.4
CS(Mf)5		9.2	13.0
IS(Mf)16		11.3	13.0
IS(Mf)9		10.9	12.8
IS8		11.3	12.7
SR4		11.1	12.6
SR4a		9.1	12.7
CS(Mf)3	Mid-flood	12.4	12.8
CS(Mf)5		11.5	12.7
IS(Mf)16		10.4	12.6
IS(Mf)9		14.7	12.4
IS8		13.5	12.3
SR4		12.2	12.3

Monitoring Station	Tide	Baseline monitoring	Impact Monitoring of this Reporting Period
SR4a		9.8	12.3

3.4 MARINE ECOLOGY

According to the baseline results in the *Appendix F* of the approved EIA Report, the dolphin groups were largely sighted near waters around Lung Kwu Chau and Sha Chau. There was no dolphin sighted along the alignment of this Contract. Two-way ANOVAs with repeated measures were conducted to compare results of average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) between baseline, transitional and impact periods. Although the STG and ANI in impact monitoring period were lower than that before the commencement of this Contract (see *Section 2.4.7*) and the differences between the five periods are statistically significant (see *Section 3.3.4* of *Appendix G*), the distribution pattern was still similar between the impact monitoring periods and before the commencement (i.e. transition period in 2012 – 2013) of this Contract. Dolphins are observed heavily utilized area around Lung Kwu Chau and less frequently in the North Lantau region where the works area of this Contract is situated. The monitoring results in this reporting period are considered to be in line with the EIA predictions, and the review of monitoring data suggested that no unacceptable impacts was noted from the marine works under this Contract. It is essential to monitor the dolphin usage in North Lantau region for the rest of impact monitoring period to keep track on the trend of dolphin ranging pattern.

3.5 WASTE MANAGEMENT

In general, wastes generated from the construction activities including C&D materials (inert and non-inert), chemical wastes and recyclable materials. The summary of waste generation amount is presented in *Table 2.29*.

Waste monitoring and audit programme has been undertaken during this reporting period. Wastes arising from this Project have been managed in

accordance with the recommendations in the EIA Report, the EM&A Manual, the Waste Management Plan and other relevant statutory requirements.

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

3.6 SUMMARY OF MONITORING METHODOLOGY AND EFFECTIVENESS

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

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

3.7 SUMMARY OF MITIGATION MEASURES

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

4 FUTURE KEY ISSUES

4.1 KEY ISSUES FOR THE COMING PERIOD

Potential environmental impacts arising from the upcoming construction activities are mainly associated with air quality, noise, marine water quality, marine ecology and waste management issues.

5 CONCLUSION AND RECOMMENDATIONS

This Third Annual EM&A Report presents findings of the EM&A activities undertaken during the period from 1 November 2015 to 31 October 2016, in accordance with the Updated EM&A Manual and the requirements of the Environmental Permits (*EP-354/2009/D* and *EP-353/2009/I*).

Neither Action Level nor Limit Level exceedances were observed for air quality, noise and water quality monitoring in this reporting period.

A total of 45 groups of 168 Chinese White Dolphins (CWDs) were sighted. Two (2) Action Level exceedance and three (3) Limit Level exceedances for both NEL and NWL regions were recorded for 4 sets of quarterly dolphin monitoring data between November 2015 and October 2016, whilst no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from the general observations. It is essential to continue monitoring the dolphin usage in North Lantau region for the rest of the impact phase monitoring period.

Environmental site inspection was carried out fifty-two (52) times in the reporting period. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site audits.

There was one (1) complaint received from EPD on 22 September 2016 regarding effluent discharge from flat top barge in the reporting period. Upon investigation, there was no adequate evidence to conclude that the complaint case was related to this Project.. No summons/ prosecution were received during the reporting period.

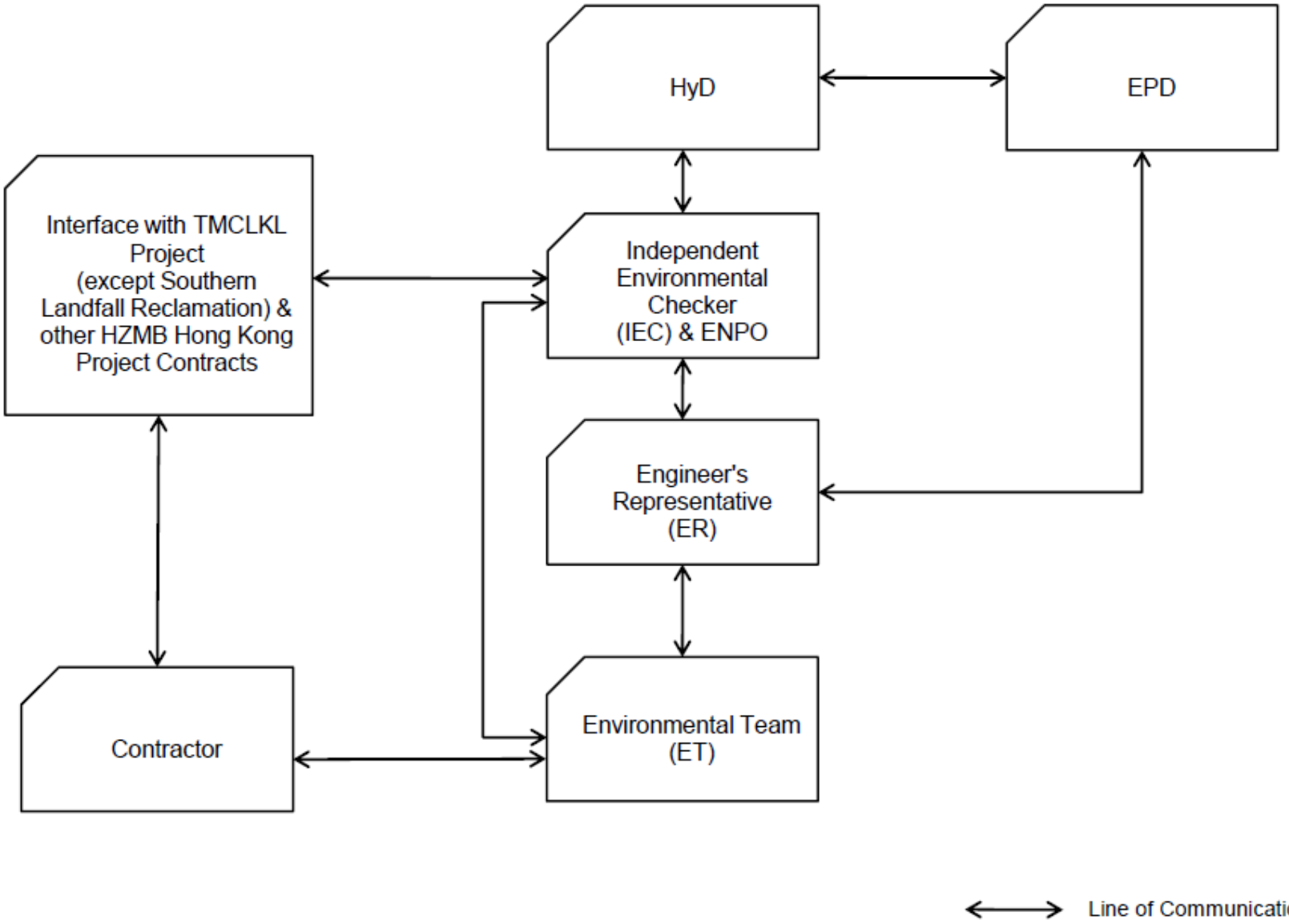
The review of monitoring data suggested that the construction works under this Contract have proceeded in an environmentally acceptable manner in this reporting period. In general, the monitoring results were in line with EIA predictions.

The monitoring programme has been reviewed and was considered as adequate to cater for the nature of works in progress. Change to the monitoring programme was thus not recommended at this stage. The

monitoring programme will be evaluated as appropriate in the next reporting period. The ET will keep track on the construction works to confirm compliance of environmental requirements and the proper implementation of all necessary mitigation measures.

Appendix A

Project Organization for Environmental Works



Appendix A1

Contract No. HY/2012/07 Southern Connection Viaduct Section
Project Organization

DATE: 06/03/2013

Environmental Resources Management

ERM

Appendix B

Environmental Mitigation and Enhancement Measure Implementation Schedules

(Adopted from: CINOTECH (2011) Agreement No. CE35/2011 EP Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao BridgeTuen Mun-Chep Lap Kok Link – Investigation. UpdatedEM&A Manual for Tuen Mun-Chek Lap Kok Link)

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
AIR QUALITY									
4.8.1	3.8	An effective watering programme of eight daily watering with complete coverage, is estimated to reduce by 50%. This is recommended for all areas in order to reduce dust levels to a minimum;	All areas / throughout construction period	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		<>
4.8.1	3.8	The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	The Contractor shall not burn debris or other materials on the works areas.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8. 1	3.8	In hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet.	All unpaved haul roads / throughout construction period in hot, dry or windy weather	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		<>
4.8.1	3.8	Where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8. 1	3.8	Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>
4.8.1	3.8	During transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
4.8.1	3.8	Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>
4.8.1	3.8	No earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to any earthworks excavation activity on the site.	All site exits / throughout construction period	Contractor	TMEIA Avoid dust		Y		<>
4.8.1	3.8	Areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is practicable.	All exposed surfaces / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	All stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>
4.11	Section 3	EM&A in the form of 1 hour and 24 hour dust monitoring and site audit	All representative existing ASRs / throughout construction period	Contractor	EM&A Manual		Y		✓
NOISE									
5.11	Section 4	Noise monitoring	All existing representative sensitive receivers / during North Lantau Viaduct construction	Contractor	EM&A Manual		Y		✓
WATER QUALITY									
General Marine Works									
6.10	-	Bored piling to be undertaken within a metal casing.	Marine viaducts of TM-CLKL and HKLR/ bored piling	Contractor	TM-EIAO		Y		✓
6.10	-	Barges and hopper dredgers shall have tight fitting seals to their bottom openings to prevent leakage of material.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
6.10	-	Any pipe leakages shall be repaired quickly. Plant should not be operated with leaking pipes.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<>
6.10	-	Loading of barges and hoppers shall be controlled to prevent splashing of dredged material to the surrounding water. Barges or hoppers shall not be filled to a level which will cause overflow of materials or pollution of water during loading or transportation.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.10	-	Excess material shall be cleaned from the decks and exposed fittings of barges and hopper dredgers before the vessel is moved	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<>
6.10	-	Adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action;	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.10	-	All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.10	-	The works shall not cause foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the works site.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<>
Temporary Staging work									
	5.2	Regular inspection for the accumulation of floating refuse and collection of floating refuse if required	During temporary staging works	Contractor			Y		✓
	5.2	Provision of temporary drainage system on the temporary staging for collection of construction site runoff to allow appropriate treatment before discharge into the sea	During temporary staging works	Contractor			Y		<>
	5.2	Wastewater generated from construction works such as bored / drilling water will be collected, treated, neutralized and de-silted through silt trap or sedimentation tank before disposal	During temporary staging works	Contractor			Y		✓
	5.2	One additional water quality monitoring station is	During temporary	Contractor			Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
		proposed at station SR4a In case elevated SS or turbidity is identified during the water quality monitoring, the source of pollution will be tracked down and be removed as soon as possible. In case depletion of dissolved oxygen is identified, artificial aeration will be arranged at the monitoring station SR4a,	staging works						
Land Works									
6.10	-	Wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Sewage effluent and discharges from on- site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the WPCO or collected for disposal offsite. The use of soaks away shall be avoided.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Storm drainage shall be directed to storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct storm water to such silt removal facilities. Catch pits and perimeter channels should be constructed in advance of site formation works and earthworks.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Silt removal facilities, channels and manholes shall be maintained and any deposited silt and grit shall be removed regularly, including specifically at the onset of and after each rainstorm.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
6.10	-	Open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	5.8	Manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	All vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Vehicle and plant servicing areas, vehicle wash bays and lubrication facilities shall be located under roofed areas. The drainage in these covered areas shall be connected to foul sewers via a petrol interceptor in accordance with the requirements of the WPCO or collected for offsite disposal.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	The Contractor shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance.	All areas/ throughout construction period	Contractor	TM-EIAO Waste Disposal Ordinance		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
6.10	-	All fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. The storage areas should be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Roadside gullies to trap silt and grit shall be provided prior to discharging the stormwater into the marine environment. The sumps will be maintained and cleaned at regular intervals.	Roadside/design and operation	Design Consultant/ Contractor	TM-EIAO	Y		Y	**n/a**
6.10	Section 5	All construction works shall be subject to routine audit to ensure implementation of all EIA recommendations and good working practice.	All areas/ throughout construction period	Contractor	EM&A Manual		Y		✓
Water Quality Monitoring									
6.10	Section 5	Water quality monitoring shall be undertaken for suspended solids, turbidity, and dissolved oxygen. Nutrients and metal parameters shall also be measured for Mf sediment operations (only HKBCF and HKLR required handling of Mf sediment) during baseline, backfilling and post construction period. One year operation phase water quality monitoring at designated stations	Designated monitoring stations as defined in EM&A Manual, Section 5/ Before, through-out marine construction period, post construction and monthly operational phase water quality monitoring for a year.	Contractor	EM&A Manual		Y	Y	✓
ECOLOGY									
8.14	6.3	Specification for and implement pre, during and post construction dolphin abundance monitoring.	All Areas/Detailed Design/ during construction works/post construction	Design Consultant/ Contractor	TMEIA	Y	Y	Y	✓
8.14	6.3	Specification for bored piling monitoring	Detailed Design	Design Consultant	TMEIA	Y			✓
8.14	6.3	Implement any recommendations of the bored piling monitoring	Southern marine viaduct/Throughout	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
			construction during bored piling						
8.14	6.3,6.5	Avoidance of peak CWD calving season in May and June for driving of metal caissons during bored piling works	Southern marine viaduct/ May and June during bored piling	Contractor	TMEIA		Y		✓
8.14	6.3,6.5	Specification and implementation of 250m dolphin exclusion zone.	All marine bored piling and temporary staging works areas/Detailed Design/during all marine bored piling and temporary staging works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.3, 6.5	Specification and deployment of an artificial reef of an area of 3,600m² in an area where fishing activities are prohibited.	Area of prohibited fishing activities/Detailed Design/towards end of construction period	TM-CLKL/ HKBCF Design Consultant/ TM-CLKL/ HKBCF Contractor	TMEIA	Y		Y	AFCD
8.14	6.3, 6.5	Specification and implementation of marine vessel control specifications	All areas/Detailed Design/during construction works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.14	6.3, 6.5	Design and implementation of acoustic decoupling methods for marine bored piling and the whole lifespan of temporary staging works.	All areas/ Detailed Design/during marine bored piling and temporary staging works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Tai Ho Wan (donor site) and Yam Tsui Wan (receptor site) /Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.5	Audit coral translocation success	Yam Tsui Wan (receptor site)/Post translocation	Contractor	TMEIA		Y		✓
7.13	6.5	Undertaken gabion wall works in Stream NL1 in the dry season	North Lantau slope works/dry	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
			season/construction phase						
7.13	6.5	The loss of habitat shall be supplemented by enhancement planting in accordance with the landscape mitigation schedule.	All areas / As soon as accessible	Contractor	TMEIA		Y		AFCD/LCSD
7.13	6.5	Spoil heaps shall be covered at all times.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Avoid damage and disturbance to the remaining and surrounding natural habitat	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		<>
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Construction activities should be restricted to the proposed works boundary	All areas / Throughout construction period	Contractor	TMEIA		Y		<>
LANDSCAPE AND VISUAL									
10.9	7.6	Round angle, patterned finishes, and oval shaped pier were considered in the viaduct design, and further details will be developed under ACABAS submission (DM3)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Details of the street furniture will be developed in the detailed design stage (DM4)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Aesthetic design of the viaduct, retaining wall and other structures will be developed under ACABAS submission (DM5)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Existing trees on boundary of the Project Area shall be carefully protected during construction. Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas. (Tree	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
		protection measures will be detailed at Tree Removal Application stage) (CM1)							
10.9	7.6	Trees unavoidably affected by the works shall be transplanted where practical. Trees will be transplanted straight to their final receptor site and not held in a temporary nursery. A detailed Tree Transplanting Specification shall be provided in the Contract Specification. Sufficient time for necessary tree root and crown preparation periods shall be allowed in the project programme (CM2)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Hillside and roadside screen planting to proposed roads, associated structures and slope works (CM3).	All areas/detailed design/ during construction/post construction	Design Consultant/	TMEIA	Y	Y		✓
10.9	7.6	Hydroseeding or sheeting of soil stockpiles with visually unobtrusive material (in earth tone) (CM4)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		<>
10.9	7.6	Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Control night-time lighting and glare by hooding all lights (CM6)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Ensure no run-off into water body adjacent to the Project Area (CM7)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (CM8)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Recycle/Reuse all felled trees and vegetation, e.g. mulching (CM9)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
10.9	7.6	Compensatory tree planting shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Felling Application process under ETWBTC 3/2006 (CM10).	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Re-vegetation of affected woodland/shrubland with native species (OM1)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	AFCD/HyD/ L CSD
10.9	7.6	Tall buffer screen tree / shrub / climber planting should be incorporated to soften hard engineering structures and facilities (OM2)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD/LCSD
10.9	7.6	Streetscape elements (e.g. paving, signage, street furniture, lighting etc.) shall be sensitively designed in a manner that responds to the local context, and minimises potential negative landscape and visual impacts. Lighting units should be directional and minimise unnecessary light spill (OM3)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD/LCSD
10.9	7.6	Structure, ornamental tree / shrub / climber planting should be provided along roadside amenity strips, central dividers and newly formed slopes to enhance the townscape quality and further greenery enhancement (OM4)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD/LCSD
10.9	7.6	Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD
WASTE									
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		✓
12.6		The Contractor shall prepare and implement a Waste	Contract mobilisation	Contractor	TMEIA, Works		Y		✓

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

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
12.6	8.1	Provisions to be made in contract documents to allow and promote the use of recycled aggregates where appropriate.	Detailed Design	Design Consultant	TMEIA	Y			✓
12.6	8.1	The Contractor shall be prohibited from disposing of C&D materials at any sensitive locations. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust/ surface run off.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork/plastic facing for construction works should be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should avoid over-ordering and wastage.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by	All areas / throughout construction period	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
		scrap steel mills. Different areas of the sites should be considered for segregation and storage activities.							
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows: - suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed; - Having a capacity of <450L unless the specifications have been approved by the EPD; and - Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations. Clearly labelled and used solely for the storage of chemical wastes; - Enclosed with at least 3 sides; - Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest; - Adequate ventilation; - Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and - Incompatible materials are adequately separated.	All areas / throughout construction period	Contractor	TMEIA		Y		<>
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
			construction period						
12.6	8.1	Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilizing them.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.	All areas / throughout construction period	Contractor	TMEIA		Y		<>
12.6	8.1	All waste containers shall be in a secure area on hard standing.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Office wastes can be reduced by recycling of paper if such volume is sufficiently large to warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminum cans, plastic bottles, etc. should be provided on-site.	Site Offices/ throughout construction period	Contractor	TMEIA		Y		✓
12.6	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through	All areas / throughout	Contractor	EM&A Manual		Y		<>

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
		the site audit programme shall be undertaken.	construction period						
CULTURAL HERITAGE									
11.8	Section 9	EM&A in the form of audit of the mitigation measures	All areas / throughout construction period	Highways Department	EIAO-TM		Y		n/a

Notes:

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

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

Remark:

✓ Compliance of Mitigation Measures

<> Compliance of Mitigation but need improvement

x Non-compliance of Mitigation Measures

▲ Non-compliance of Mitigation Measures but rectified by Contractor

Δ Deficiency of Mitigation Measures but rectified by Contractor

N/A Not Applicable in Reporting Period

Appendix C

Summary of Action and Limit Levels

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

Parameters	Action	Limit
24 Hour TSP Level in μg/m³	ASR9A/ASR8A = 178 ASR9C/ASR8/ASR9 = 178	260
1 Hour TSP Level in μg /m³	ASR9A/ASR8A = 394 ASR9C/ASR8/ASR9 = 393	500

Table C2 Action and Limit Levels for Construction Noise (0700-1900 hrs of normal weekdays)

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)

Table C3 Action and Limit Levels for Water Quality

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

Notes:

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

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

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

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

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

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

Table C4 Action and Limit Levels for Impact Dolphin Monitoring

	North Lantau Social Cluster	
	NEL	**NWL**
Action Level	STG < 70% of baseline & ANI < 70% of baseline	STG < 70% of baseline & ANI < 70% of baseline
Limit Level	[STG < 40% of baseline & ANI < 40% of baseline] and STG < 40% of baseline & ANI < 40% of baseline	

Notes:

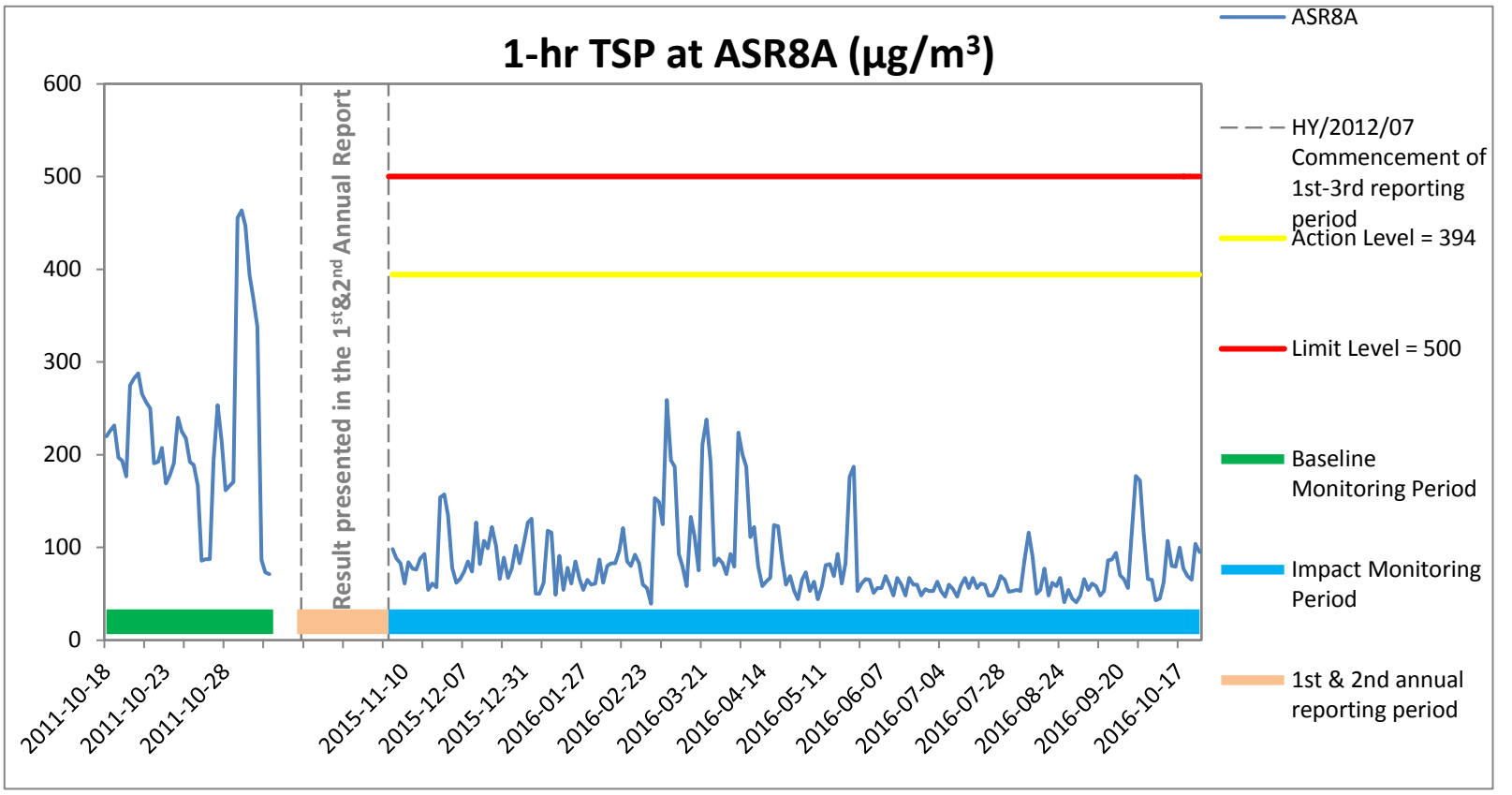
1. STG means quarterly encounter rate of number of dolphin sightings, which is **6.00 in NEL** and **9.85 in NWL** during the baseline monitoring period
2. ANI means quarterly encounter rate of total number of dolphins, which is **22.19 in NEL** and **44.66 in NWL** during the baseline monitoring period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

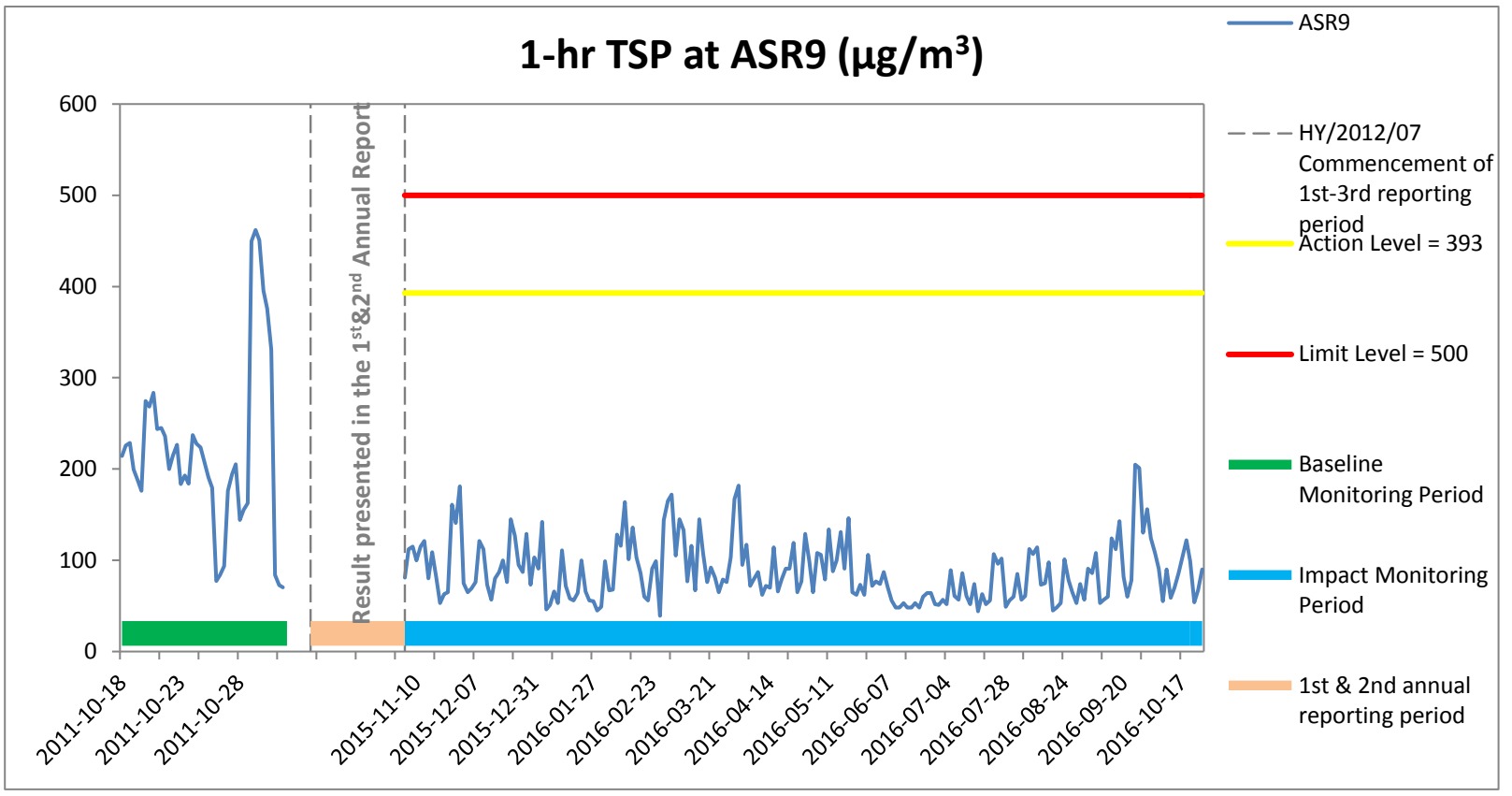
Table C5 Derived Value of Action Level (AL) and Limit Level (LL)

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

Appendix D

Impact Air Quality Monitoring Graphical Presentation

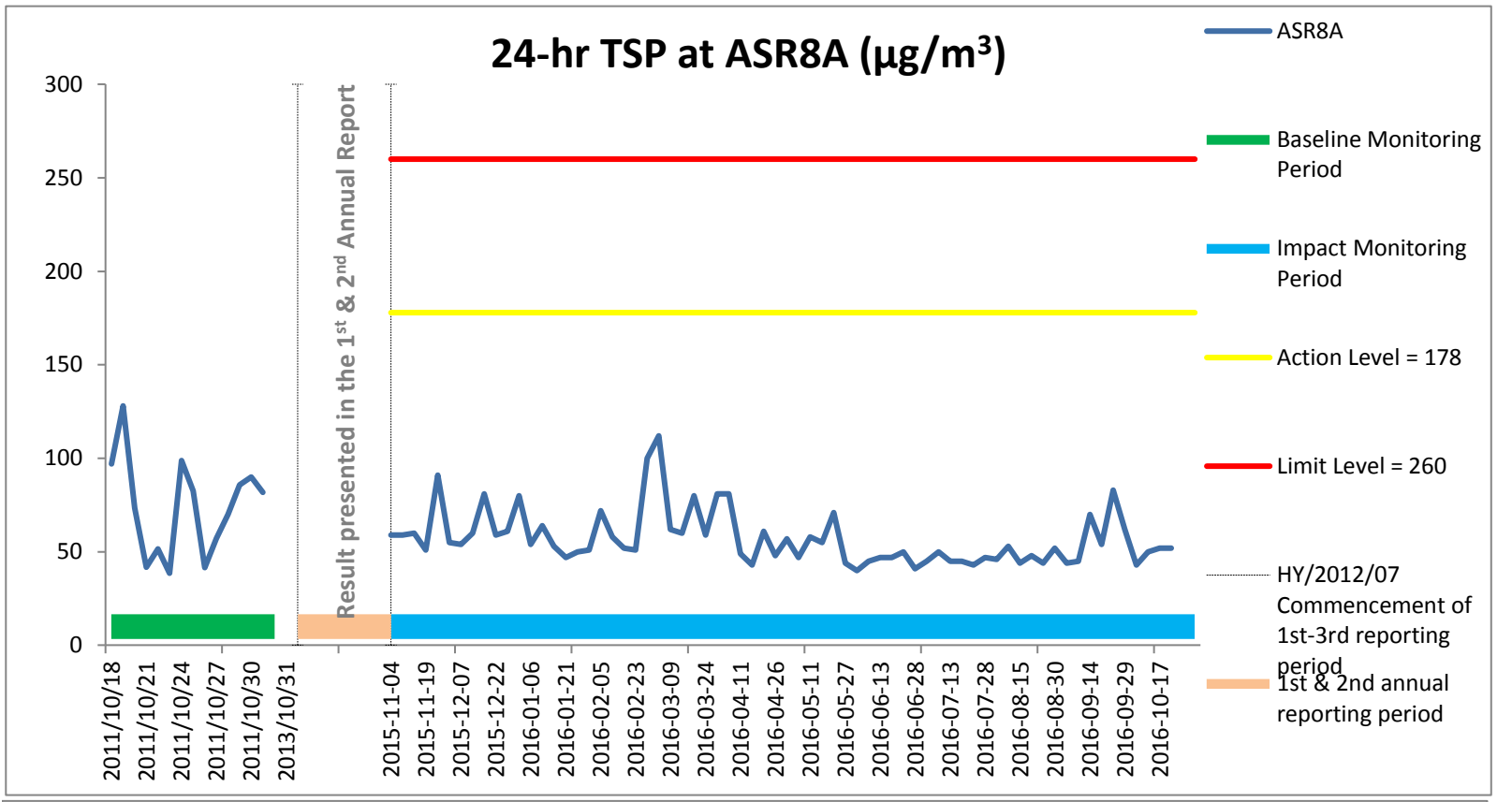


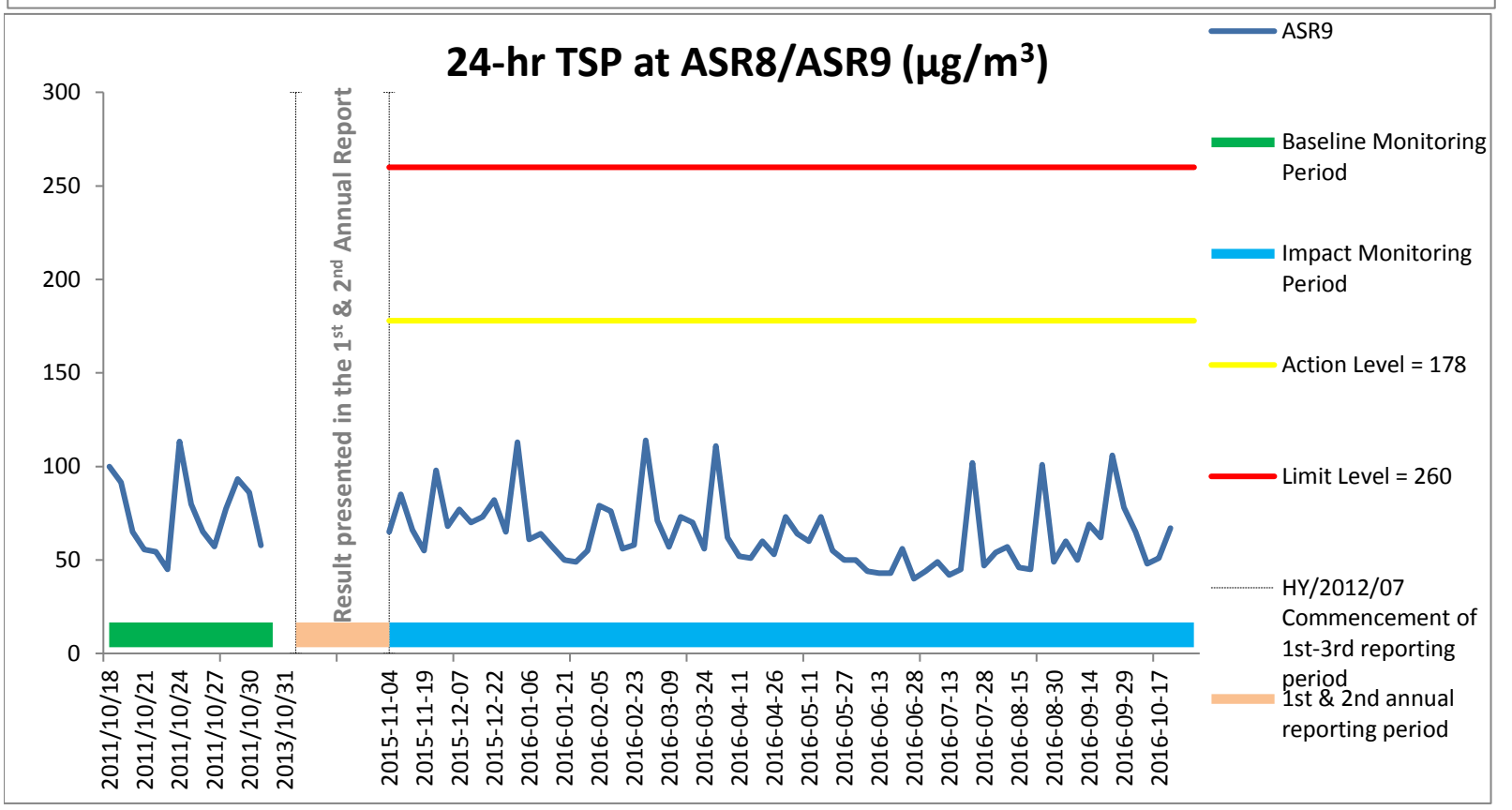


Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions.

Major construction works undertaken within the reporting period include Predrilling at Viaduct F; Construction and installation of pile caps; Pier construction; Re-alignment of Cheung Tung Road; Additional land GI, trial pits & lab testing; Relocation of MTRC fence; Construction of land section of berth at Southern Landfall; Road works along North Lantau Highway; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.

Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





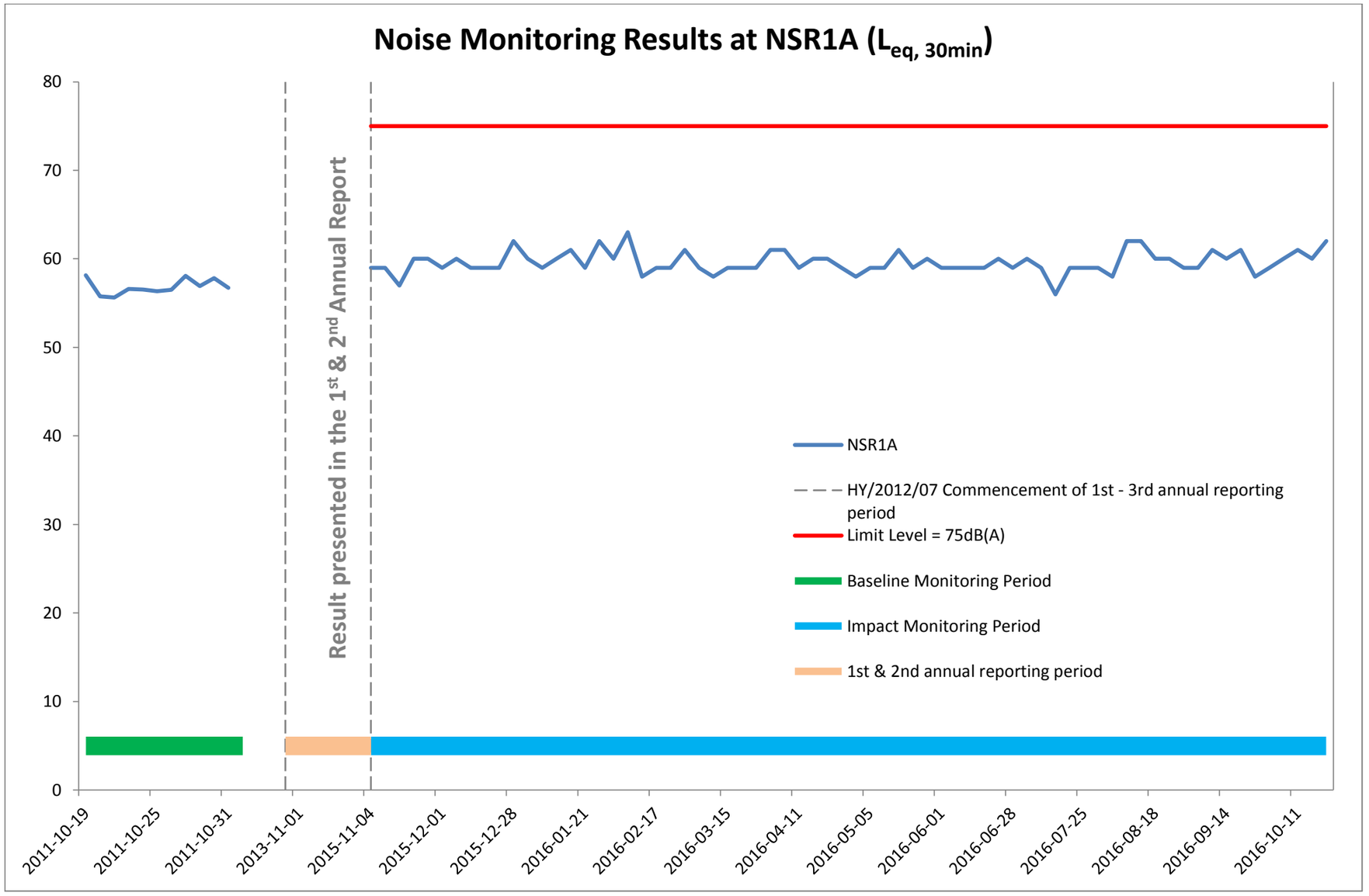
Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions.

Major construction works undertaken within the reporting period include Predrilling at Viaduct F; Construction and installation of pile caps; Pier construction; Re-alignment of Cheung Tung Road; Additional land GI, trial pits & lab testing; Relocation of MTRC fence; Construction of land section of berth at Southern Landfall; Road works along North Lantau Highway; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.

Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.

Appendix E

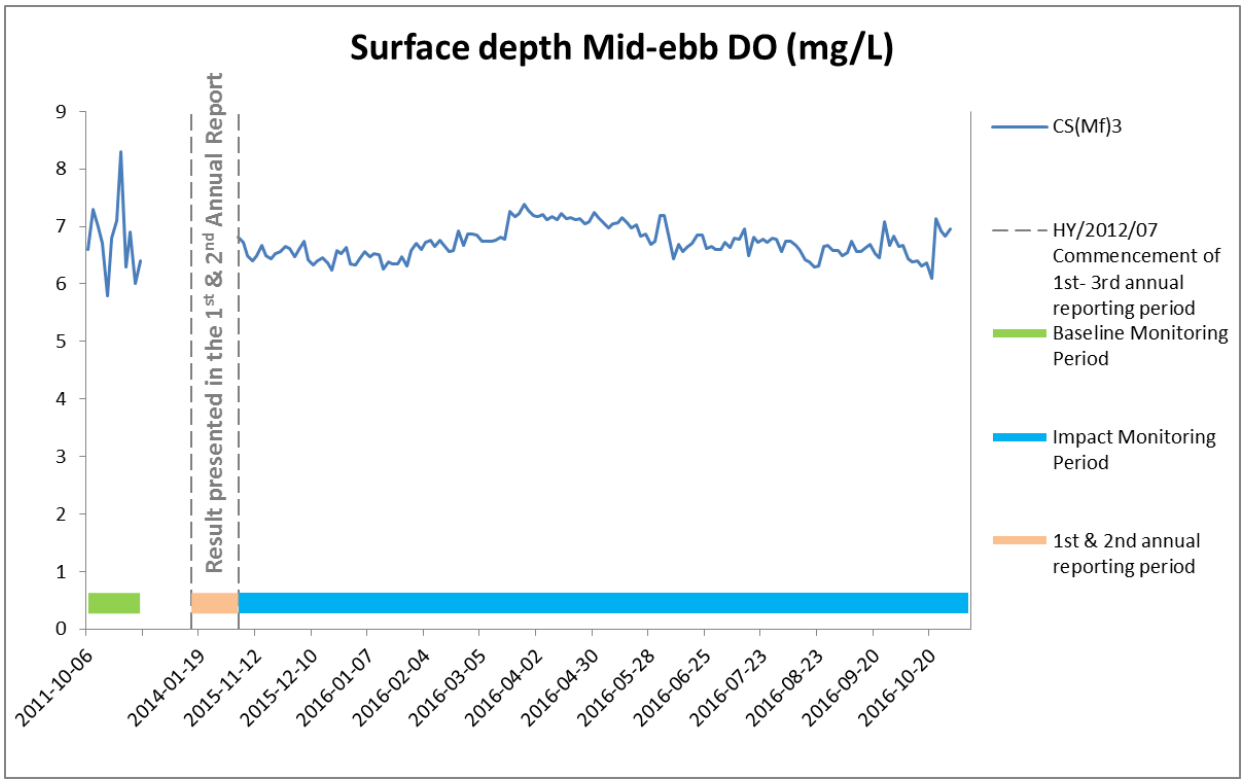
Impact Noise Monitoring Graphical Presentation



Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions.
Major construction works undertaken within the reporting period include Predrilling at Viaduct F; Construction and installation of pile caps; Pier construction; Re-alignment of Cheung Tung Road; Additional land GI, trial pits & lab testing; Relocation of MTRC fence; Construction of land section of berth at Southern Landfall; Road works along North Lantau Highway; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.
Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.
Baseline monitoring results are presented graphically in daily average.

Appendix F

Impact Water Quality Monitoring Graphical Presentation



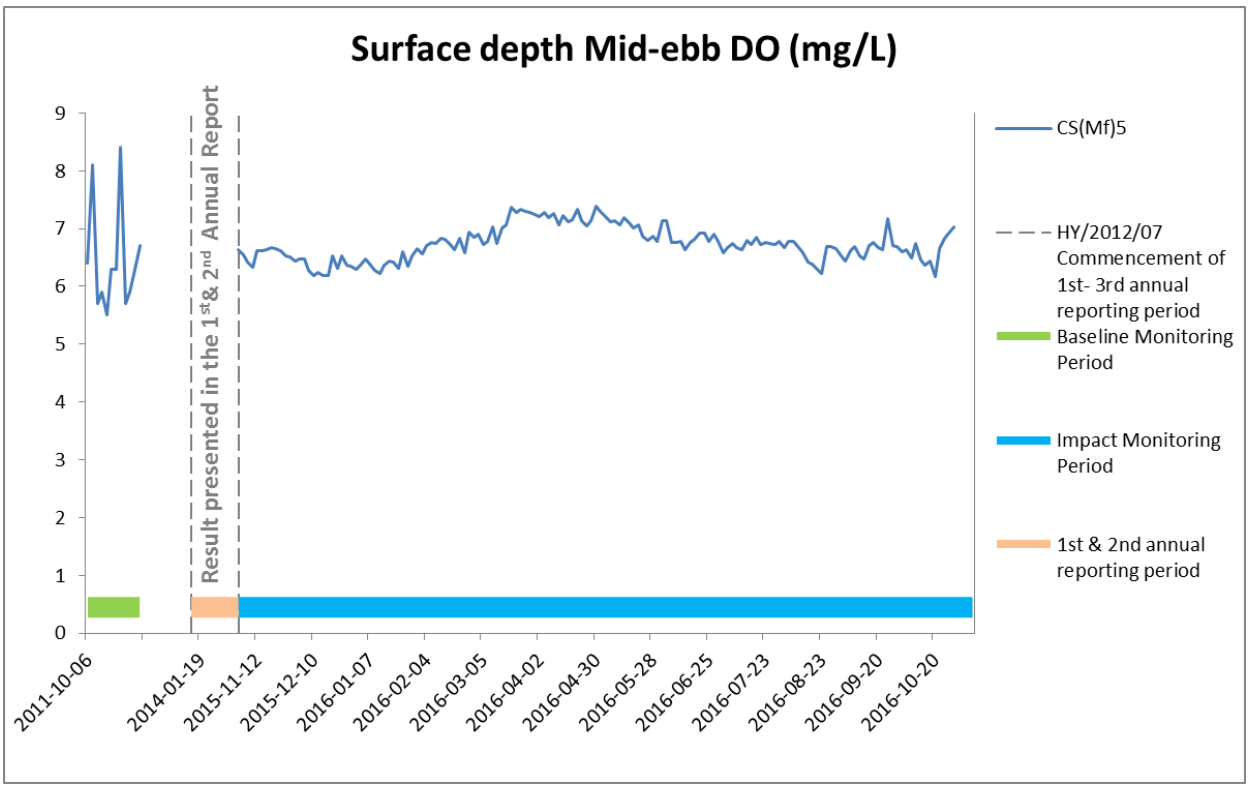
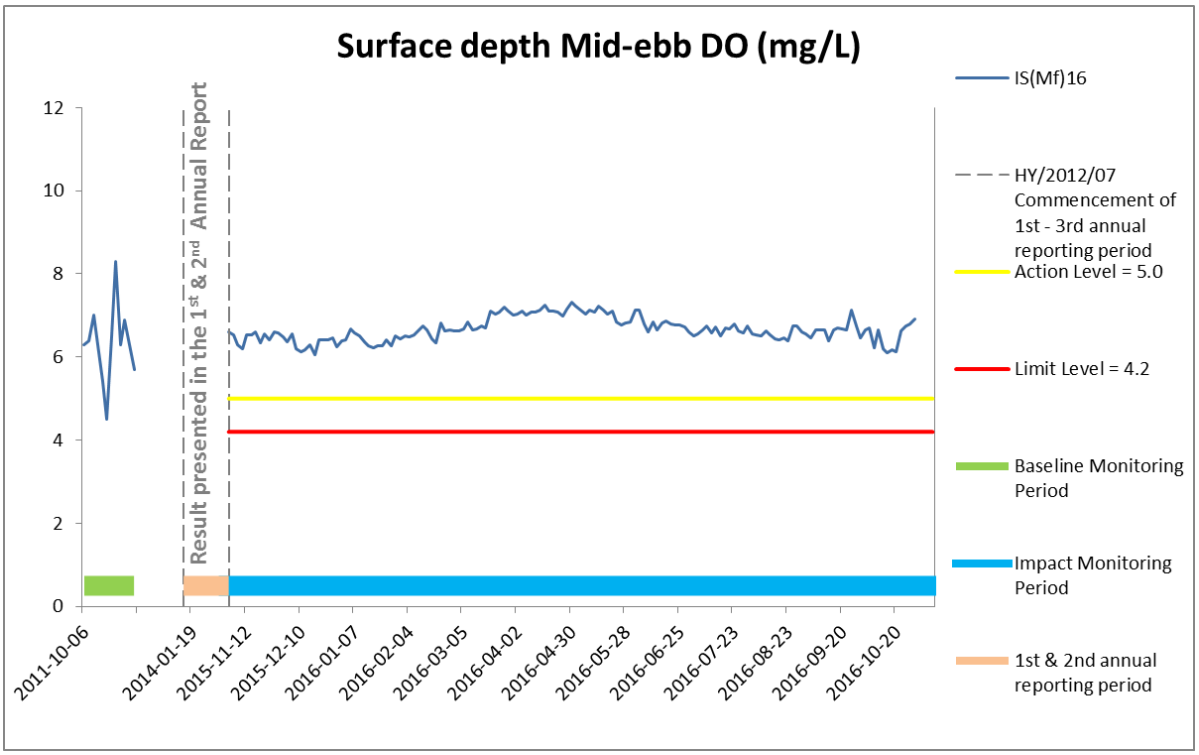


Figure F1 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM



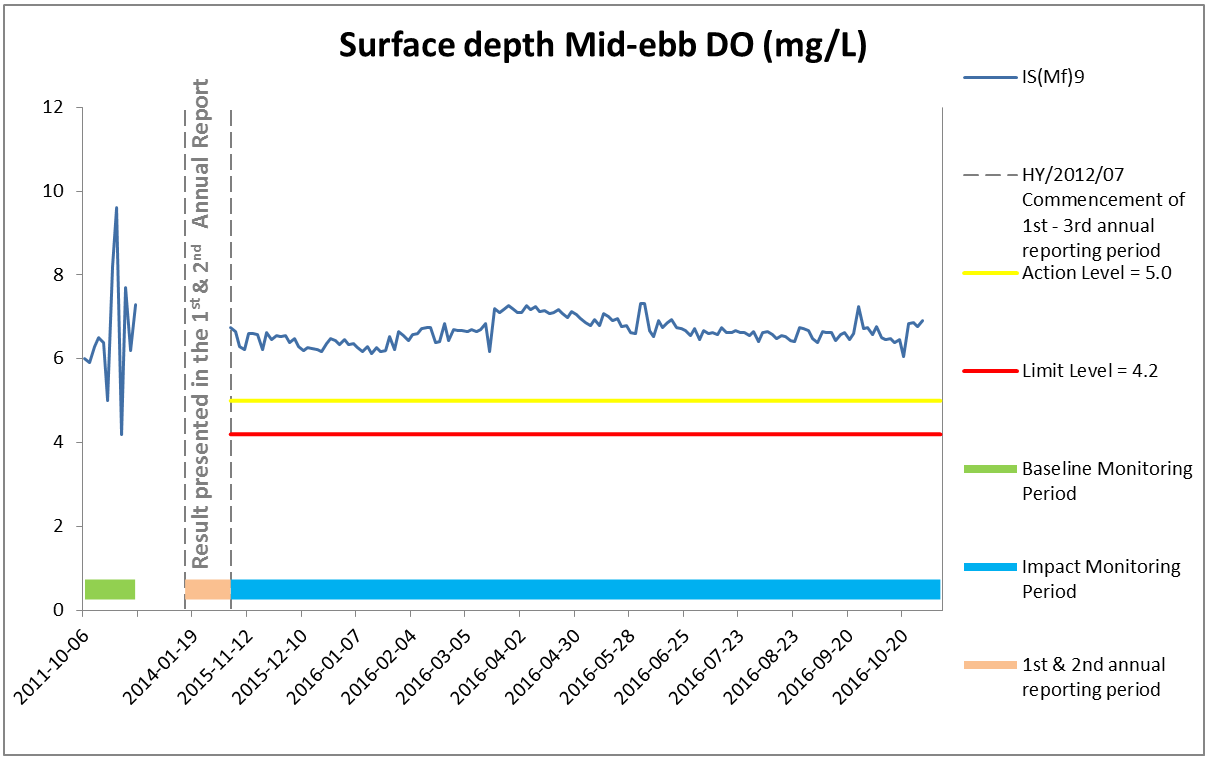
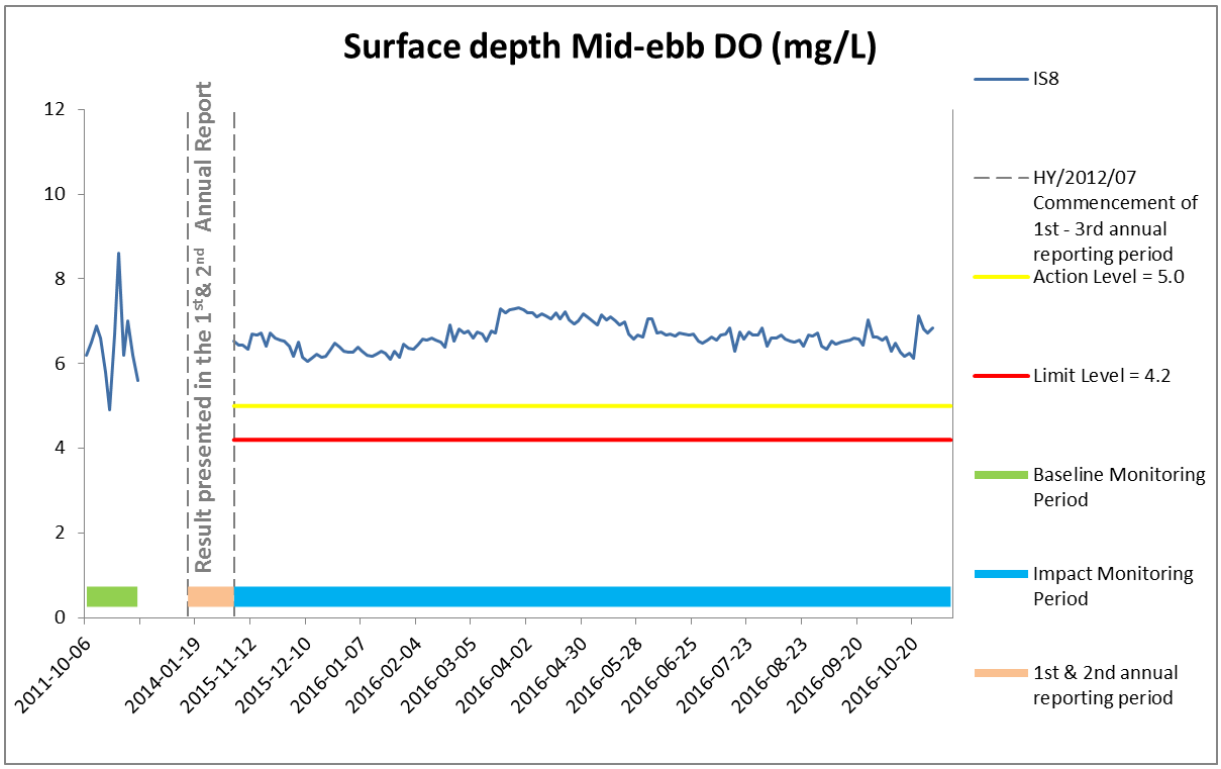


Figure F2 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM



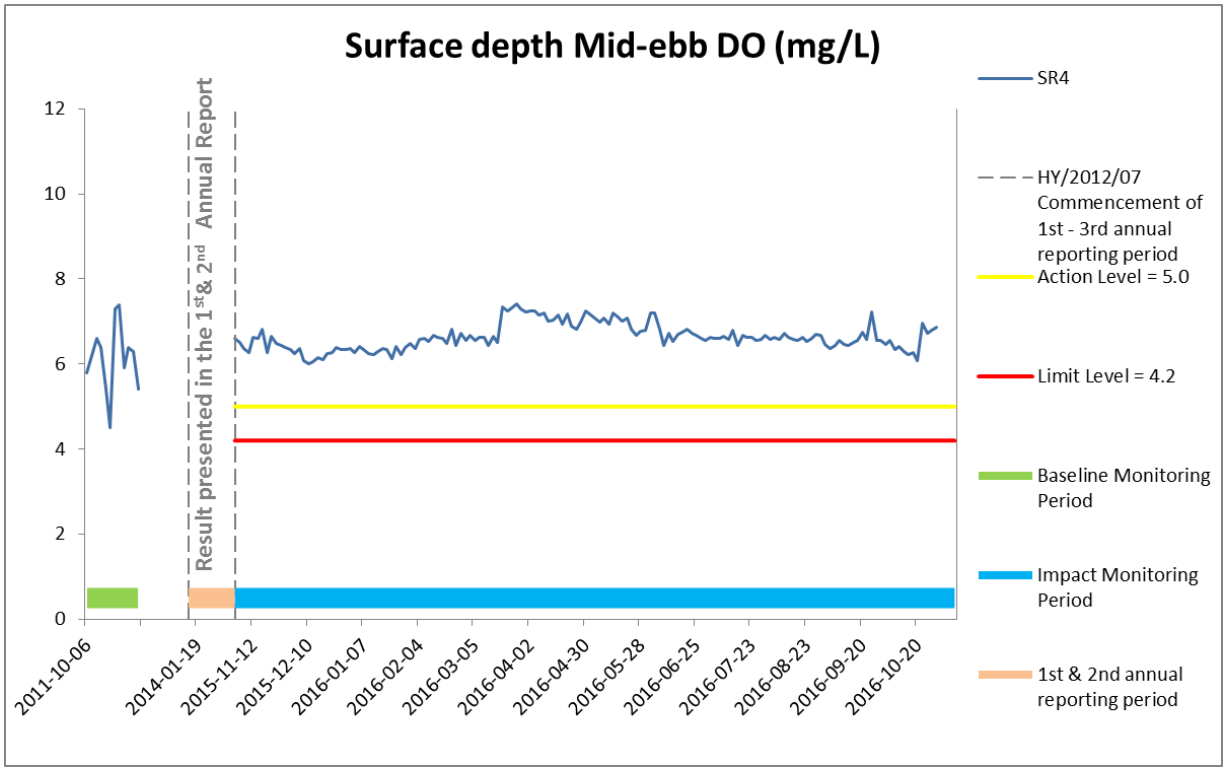


Figure F3 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

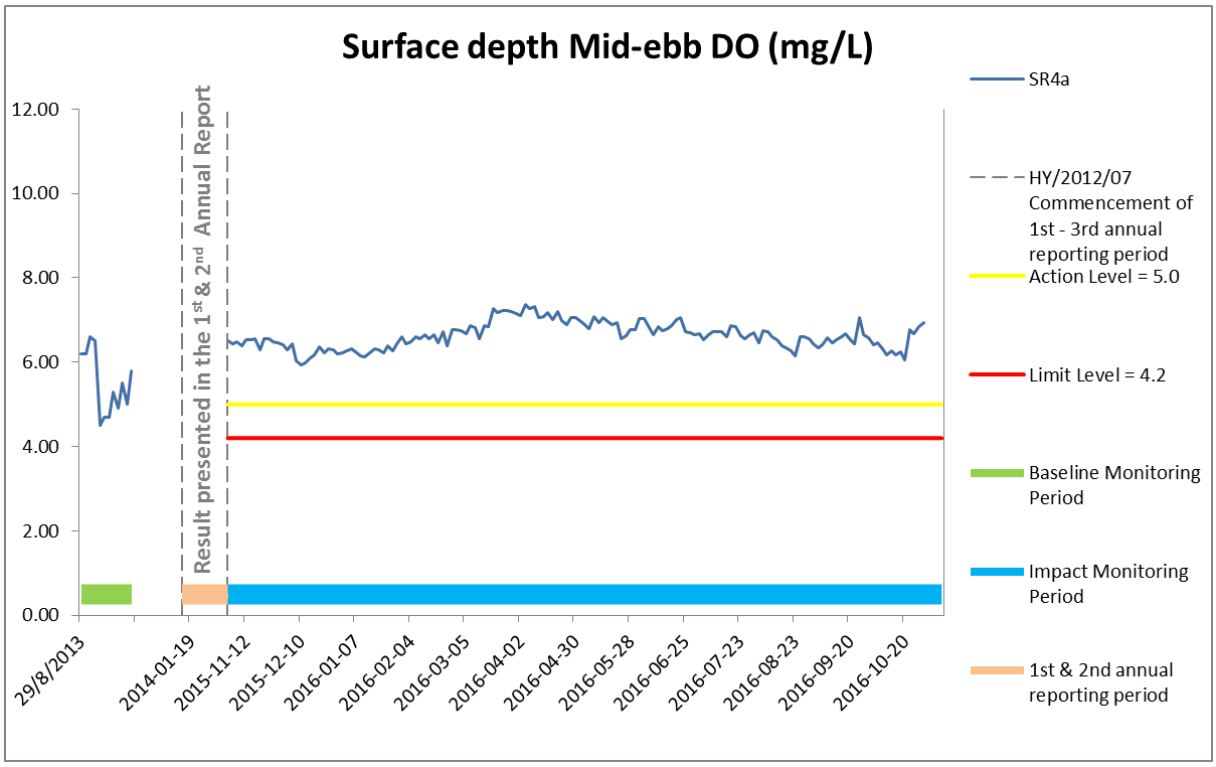
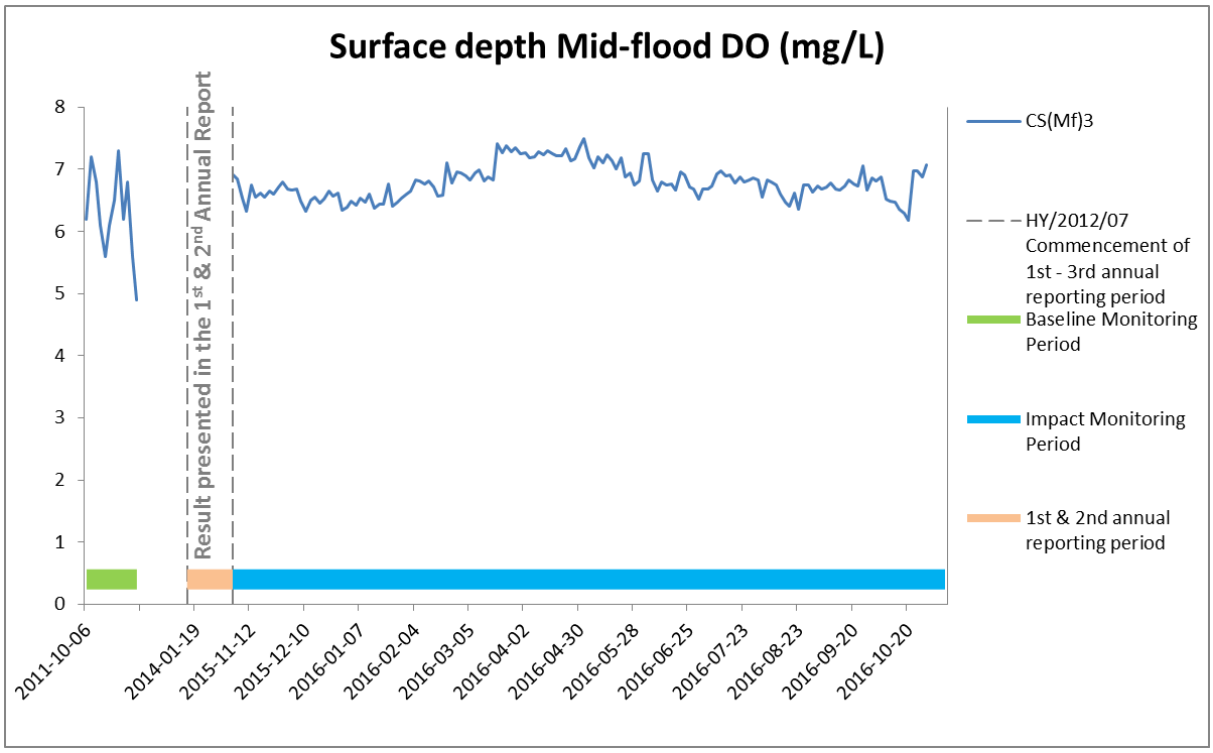


Figure F4 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM



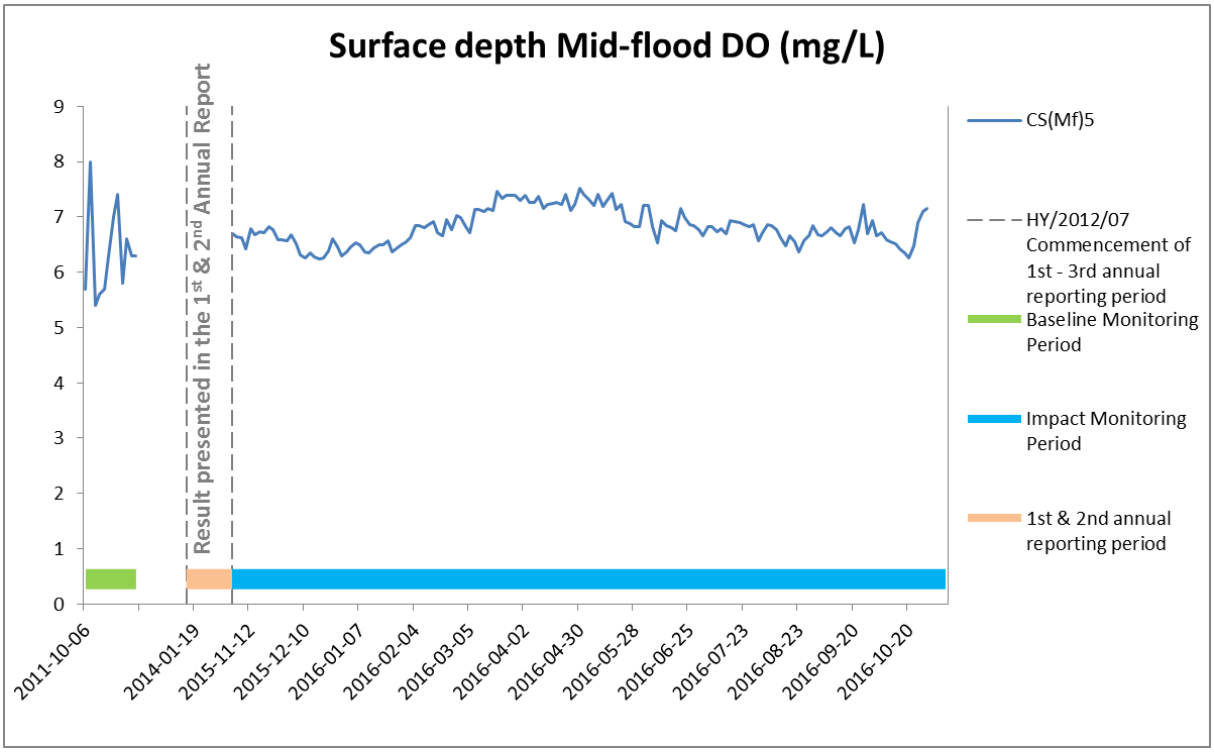
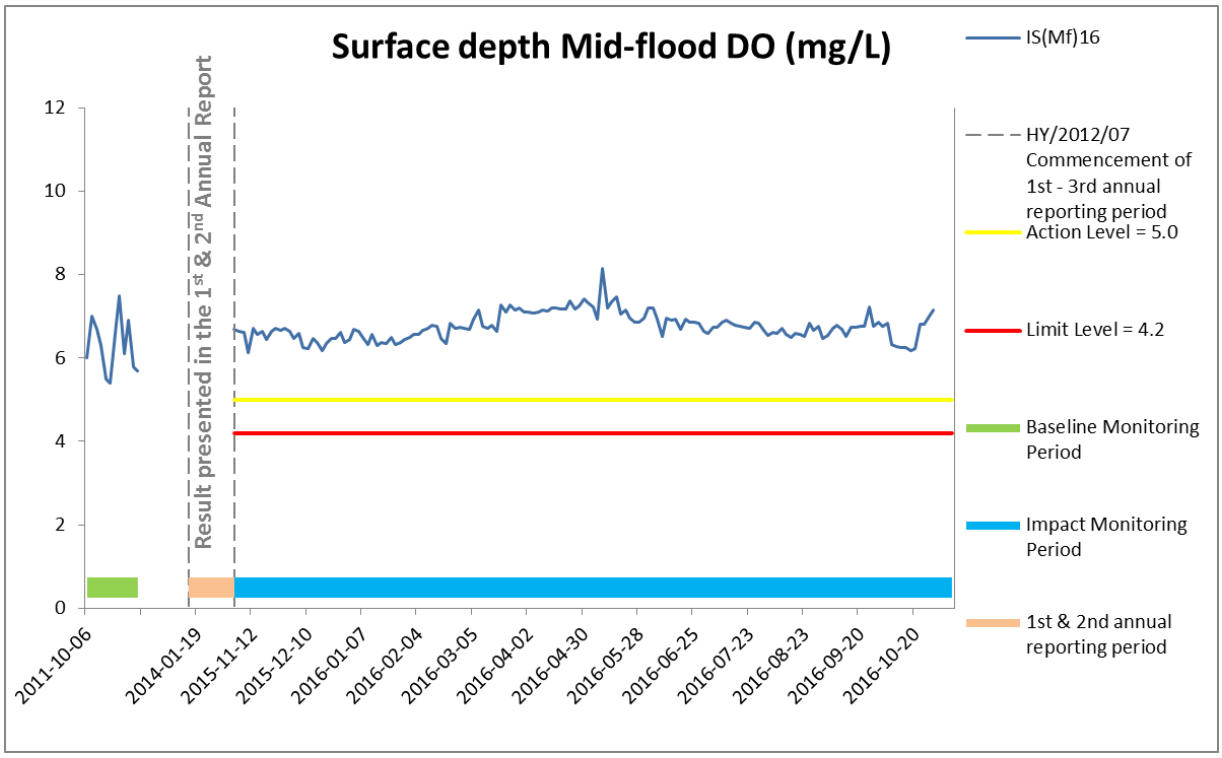


Figure F5 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



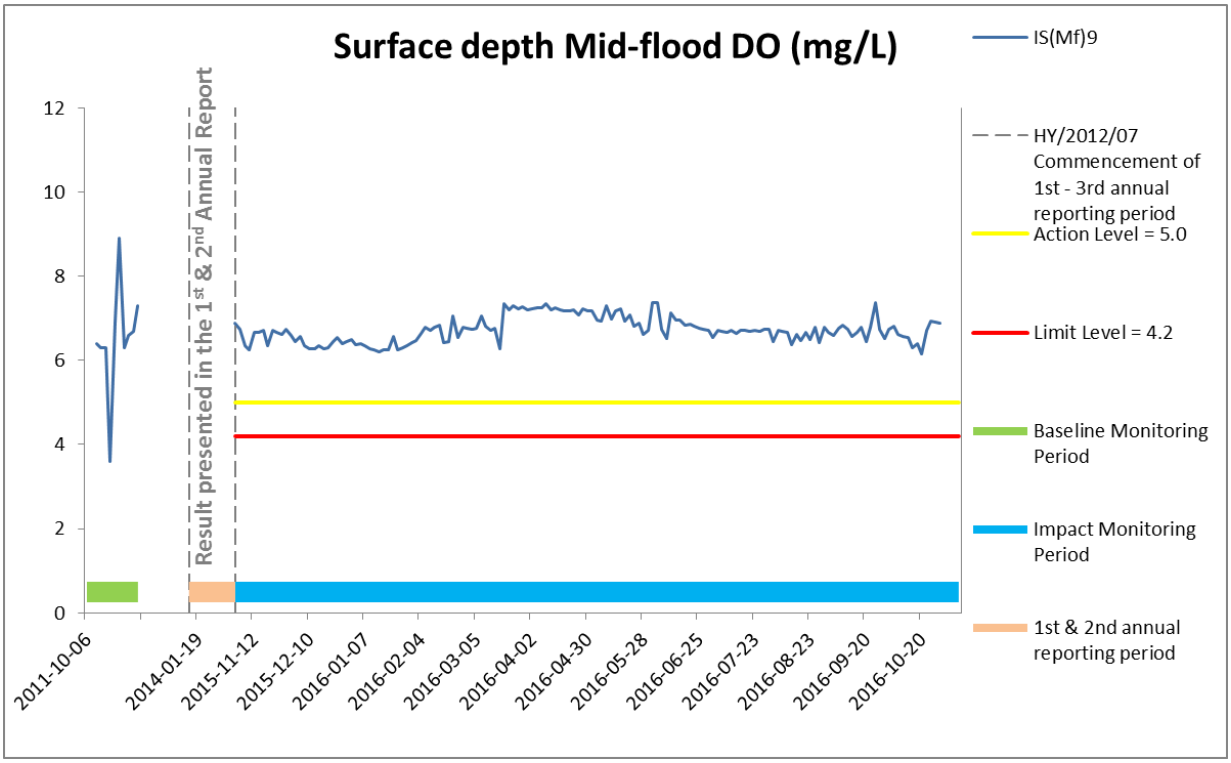
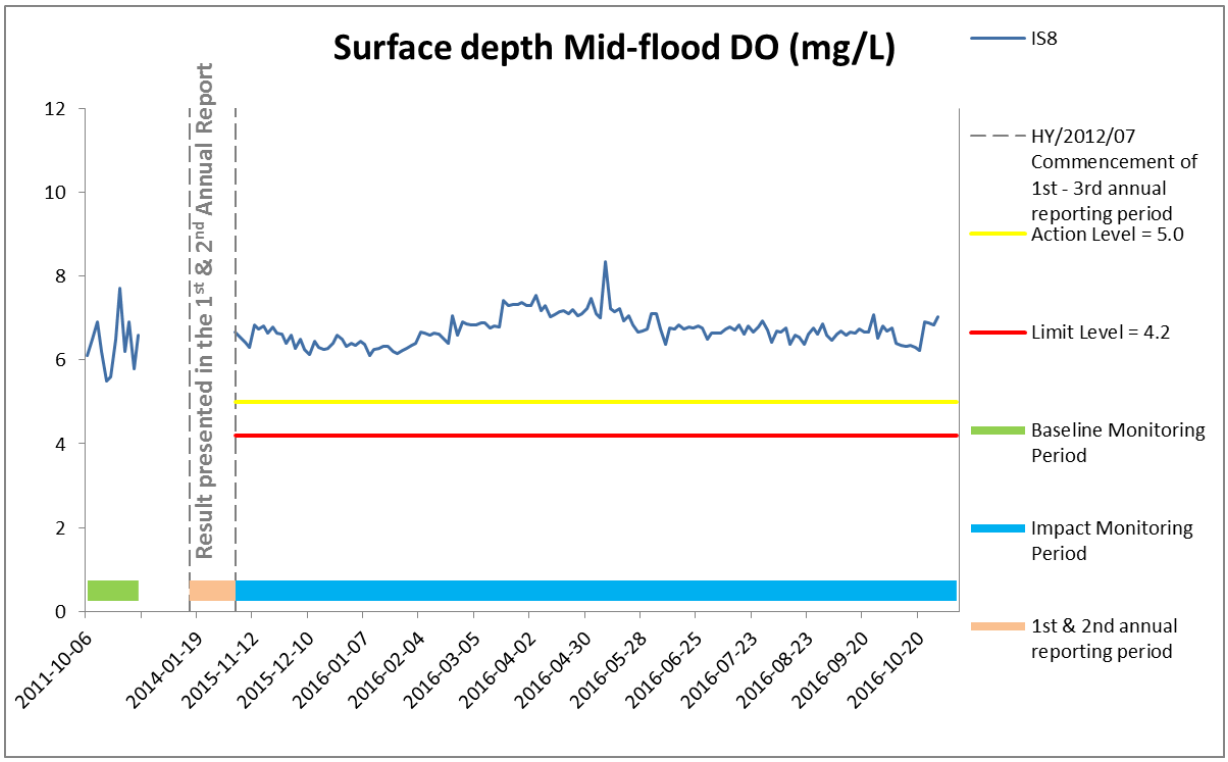


Figure F6 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



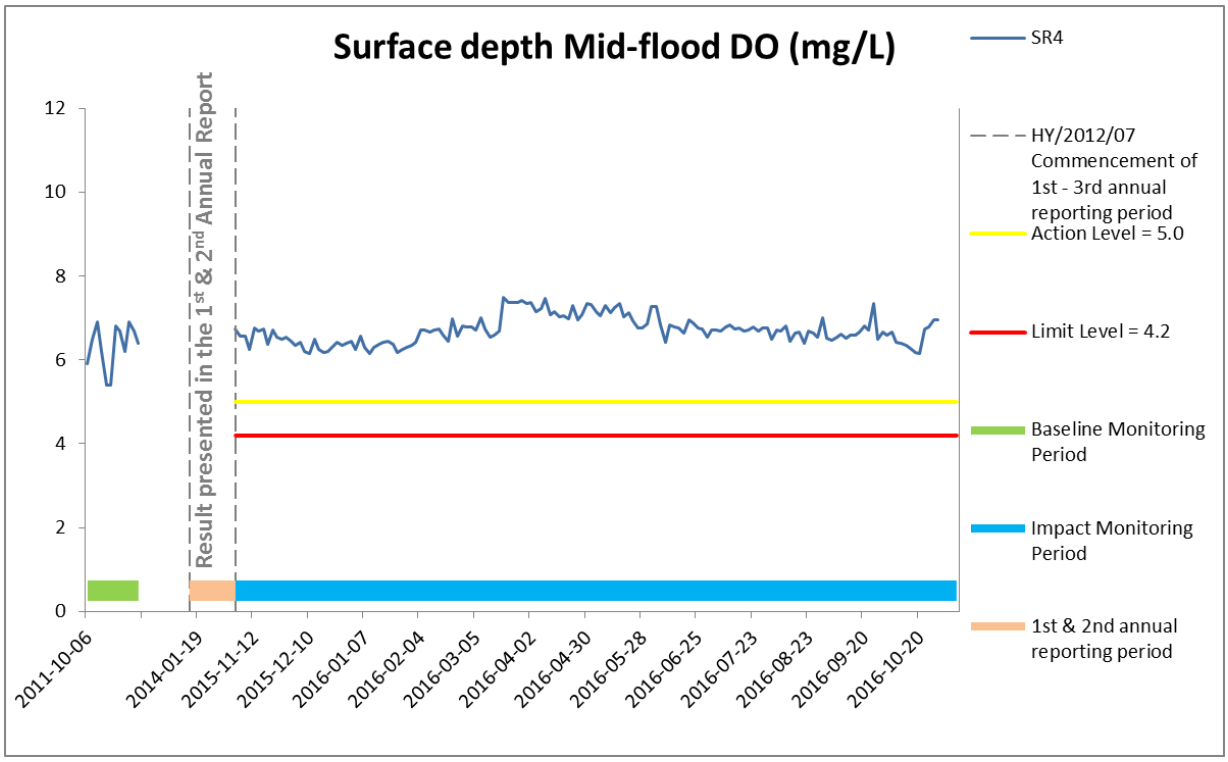


Figure F7 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

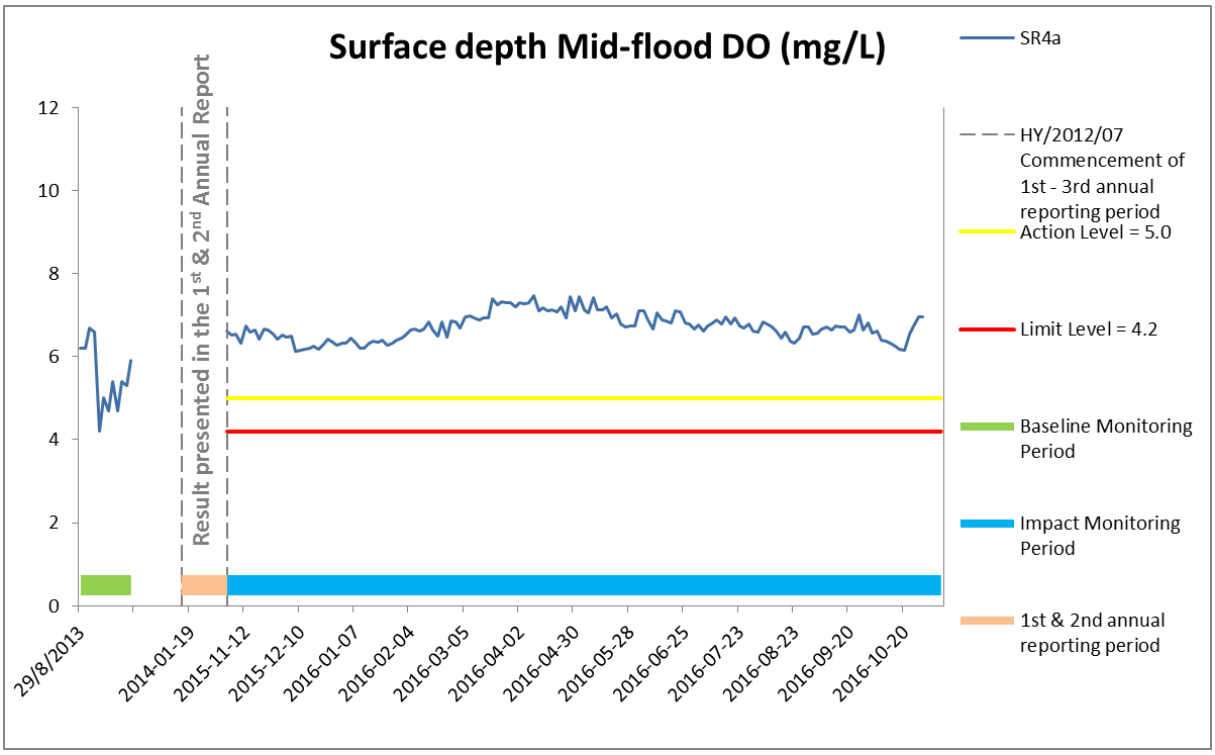
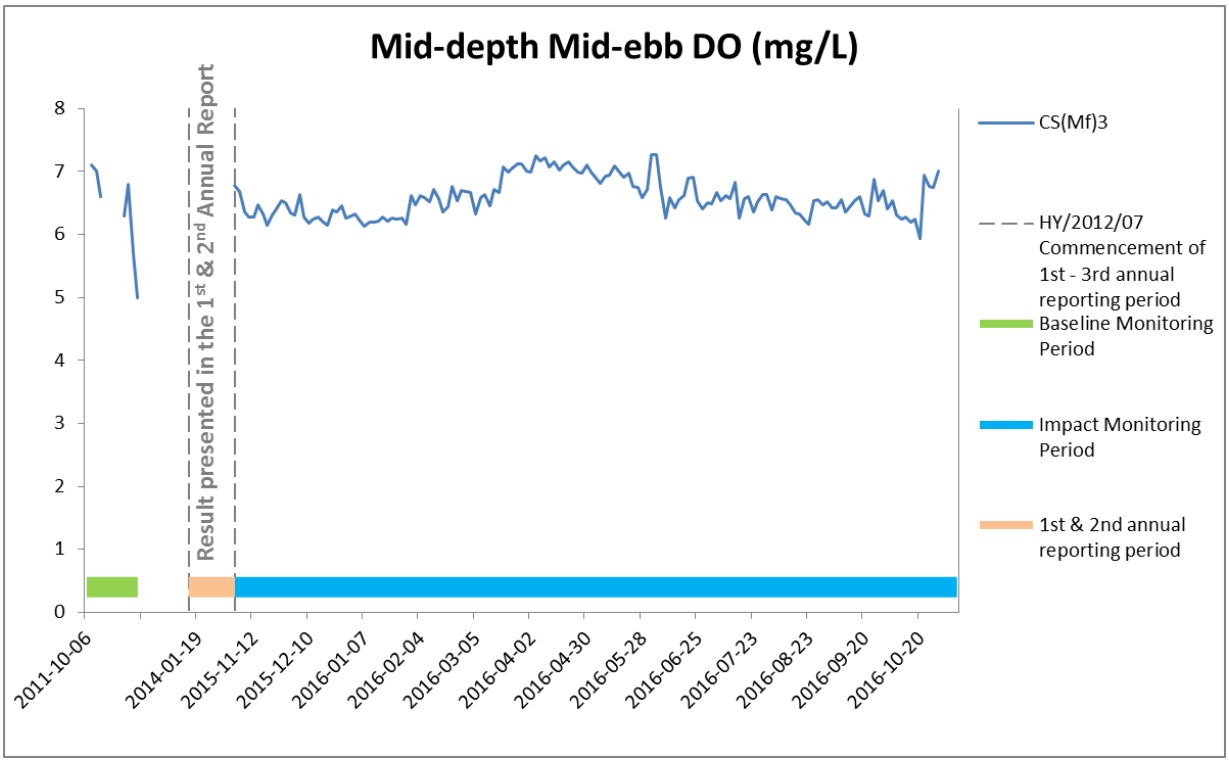


Figure F8 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



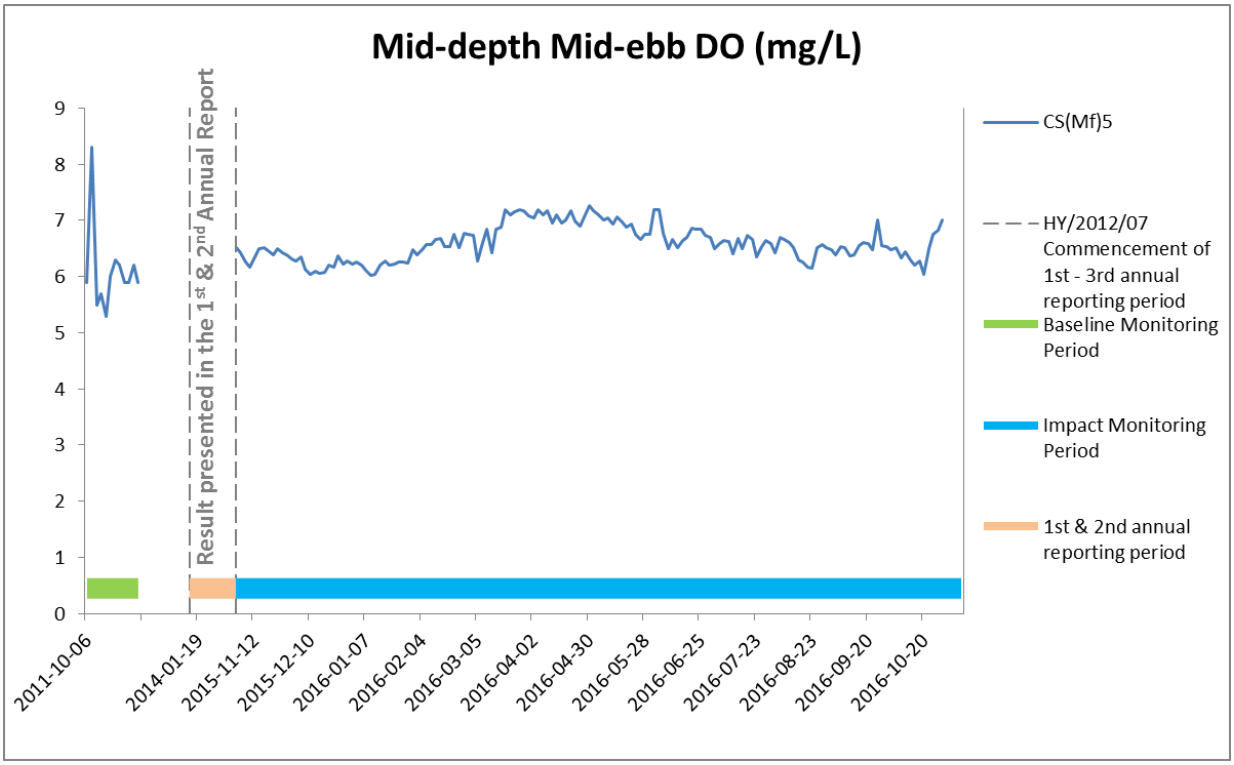


Figure F9 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and IS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

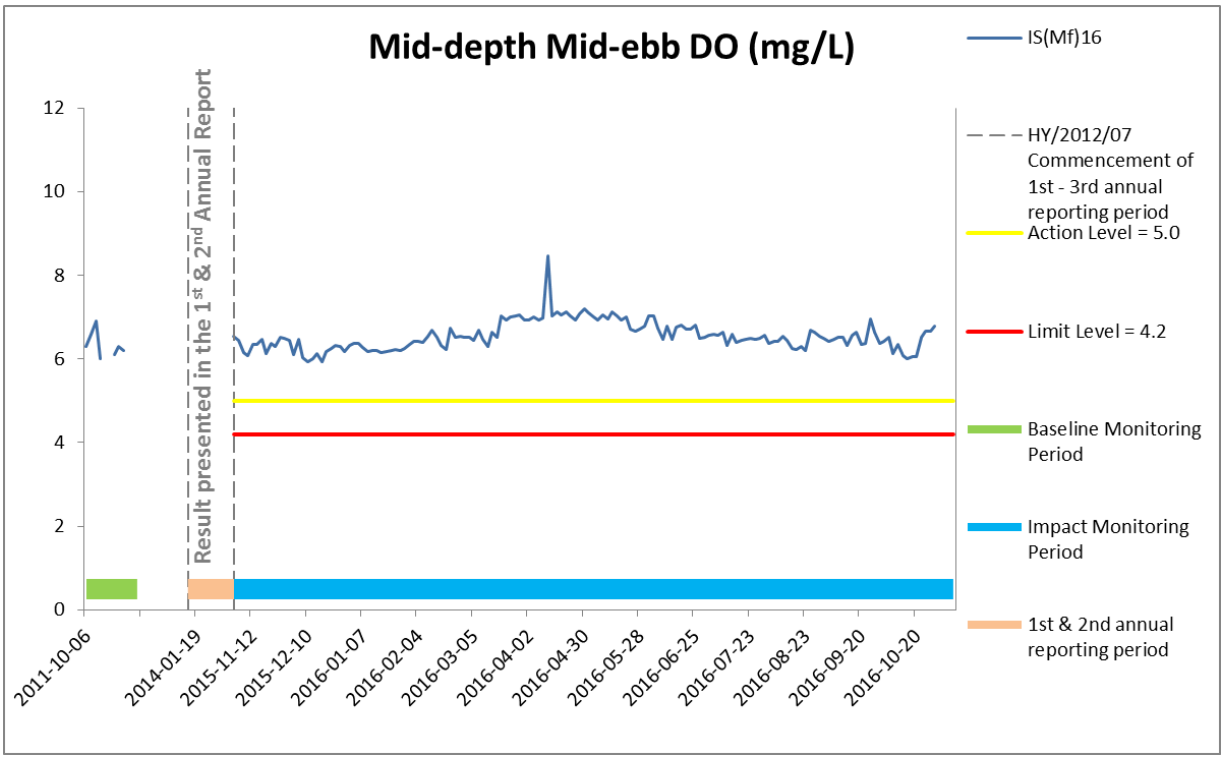
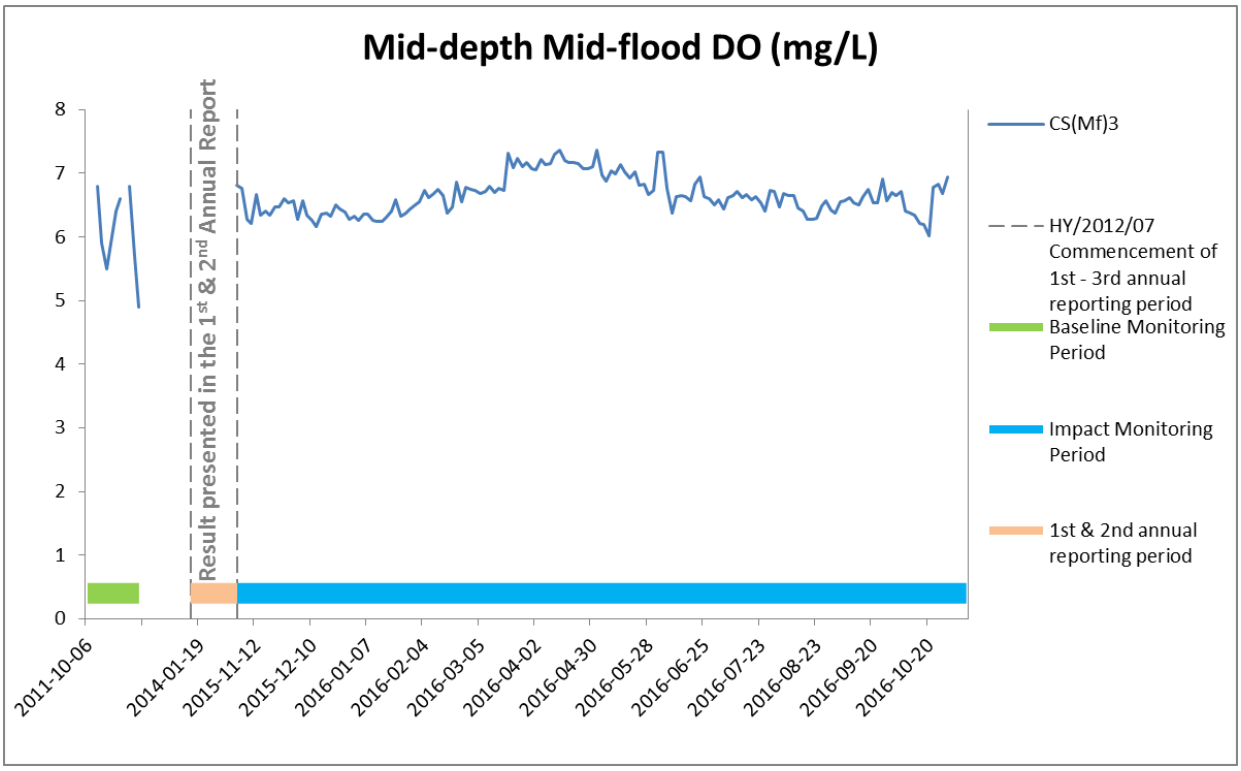


Figure F10 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS(Mf)16.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



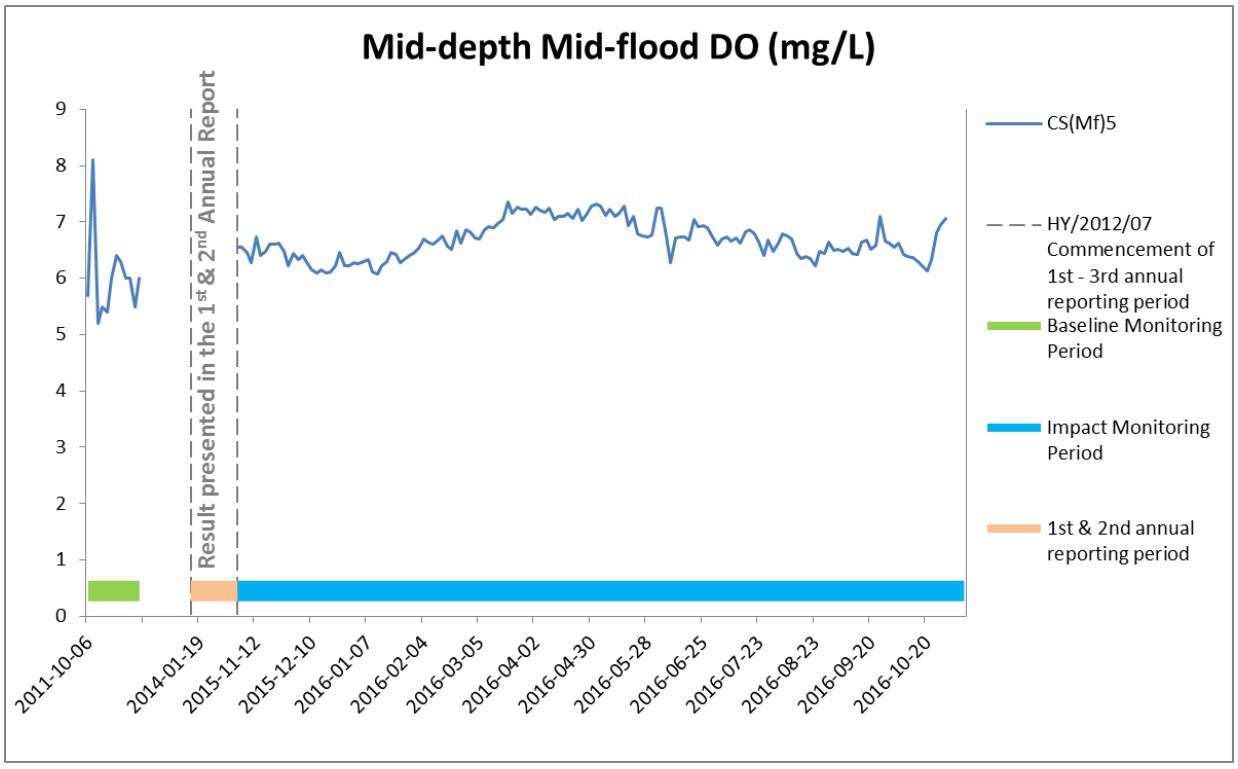


Figure F11 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and IS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM

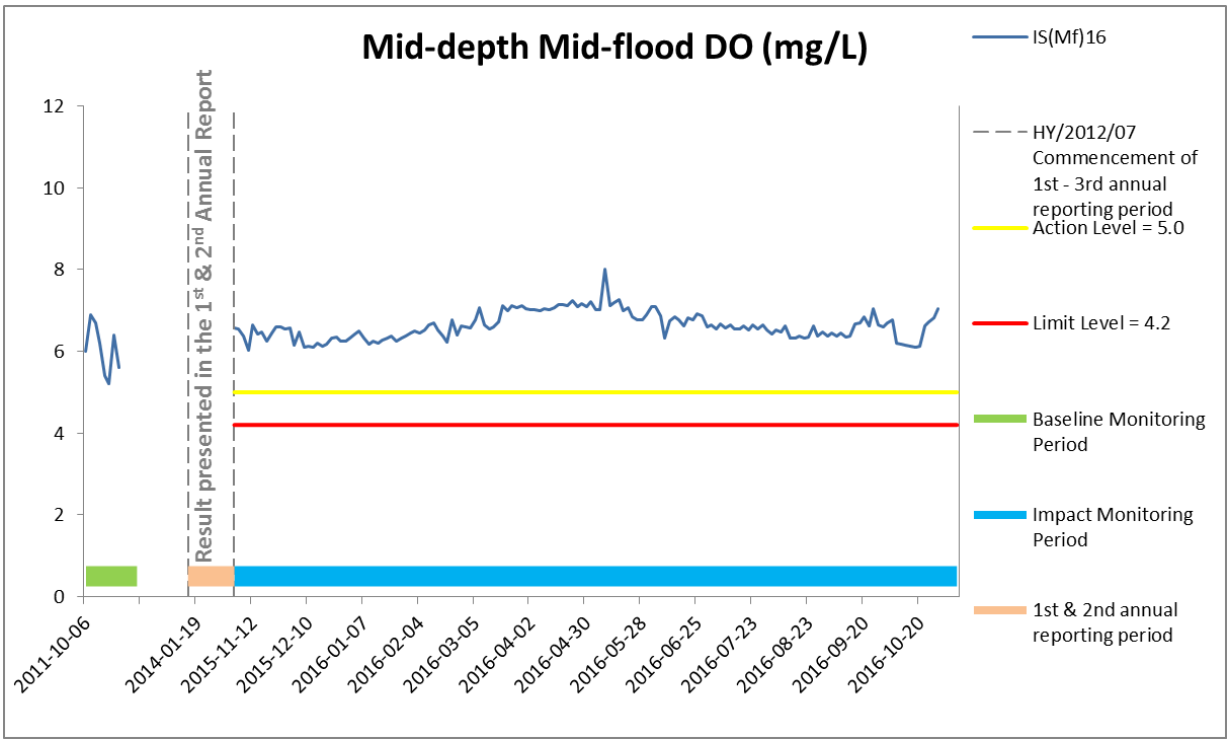


Figure F12 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2015 and 31 October 2016 at IS(Mf)16.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM

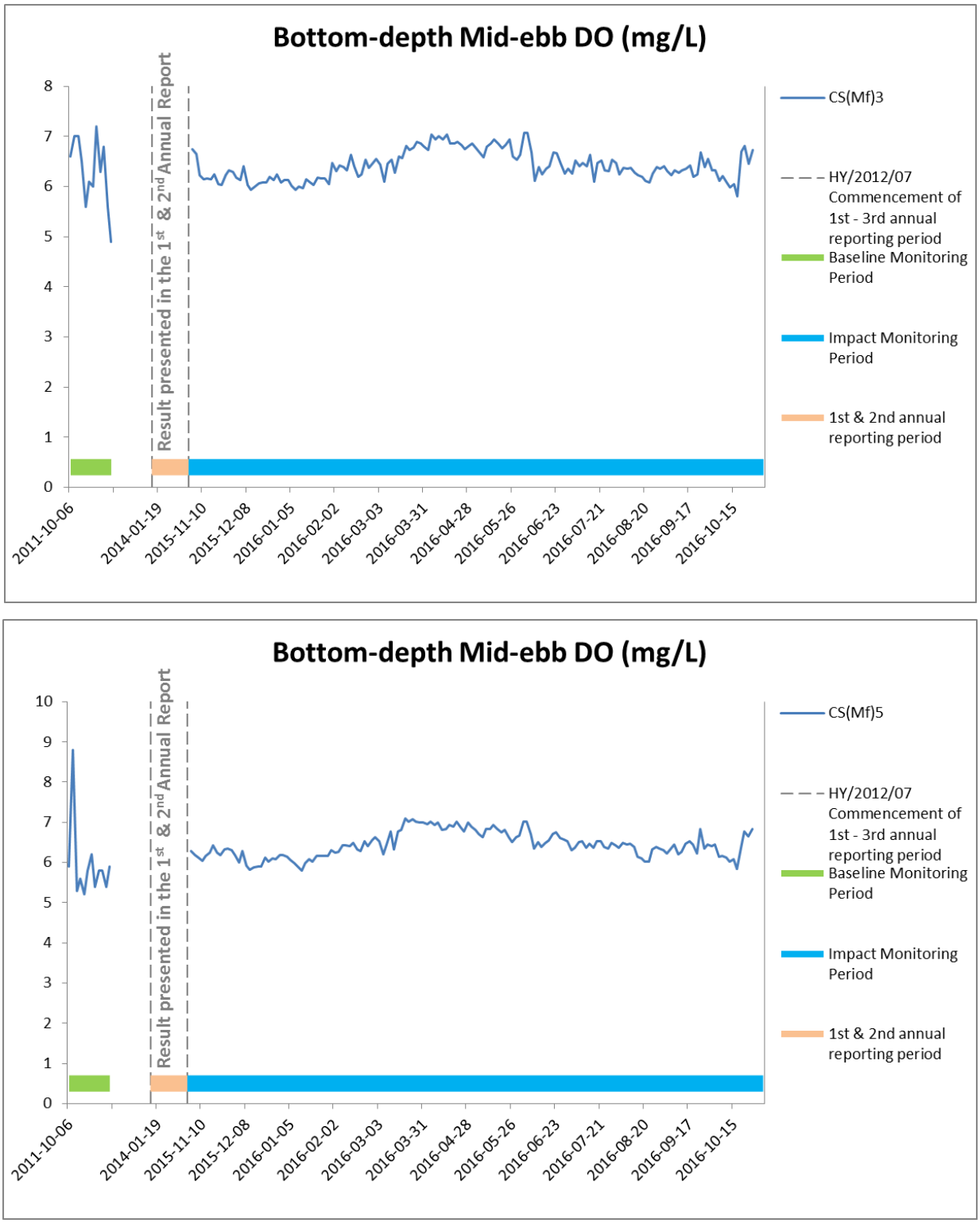
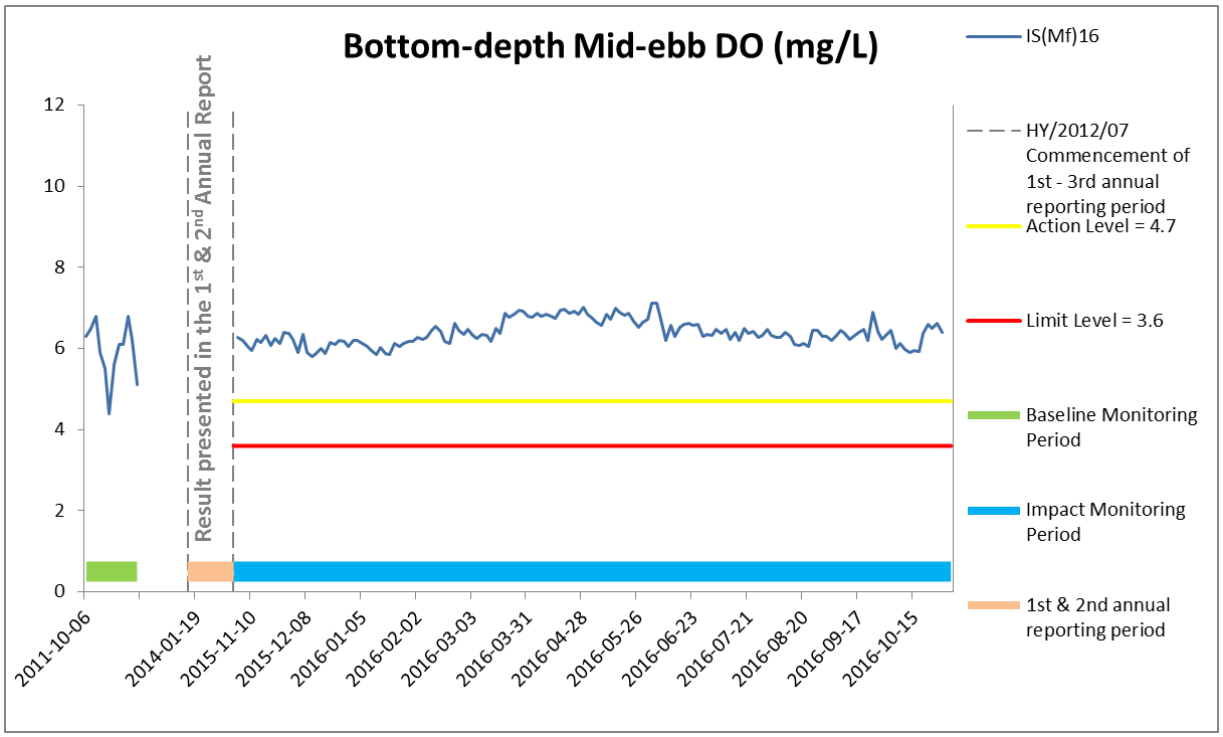


Figure F13 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



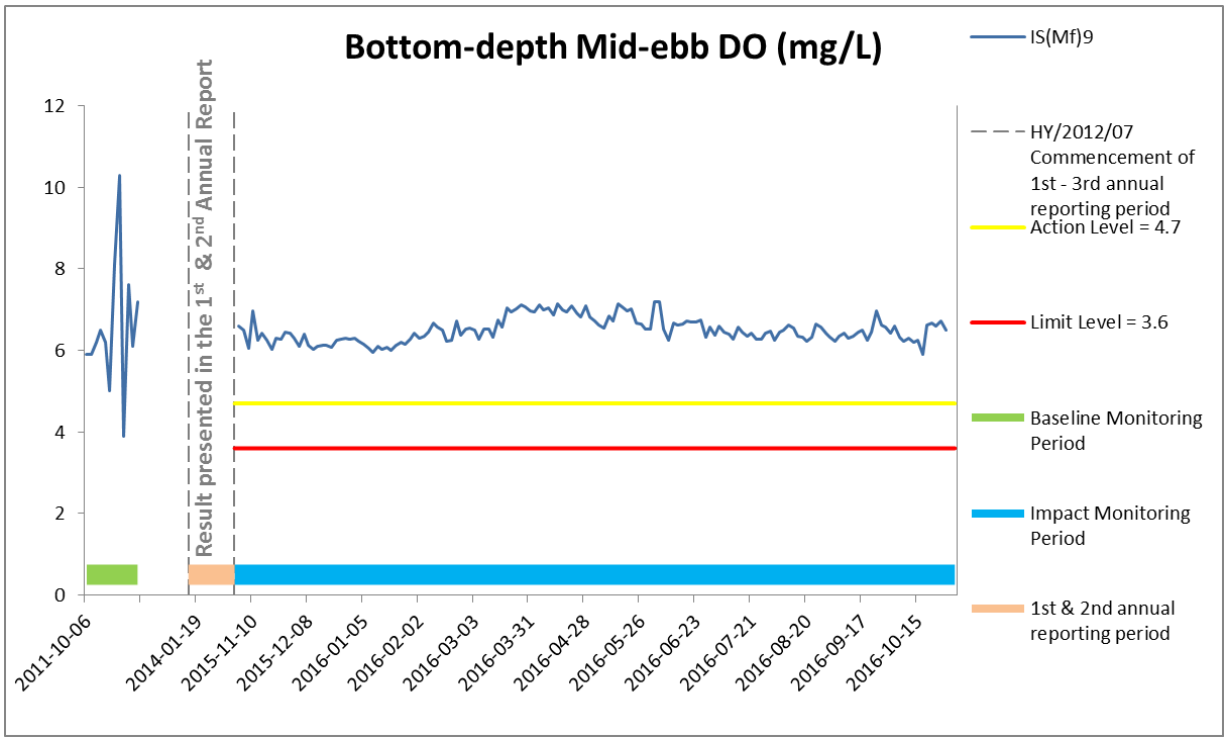
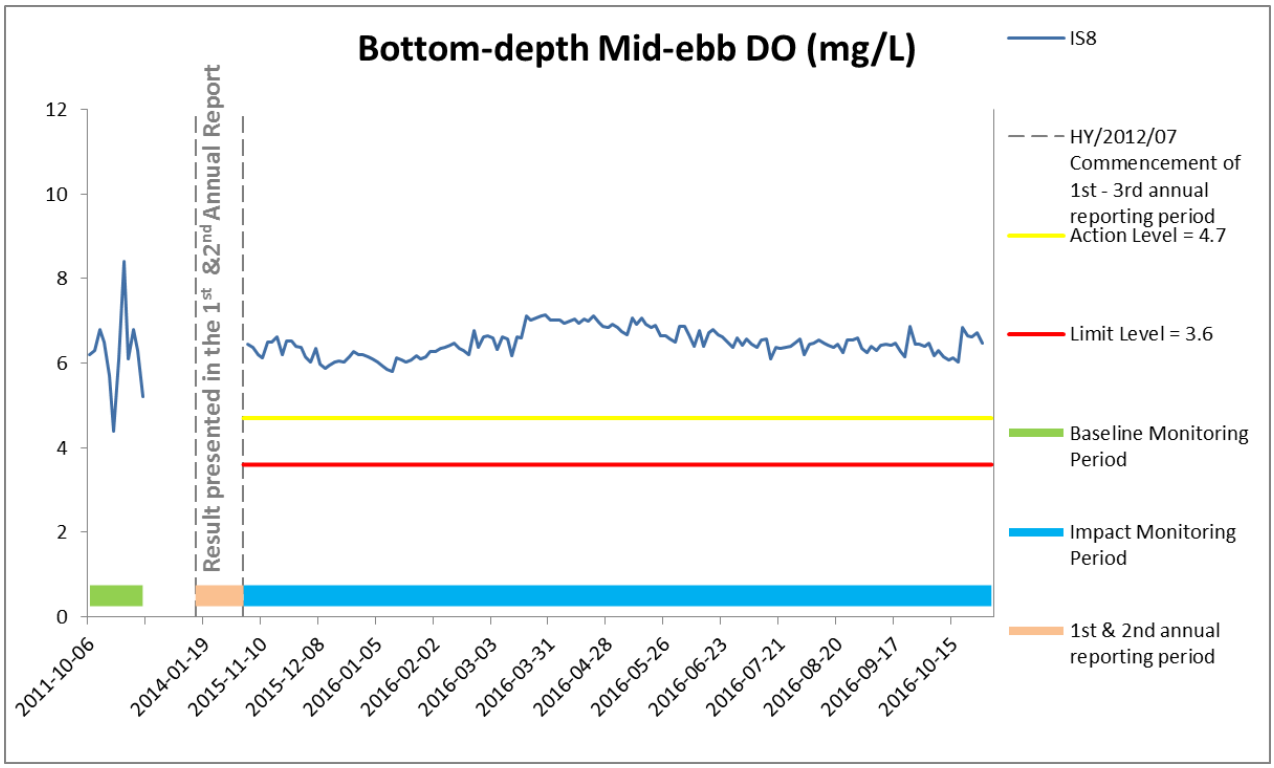


Figure F14 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM



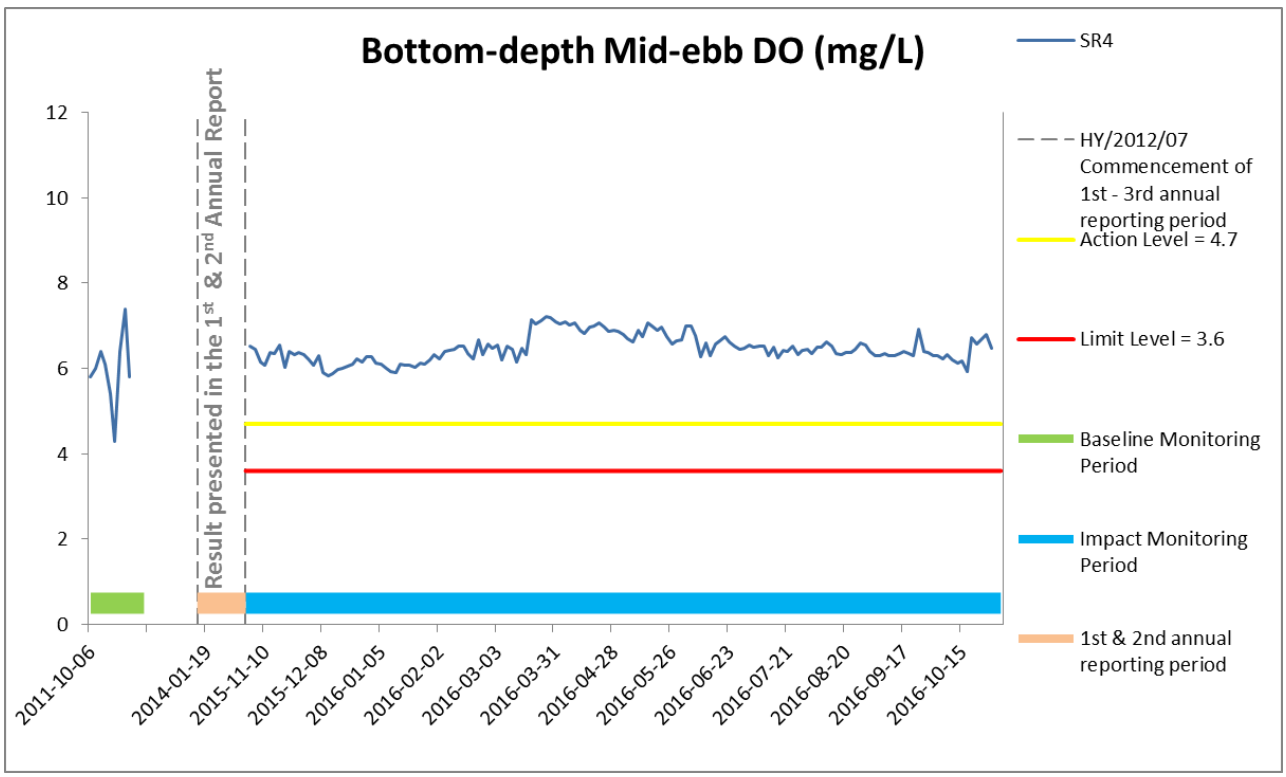


Figure F15 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM

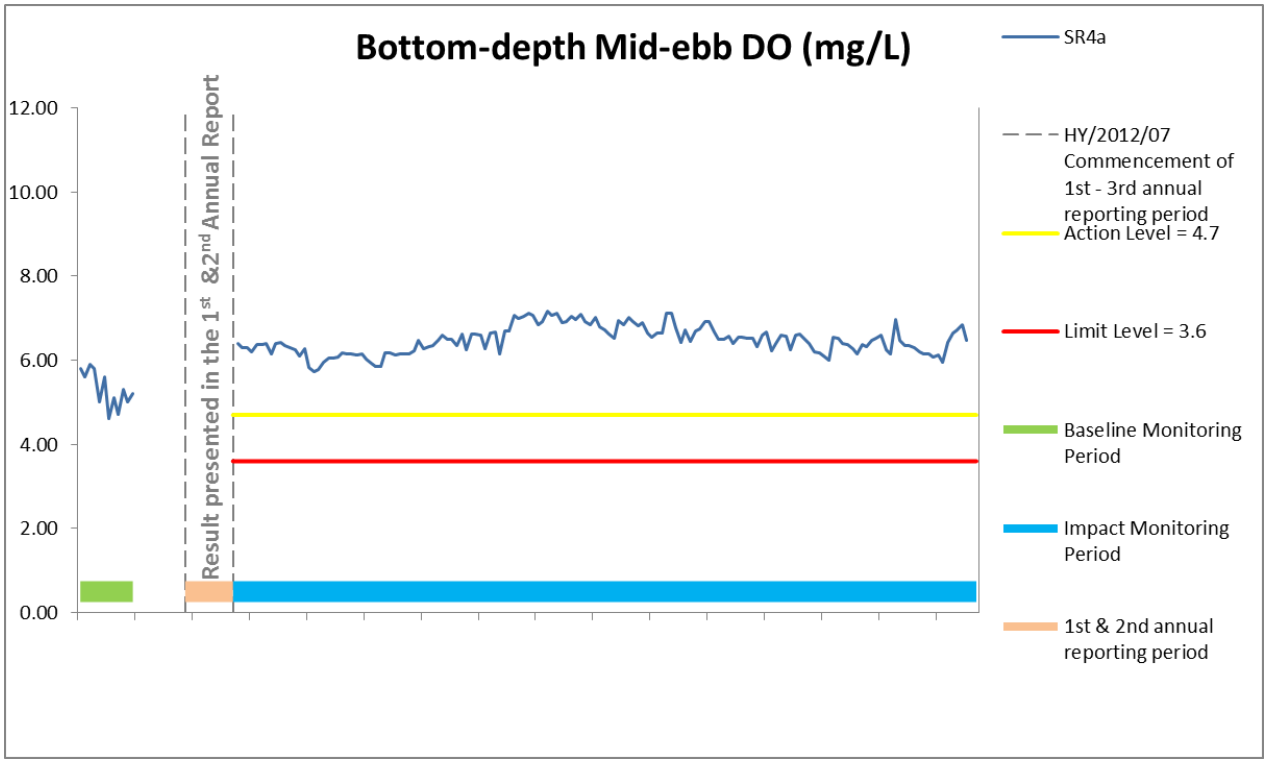
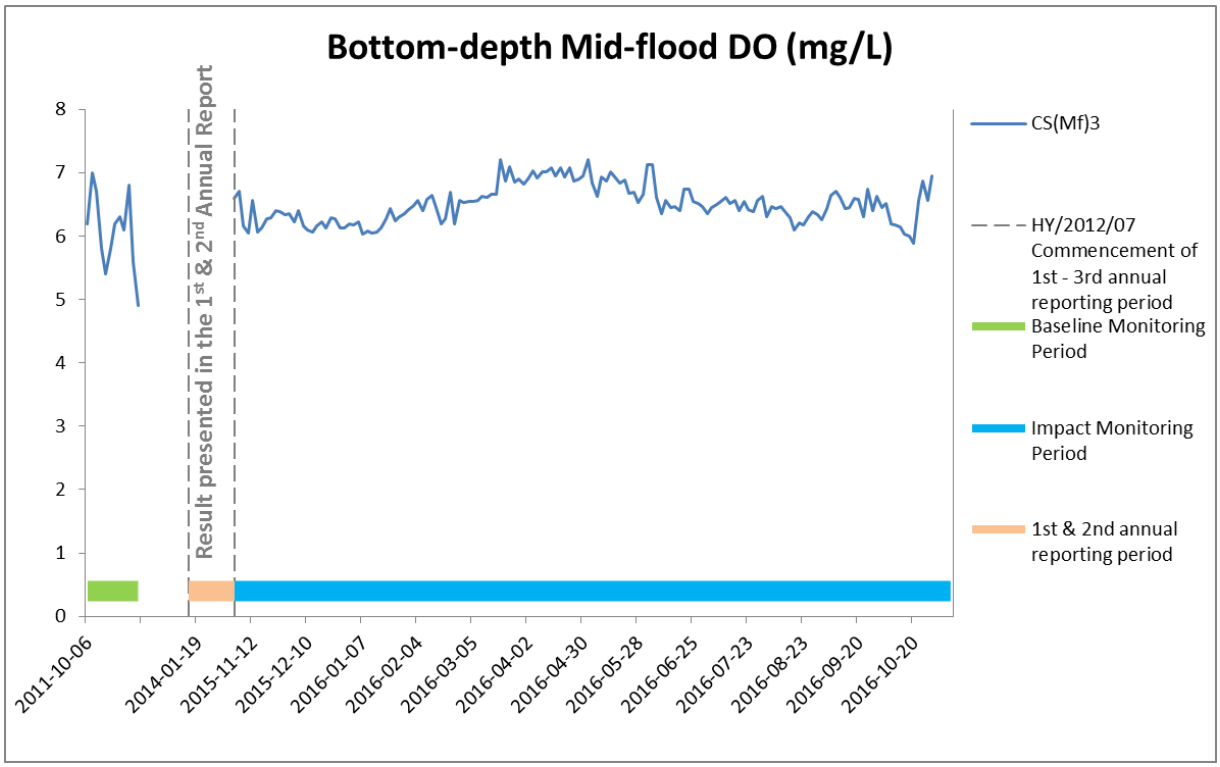


Figure F16 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM



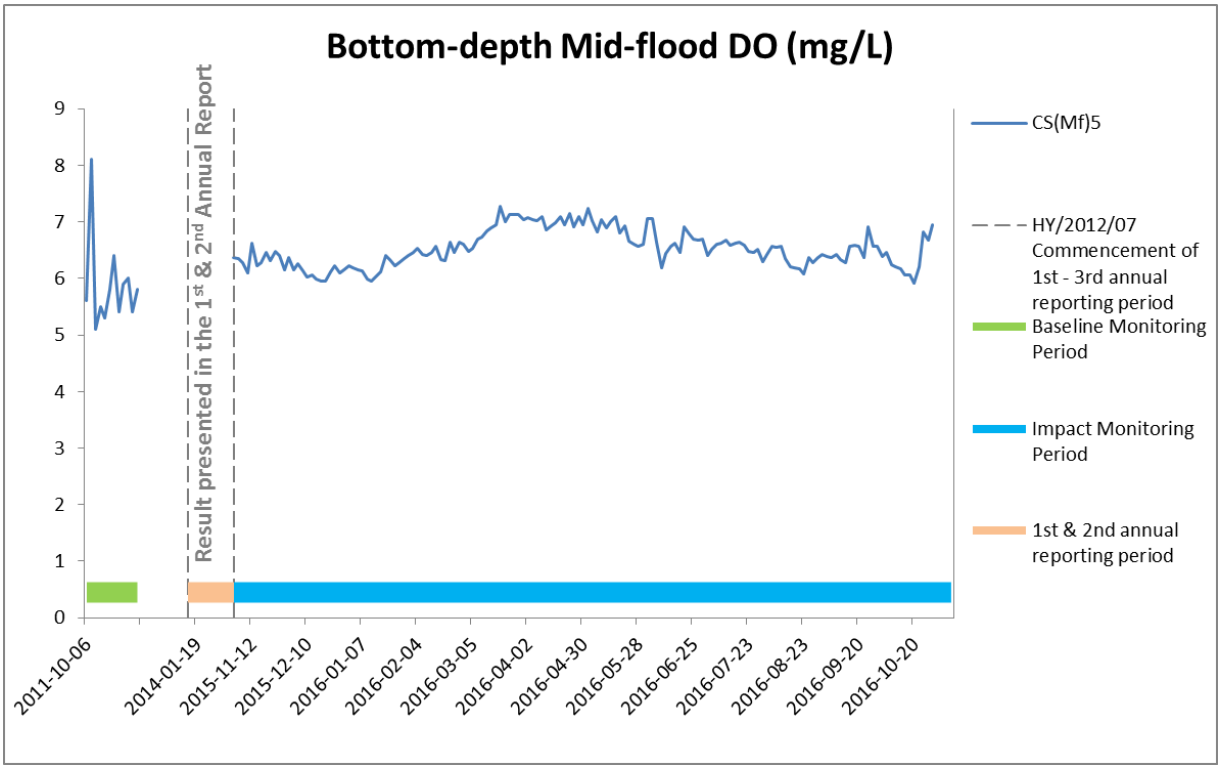
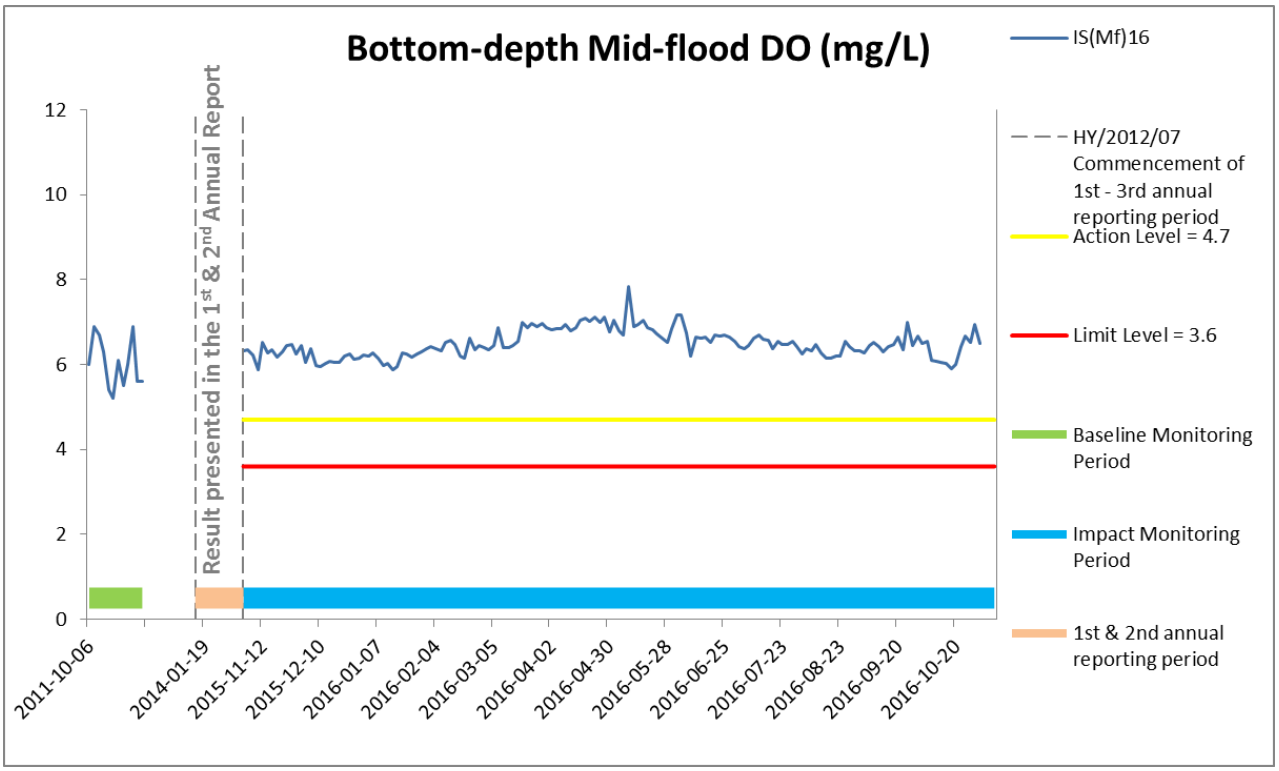


Figure F17 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



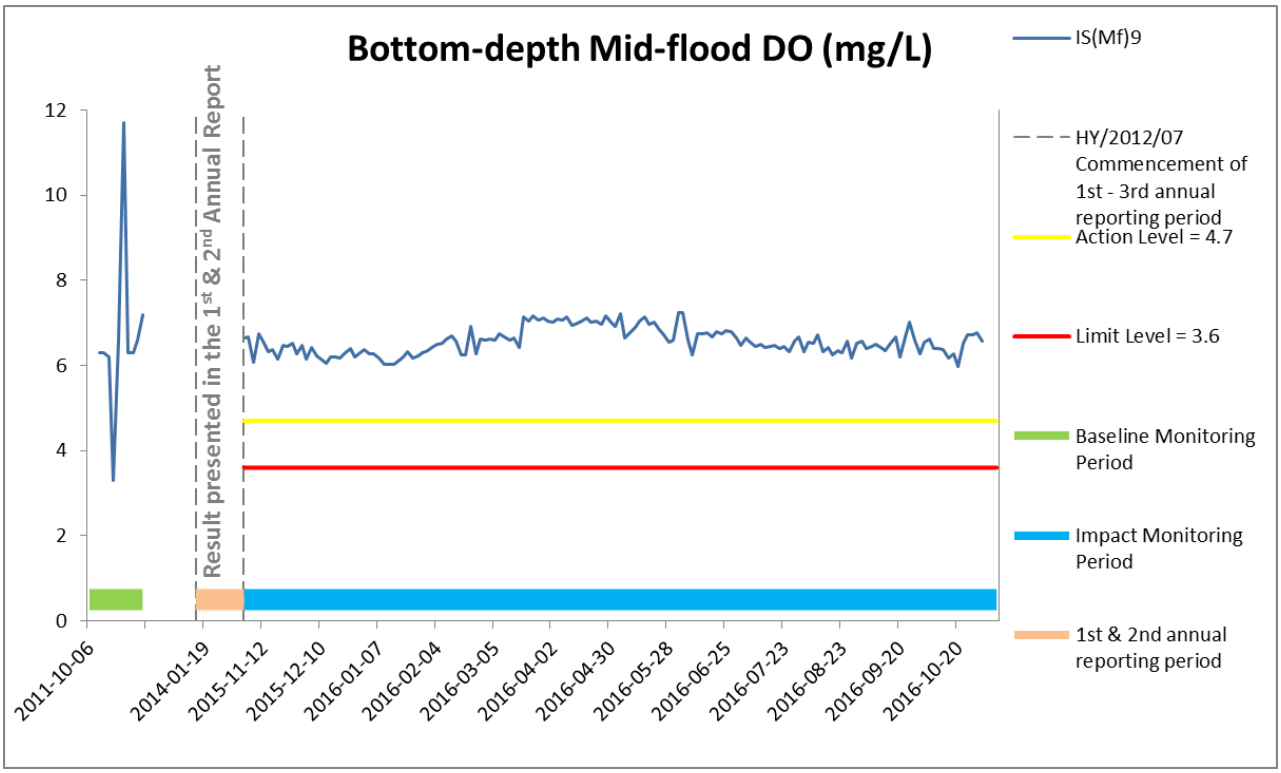
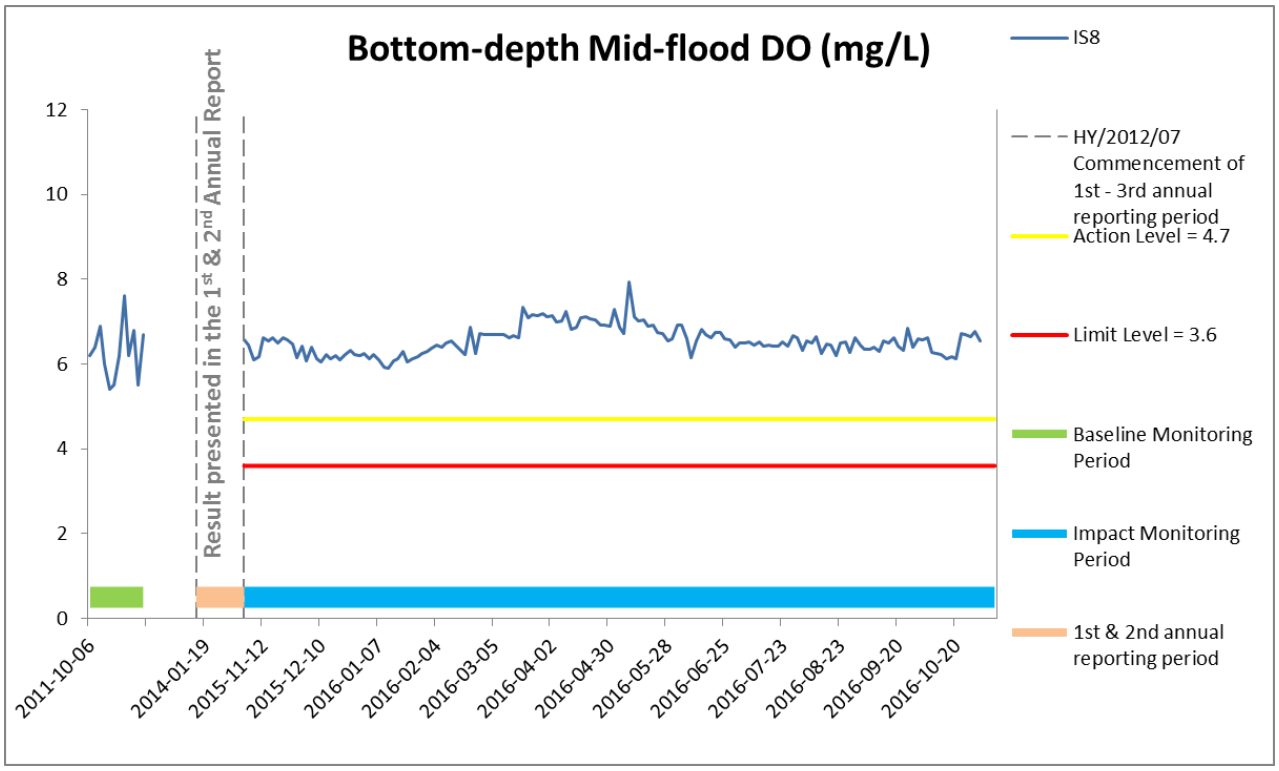


Figure F18 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



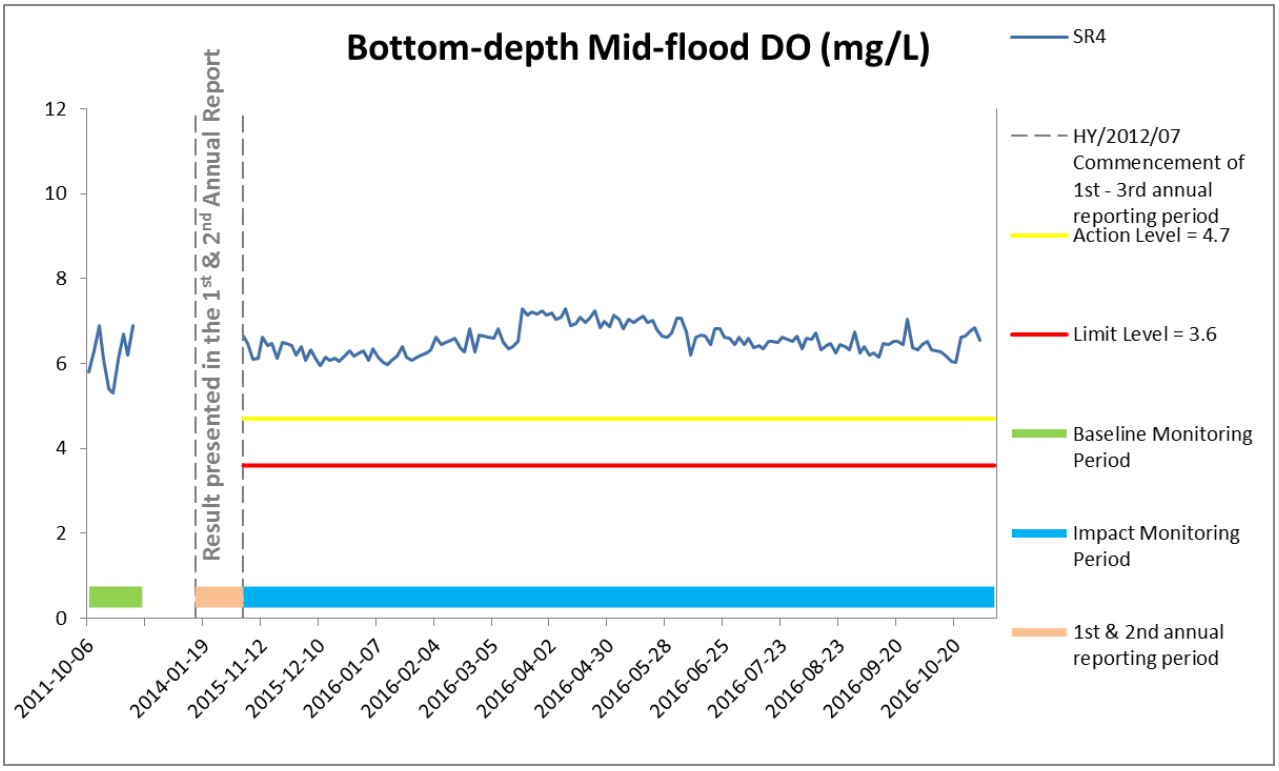


Figure F19 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

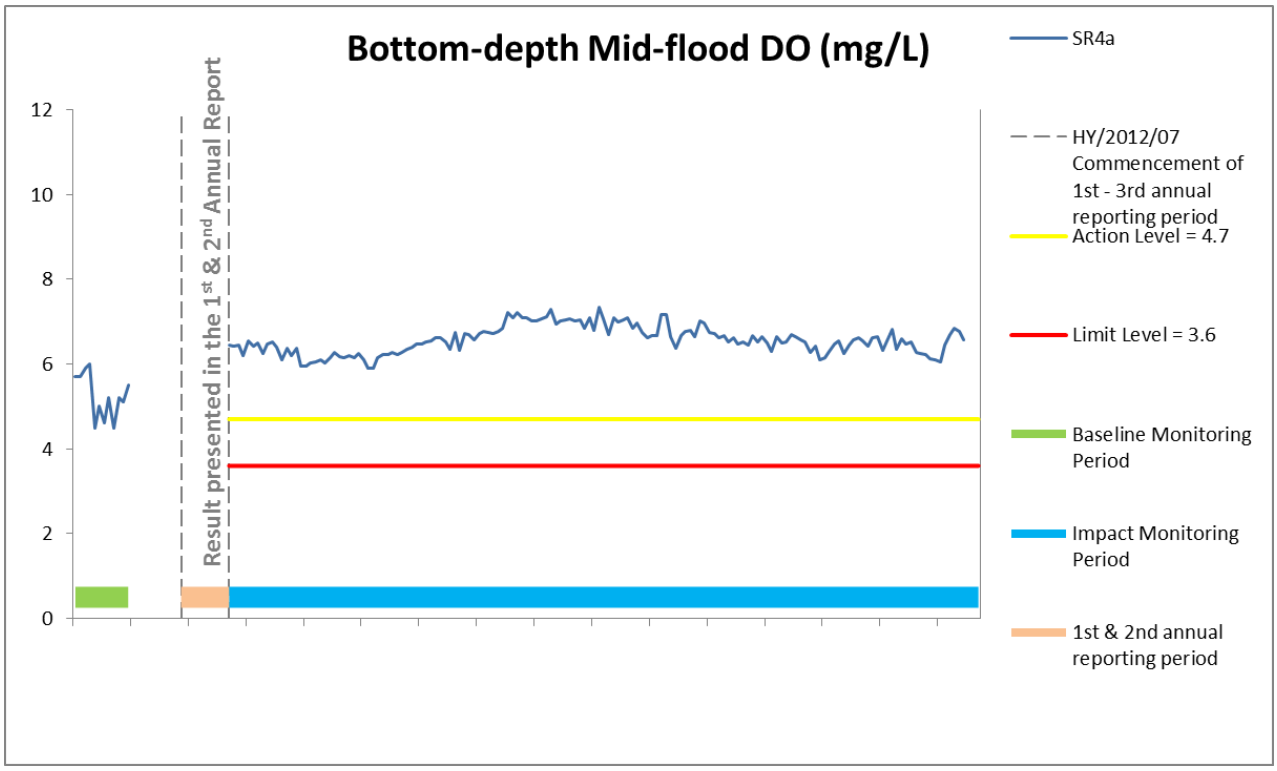
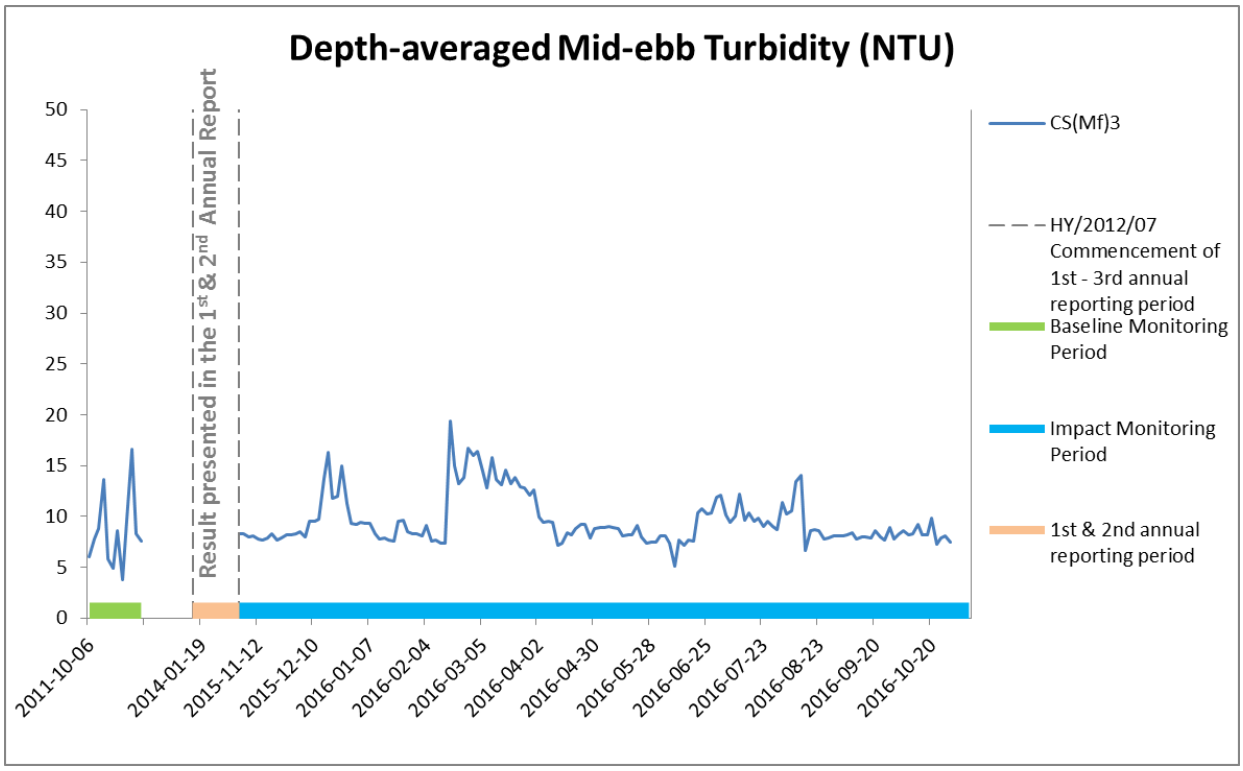


Figure F20 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



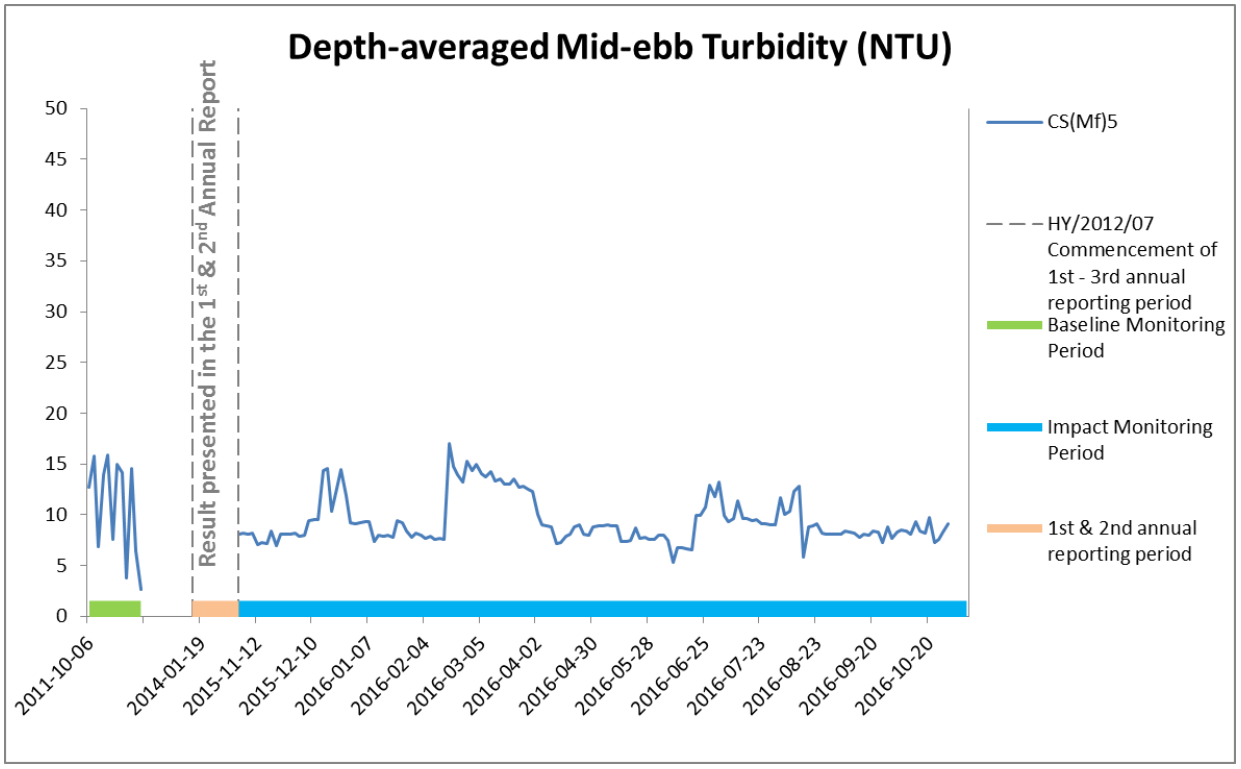
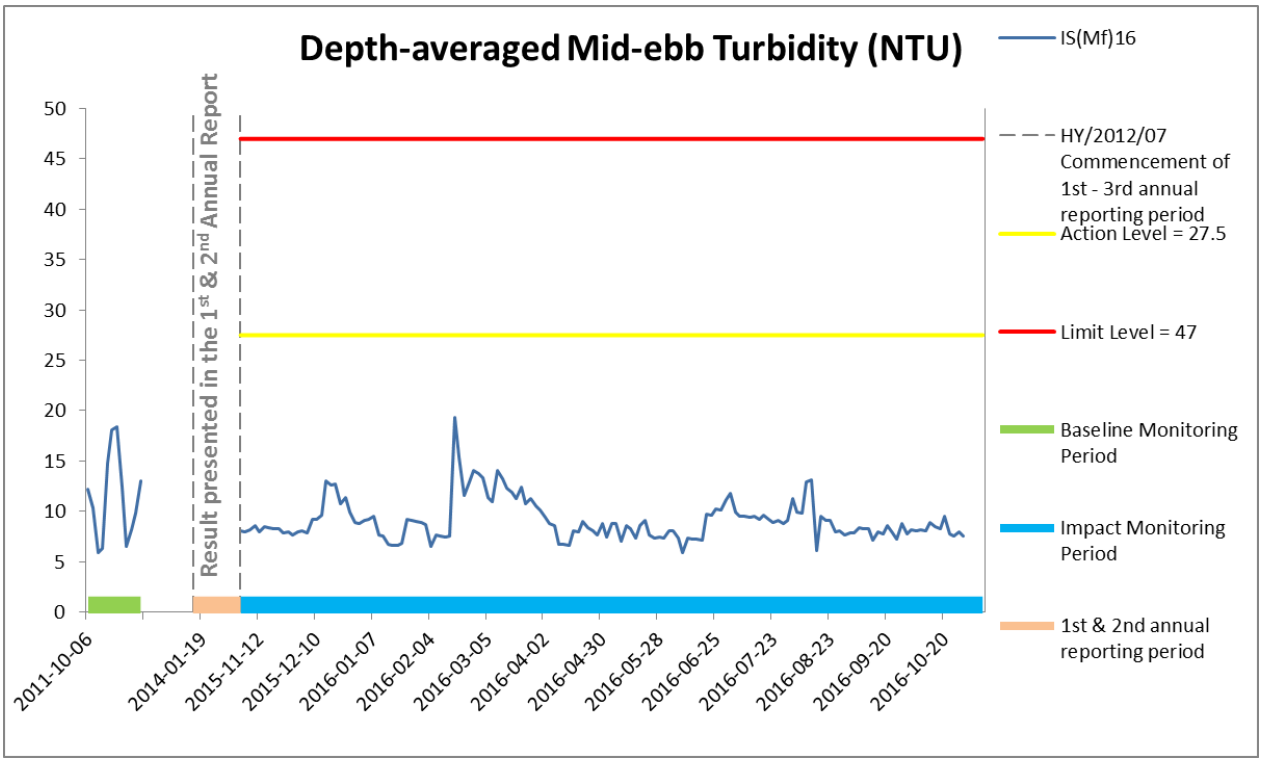


Figure F21 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



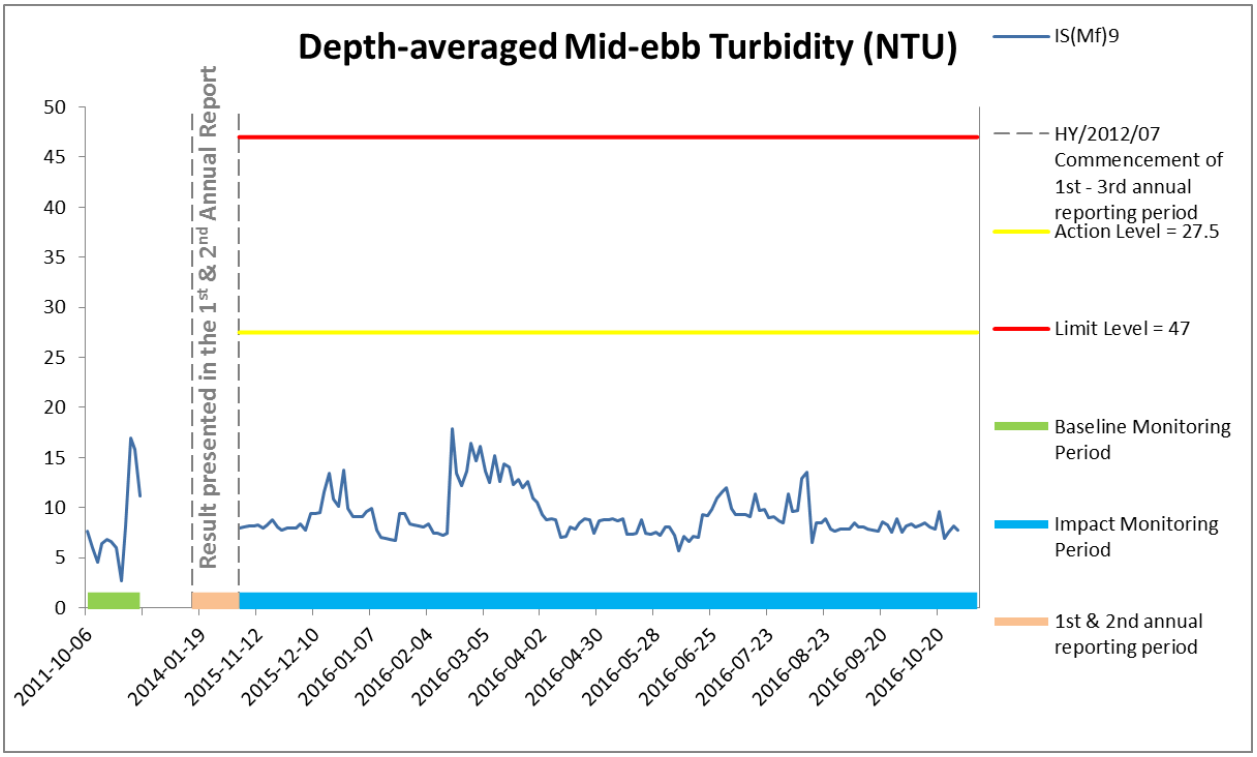
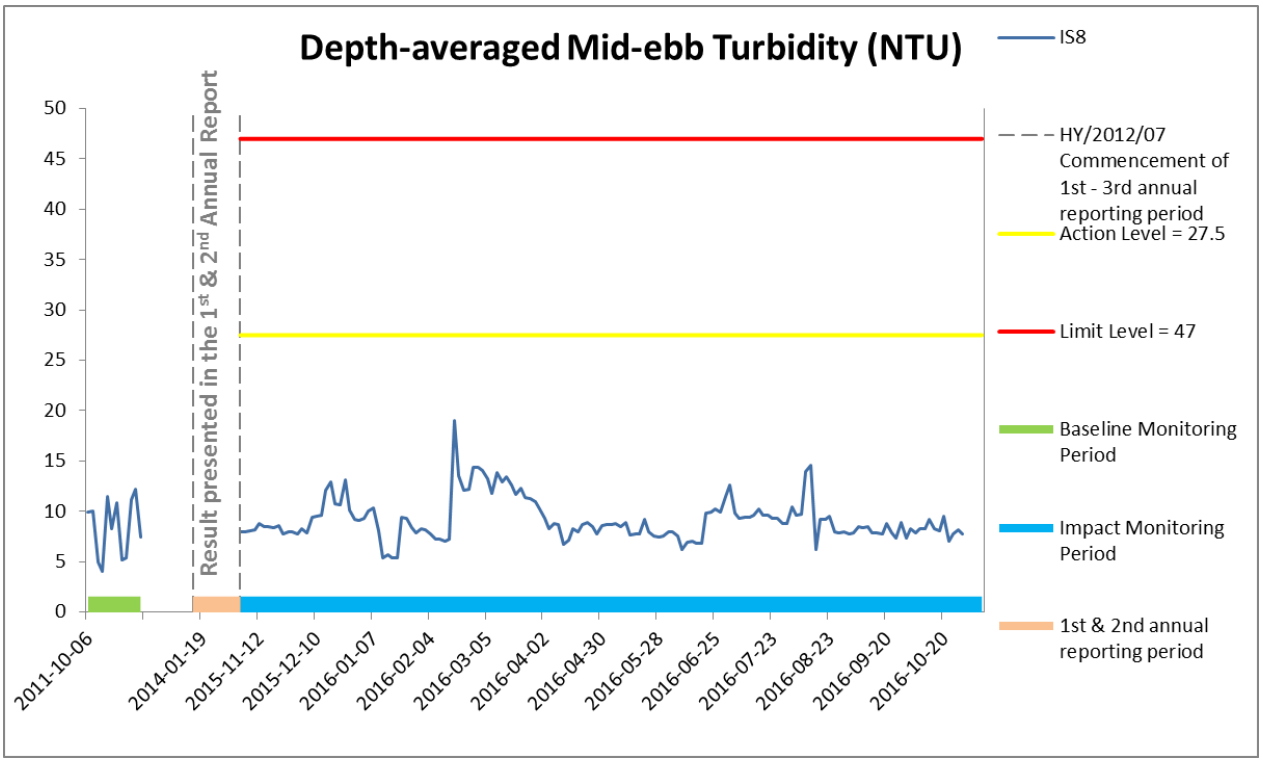


Figure F22 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



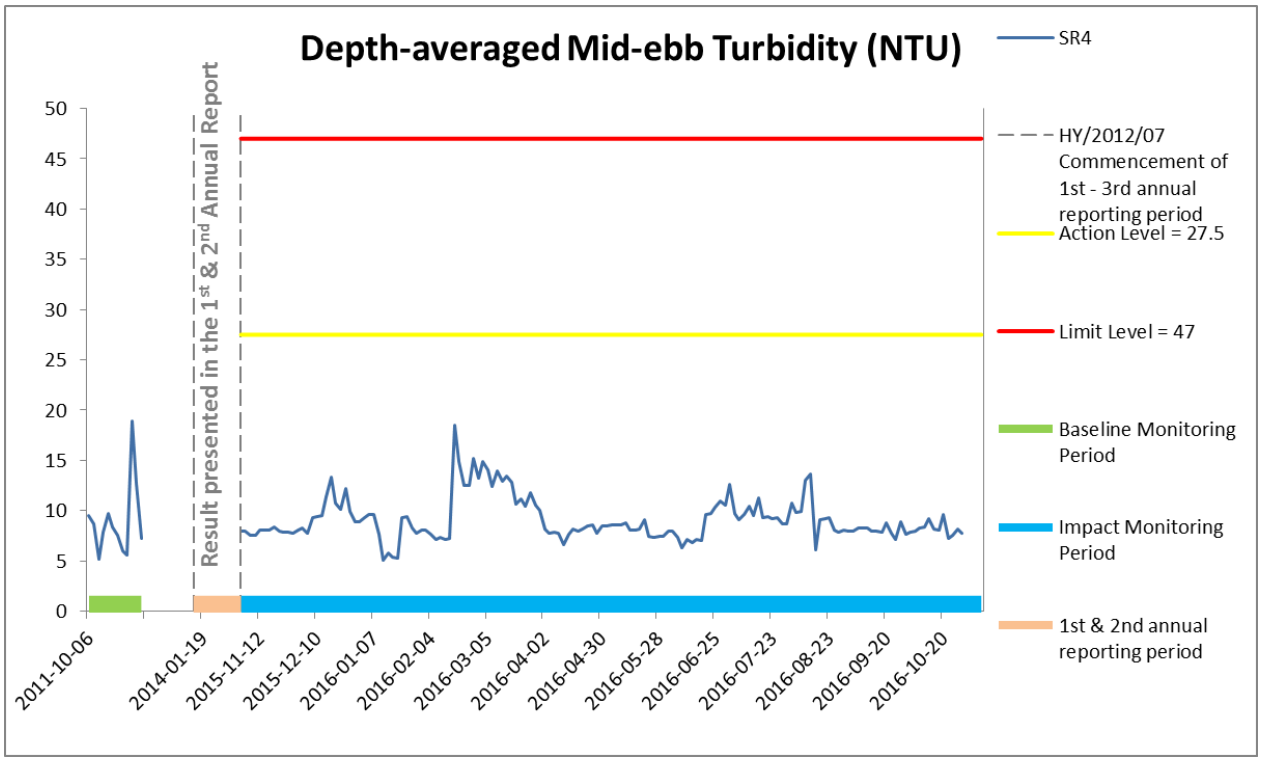


Figure F23 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

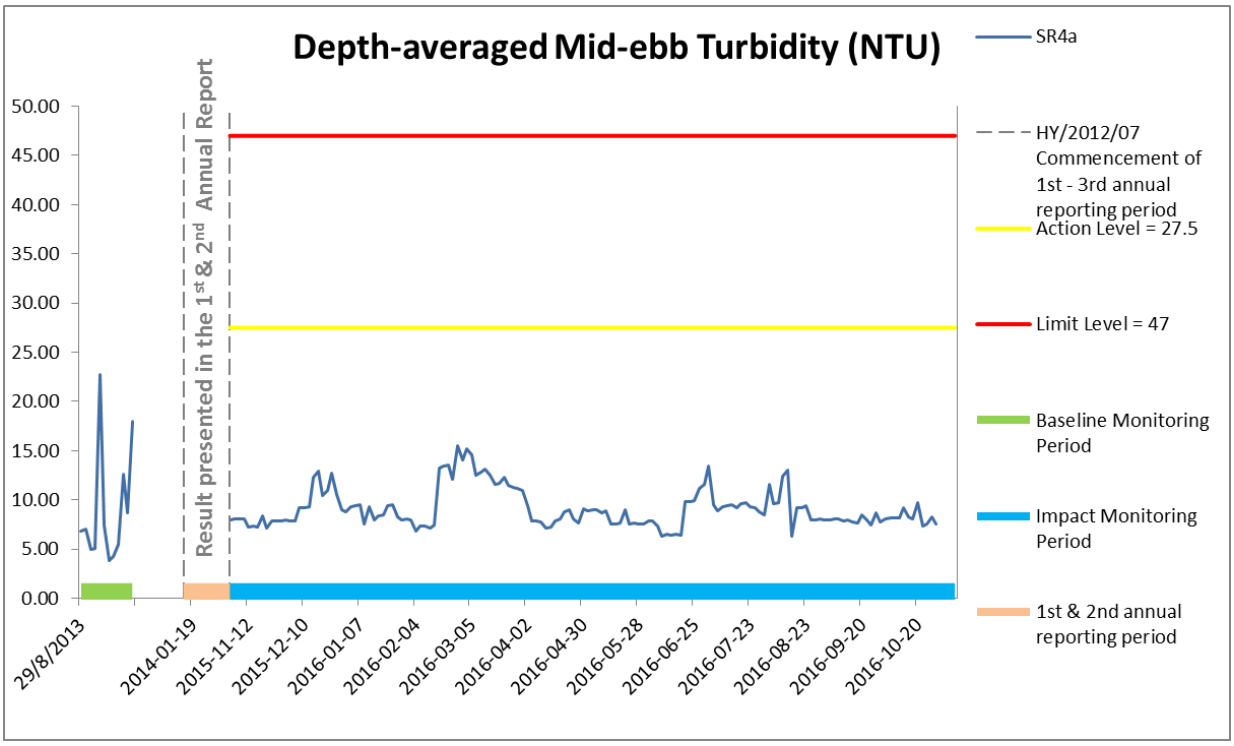
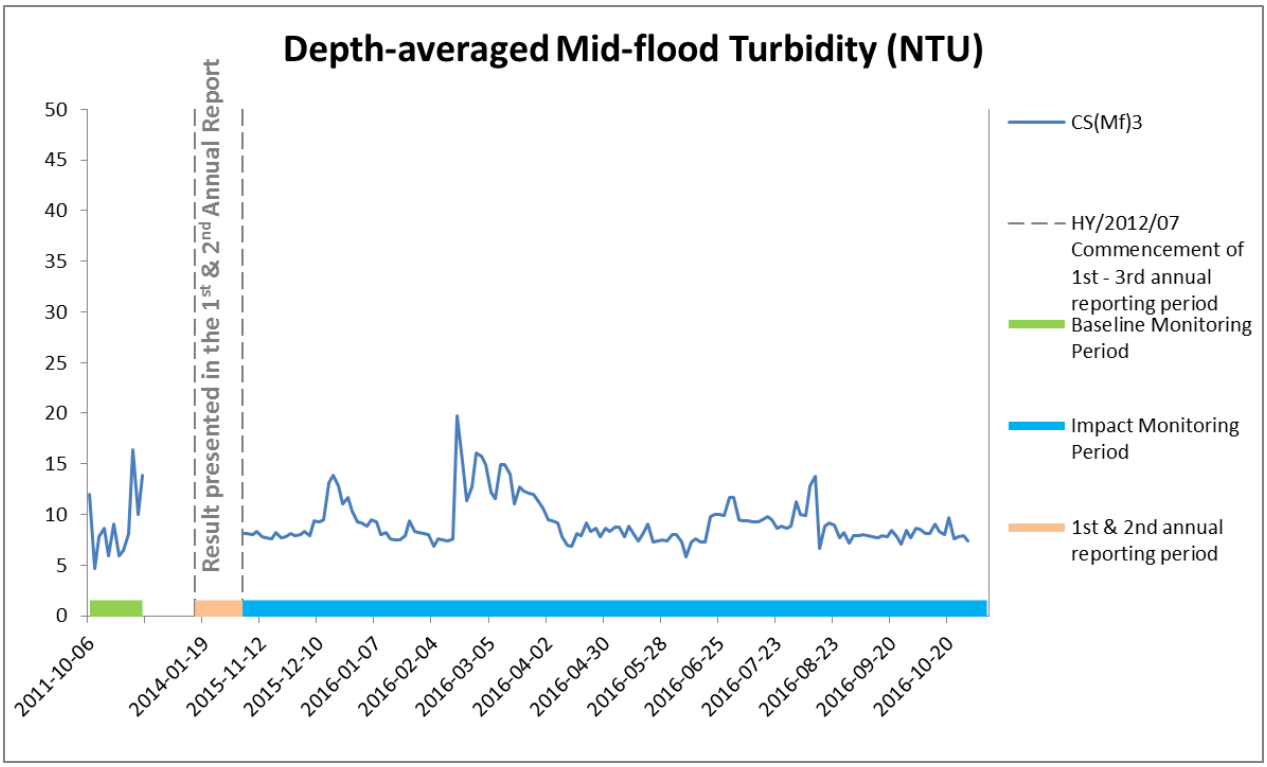


Figure F24 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



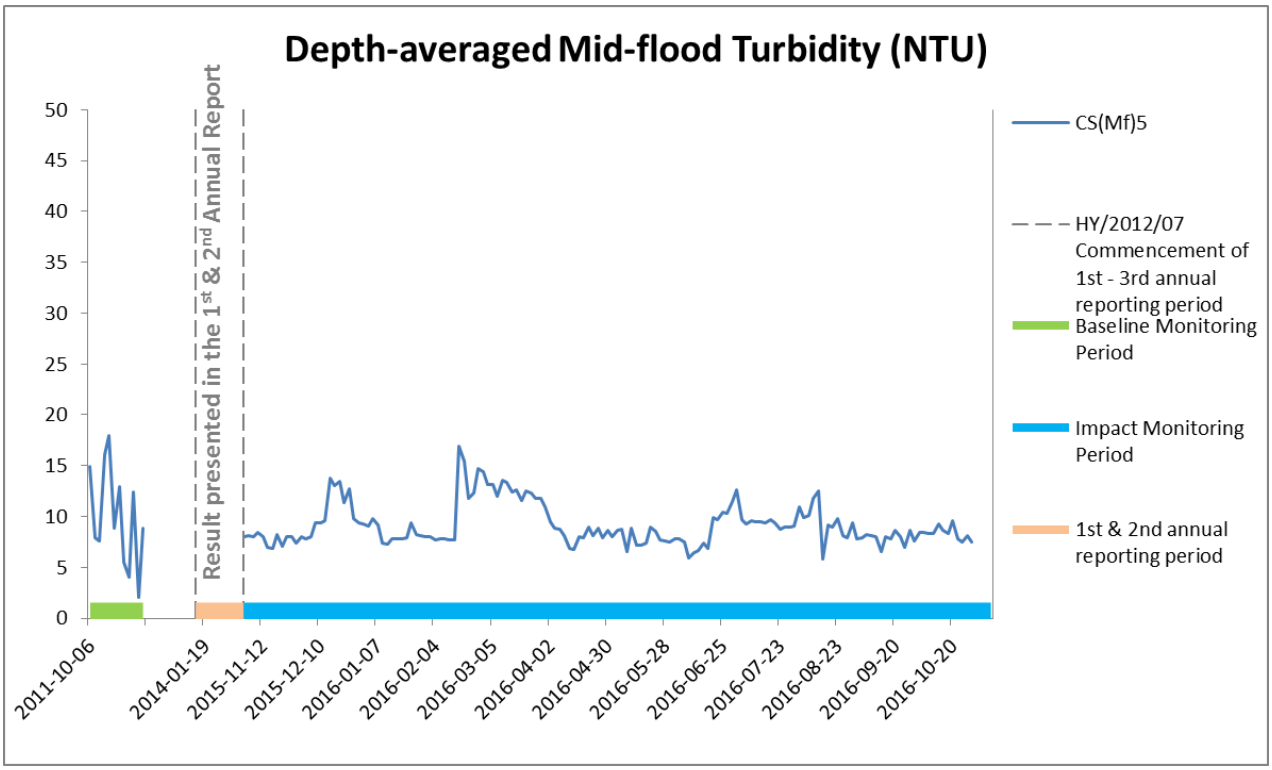
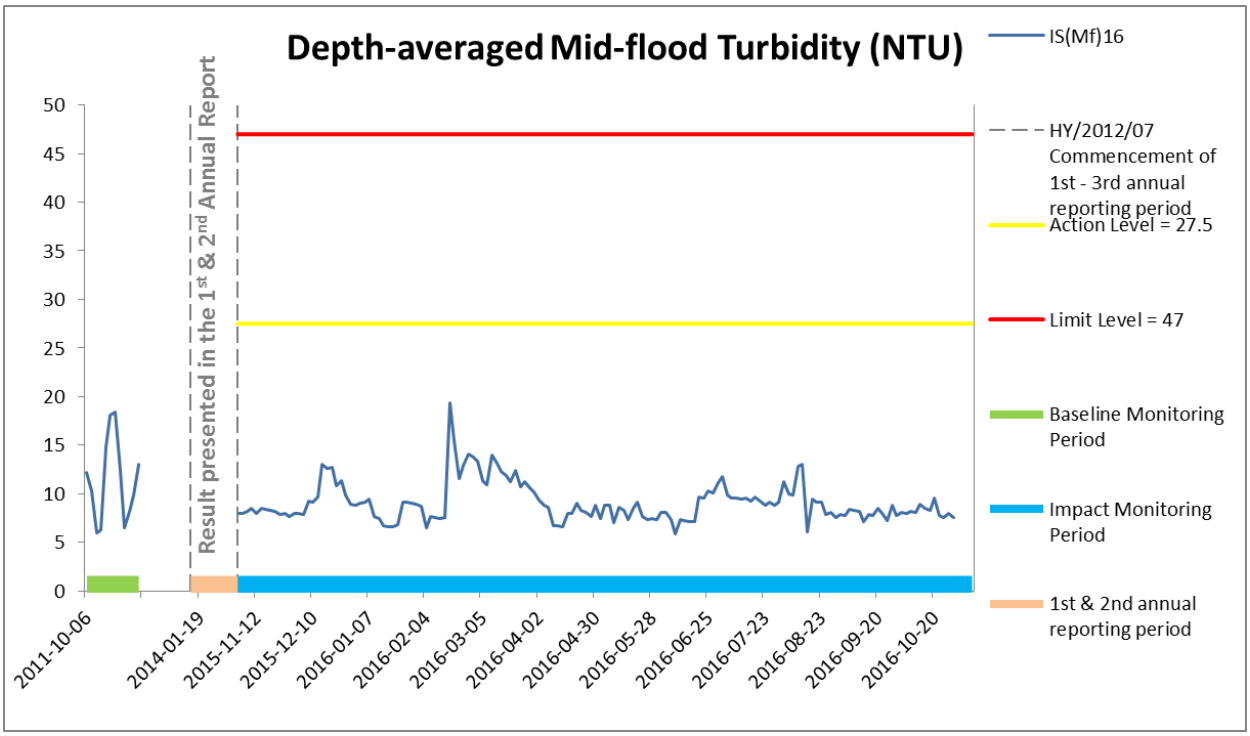


Figure F25 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(MF)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



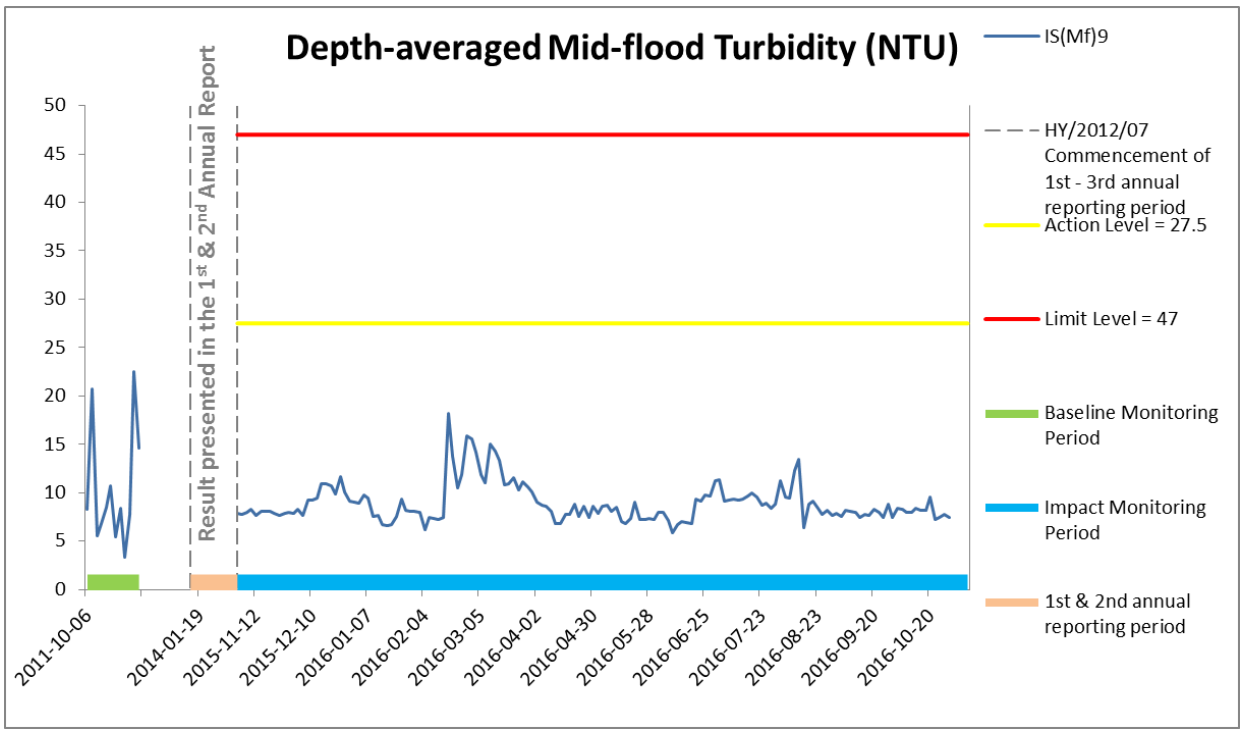
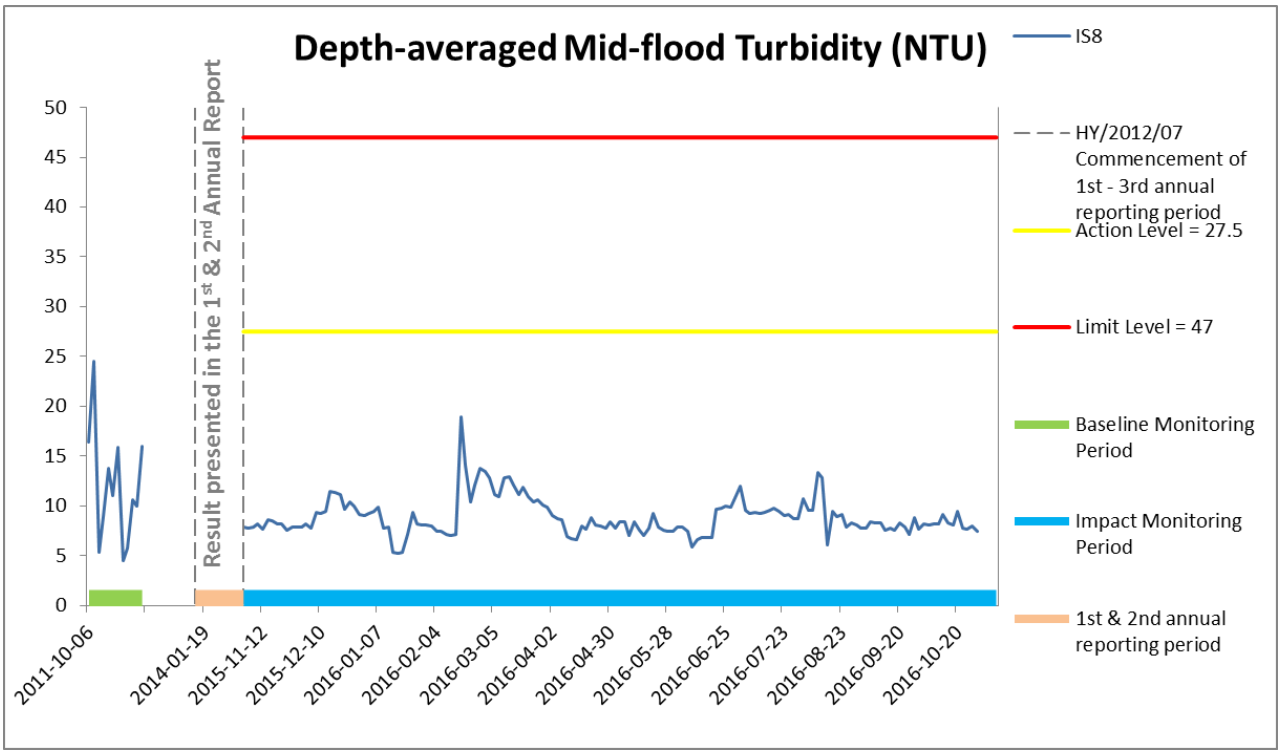


Figure F26 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



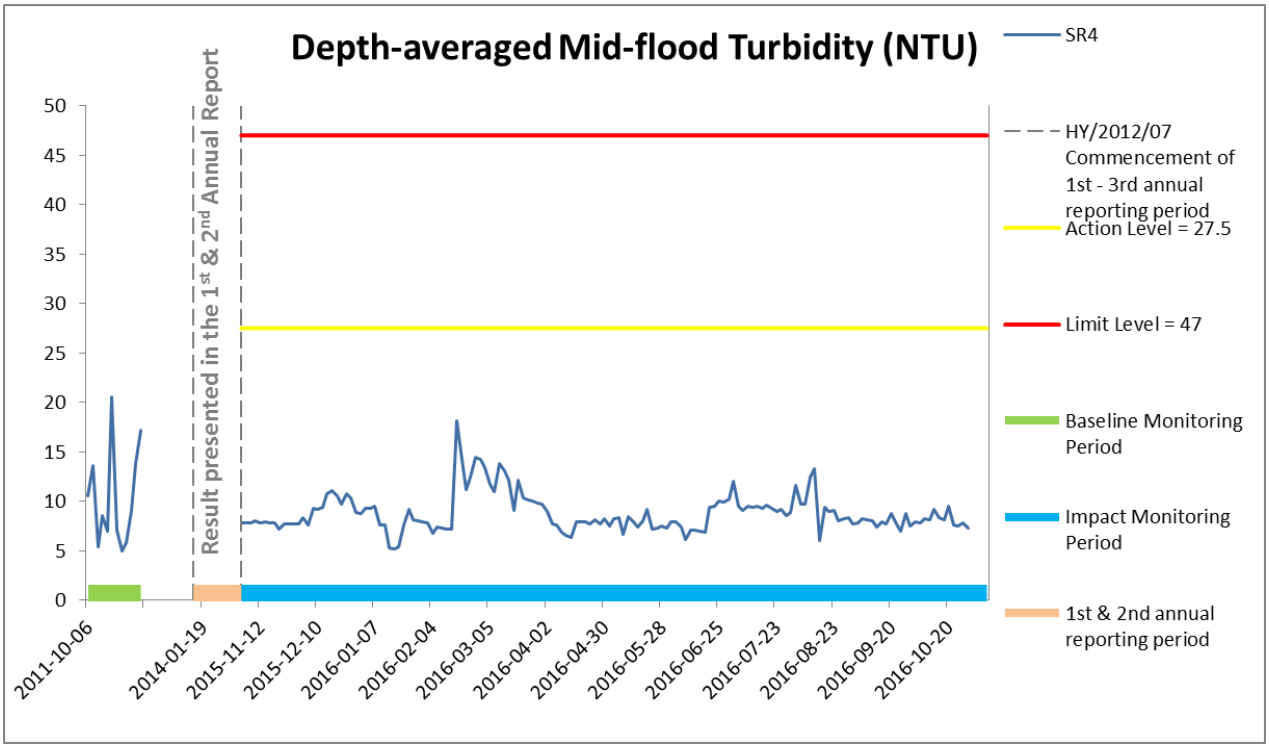


Figure F27 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

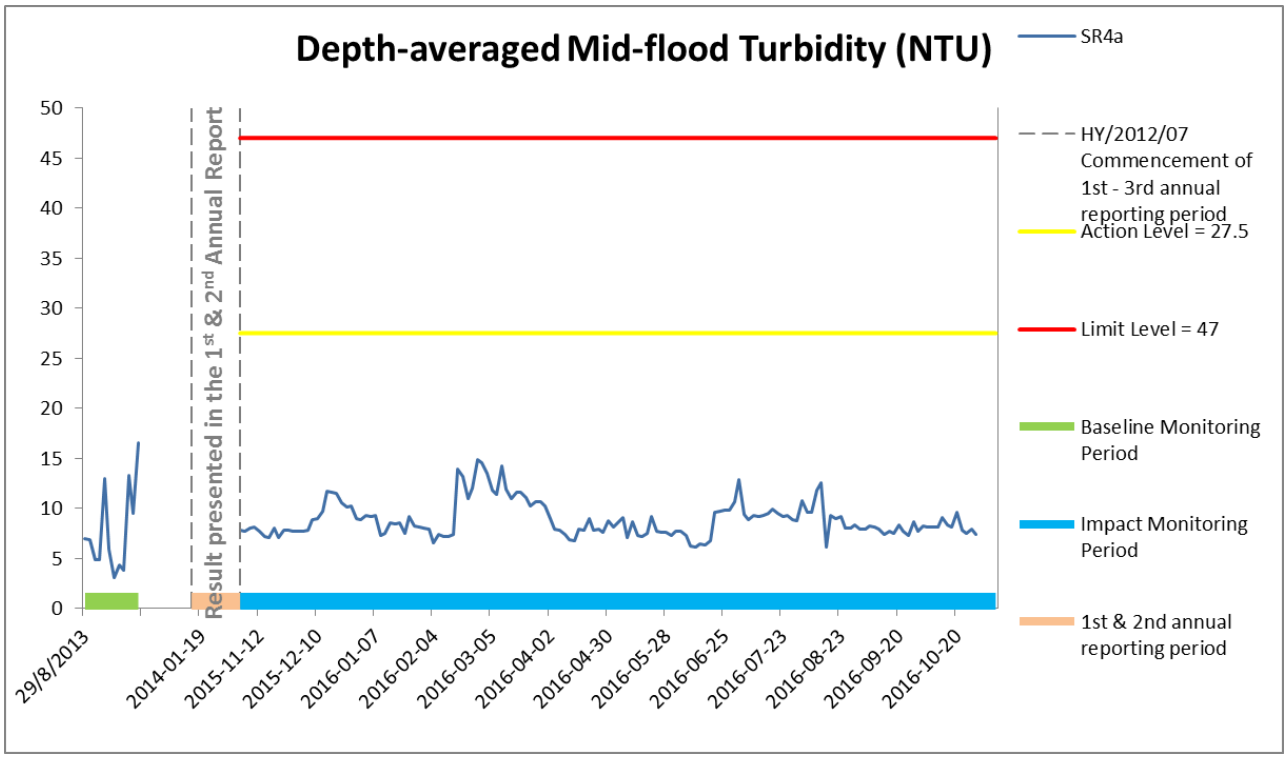
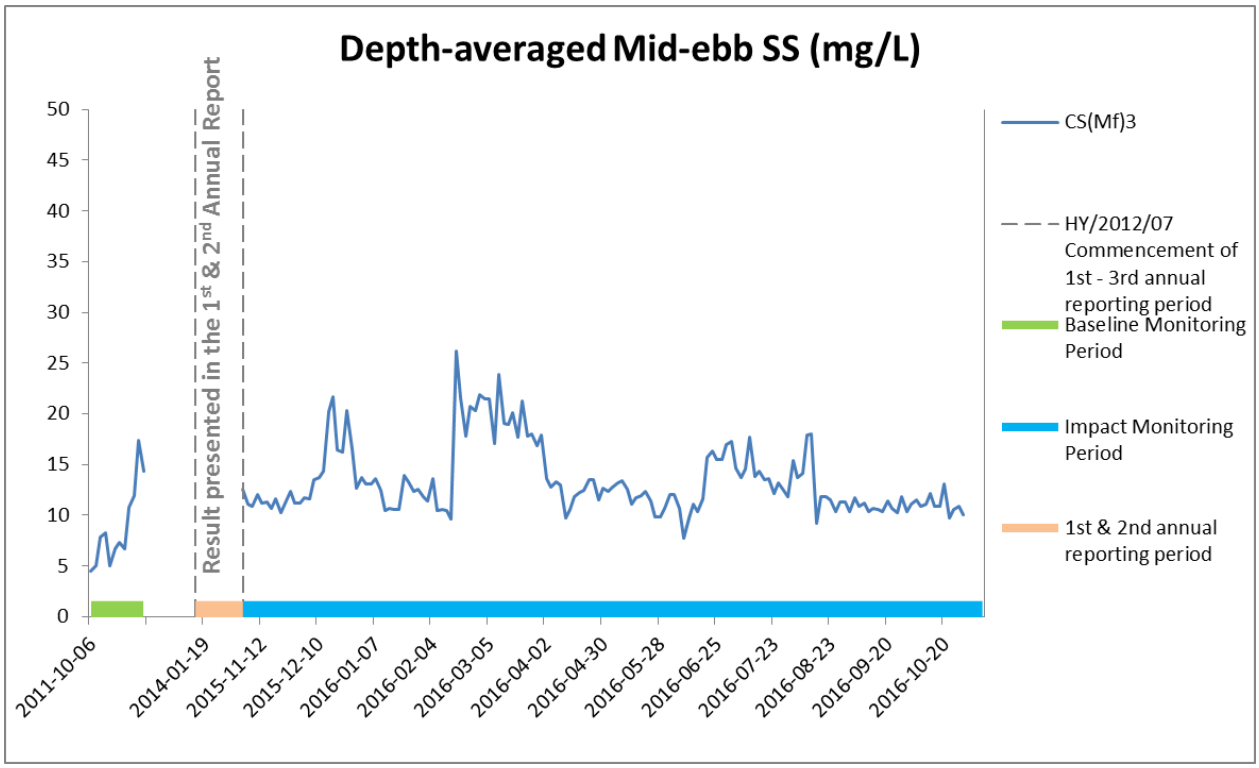


Figure F28 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



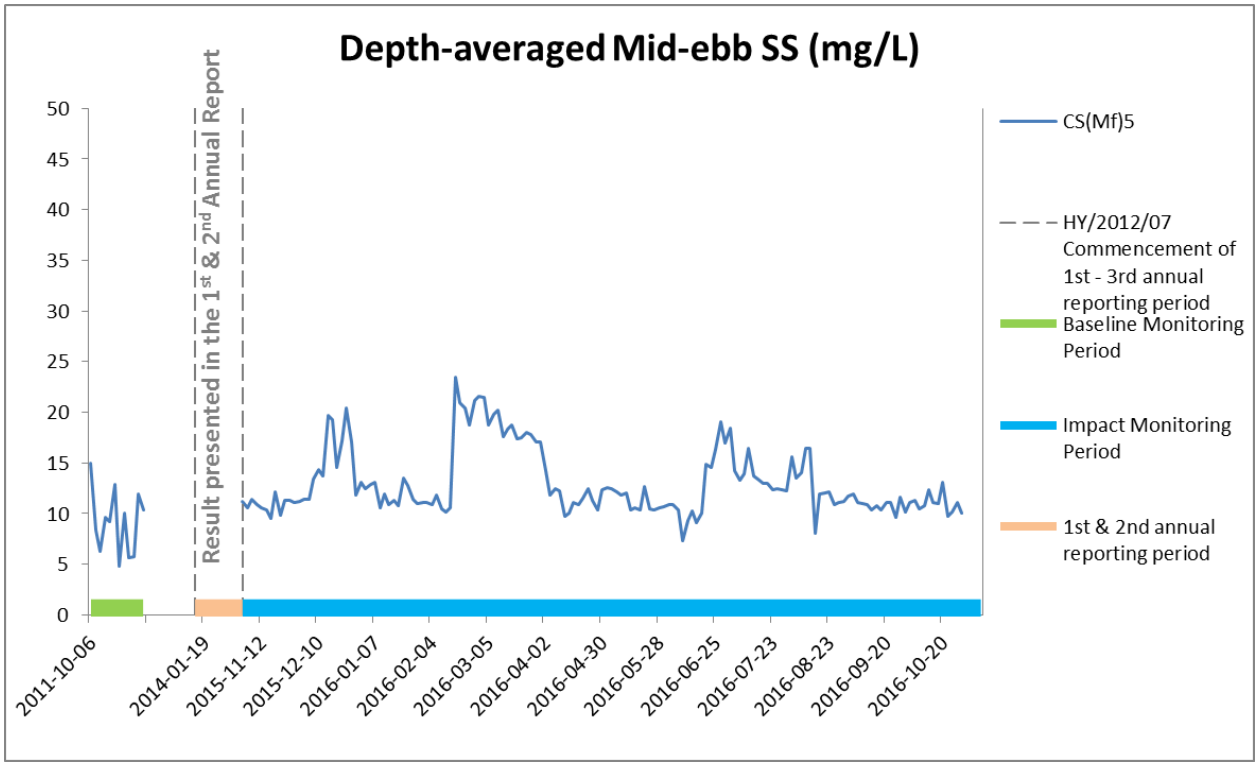
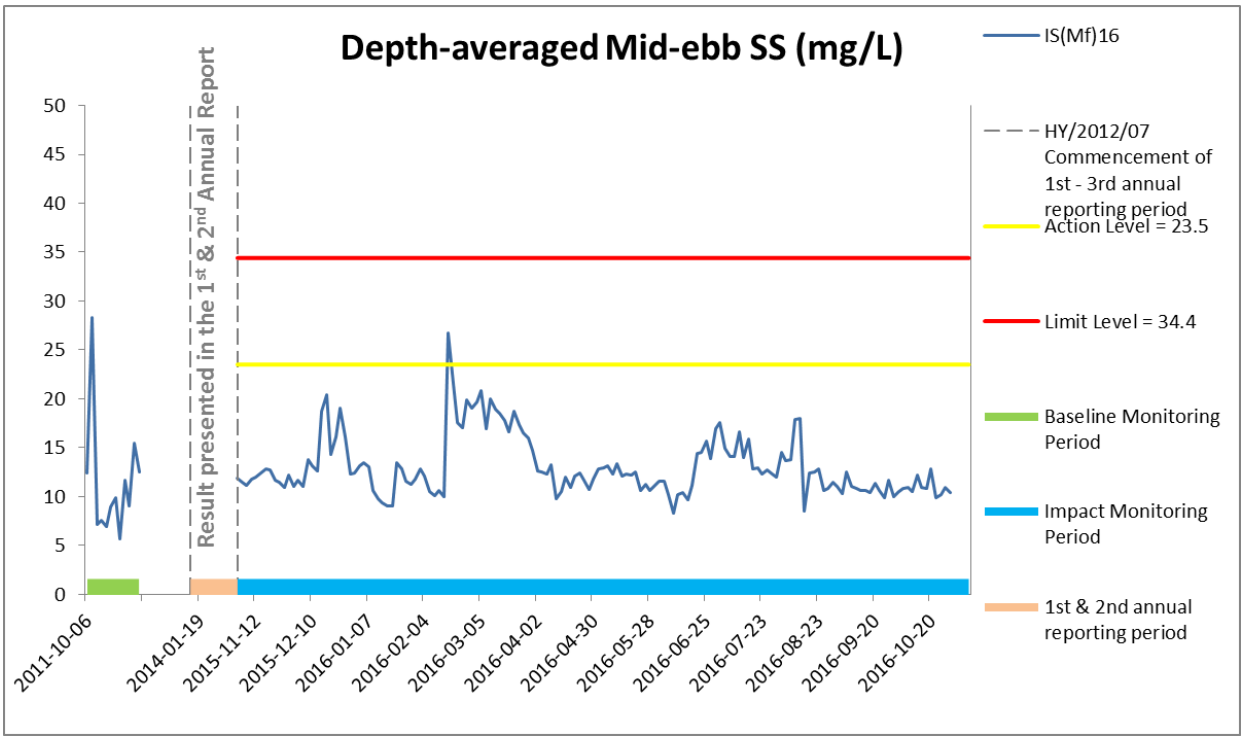


Figure F29 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



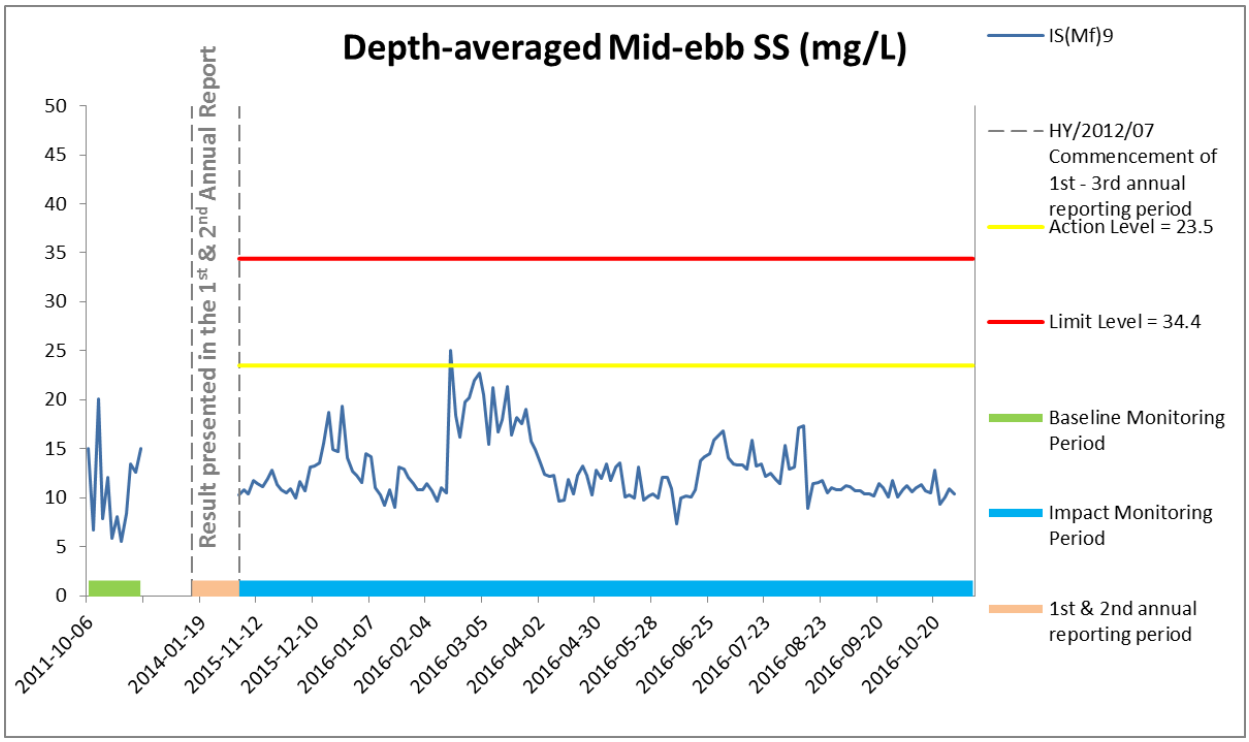
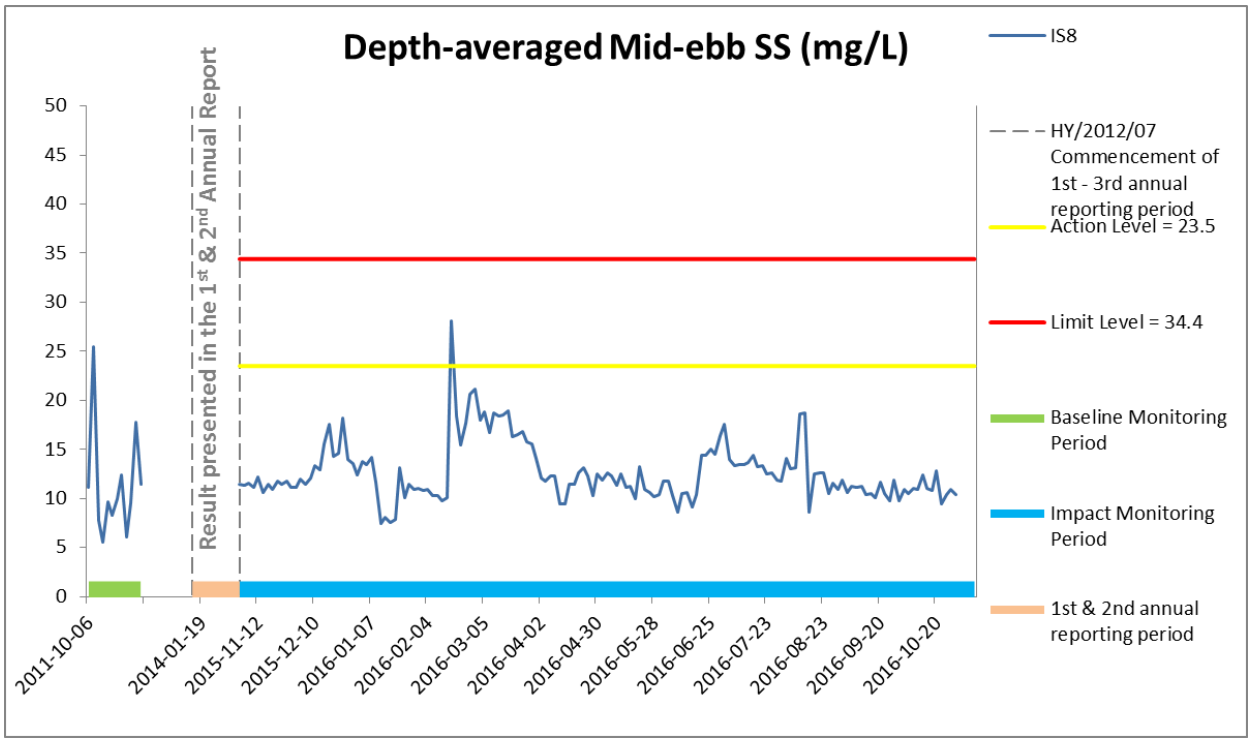


Figure F30 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions.
Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM



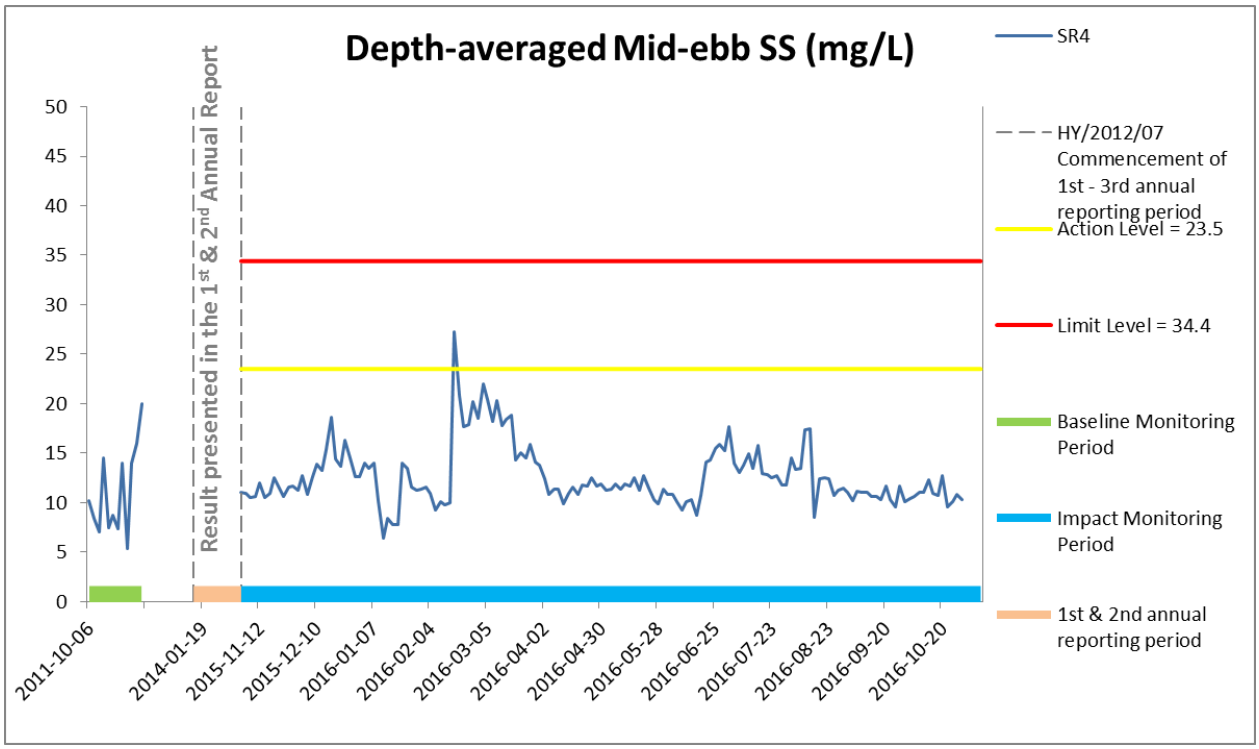


Figure F31 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

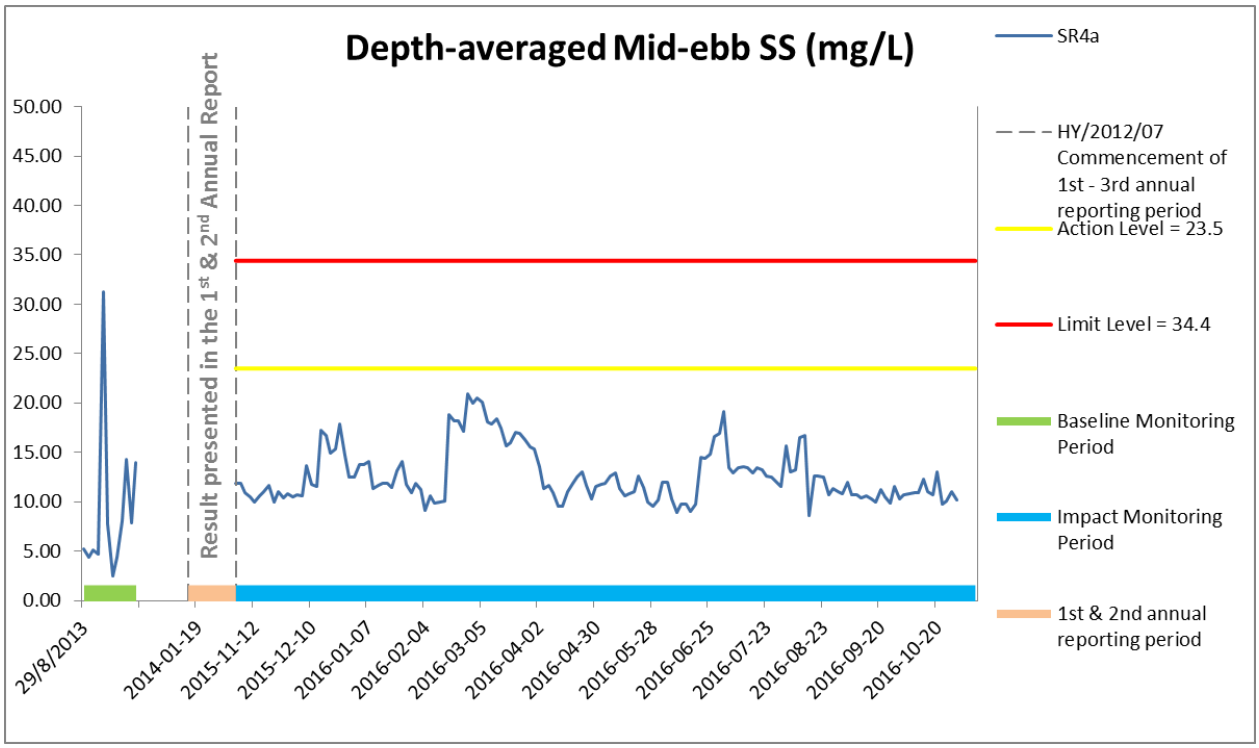
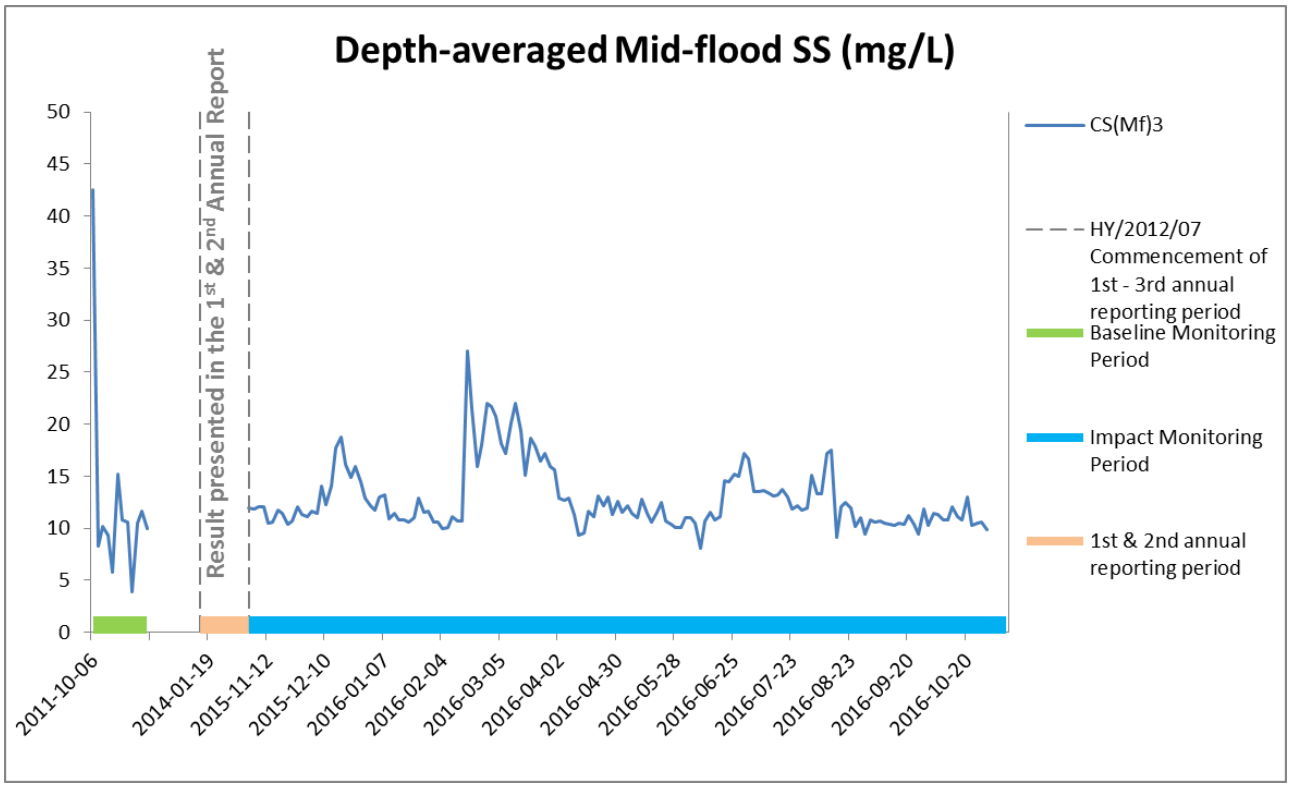


Figure F32 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)



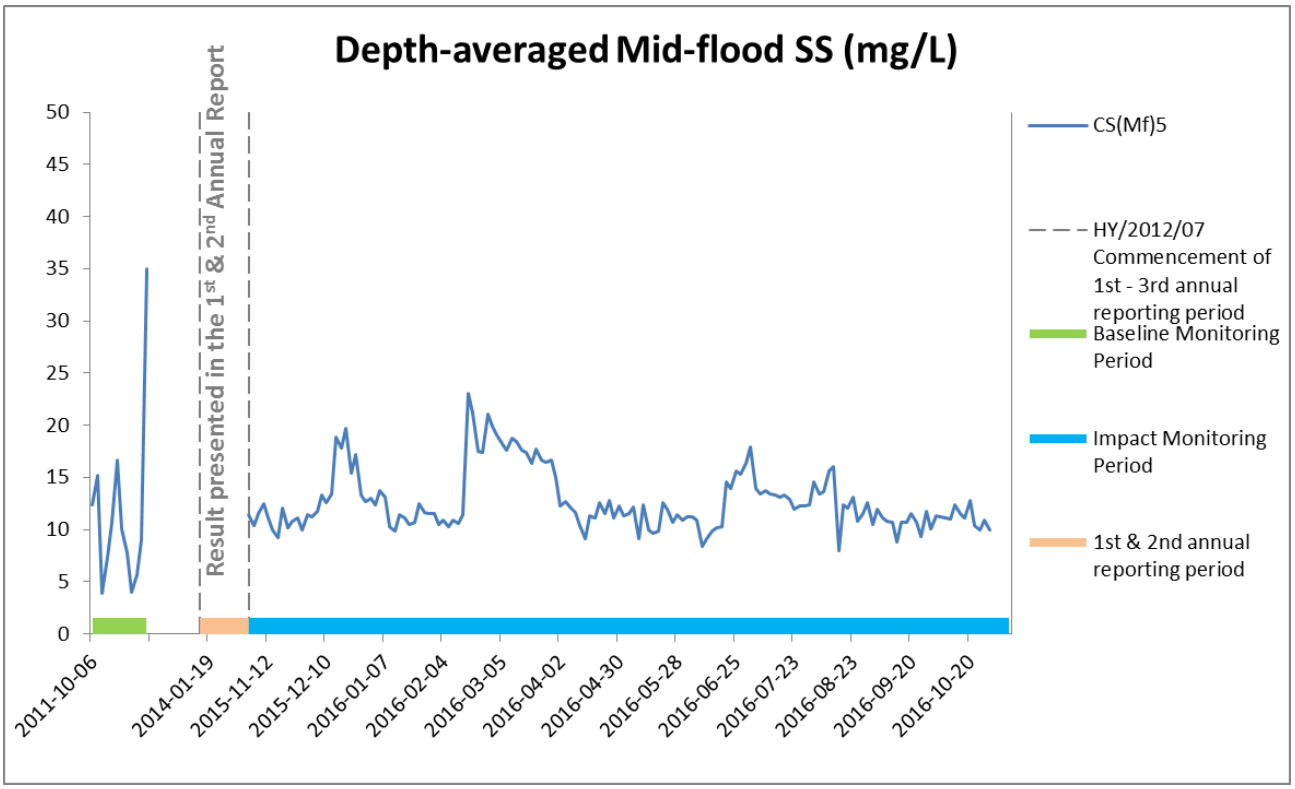


Figure F33 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 31 October 2016 at CS(Mf)3 and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

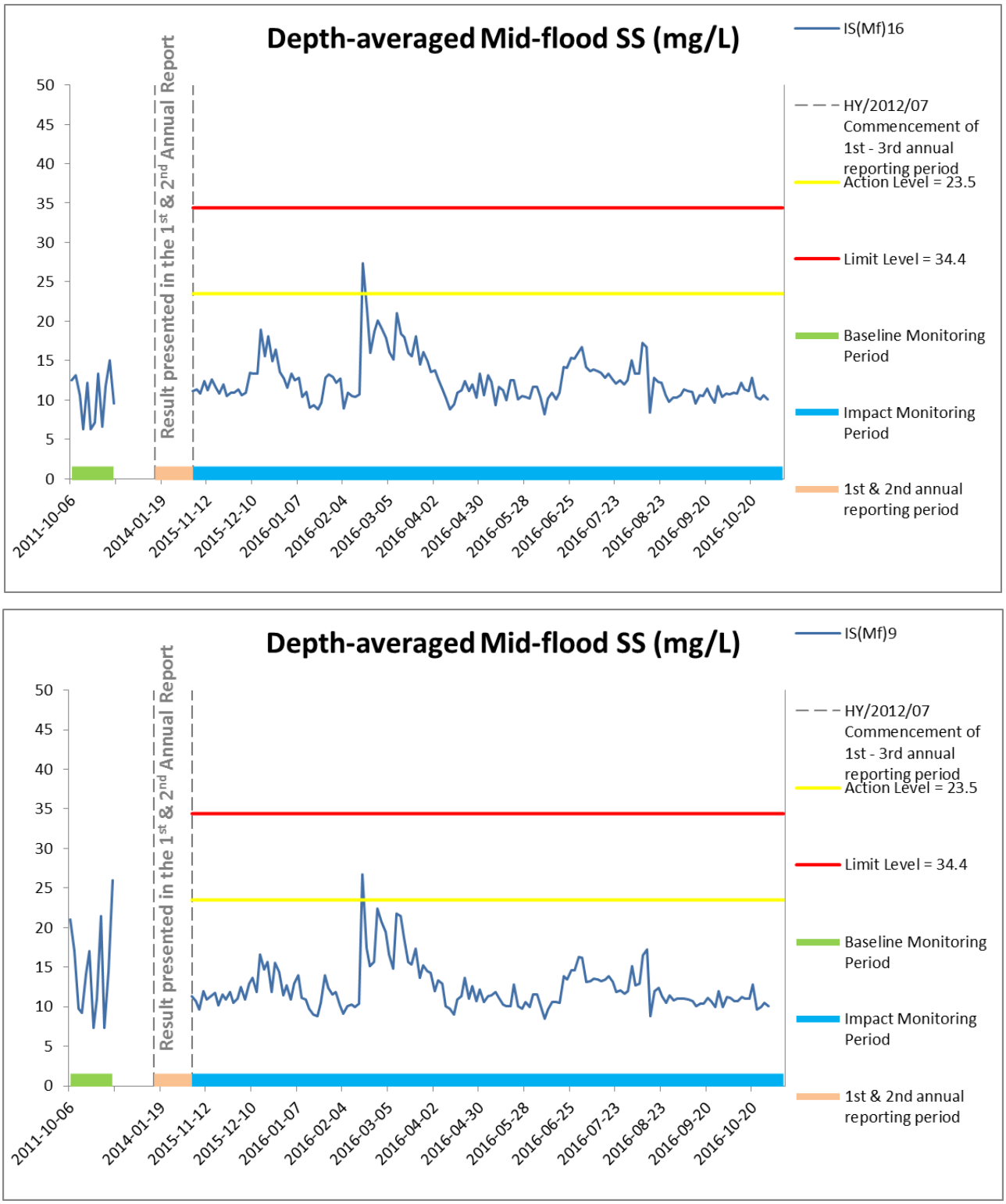
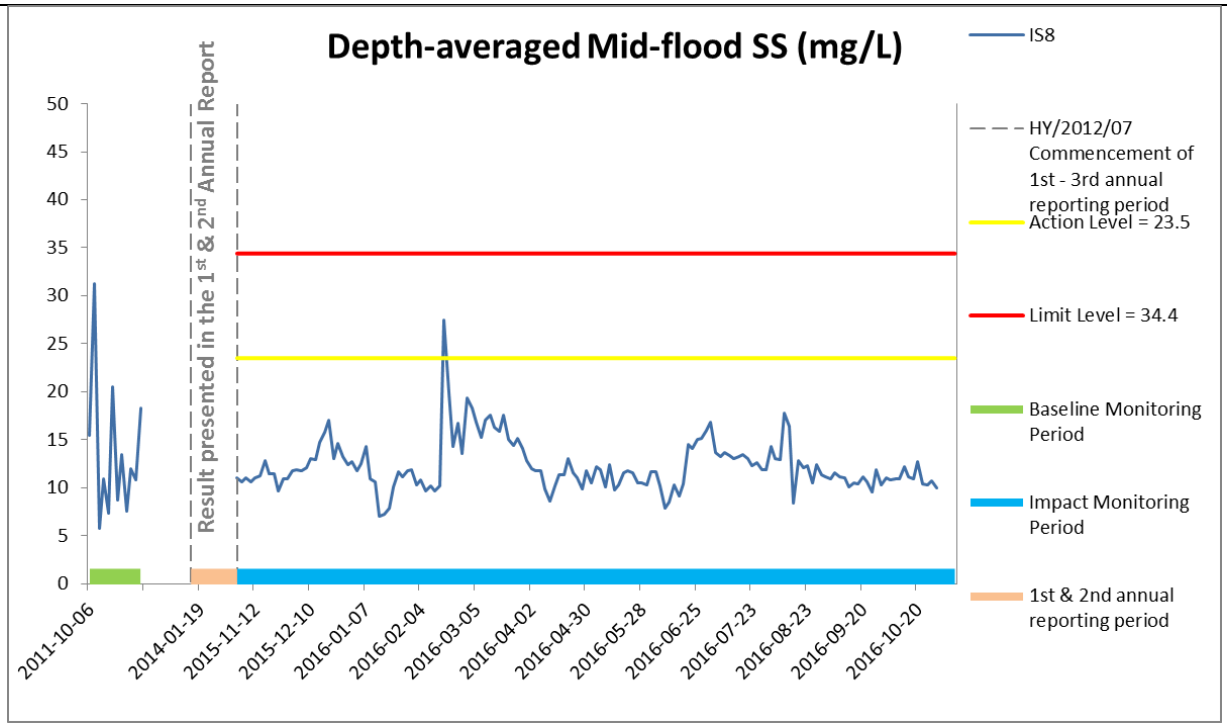


Figure F34 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 31 October 2016 at IS(Mf)16 and IS(Mf)9 .

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Environmental Resources Management

ERM



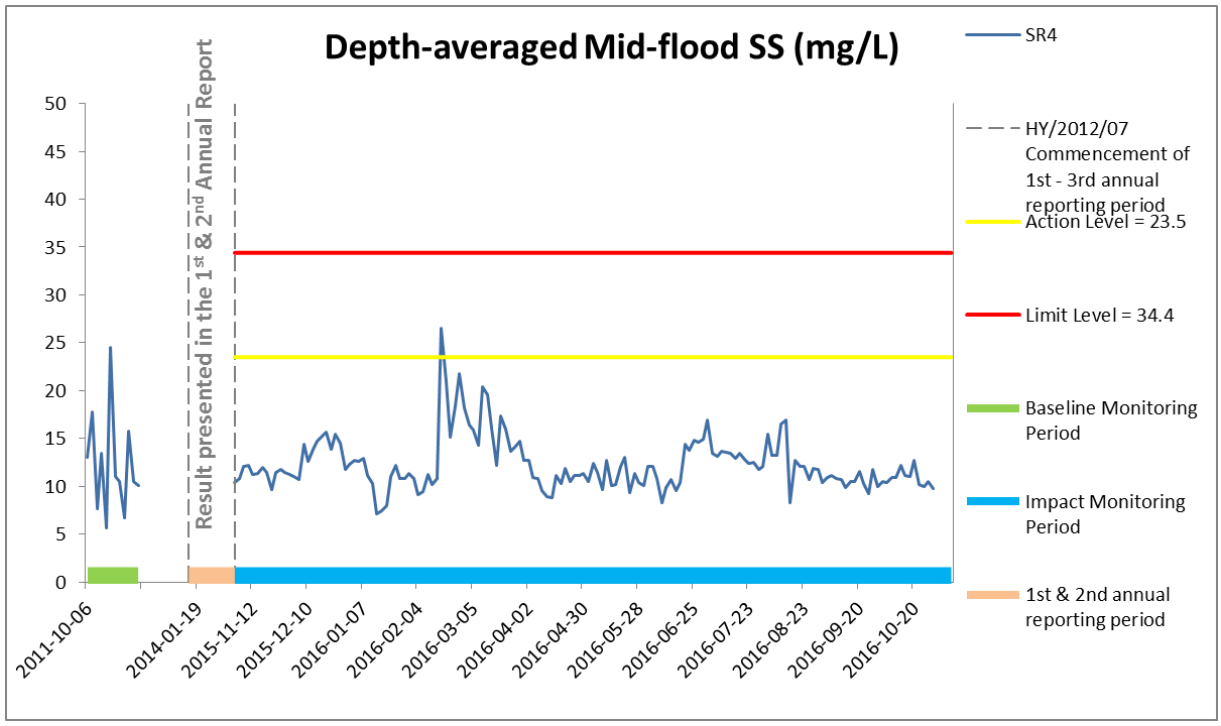


Figure F35 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 31 October 2016 at IS8 and SR4.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

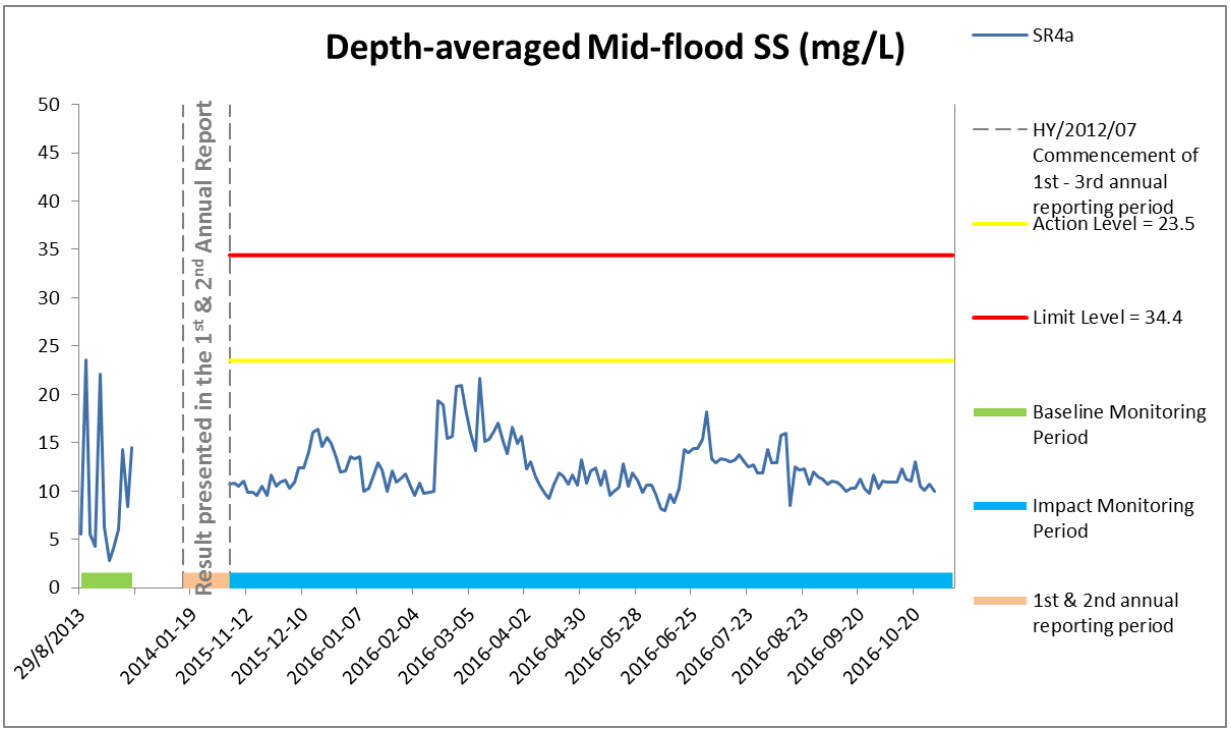


Figure F36 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 31 October 2016 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period. Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Construction of marine section of berth at southern landfall; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment. WQM on 09 February 2016 was cancelled due to suspension of marine works during holiday, as well as WQM on 02 August 2016 and 18 October 2016 were cancelled due to adverse weather.)

Appendix G

Impact Dolphin Monitoring Survey Result

CONTRACT NO. HY/2012/07
Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link (Southern Connection Viaduct Section)
Chinese White Dolphin Monitoring

Third Annual Progress Report (November 2015 - October 2016)
submitted to Gammon Construction Limited

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

23 March 2017

1. Introduction

1.1. The Tuen Mun-Chek Lap Kok Link (TM-CLKL) comprises a 1.6 km long dual 2-lane viaduct section between the Hong Kong Boundary Crossing Facilities (HKBCF) and the North Lantau Highway and associated roads at Tai Ho. Gammon Construction Limited (hereinafter called the "Contractor") was awarded as the main contractor of "Contract No. HY/2012/07 – Hong Kong-Zhuhai-Macao Bridge Tuen Mun-Chek Lap Kok Link – Southern Connection Viaduct Section".

1.2. According to the updated Environmental Monitoring and Audit (EM&A) Manual (for TM-CLKL), monthly line-transect vessel surveys for Chinese White Dolphin should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas as in AFCD annual marine mammal monitoring programme. However, as such surveys have been undertaken by the HKLR03 and HKBCF projects in the same areas (i.e. NWL and NEL), a combined monitoring approach is recommended by the Highways Department, that the TM-CLKL EM&A project can utilize the monitoring data collected by HKLR03 or HKBCF project to avoid any redundancy in monitoring effort. Such exemption for the dolphin monitoring will end upon the completion of the dolphin monitoring carried out by HKLR03 contract as well as the TM-CLKL Northern Connection Sub-Sea Tunnel Section (HY/2012/08)

1.3. In November 2013, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by Gammon Construction Limited as their dolphin specialist for the TM-CLKL Southern Viaduct Section EM&A project. He is responsible for the dolphin monitoring study, including the data collection on Chinese White Dolphins during the construction phase (i.e. impact period) of the TM-CLKL project in Northwest Lantau (NWL) and Northeast Lantau (NEL) survey areas.

1.4. During the construction period of HKLR, the dolphin specialist would be in charge of reviewing and collating information collected by HKLR03 dolphin monitoring programme to

examine any potential impacts of TM-CLKL construction works on the dolphins.

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

1.6. This report is the third annual progress report under the TM-CLKL construction phase dolphin monitoring programme submitted to the Gammon Construction Limited, summarizing the results of the surveys findings during the period of November 2015 to October 2016, utilizing the survey data collected by HKLR03 project.

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

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

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

Line No.		Easting	Northing		Line No.		Easting	Northing
1	Start Point	804671	815456		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805475	815913		14	Start Point	817537	820220
2	End Point	805477	826654		14	End Point	817537	824613
3	Start Point	806464	819435		15	Start Point	818568	820735
3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	819771		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	820220		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671
6	Start Point	809490	820466		18	Start Point	821504	822371
6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	820880		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	820872		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					
12	End Point	815542	824882					

2.1.2. The HKLR03 survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2015, 2016). 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* or *Steiner* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^{o} and 90^{o} (in relation to the bow, which is defined as 0^{o}). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

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

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

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

2.1.7. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as “primary” survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as

"secondary" survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese white dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

2.2. Photo-identification Work

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

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

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

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

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

2.3. Data Analysis

2.3.1. The following analyses were performed utilizing the HKLR03 dolphin monitoring data collected under the present impact phase (the third year of TMCLKL construction; i.e. November 2015 to October 2016). In addition, these analyses were also conducted for the one-year baseline phase (one year before any HZMB construction works have commenced; i.e. February 2011 to January 2012); the one-year transitional phase (one year after the HZMB construction works (HKBCF and HKLR works) have commenced, but before the commencement of TMCLKL construction works; i.e. November 2012 to October 2013); and the first and second years of TMCLKL construction (i.e. November 2013 to October 2014 & November 2014 to October 2015).

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

Distribution analysis

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

Encounter rate analysis

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

2.3.5. Firstly, for the comparison with the HZMB monitoring results, the encounter rates were calculated using primary survey effort alone. The average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) were deduced based on the encounter rates from the 24 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 and second years of impact period as well as the transitional period and baseline period.

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

Quantitative grid analysis on habitat use

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

from on-effort sightings per km^2) were then calculated for each 1 km by 1 km grid with the aid of GIS.

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

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

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

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

Behavioural analysis

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

Ranging pattern analysis

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

3. Monitoring Results

3.1. Summary of survey effort and dolphin sightings

3.1.1. During the third year of TMCLKL impact phase monitoring (November 2015 to October 2016), a total of 24 sets of systematic line-transect vessel surveys were conducted under the HKLR03 monitoring works to cover all transect lines in NWL and NEL survey areas twice per month.

3.1.2. From these HKLR03 surveys, a total of 3,598.07 km of survey effort was collected, with 92.7% 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, 1,373.63 km and 2,224.44 km of survey effort were conducted in NEL and NWL survey areas respectively.

3.1.3. The total survey effort conducted on primary lines was 2,609.11 km, while the effort on secondary lines was 988.96 km. The survey effort conducted on primary and secondary lines were both considered as on-effort survey data. Summary table of the survey effort is shown in Appendix I.

3.1.4. From the 24 sets of HKLR03 monitoring surveys from November 2015 to October 2016, a total of 45 groups of 168 Chinese White Dolphins were sighted. All except seven dolphin groups were sighted during on-effort search. Among the 38 on-effort sightings, 33 of them were made on primary lines, while the other five dolphin sightings were made on secondary lines.

3.1.5. During this 12-month period, all except one dolphin sighting were made in NWL, and the only rare off-effort sighting made in NEL on June 6th was a lone animal. A summary table of the dolphin sightings is shown in Appendix II.

3.2. Distribution

3.2.1. Distribution of dolphin sightings made during the HKLR03 monitoring surveys in November 2015 to October 2016 is shown in Figure 1.

3.2.2. Similar to the first and second years of impact phase, the majority of dolphin sightings made during the third year of impact phase were concentrated at the northwestern end of the North Lantau region, mainly to the north of Lung Kwu Chau (Figure 1). Some dolphin groups were also sighted around Lung Kwu Chau and Sha Chau, near Pillar Point and near Shum Wat in NWL, while the lone sighting made in NEL was located in the coastal water between Shum Shui Kok and Yam O (Figure 1).

3.2.3. None of the dolphin groups were sighted in the vicinity of TMCLKL southern viaduct, but one group was sighted adjacent to the northern landfall of TMCLKL construction site (Figure 1). Moreover, another sighting was made just to the north of HKBCF, while four sightings were made adjacent to the HKLR09 alignment near Shum Wat (Figure 1).

3.2.4. In general, dolphins appeared to have mostly avoided the construction areas of HZMB works during the present impact phase monitoring period, which was consistent with the dolphin distribution during the first two years of impact phase.

3.2.5. Dolphin sighting distribution of the present impact phase monitoring period (November 2015 to October 2016) was compared to the ones during the baseline phase (February 2011 to January 2012), the transitional phase (November 2012 to October 2013) and the first and second years of impact phase (November 2013 to October 2014 & November 2014 to October 2015 respectively).

3.2.6. During the present impact phase period in 2015-16, the distribution was largely similar to the previous impact phase period in 2014-15, with dolphins being largely vacated from the NEL survey area and the eastern half of the NWL survey area (Figure 2). 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 three periods of impact phase of TMCLKL construction (Figure 2).

3.2.7. The only area where dolphin occurrence was consistent across the five periods was around the Lung Kwu Chau area, but even so such occurrence there was progressively diminishing in recent years (Figure 2).

3.2.8. Notably, dolphin usage around Lung Kwu Chau reached to a lower point in 2015-16, with only a few dolphin groups sighted at this critical dolphin habitat in the past (Figure 2). Such decline could be related to the recent diversion of high-speed ferry traffic originated from the Airport's Sky Pier, where the ferries have been traversing through the waters to the north of Lung Kwu Chau since late December 2015.

3.3. Encounter rate

3.3.1. During the present 12-month impact phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline, transitional and first year 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 present 12-month study period using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 1.82 sightings and 7.08 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 2015-16.

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

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		**Encounter rate (ANI)** (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Northeast Lantau	**Northwest Lantau**	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (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

3.3.3. 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 baseline, transitional and the three impact phase periods. The two variables that were examined included the different periods and the two locations (i.e. NEL and NWL).

3.3.4. For the comparison between the different monitoring periods, the p-value for the differences in average dolphin encounter rates of STG and ANI were both 0.000000 and 0.00000 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.

3.3.5. In NEL, the dolphin encounter rates (both STG and ANI) in the third year of TMCLKL impact monitoring period were nil, which was a huge contrast to the averages during the baseline phase and transitional phase (Table 2). Such progressive decline has actually existed in this area since the transitional phase (i.e. well before the TMCLKL construction works commenced), with the averages in the transitional phase being much lower than the ones in the baseline phase (reductions of 71.9% for STG and 76.1% respectively). Since then, dolphin occurrence has further diminished to an extremely low level during the first and second years of TMCLKL construction works, and then to complete absence in the third year.

3.3.6. In NWL, the average dolphin encounter rates (STG and ANI) during the present impact phase monitoring period were much lower (reductions of 72.9% and 71.1% respectively) than the ones recorded in the baseline period, indicating a dramatic decline in dolphin usage of this survey area during the third year of TMCLKL impact phase monitoring period (Table 2). Notably, the encounter rates in NWL during the first year of impact phase (2013-14) were only slightly lower than the baseline period, but such decline has

quickly escalated during the second and third years of impact phase, signaling a further widespread of declining usage by the dolphins throughout the entire North Lantau region with no sign of recovery.

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from one to 12 individuals per group in North Lantau region during November 2015 – October 2016. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline, transitional and first two years of impact phases, as shown in Table 3.

3.4.2. The average dolphin group sizes in the entire North Lantau region as well as in NWL waters during the present impact phase monitoring period were slightly higher than the ones recorded during the baseline and transitional phases, similar to the first year of impact phase, but lower than the second year of impact phase (Table 3). On the other hand, there was only one group of a lone animal found in NEL during the present impact phase monitoring period, and such group size was much lower than the ones during the baseline and transitional phases.

Table 3. Comparison of average dolphin group sizes from the first three years of impact phase, transitional phase and baseline phase monitoring periods (± denotes the standard deviation of the average encounter rates)

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase III (2015-16)	3.73 ± 3.14 (n = 45)	1.00 (n = 1)	3.80 ± 3.14 (n = 44)
Impact Phase II (2014-15)	4.24 ± 3.15 (n = 54)	1.00 (n = 1)	4.30 ± 3.15 (n = 53)
Impact Phase I (2013-14)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

3.4.3. Among the 45 dolphin groups sighted during the impact phase, 29 of them were composed of 1-4 individuals only, while there were only four dolphin groups with more than 10 individuals (Appendix II).

3.4.4. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present impact phase is shown in Figure 3, with comparison to the ones in the first two years of impact phase, transitional phase and baseline phase. During the impact phase in 2015-16, distribution of the larger dolphin groups were mainly concentrated at the northwestern portion of the North Lantau waters (Figure 3).

3.4.5. Notably, throughout the three impact phases, distribution of these larger groups has been restricted to the northwestern portion of North Lantau region. Such restriction was drastically different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many also sighted in NEL waters (Figure 3).

3.5. Habitat use

3.5.1. During the impact phase monitoring period in 2015-16, the most heavily utilized habitat by Chinese White Dolphins was only found around Lung Kwu Chau (Figures 4a and 4b). For the rest of North Lantau region, only a handful of grids to the west of Sha Chau, around Sha Chau, near HKLR09 alignment and near the northern landfall of TMCLKL have recorded low to moderately low dolphin densities (Figures 4a and 4b). Moreover, all grids near the reclamation sites of HKLR03 and HKBCF projects sites did not record any presence of dolphins in the present 12-month impact monitoring period in 2015-16 (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 three periods of impact phases (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 present impact phase period (Figure 5).

3.5.3. Moreover, dolphin usage of NWL waters also declined dramatically during the present impact phase monitoring period, with the only higher densities occurred right around the Lung Kwu Chau area, in contrast to a more evenly spread usage in NWL during the baseline phase, transitional phase and first year of impact phase monitoring (Figure 5). It appeared that there was a more widespread decline of dolphin usage throughout the North Lantau waters in the second and third years of the impact phase.

3.6. Mother-calf pairs

3.6.1. During the present 12-month impact phase monitoring period, no young calves were sighted at all with their mothers in North Lantau waters. This was drastically different from the regular occurrence of young calves in North Lantau region during the baseline phase, transitional phase and the first year of impact phase monitoring (Figure 6).

3.7. Activities and associations with fishing boats

3.7.1. Five and four dolphin sightings were associated with feeding and socializing activities respectively during the 12-month impact phase monitoring period. The percentage of sightings associated with feeding activities during the present impact phase (11.1%) was higher than the impact phase in 2013-14 (5.9%) and transitional phase (8.6%), but lower than the previous impact phase in 2014-15 (18.5%) and baseline phase (12.8%).

3.7.2. On the contrary, the percentage of socializing activities during the present impact phase monitoring period (8.9%) was higher than the first two years of impact phases (5.5% in 2014-15 and 5.9% in 2013-14), as well as the baseline period (3.8%) and transitional period (6.4%). Notably, only one of the 45 dolphin groups was engaged in traveling activity, while none of these groups was engaged in resting activity during the present

impact phase monitoring period in 2015-16.

3.7.3. Distribution of dolphins engaged in feeding, socializing and traveling activities during the present impact phase monitoring period is shown in Figure 7. The five dolphin groups associated with feeding activities occurred near Lung Kwu Chau and Sha Chau as well as adjacent to HKLR09 alignment near Shum Wat, while the four dolphin groups associated with socializing activities were located to the north of Lung Kwu Chau, near the northern landfall of TMCLKL as well as adjacent to the HKLR09 alignment (Figure 7).

3.7.4. In contrast, during the baseline phase, feeding activities were frequently sighted along the Urmston Road, within the marine park, to the west of airport platform and around the Brothers Islands, while the socializing activities were more scattered throughout the North Lantau region in the same period as well as in the transitional phase (Figure 7). It is apparent that the "hotspots" where dolphins engaged in different activities were considerably different between the baseline, transitional and impact phases.

3.7.5. Notably, none of the 45 dolphin groups sighted during the impact phase monitoring period in 2015-16 was found to be associated with any operating fishing vessel. The extremely rare event of fishing boat association during the three periods of impact phase as well as the transitional phase was quite different from the baseline period with 14 of 288 dolphin groups associated with fishing boats.

3.8. Summary of photo-identification works

3.8.1. During the 12-month impact phase monitoring period in 2015-16, a total of 42 individuals sighted 118 times altogether were identified (see Appendix III). All of these re-sightings were made in NWL, while the lone individual sighted in NEL was not identified.

3.8.2. Nearly two-thirds of the 42 identified individuals were sighted only once or twice, while the rest were sighted more frequently during the 12-month period. For example, seven individuals were sighted more than five to nine times (NL136, NL182, NL202, NL210, NL285, NL286 and NL320), while one individual (NL48) were sighted ten times during the HKLR03 surveys in 2015-16. Their frequent occurrences during the third year of impact phase monitoring indicated strong reliance of NWL waters as their home ranges.

3.8.3. Notably, five recognized females (i.e. NL33, NL104, NL202, NL233 and NL264) were accompanied with their calves during their re-sightings, and all of these calves are older and already in their juvenile stage. For example, the calves of NL264 (i.e. NL288) and NL202 (i.e. NL286) have been accompanying their mothers for over 7-8 years.

3.9. Individual range use

3.9.1. Ranging patterns of the 42 individuals identified during the 12-month impact phase monitoring period in 2015-16 were determined by fixed kernel method, and are shown in Appendix IV.

3.9.2. Almost all identified dolphins sighted within this 12-month period were utilizing their ranges primarily in NWL (with the exception of NL293 and WL243), while 16 of them have extended their range use to West Lantau waters (e.g. NL104, NL136, NL210,

NL302) based on the HKLR09 monitoring data collected concurrently during the same 12-month period. All of these identified dolphins have avoided the NEL waters (Appendix IV), the area where many of them have utilized as their core areas of activities in the past.

3.9.3. Temporal changes in range use of 31 individual dolphins that ranged across different survey areas in North, West and South Lantau waters were examined in details during baseline phase, transitional phase and three periods of impact phases (Appendix V). It is apparent that 17 of them (e.g. CH34, NL33, NL210, NL259) have gradually shifted their range use away from their previously important habitat in NEL in the past few years, and have been completely absent from there in the present impact phase (Appendix V).

3.9.4. Moreover, 20 individual dolphins have gradually diminished their utilization of NWL waters during the TMCLKL impact phases, and at the same time all of them (e.g. NL98, NL261, NL287, NL302) have increased their utilization of WL waters, apparently expanding their range use into West Lantau waters (Appendix V). Six individuals (NL33, NL120, NL123, NL224, NL269 and NL287) have even expanded their range use to Southwest Lantau waters as well during the past two periods of impact phase (Appendix V).

3.9.5. Notably, while some individuals have expanded their range use in WL and diminished their range use in NWL, ten individuals (e.g. NL103, NL264, WL17) have utilized waters of Hong Kong generally less during the past two impact phase periods (Appendix V). This corresponded well with a much lower dolphin encounter rate in NWL in 2014-15 and 2015-16 impact phase periods as examined in Section 3.3.4.

3.9.7. The apparent range shifts of many identified individual dolphins examined above were also documented in Hung (2016), and such shifts could be related to the disturbance of construction activities and other existing threats in the North Lantau region. This should be continuously monitored for the rest of the TMCLKL impact phase monitoring period to determine whether such range shifts are temporary or permanent, and whether the dolphins would continue the North Lantau waters once the HZMB-related construction works have completed.

4. Conclusion

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

4.2. Although the dolphins infrequently occurred along the alignment of TMCLKL southern connection viaduct in the past and during the baseline monitoring period, it is apparent that dolphin usage has been drastically reduced in the entire North Lantau region, and many individuals have shifted away from the important habitats around the Brothers Islands and the rest of North Lantau waters.

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

5. References

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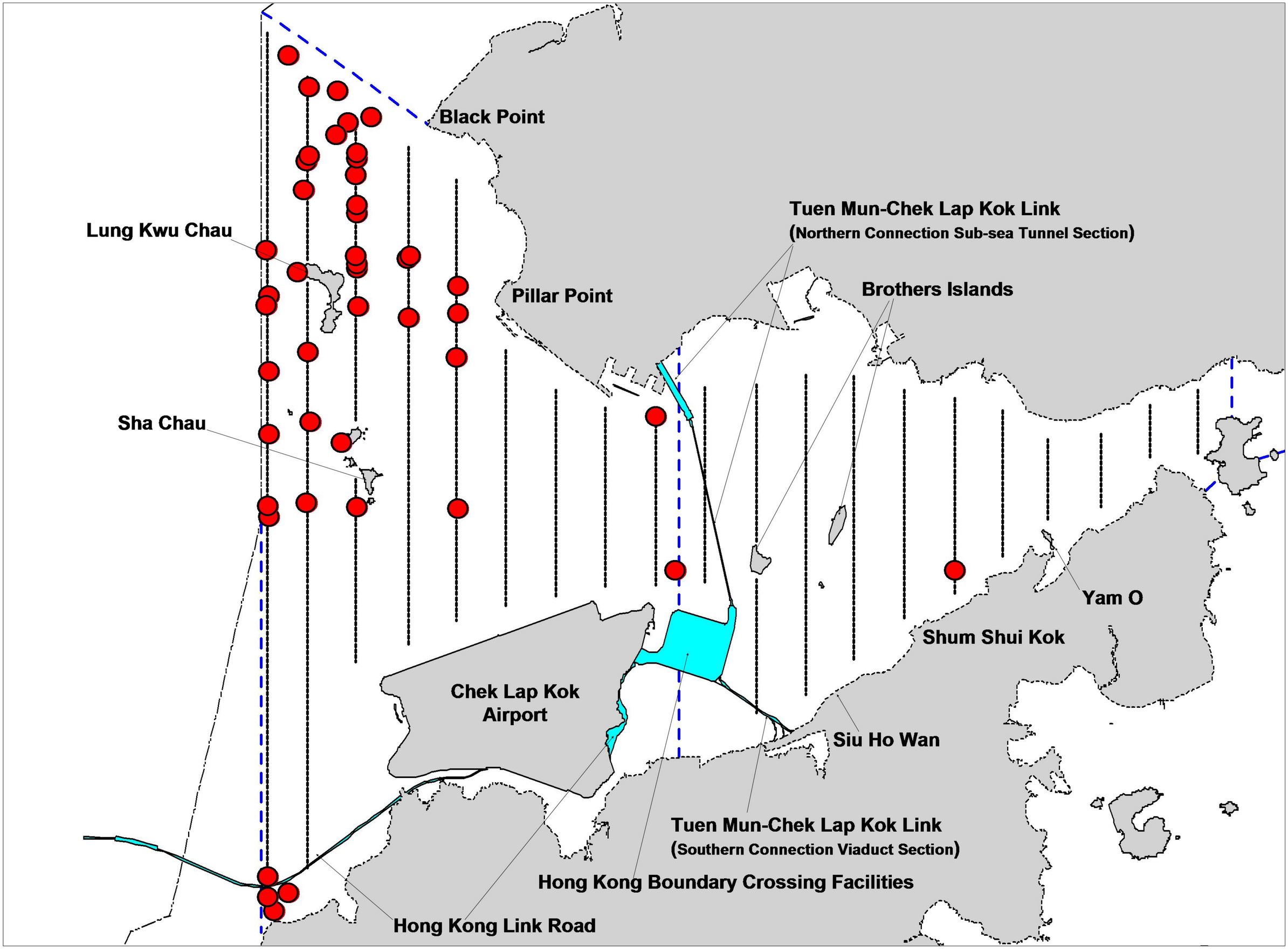


Figure 1. Distribution of Chinese white dolphin sightings in North Lantau region during the third year of TMCLKL construction works (November 2015 to October 2016), utilizing the HKLR03 monitoring data

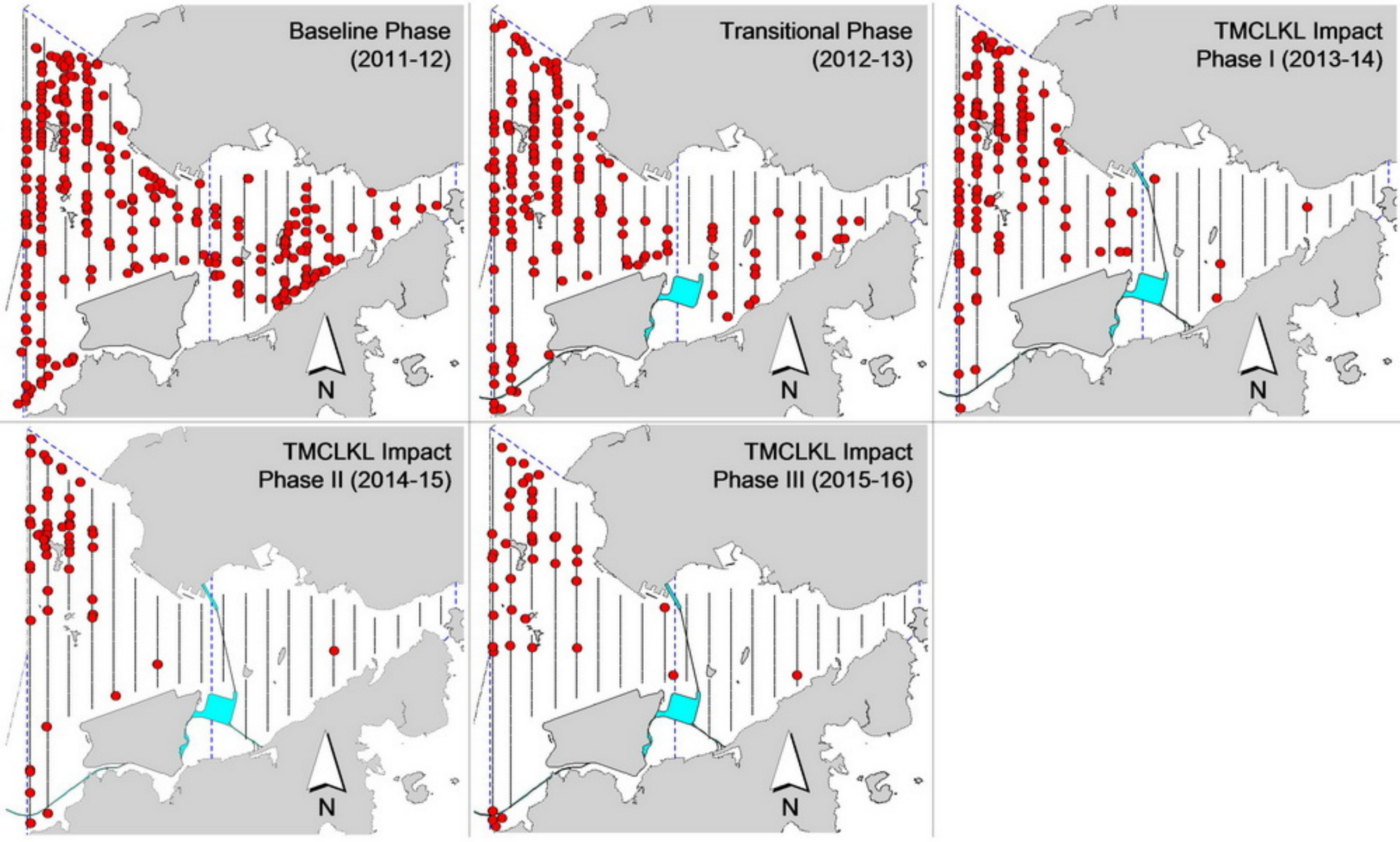
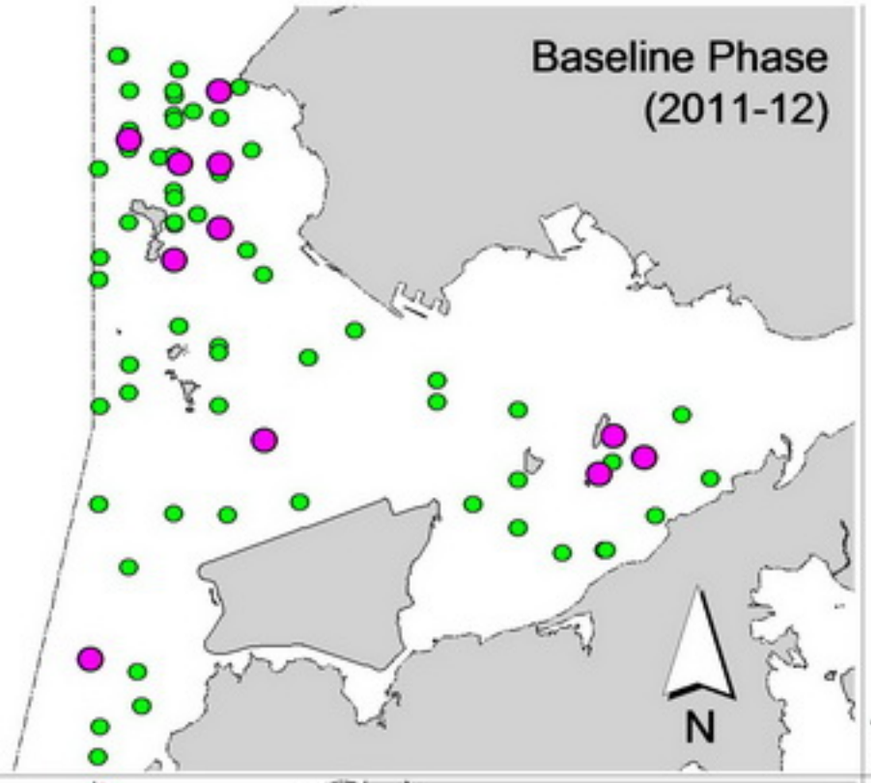
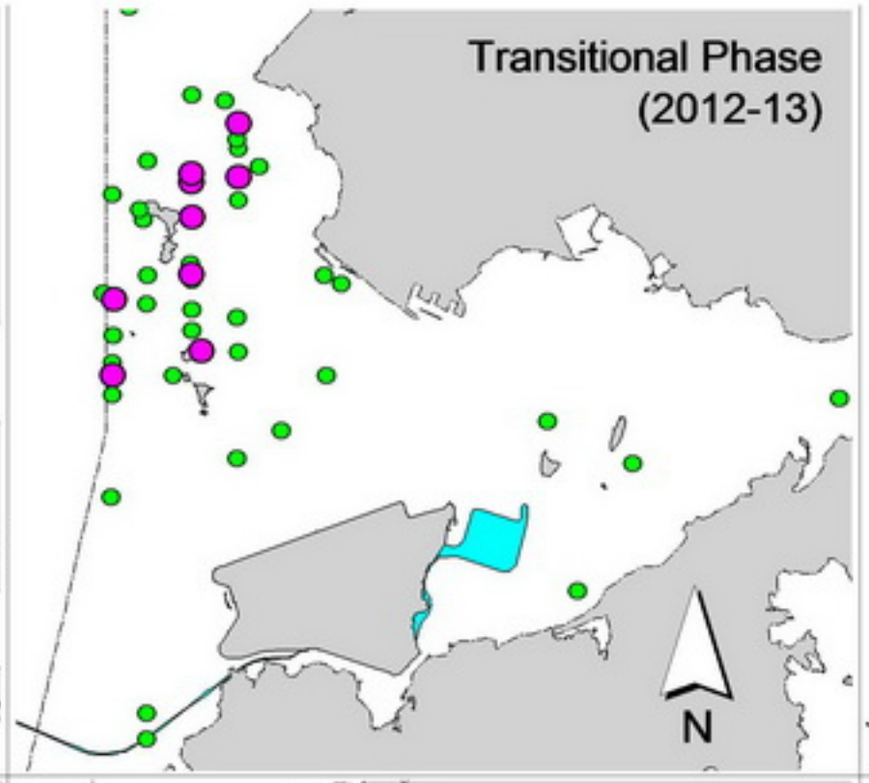
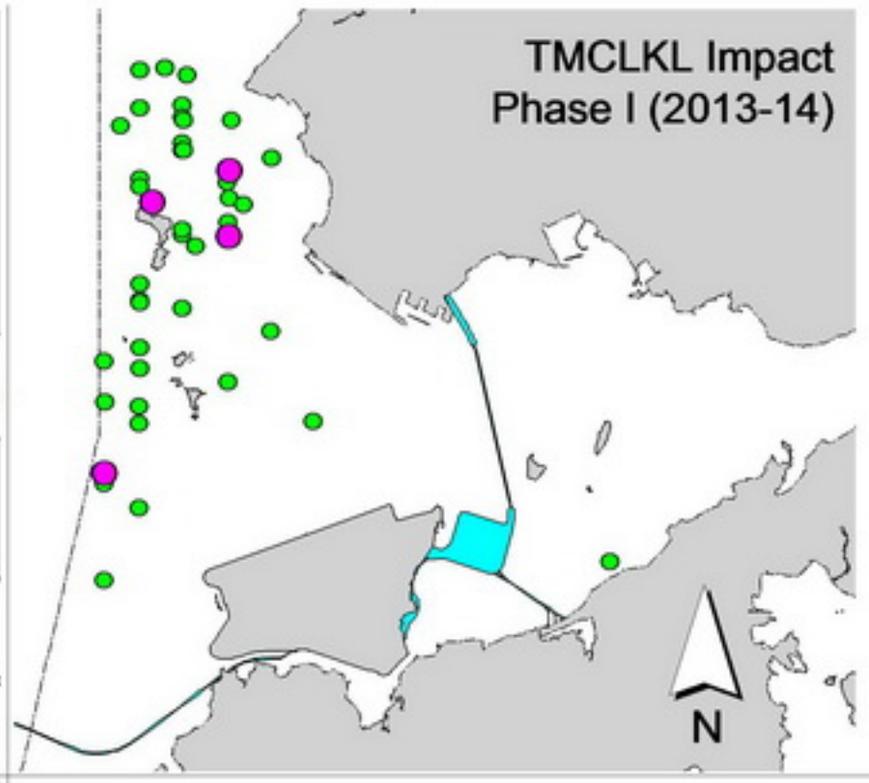
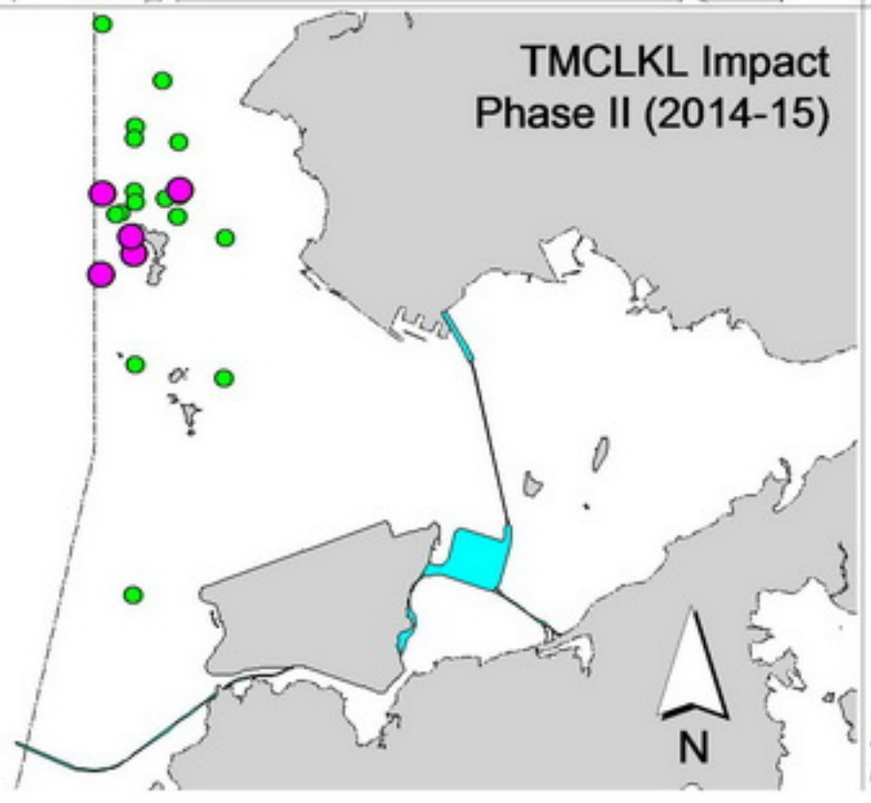


Figure 2. A comparison on distribution of Chinese white dolphin sightings in North Lantau region during the baseline, transitional and three impact phases of TMCLKL construction works









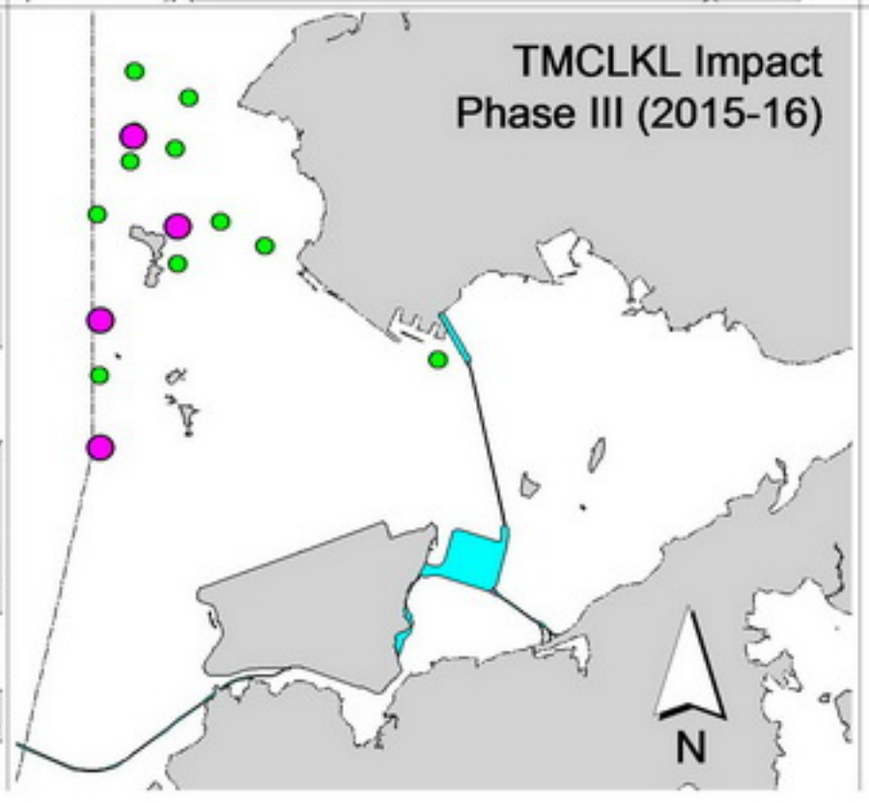


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

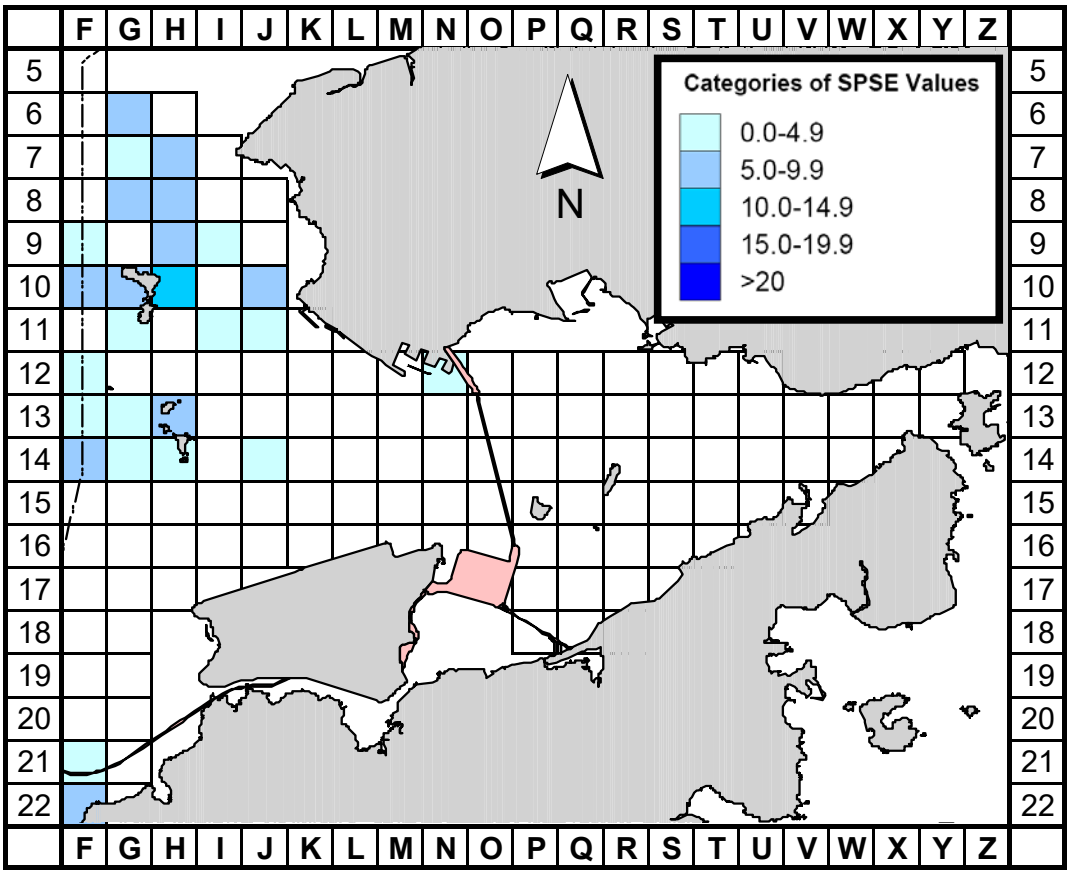


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Nov15 - Oct16) (SPSE = no. of on-effort sightings per 100 units of survey effort)

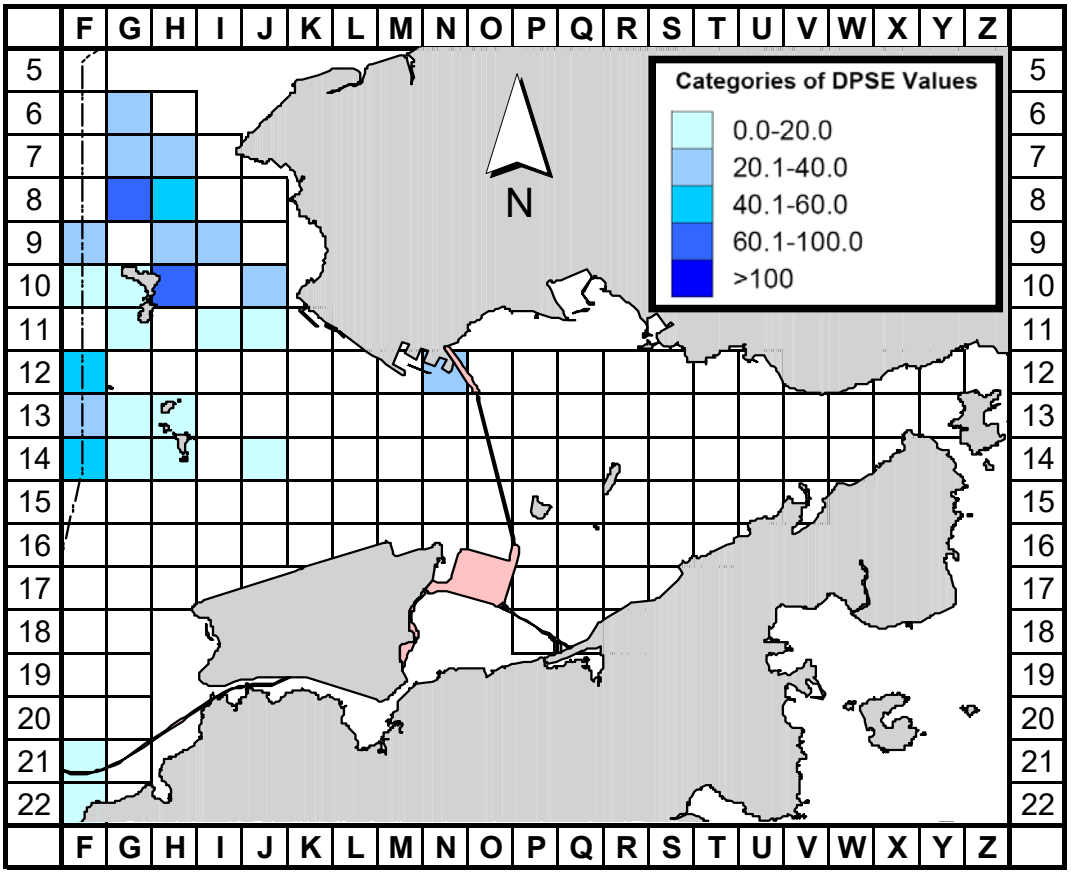


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Nov15 -Oct16) (DPSE = no. of dolphins per 100 units of survey effort)

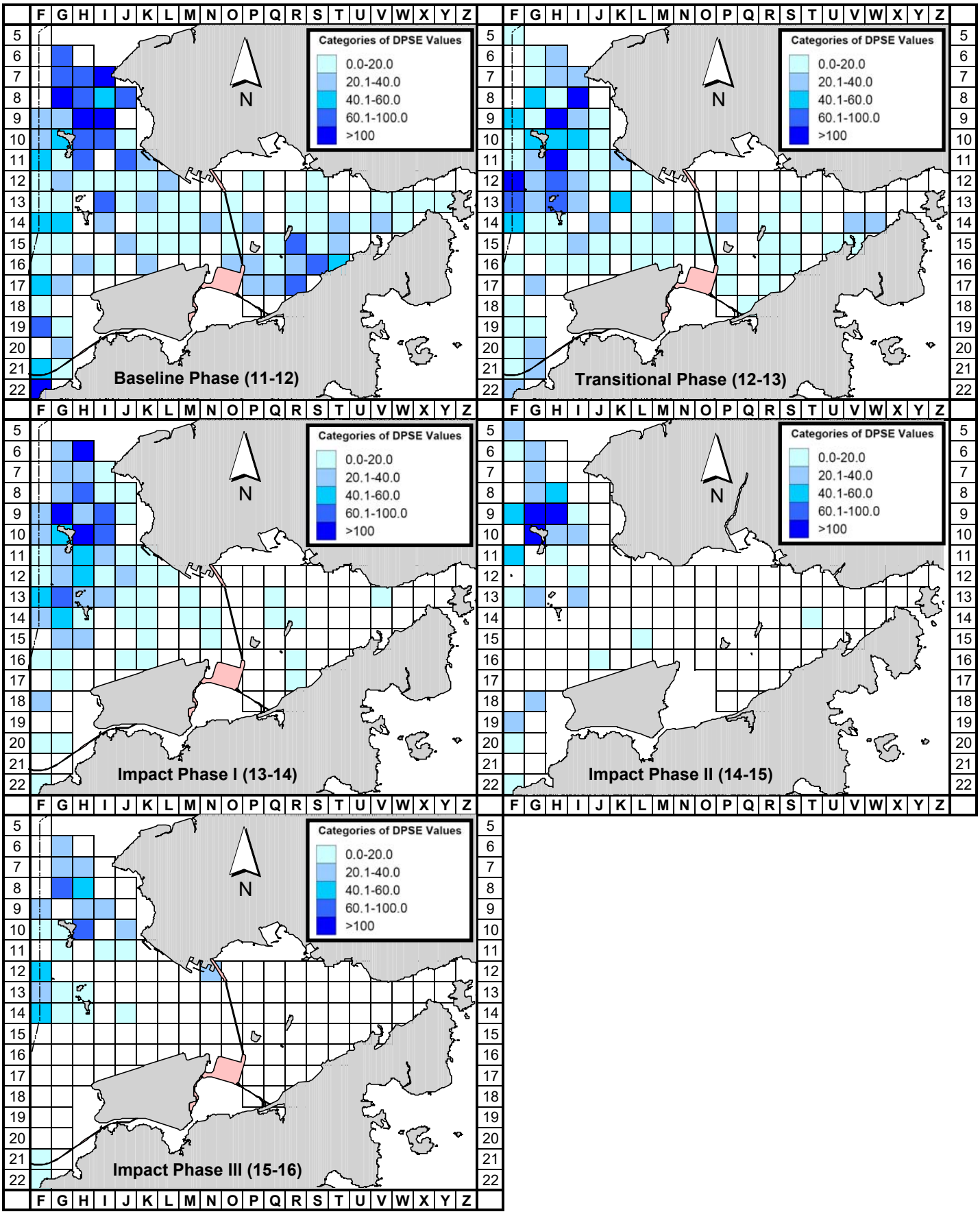


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km^2 in NWL and NEL survey areas between the three impact phases (Nov15-Oct16, Nov14-Oct15 and Nov13-Oct14), transitional phase (Nov12-Oct13) and baseline phase (Feb11-Jan12) monitoring periods (DPSE = no. of dolphins per 100 units of survey effort)

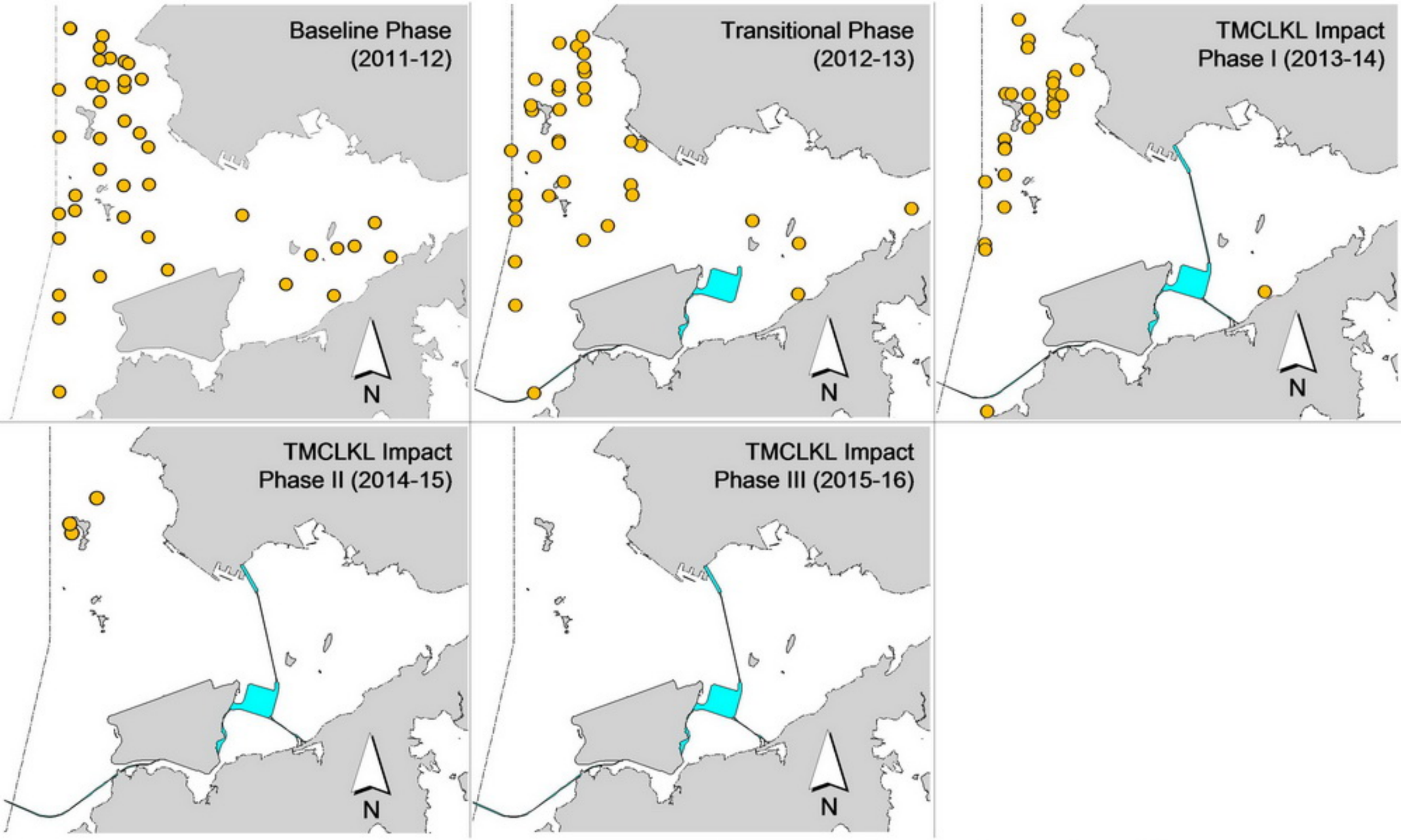


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works

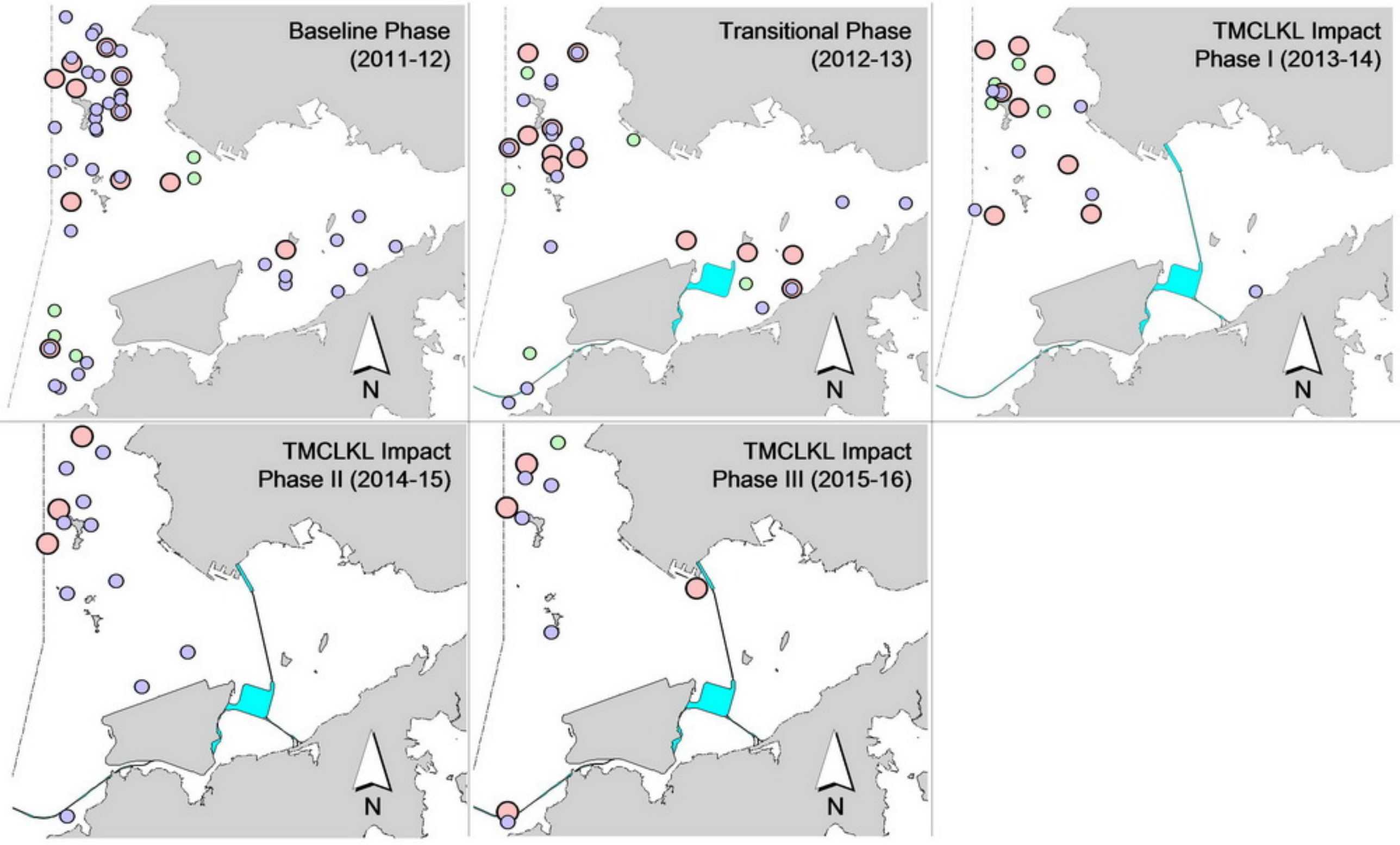


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works

Appendix I. HKLR03 Survey Effort Database (November 2015 - October 201

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
2-Nov-15	NW LANTAU	2	6.50	AUTUMN	STANDARD31516	HKLR	P
2-Nov-15	NW LANTAU	3	27.18	AUTUMN	STANDARD31516	HKLR	P
2-Nov-15	NW LANTAU	4	7.13	AUTUMN	STANDARD31516	HKLR	P
2-Nov-15	NW LANTAU	2	2.30	AUTUMN	STANDARD31516	HKLR	S
2-Nov-15	NW LANTAU	3	7.55	AUTUMN	STANDARD31516	HKLR	S
2-Nov-15	NW LANTAU	4	2.74	AUTUMN	STANDARD31516	HKLR	S
2-Nov-15	NE LANTAU	2	14.92	AUTUMN	STANDARD31516	HKLR	P
2-Nov-15	NE LANTAU	3	1.70	AUTUMN	STANDARD31516	HKLR	P
2-Nov-15	NE LANTAU	2	7.98	AUTUMN	STANDARD31516	HKLR	S
2-Nov-15	NE LANTAU	3	2.40	AUTUMN	STANDARD31516	HKLR	S
6-Nov-15	NW LANTAU	3	18.35	AUTUMN	STANDARD31516	HKLR	P
6-Nov-15	NW LANTAU	4	13.86	AUTUMN	STANDARD31516	HKLR	P
6-Nov-15	NW LANTAU	3	6.79	AUTUMN	STANDARD31516	HKLR	S
6-Nov-15	NE LANTAU	2	5.90	AUTUMN	STANDARD31516	HKLR	P
6-Nov-15	NE LANTAU	3	14.15	AUTUMN	STANDARD31516	HKLR	P
6-Nov-15	NE LANTAU	2	6.70	AUTUMN	STANDARD31516	HKLR	S
6-Nov-15	NE LANTAU	3	3.95	AUTUMN	STANDARD31516	HKLR	S
10-Nov-15	NW LANTAU	2	2.44	AUTUMN	STANDARD31516	HKLR	P
10-Nov-15	NW LANTAU	3	27.80	AUTUMN	STANDARD31516	HKLR	P
10-Nov-15	NW LANTAU	4	0.98	AUTUMN	STANDARD31516	HKLR	P
10-Nov-15	NW LANTAU	2	0.28	AUTUMN	STANDARD31516	HKLR	S
10-Nov-15	NW LANTAU	3	6.23	AUTUMN	STANDARD31516	HKLR	S
10-Nov-15	NW LANTAU	4	1.30	AUTUMN	STANDARD31516	HKLR	S
10-Nov-15	NE LANTAU	2	9.09	AUTUMN	STANDARD31516	HKLR	P
10-Nov-15	NE LANTAU	3	10.38	AUTUMN	STANDARD31516	HKLR	P
10-Nov-15	NE LANTAU	2	8.03	AUTUMN	STANDARD31516	HKLR	S
10-Nov-15	NE LANTAU	3	2.70	AUTUMN	STANDARD31516	HKLR	S
16-Nov-15	NE LANTAU	2	5.26	AUTUMN	STANDARD31516	HKLR	P
16-Nov-15	NE LANTAU	3	12.22	AUTUMN	STANDARD31516	HKLR	P
16-Nov-15	NE LANTAU	2	7.72	AUTUMN	STANDARD31516	HKLR	S
16-Nov-15	NE LANTAU	3	2.10	AUTUMN	STANDARD31516	HKLR	S
16-Nov-15	NW LANTAU	2	6.48	AUTUMN	STANDARD31516	HKLR	P
16-Nov-15	NW LANTAU	3	21.03	AUTUMN	STANDARD31516	HKLR	P
16-Nov-15	NW LANTAU	4	9.27	AUTUMN	STANDARD31516	HKLR	P
16-Nov-15	NW LANTAU	5	4.10	AUTUMN	STANDARD31516	HKLR	P
16-Nov-15	NW LANTAU	2	2.53	AUTUMN	STANDARD31516	HKLR	S
16-Nov-15	NW LANTAU	3	7.79	AUTUMN	STANDARD31516	HKLR	S
16-Nov-15	NW LANTAU	4	2.60	AUTUMN	STANDARD31516	HKLR	S
2-Dec-15	NW LANTAU	2	34.36	WINTER	STANDARD31516	HKLR	P
2-Dec-15	NW LANTAU	3	6.71	WINTER	STANDARD31516	HKLR	P
2-Dec-15	NW LANTAU	2	12.06	WINTER	STANDARD31516	HKLR	S
2-Dec-15	NW LANTAU	3	0.90	WINTER	STANDARD31516	HKLR	S
2-Dec-15	NE LANTAU	1	0.77	WINTER	STANDARD31516	HKLR	P
2-Dec-15	NE LANTAU	2	15.53	WINTER	STANDARD31516	HKLR	P
2-Dec-15	NE LANTAU	2	10.30	WINTER	STANDARD31516	HKLR	S
7-Dec-15	NE LANTAU	2	18.39	WINTER	STANDARD31516	HKLR	P
7-Dec-15	NE LANTAU	3	1.75	WINTER	STANDARD31516	HKLR	P
7-Dec-15	NE LANTAU	2	9.11	WINTER	STANDARD31516	HKLR	S
7-Dec-15	NE LANTAU	3	1.35	WINTER	STANDARD31516	HKLR	S
7-Dec-15	NW LANTAU	2	3.22	WINTER	STANDARD31516	HKLR	P
7-Dec-15	NW LANTAU	3	28.58	WINTER	STANDARD31516	HKLR	P
7-Dec-15	NW LANTAU	2	0.27	WINTER	STANDARD31516	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
7-Dec-15	NW LANTAU	3	7.53	WINTER	STANDARD31516	HKLR	S
9-Dec-15	NW LANTAU	2	1.20	WINTER	STANDARD31516	HKLR	P
9-Dec-15	NW LANTAU	3	13.30	WINTER	STANDARD31516	HKLR	P
9-Dec-15	NW LANTAU	4	14.71	WINTER	STANDARD31516	HKLR	P
9-Dec-15	NW LANTAU	5	2.69	WINTER	STANDARD31516	HKLR	P
9-Dec-15	NW LANTAU	2	1.10	WINTER	STANDARD31516	HKLR	S
9-Dec-15	NW LANTAU	3	1.84	WINTER	STANDARD31516	HKLR	S
9-Dec-15	NW LANTAU	4	4.72	WINTER	STANDARD31516	HKLR	S
9-Dec-15	NE LANTAU	2	12.20	WINTER	STANDARD31516	HKLR	P
9-Dec-15	NE LANTAU	3	7.10	WINTER	STANDARD31516	HKLR	P
9-Dec-15	NE LANTAU	2	8.50	WINTER	STANDARD31516	HKLR	S
9-Dec-15	NE LANTAU	3	2.30	WINTER	STANDARD31516	HKLR	S
15-Dec-15	NW LANTAU	2	10.12	WINTER	STANDARD31516	HKLR	P
15-Dec-15	NW LANTAU	3	17.24	WINTER	STANDARD31516	HKLR	P
15-Dec-15	NW LANTAU	4	13.57	WINTER	STANDARD31516	HKLR	P
15-Dec-15	NW LANTAU	2	2.83	WINTER	STANDARD31516	HKLR	S
15-Dec-15	NW LANTAU	3	10.47	WINTER	STANDARD31516	HKLR	S
15-Dec-15	NE LANTAU	2	15.04	WINTER	STANDARD31516	HKLR	P
15-Dec-15	NE LANTAU	3	1.60	WINTER	STANDARD31516	HKLR	P
15-Dec-15	NE LANTAU	2	10.16	WINTER	STANDARD31516	HKLR	S
8-Jan-16	NW LANTAU	2	25.03	WINTER	STANDARD31516	HKLR	P
8-Jan-16	NW LANTAU	3	15.46	WINTER	STANDARD31516	HKLR	P
8-Jan-16	NW LANTAU	2	10.60	WINTER	STANDARD31516	HKLR	S
8-Jan-16	NW LANTAU	3	2.21	WINTER	STANDARD31516	HKLR	S
8-Jan-16	NE LANTAU	2	16.39	WINTER	STANDARD31516	HKLR	P
8-Jan-16	NE LANTAU	2	8.31	WINTER	STANDARD31516	HKLR	S
8-Jan-16	NE LANTAU	3	2.10	WINTER	STANDARD31516	HKLR	S
11-Jan-16	NE LANTAU	1	1.97	WINTER	STANDARD31516	HKLR	P
11-Jan-16	NE LANTAU	2	15.21	WINTER	STANDARD31516	HKLR	P
11-Jan-16	NE LANTAU	3	2.72	WINTER	STANDARD31516	HKLR	P
11-Jan-16	NE LANTAU	2	11.00	WINTER	STANDARD31516	HKLR	S
11-Jan-16	NE LANTAU	3	1.30	WINTER	STANDARD31516	HKLR	S
11-Jan-16	NW LANTAU	2	11.76	WINTER	STANDARD31516	HKLR	P
11-Jan-16	NW LANTAU	3	19.32	WINTER	STANDARD31516	HKLR	P
11-Jan-16	NW LANTAU	2	4.82	WINTER	STANDARD31516	HKLR	S
11-Jan-16	NW LANTAU	3	1.00	WINTER	STANDARD31516	HKLR	S
11-Jan-16	NW LANTAU	4	2.10	WINTER	STANDARD31516	HKLR	S
13-Jan-16	NE LANTAU	1	1.00	WINTER	STANDARD31516	HKLR	P
13-Jan-16	NE LANTAU	2	15.93	WINTER	STANDARD31516	HKLR	P
13-Jan-16	NE LANTAU	2	9.63	WINTER	STANDARD31516	HKLR	S
13-Jan-16	NE LANTAU	3	0.64	WINTER	STANDARD31516	HKLR	S
13-Jan-16	NW LANTAU	2	26.61	WINTER	STANDARD31516	HKLR	P
13-Jan-16	NW LANTAU	3	15.03	WINTER	STANDARD31516	HKLR	P
13-Jan-16	NW LANTAU	2	5.05	WINTER	STANDARD31516	HKLR	S
13-Jan-16	NW LANTAU	3	6.87	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NW LANTAU	2	22.73	WINTER	STANDARD31516	HKLR	P
19-Jan-16	NW LANTAU	3	9.01	WINTER	STANDARD31516	HKLR	P
19-Jan-16	NW LANTAU	2	6.16	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NW LANTAU	3	1.50	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NE LANTAU	1	0.90	WINTER	STANDARD31516	HKLR	P
19-Jan-16	NE LANTAU	2	16.70	WINTER	STANDARD31516	HKLR	P
19-Jan-16	NE LANTAU	3	2.29	WINTER	STANDARD31516	HKLR	P
19-Jan-16	NE LANTAU	1	2.30	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NE LANTAU	2	8.41	WINTER	STANDARD31516	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
2-Feb-16	NE LANTAU	2	20.46	WINTER	STANDARD31516	HKLR	P
2-Feb-16	NE LANTAU	2	6.05	WINTER	STANDARD31516	HKLR	S
2-Feb-16	NE LANTAU	3	4.59	WINTER	STANDARD31516	HKLR	S
2-Feb-16	NW LANTAU	2	6.80	WINTER	STANDARD31516	HKLR	P
2-Feb-16	NW LANTAU	3	26.28	WINTER	STANDARD31516	HKLR	P
2-Feb-16	NW LANTAU	2	2.32	WINTER	STANDARD31516	HKLR	S
2-Feb-16	NW LANTAU	3	4.50	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NW LANTAU	2	21.30	WINTER	STANDARD31516	HKLR	P
3-Feb-16	NW LANTAU	3	19.74	WINTER	STANDARD31516	HKLR	P
3-Feb-16	NW LANTAU	2	10.82	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NW LANTAU	3	2.24	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NE LANTAU	1	1.82	WINTER	STANDARD31516	HKLR	P
3-Feb-16	NE LANTAU	2	14.48	WINTER	STANDARD31516	HKLR	P
3-Feb-16	NE LANTAU	1	2.49	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NE LANTAU	2	8.08	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NW LANTAU	2	6.05	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NW LANTAU	3	31.35	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NW LANTAU	4	3.00	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NW LANTAU	2	5.70	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NW LANTAU	3	4.80	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NW LANTAU	4	3.10	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NE LANTAU	1	1.10	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NE LANTAU	2	15.25	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NE LANTAU	1	1.40	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NE LANTAU	2	8.16	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NE LANTAU	3	1.09	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NE LANTAU	2	20.26	WINTER	STANDARD31516	HKLR	P
22-Feb-16	NE LANTAU	2	9.08	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NE LANTAU	3	1.86	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NW LANTAU	2	14.88	WINTER	STANDARD31516	HKLR	P
22-Feb-16	NW LANTAU	3	16.99	WINTER	STANDARD31516	HKLR	P
22-Feb-16	NW LANTAU	2	2.43	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NW LANTAU	3	5.10	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NW LANTAU	4	0.30	WINTER	STANDARD31516	HKLR	S
7-Mar-16	NW LANTAU	1	18.42	SPRING	STANDARD31516	HKLR	P
7-Mar-16	NW LANTAU	2	10.78	SPRING	STANDARD31516	HKLR	P
7-Mar-16	NW LANTAU	3	10.30	SPRING	STANDARD31516	HKLR	P
7-Mar-16	NW LANTAU	1	2.50	SPRING	STANDARD31516	HKLR	S
7-Mar-16	NW LANTAU	2	3.70	SPRING	STANDARD31516	HKLR	S
7-Mar-16	NW LANTAU	3	6.70	SPRING	STANDARD31516	HKLR	S
7-Mar-16	NE LANTAU	2	16.44	SPRING	STANDARD31516	HKLR	P
7-Mar-16	NE LANTAU	2	10.46	SPRING	STANDARD31516	HKLR	S
11-Mar-16	NW LANTAU	2	15.40	SPRING	STANDARD31516	HKLR	P
11-Mar-16	NW LANTAU	3	16.20	SPRING	STANDARD31516	HKLR	P
11-Mar-16	NW LANTAU	2	7.60	SPRING	STANDARD31516	HKLR	S
11-Mar-16	NW LANTAU	3	0.30	SPRING	STANDARD31516	HKLR	S
11-Mar-16	NE LANTAU	1	2.04	SPRING	STANDARD31516	HKLR	P
11-Mar-16	NE LANTAU	2	17.97	SPRING	STANDARD31516	HKLR	P
11-Mar-16	NE LANTAU	1	2.40	SPRING	STANDARD31516	HKLR	S
11-Mar-16	NE LANTAU	2	6.19	SPRING	STANDARD31516	HKLR	S
11-Mar-16	NE LANTAU	3	2.20	SPRING	STANDARD31516	HKLR	S
22-Mar-16	NE LANTAU	2	7.42	SPRING	STANDARD31516	HKLR	P
22-Mar-16	NE LANTAU	3	27.44	SPRING	STANDARD31516	HKLR	P
22-Mar-16	NE LANTAU	4	2.30	SPRING	STANDARD31516	HKLR	P

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
22-Mar-16	NE LANTAU	2	5.86	SPRING	STANDARD31516	HKLR	S
22-Mar-16	NE LANTAU	3	8.18	SPRING	STANDARD31516	HKLR	S
22-Mar-16	NE LANTAU	4	0.40	SPRING	STANDARD31516	HKLR	S
22-Mar-16	NW LANTAU	2	3.59	SPRING	STANDARD31516	HKLR	P
22-Mar-16	NW LANTAU	3	9.39	SPRING	STANDARD31516	HKLR	P
22-Mar-16	NW LANTAU	4	8.10	SPRING	STANDARD31516	HKLR	P
22-Mar-16	NW LANTAU	5	2.40	SPRING	STANDARD31516	HKLR	P
22-Mar-16	NW LANTAU	2	1.40	SPRING	STANDARD31516	HKLR	S
22-Mar-16	NW LANTAU	3	5.12	SPRING	STANDARD31516	HKLR	S
23-Mar-16	NW LANTAU	2	27.12	SPRING	STANDARD31516	HKLR	P
23-Mar-16	NW LANTAU	3	22.69	SPRING	STANDARD31516	HKLR	P
23-Mar-16	NW LANTAU	2	4.11	SPRING	STANDARD31516	HKLR	S
23-Mar-16	NW LANTAU	3	5.20	SPRING	STANDARD31516	HKLR	S
5-Apr-16	NW LANTAU	0	0.83	SPRING	STANDARD31516	HKLR	P
5-Apr-16	NW LANTAU	1	5.38	SPRING	STANDARD31516	HKLR	P
5-Apr-16	NW LANTAU	2	21.07	SPRING	STANDARD31516	HKLR	P
5-Apr-16	NW LANTAU	3	13.64	SPRING	STANDARD31516	HKLR	P
5-Apr-16	NW LANTAU	2	3.00	SPRING	STANDARD31516	HKLR	S
5-Apr-16	NW LANTAU	3	10.08	SPRING	STANDARD31516	HKLR	S
5-Apr-16	NE LANTAU	1	1.60	SPRING	STANDARD31516	HKLR	P
5-Apr-16	NE LANTAU	2	15.44	SPRING	STANDARD31516	HKLR	P
5-Apr-16	NE LANTAU	1	2.10	SPRING	STANDARD31516	HKLR	S
5-Apr-16	NE LANTAU	2	8.06	SPRING	STANDARD31516	HKLR	S
12-Apr-16	NE LANTAU	2	3.81	SPRING	STANDARD31516	HKLR	P
12-Apr-16	NE LANTAU	3	13.73	SPRING	STANDARD31516	HKLR	P
12-Apr-16	NE LANTAU	4	2.60	SPRING	STANDARD31516	HKLR	P
12-Apr-16	NE LANTAU	2	4.20	SPRING	STANDARD31516	HKLR	S
12-Apr-16	NE LANTAU	3	6.46	SPRING	STANDARD31516	HKLR	S
12-Apr-16	NW LANTAU	3	4.57	SPRING	STANDARD31516	HKLR	P
12-Apr-16	NW LANTAU	4	25.36	SPRING	STANDARD31516	HKLR	P
12-Apr-16	NW LANTAU	5	1.90	SPRING	STANDARD31516	HKLR	P
12-Apr-16	NW LANTAU	3	5.97	SPRING	STANDARD31516	HKLR	S
12-Apr-16	NW LANTAU	4	2.10	SPRING	STANDARD31516	HKLR	S
15-Apr-16	NW LANTAU	2	5.14	SPRING	STANDARD31516	HKLR	P
15-Apr-16	NW LANTAU	3	20.36	SPRING	STANDARD31516	HKLR	P
15-Apr-16	NW LANTAU	4	6.20	SPRING	STANDARD31516	HKLR	P
15-Apr-16	NW LANTAU	2	3.40	SPRING	STANDARD31516	HKLR	S
15-Apr-16	NW LANTAU	3	3.10	SPRING	STANDARD31516	HKLR	S
15-Apr-16	NW LANTAU	4	1.40	SPRING	STANDARD31516	HKLR	S
15-Apr-16	NE LANTAU	2	14.06	SPRING	STANDARD31516	HKLR	P
15-Apr-16	NE LANTAU	3	6.93	SPRING	STANDARD31516	HKLR	P
15-Apr-16	NE LANTAU	2	7.11	SPRING	STANDARD31516	HKLR	S
15-Apr-16	NE LANTAU	3	2.90	SPRING	STANDARD31516	HKLR	S
19-Apr-16	NE LANTAU	3	10.81	SPRING	STANDARD31516	HKLR	P
19-Apr-16	NE LANTAU	4	6.46	SPRING	STANDARD31516	HKLR	P
19-Apr-16	NE LANTAU	3	10.03	SPRING	STANDARD31516	HKLR	S
19-Apr-16	NW LANTAU	2	6.79	SPRING	STANDARD31516	HKLR	P
19-Apr-16	NW LANTAU	3	15.26	SPRING	STANDARD31516	HKLR	P
19-Apr-16	NW LANTAU	4	9.20	SPRING	STANDARD31516	HKLR	P
19-Apr-16	NW LANTAU	5	9.70	SPRING	STANDARD31516	HKLR	P
19-Apr-16	NW LANTAU	6	1.30	SPRING	STANDARD31516	HKLR	P
19-Apr-16	NW LANTAU	2	3.83	SPRING	STANDARD31516	HKLR	S
19-Apr-16	NW LANTAU	3	3.01	SPRING	STANDARD31516	HKLR	S
19-Apr-16	NW LANTAU	4	6.39	SPRING	STANDARD31516	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
3-May-16	NE LANTAU	2	15.29	SPRING	STANDARD31516	HKLR	P
3-May-16	NE LANTAU	3	1.40	SPRING	STANDARD31516	HKLR	P
3-May-16	NE LANTAU	2	10.01	SPRING	STANDARD31516	HKLR	S
3-May-16	NW LANTAU	2	16.24	SPRING	STANDARD31516	HKLR	P
3-May-16	NW LANTAU	3	23.50	SPRING	STANDARD31516	HKLR	P
3-May-16	NW LANTAU	2	7.16	SPRING	STANDARD31516	HKLR	S
3-May-16	NW LANTAU	3	5.60	SPRING	STANDARD31516	HKLR	S
12-May-16	NW LANTAU	2	15.26	SPRING	STANDARD31516	HKLR	P
12-May-16	NW LANTAU	3	16.74	SPRING	STANDARD31516	HKLR	P
12-May-16	NW LANTAU	2	7.60	SPRING	STANDARD31516	HKLR	S
12-May-16	NE LANTAU	2	6.52	SPRING	STANDARD31516	HKLR	P
12-May-16	NE LANTAU	3	13.33	SPRING	STANDARD31516	HKLR	P
12-May-16	NE LANTAU	2	4.72	SPRING	STANDARD31516	HKLR	S
12-May-16	NE LANTAU	3	6.69	SPRING	STANDARD31516	HKLR	S
17-May-16	NE LANTAU	2	10.20	SPRING	STANDARD31516	HKLR	P
17-May-16	NE LANTAU	3	9.92	SPRING	STANDARD31516	HKLR	P
17-May-16	NE LANTAU	2	6.30	SPRING	STANDARD31516	HKLR	S
17-May-16	NE LANTAU	3	4.38	SPRING	STANDARD31516	HKLR	S
17-May-16	NW LANTAU	2	2.74	SPRING	STANDARD31516	HKLR	P
17-May-16	NW LANTAU	3	28.07	SPRING	STANDARD31516	HKLR	P
17-May-16	NW LANTAU	4	0.79	SPRING	STANDARD31516	HKLR	P
17-May-16	NW LANTAU	3	7.80	SPRING	STANDARD31516	HKLR	S
26-May-16	NW LANTAU	2	14.13	SPRING	STANDARD31516	HKLR	P
26-May-16	NW LANTAU	3	26.67	SPRING	STANDARD31516	HKLR	P
26-May-16	NW LANTAU	2	7.10	SPRING	STANDARD31516	HKLR	S
26-May-16	NW LANTAU	3	6.00	SPRING	STANDARD31516	HKLR	S
26-May-16	NE LANTAU	2	2.62	SPRING	STANDARD31516	HKLR	P
26-May-16	NE LANTAU	3	14.38	SPRING	STANDARD31516	HKLR	P
26-May-16	NE LANTAU	2	3.70	SPRING	STANDARD31516	HKLR	S
26-May-16	NE LANTAU	3	6.10	SPRING	STANDARD31516	HKLR	S
1-Jun-16	NW LANTAU	3	5.57	SUMMER	STANDARD31516	HKLR	P
1-Jun-16	NW LANTAU	4	24.03	SUMMER	STANDARD31516	HKLR	P
1-Jun-16	NW LANTAU	5	1.80	SUMMER	STANDARD31516	HKLR	P
1-Jun-16	NW LANTAU	3	2.80	SUMMER	STANDARD31516	HKLR	S
1-Jun-16	NW LANTAU	4	5.30	SUMMER	STANDARD31516	HKLR	S
1-Jun-16	NE LANTAU	2	6.91	SUMMER	STANDARD31516	HKLR	P
1-Jun-16	NE LANTAU	3	12.82	SUMMER	STANDARD31516	HKLR	P
1-Jun-16	NE LANTAU	2	8.05	SUMMER	STANDARD31516	HKLR	S
1-Jun-16	NE LANTAU	3	2.52	SUMMER	STANDARD31516	HKLR	S
6-Jun-16	NW LANTAU	1	4.44	SUMMER	STANDARD31516	HKLR	P
6-Jun-16	NW LANTAU	2	30.16	SUMMER	STANDARD31516	HKLR	P
6-Jun-16	NW LANTAU	3	5.59	SUMMER	STANDARD31516	HKLR	P
6-Jun-16	NW LANTAU	2	13.61	SUMMER	STANDARD31516	HKLR	S
6-Jun-16	NE LANTAU	2	15.55	SUMMER	STANDARD31516	HKLR	P
6-Jun-16	NE LANTAU	3	0.80	SUMMER	STANDARD31516	HKLR	P
6-Jun-16	NE LANTAU	2	10.94	SUMMER	STANDARD31516	HKLR	S
13-Jun-16	NW LANTAU	3	28.50	SUMMER	STANDARD31516	HKLR	P
13-Jun-16	NW LANTAU	4	5.40	SUMMER	STANDARD31516	HKLR	P
13-Jun-16	NW LANTAU	3	4.90	SUMMER	STANDARD31516	HKLR	S
13-Jun-16	NW LANTAU	4	4.90	SUMMER	STANDARD31516	HKLR	S
13-Jun-16	NE LANTAU	2	14.58	SUMMER	STANDARD31516	HKLR	P
13-Jun-16	NE LANTAU	3	5.31	SUMMER	STANDARD31516	HKLR	P
13-Jun-16	NE LANTAU	2	6.03	SUMMER	STANDARD31516	HKLR	S
13-Jun-16	NE LANTAU	3	5.18	SUMMER	STANDARD31516	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
17-Jun-16	NW LANTAU	2	20.32	SUMMER	STANDARD31516	HKLR	P
17-Jun-16	NW LANTAU	3	18.28	SUMMER	STANDARD31516	HKLR	P
17-Jun-16	NW LANTAU	2	3.00	SUMMER	STANDARD31516	HKLR	S
17-Jun-16	NW LANTAU	3	5.50	SUMMER	STANDARD31516	HKLR	S
17-Jun-16	NE LANTAU	2	11.80	SUMMER	STANDARD31516	HKLR	P
17-Jun-16	NE LANTAU	3	5.68	SUMMER	STANDARD31516	HKLR	P
17-Jun-16	NE LANTAU	2	3.32	SUMMER	STANDARD31516	HKLR	S
17-Jun-16	NE LANTAU	3	2.90	SUMMER	STANDARD31516	HKLR	S
5-Jul-16	NW LANTAU	2	4.50	SUMMER	STANDARD31516	HKLR	P
5-Jul-16	NW LANTAU	3	29.29	SUMMER	STANDARD31516	HKLR	P
5-Jul-16	NW LANTAU	4	6.90	SUMMER	STANDARD31516	HKLR	P
5-Jul-16	NW LANTAU	2	2.10	SUMMER	STANDARD31516	HKLR	S
5-Jul-16	NW LANTAU	3	7.30	SUMMER	STANDARD31516	HKLR	S
5-Jul-16	NW LANTAU	4	3.70	SUMMER	STANDARD31516	HKLR	S
5-Jul-16	NE LANTAU	2	2.30	SUMMER	STANDARD31516	HKLR	P
5-Jul-16	NE LANTAU	3	13.62	SUMMER	STANDARD31516	HKLR	P
5-Jul-16	NE LANTAU	4	0.81	SUMMER	STANDARD31516	HKLR	P
5-Jul-16	NE LANTAU	2	4.30	SUMMER	STANDARD31516	HKLR	S
5-Jul-16	NE LANTAU	3	5.77	SUMMER	STANDARD31516	HKLR	S
12-Jul-16	NW LANTAU	1	4.04	SUMMER	STANDARD31516	HKLR	P
12-Jul-16	NW LANTAU	2	27.40	SUMMER	STANDARD31516	HKLR	P
12-Jul-16	NW LANTAU	1	2.10	SUMMER	STANDARD31516	HKLR	S
12-Jul-16	NW LANTAU	2	6.27	SUMMER	STANDARD31516	HKLR	S
12-Jul-16	NE LANTAU	2	19.99	SUMMER	STANDARD31516	HKLR	P
12-Jul-16	NE LANTAU	2	11.81	SUMMER	STANDARD31516	HKLR	S
18-Jul-16	NW LANTAU	2	4.34	SUMMER	STANDARD31516	HKLR	P
18-Jul-16	NW LANTAU	3	29.06	SUMMER	STANDARD31516	HKLR	P
18-Jul-16	NW LANTAU	4	7.70	SUMMER	STANDARD31516	HKLR	P
18-Jul-16	NW LANTAU	2	2.00	SUMMER	STANDARD31516	HKLR	S
18-Jul-16	NW LANTAU	3	7.60	SUMMER	STANDARD31516	HKLR	S
18-Jul-16	NW LANTAU	4	3.00	SUMMER	STANDARD31516	HKLR	S
18-Jul-16	NE LANTAU	2	15.66	SUMMER	STANDARD31516	HKLR	P
18-Jul-16	NE LANTAU	3	1.06	SUMMER	STANDARD31516	HKLR	P
18-Jul-16	NE LANTAU	2	9.89	SUMMER	STANDARD31516	HKLR	S
27-Jul-16	NE LANTAU	2	18.79	SUMMER	STANDARD31516	HKLR	P
27-Jul-16	NE LANTAU	3	0.70	SUMMER	STANDARD31516	HKLR	P
27-Jul-16	NE LANTAU	2	10.91	SUMMER	STANDARD31516	HKLR	S
27-Jul-16	NW LANTAU	2	19.61	SUMMER	STANDARD31516	HKLR	P
27-Jul-16	NW LANTAU	3	11.30	SUMMER	STANDARD31516	HKLR	P
27-Jul-16	NW LANTAU	4	0.60	SUMMER	STANDARD31516	HKLR	P
27-Jul-16	NW LANTAU	2	6.89	SUMMER	STANDARD31516	HKLR	S
27-Jul-16	NW LANTAU	3	1.20	SUMMER	STANDARD31516	HKLR	S
5-Aug-16	NW LANTAU	1	0.88	SUMMER	STANDARD31516	HKLR	P
5-Aug-16	NW LANTAU	2	39.05	SUMMER	STANDARD31516	HKLR	P
5-Aug-16	NW LANTAU	2	11.73	SUMMER	STANDARD31516	HKLR	S
5-Aug-16	NW LANTAU	3	1.70	SUMMER	STANDARD31516	HKLR	S
5-Aug-16	NE LANTAU	2	16.76	SUMMER	STANDARD31516	HKLR	P
5-Aug-16	NE LANTAU	2	9.74	SUMMER	STANDARD31516	HKLR	S
9-Aug-16	NW LANTAU	1	23.75	SUMMER	STANDARD36826	HKLR	P
9-Aug-16	NW LANTAU	2	7.05	SUMMER	STANDARD36826	HKLR	P
9-Aug-16	NW LANTAU	1	6.40	SUMMER	STANDARD36826	HKLR	S
9-Aug-16	NW LANTAU	2	1.70	SUMMER	STANDARD36826	HKLR	S
9-Aug-16	NE LANTAU	1	1.61	SUMMER	STANDARD36826	HKLR	P
9-Aug-16	NE LANTAU	2	9.89	SUMMER	STANDARD36826	HKLR	P

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
9-Aug-16	NE LANTAU	3	7.85	SUMMER	STANDARD36826	HKLR	P
9-Aug-16	NE LANTAU	2	8.65	SUMMER	STANDARD36826	HKLR	S
9-Aug-16	NE LANTAU	3	2.10	SUMMER	STANDARD36826	HKLR	S
17-Aug-16	NE LANTAU	2	13.69	SUMMER	STANDARD36826	HKLR	P
17-Aug-16	NE LANTAU	3	6.29	SUMMER	STANDARD36826	HKLR	P
17-Aug-16	NE LANTAU	2	10.92	SUMMER	STANDARD36826	HKLR	S
17-Aug-16	NW LANTAU	2	23.13	SUMMER	STANDARD36826	HKLR	P
17-Aug-16	NW LANTAU	3	4.78	SUMMER	STANDARD36826	HKLR	P
17-Aug-16	NW LANTAU	4	2.58	SUMMER	STANDARD36826	HKLR	P
17-Aug-16	NW LANTAU	2	5.31	SUMMER	STANDARD36826	HKLR	S
17-Aug-16	NW LANTAU	3	2.44	SUMMER	STANDARD36826	HKLR	S
17-Aug-16	NW LANTAU	4	0.56	SUMMER	STANDARD36826	HKLR	S
23-Aug-16	NW LANTAU	1	0.94	SUMMER	STANDARD31516	HKLR	P
23-Aug-16	NW LANTAU	2	38.76	SUMMER	STANDARD31516	HKLR	P
23-Aug-16	NW LANTAU	2	13.50	SUMMER	STANDARD31516	HKLR	S
23-Aug-16	NE LANTAU	1	1.00	SUMMER	STANDARD31516	HKLR	P
23-Aug-16	NE LANTAU	2	15.48	SUMMER	STANDARD31516	HKLR	P
23-Aug-16	NE LANTAU	2	9.82	SUMMER	STANDARD31516	HKLR	S
13-Sep-16	NE LANTAU	2	15.97	AUTUMN	STANDARD31516	HKLR	P
13-Sep-16	NE LANTAU	2	10.03	AUTUMN	STANDARD31516	HKLR	S
13-Sep-16	NW LANTAU	2	36.84	AUTUMN	STANDARD31516	HKLR	P
13-Sep-16	NW LANTAU	3	2.60	AUTUMN	STANDARD31516	HKLR	P
13-Sep-16	NW LANTAU	2	15.06	AUTUMN	STANDARD31516	HKLR	S
14-Sep-16	NW LANTAU	3	16.30	AUTUMN	STANDARD36826	HKLR	P
14-Sep-16	NW LANTAU	4	14.20	AUTUMN	STANDARD36826	HKLR	P
14-Sep-16	NW LANTAU	3	2.30	AUTUMN	STANDARD36826	HKLR	S
14-Sep-16	NW LANTAU	4	5.30	AUTUMN	STANDARD36826	HKLR	S
14-Sep-16	NW LANTAU	5	0.50	AUTUMN	STANDARD36826	HKLR	S
14-Sep-16	NE LANTAU	2	2.79	AUTUMN	STANDARD36826	HKLR	P
14-Sep-16	NE LANTAU	3	16.35	AUTUMN	STANDARD36826	HKLR	P
14-Sep-16	NE LANTAU	4	0.76	AUTUMN	STANDARD36826	HKLR	P
14-Sep-16	NE LANTAU	2	2.40	AUTUMN	STANDARD36826	HKLR	S
14-Sep-16	NE LANTAU	3	9.00	AUTUMN	STANDARD36826	HKLR	S
21-Sep-16	NW LANTAU	2	30.13	AUTUMN	STANDARD36826	HKLR	P
21-Sep-16	NW LANTAU	3	9.42	AUTUMN	STANDARD36826	HKLR	P
21-Sep-16	NW LANTAU	2	10.37	AUTUMN	STANDARD36826	HKLR	S
21-Sep-16	NW LANTAU	3	2.31	AUTUMN	STANDARD36826	HKLR	S
21-Sep-16	NE LANTAU	1	1.80	AUTUMN	STANDARD36826	HKLR	P
21-Sep-16	NE LANTAU	2	14.60	AUTUMN	STANDARD36826	HKLR	P
21-Sep-16	NE LANTAU	1	2.10	AUTUMN	STANDARD36826	HKLR	S
21-Sep-16	NE LANTAU	2	8.10	AUTUMN	STANDARD36826	HKLR	S
23-Sep-16	NE LANTAU	2	18.82	AUTUMN	STANDARD36826	HKLR	P
23-Sep-16	NE LANTAU	3	0.81	AUTUMN	STANDARD36826	HKLR	P
23-Sep-16	NE LANTAU	2	10.07	AUTUMN	STANDARD36826	HKLR	S
23-Sep-16	NW LANTAU	2	1.25	AUTUMN	STANDARD36826	HKLR	P
23-Sep-16	NW LANTAU	3	28.81	AUTUMN	STANDARD36826	HKLR	P
23-Sep-16	NW LANTAU	4	0.80	AUTUMN	STANDARD36826	HKLR	P
23-Sep-16	NW LANTAU	3	7.34	AUTUMN	STANDARD36826	HKLR	S
4-Oct-16	NW LANTAU	2	25.94	AUTUMN	STANDARD36826	HKLR	P
4-Oct-16	NW LANTAU	3	5.70	AUTUMN	STANDARD36826	HKLR	P
4-Oct-16	NW LANTAU	2	6.60	AUTUMN	STANDARD36826	HKLR	S
4-Oct-16	NE LANTAU	2	15.22	AUTUMN	STANDARD36826	HKLR	P
4-Oct-16	NE LANTAU	3	4.57	AUTUMN	STANDARD36826	HKLR	P
4-Oct-16	NE LANTAU	2	10.41	AUTUMN	STANDARD36826	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
7-Oct-16	NE LANTAU	2	16.19	AUTUMN	STANDARD36826	HKLR	P
7-Oct-16	NE LANTAU	2	10.71	AUTUMN	STANDARD36826	HKLR	S
7-Oct-16	NW LANTAU	1	4.54	AUTUMN	STANDARD36826	HKLR	P
7-Oct-16	NW LANTAU	2	36.45	AUTUMN	STANDARD36826	HKLR	P
7-Oct-16	NW LANTAU	1	1.03	AUTUMN	STANDARD36826	HKLR	S
7-Oct-16	NW LANTAU	2	11.81	AUTUMN	STANDARD36826	HKLR	S
7-Oct-16	NW LANTAU	3	0.40	AUTUMN	STANDARD36826	HKLR	S
11-Oct-16	NW LANTAU	2	29.01	AUTUMN	STANDARD36826	HKLR	P
11-Oct-16	NW LANTAU	3	10.75	AUTUMN	STANDARD36826	HKLR	P
11-Oct-16	NW LANTAU	2	12.21	AUTUMN	STANDARD36826	HKLR	S
11-Oct-16	NW LANTAU	3	1.40	AUTUMN	STANDARD36826	HKLR	S
11-Oct-16	NE LANTAU	2	15.82	AUTUMN	STANDARD36826	HKLR	P
11-Oct-16	NE LANTAU	3	0.80	AUTUMN	STANDARD36826	HKLR	P
11-Oct-16	NE LANTAU	2	7.48	AUTUMN	STANDARD36826	HKLR	S
11-Oct-16	NE LANTAU	3	2.40	AUTUMN	STANDARD36826	HKLR	S
13-Oct-16	NW LANTAU	2	14.72	AUTUMN	STANDARD36826	HKLR	P
13-Oct-16	NW LANTAU	3	15.81	AUTUMN	STANDARD36826	HKLR	P
13-Oct-16	NW LANTAU	2	3.21	AUTUMN	STANDARD36826	HKLR	S
13-Oct-16	NW LANTAU	3	5.06	AUTUMN	STANDARD36826	HKLR	S
13-Oct-16	NE LANTAU	2	20.06	AUTUMN	STANDARD36826	HKLR	P
13-Oct-16	NE LANTAU	2	11.14	AUTUMN	STANDARD36826	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (November 2015 - October 2016)

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

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
2-Nov-15	1	1143	7	NW LANTAU	2	181	ON	HKLR	828699	806450	AUTUMN	NONE	P
6-Nov-15	1	1106	1	NW LANTAU	3	77	ON	HKLR	826830	805262	AUTUMN	NONE	P
10-Nov-15	1	1042	1	NW LANTAU	3	465	ON	HKLR	825312	805475	AUTUMN	NONE	P
16-Nov-15	1	1455	5	NW LANTAU	5	662	ON	HKLR	827241	804645	AUTUMN	NONE	P
2-Dec-15	1	1058	1	NW LANTAU	2	477	ON	HKLR	826399	804684	WINTER	NONE	P
2-Dec-15	2	1149	2	NW LANTAU	2	257	ON	HKLR	827946	806459	WINTER	NONE	P
7-Dec-15	1	1449	10	NW LANTAU	3	553	ON	HKLR	828945	805462	WINTER	NONE	P
9-Dec-15	1	1209	9	NW LANTAU	4	126	ON	HKLR	829795	806761	WINTER	NONE	S
15-Dec-15	1	1015	1	NW LANTAU	2	ND	OFF	HKLR	814683	804794	WINTER	NONE	
15-Dec-15	2	1303	2	NW LANTAU	2	169	ON	HKLR	822328	808518	WINTER	NONE	P
15-Dec-15	3	1329	3	NW LANTAU	3	236	ON	HKLR	826060	808504	WINTER	NONE	P
8-Jan-16	1	1209	1	NW LANTAU	2	591	ON	HKLR	822365	806458	WINTER	NONE	P
11-Jan-16	1	1303	6	NW LANTAU	3	140	ON	HKLR	830351	805495	WINTER	NONE	P
13-Jan-16	1	1355	1	NW LANTAU	3	54	ON	HKLR	823584	806162	WINTER	NONE	S
13-Jan-16	2	1458	2	NW LANTAU	2	83	ON	HKLR	830961	805085	WINTER	NONE	S
19-Jan-16	1	1112	8	NW LANTAU	3	332	ON	HKLR	829044	805503	WINTER	NONE	P
3-Feb-16	1	1318	5	NW LANTAU	3	28	ON	HKLR	826580	808505	WINTER	NONE	P
16-Feb-16	1	1414	6	NW LANTAU	3	145	ON	HKLR	824082	812518	WINTER	NONE	P
11-Mar-16	1	1300	1	NW LANTAU	2	ND	OFF	HKLR	821158	812895	SPRING	NONE	
23-Mar-16	1	1338	3	NW LANTAU	2	5	ON	HKLR	828123	806459	SPRING	NONE	P
5-Apr-16	1	1059	8	NW LANTAU	2	454	ON	HKLR	824938	804702	SPRING	NONE	P
19-Apr-16	1	1426	2	NW LANTAU	2	ND	OFF	HKLR	828998	806471	SPRING	NONE	
19-Apr-16	2	1451	2	NW LANTAU	2	ND	OFF	HKLR	829109	806461	SPRING	NONE	
19-Apr-16	3	1504	3	NW LANTAU	2	177	ON	HKLR	829696	806297	SPRING	NONE	P
19-Apr-16	4	1519	3	NW LANTAU	2	465	ON	HKLR	829442	806050	SPRING	NONE	S
6-Jun-16	1	1556	1	NE LANTAU	2	ND	OFF	HKLR	821150	818561	SUMMER	NONE	
5-Jul-16	1	1016	2	NW LANTAU	2	434	ON	HKLR	815337	804661	SUMMER	NONE	P
12-Jul-16	1	1335	1	NW LANTAU	2	531	ON	HKLR	825962	807516	SUMMER	NONE	P
12-Jul-16	2	1446	3	NW LANTAU	2	165	ON	HKLR	822433	805459	SUMMER	NONE	P
18-Jul-16	1	1014	1	NW LANTAU	3	ND	OFF	HKLR	815004	805073	SUMMER	NONE	
5-Aug-16	1	1049	11	NW LANTAU	2	95	ON	HKLR	822169	804686	SUMMER	NONE	P
5-Aug-16	2	1130	7	NW LANTAU	2	415	ON	HKLR	823742	804689	SUMMER	NONE	P

Appendix II. (cont'd)

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

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
5-Aug-16	3	1228	2	NW LANTAU	2	119	ON	HKLR	826905	806457	SUMMER	NONE	P
17-Aug-16	1	1353	5	NW LANTAU	2	107	ON	HKLR	827091	807487	SUMMER	NONE	P
17-Aug-16	2	1422	1	NW LANTAU	2	ND	OFF	HKLR	827147	807528	SUMMER	NONE	
21-Sep-16	1	1057	3	NW LANTAU	2	0	ON	HKLR	826211	804642	AUTUMN	NONE	P
21-Sep-16	2	1155	11	NW LANTAU	2	664	ON	HKLR	826983	806467	AUTUMN	NONE	P
21-Sep-16	3	1229	5	NW LANTAU	2	0	ON	HKLR	826185	806496	AUTUMN	NONE	P
21-Sep-16	4	1341	2	NW LANTAU	2	79	ON	HKLR	825218	808472	AUTUMN	NONE	P
4-Oct-16	1	1039	1	NW LANTAU	2	14	ON	HKLR	823995	805534	AUTUMN	NONE	P
4-Oct-16	2	1114	2	NW LANTAU	2	377	ON	HKLR	830283	806082	AUTUMN	NONE	S
7-Oct-16	1	1419	4	NW LANTAU	1	103	ON	HKLR	827149	806447	AUTUMN	NONE	P
7-Oct-16	2	1553	2	NW LANTAU	2	8	ON	HKLR	814927	804671	AUTUMN	NONE	P
11-Oct-16	1	1049	1	NW LANTAU	2	243	ON	HKLR	822391	804655	AUTUMN	NONE	P
13-Oct-16	1	1104	5	NW LANTAU	3	69	ON	HKLR	828391	805399	AUTUMN	NONE	P

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in November 2015-October 2016

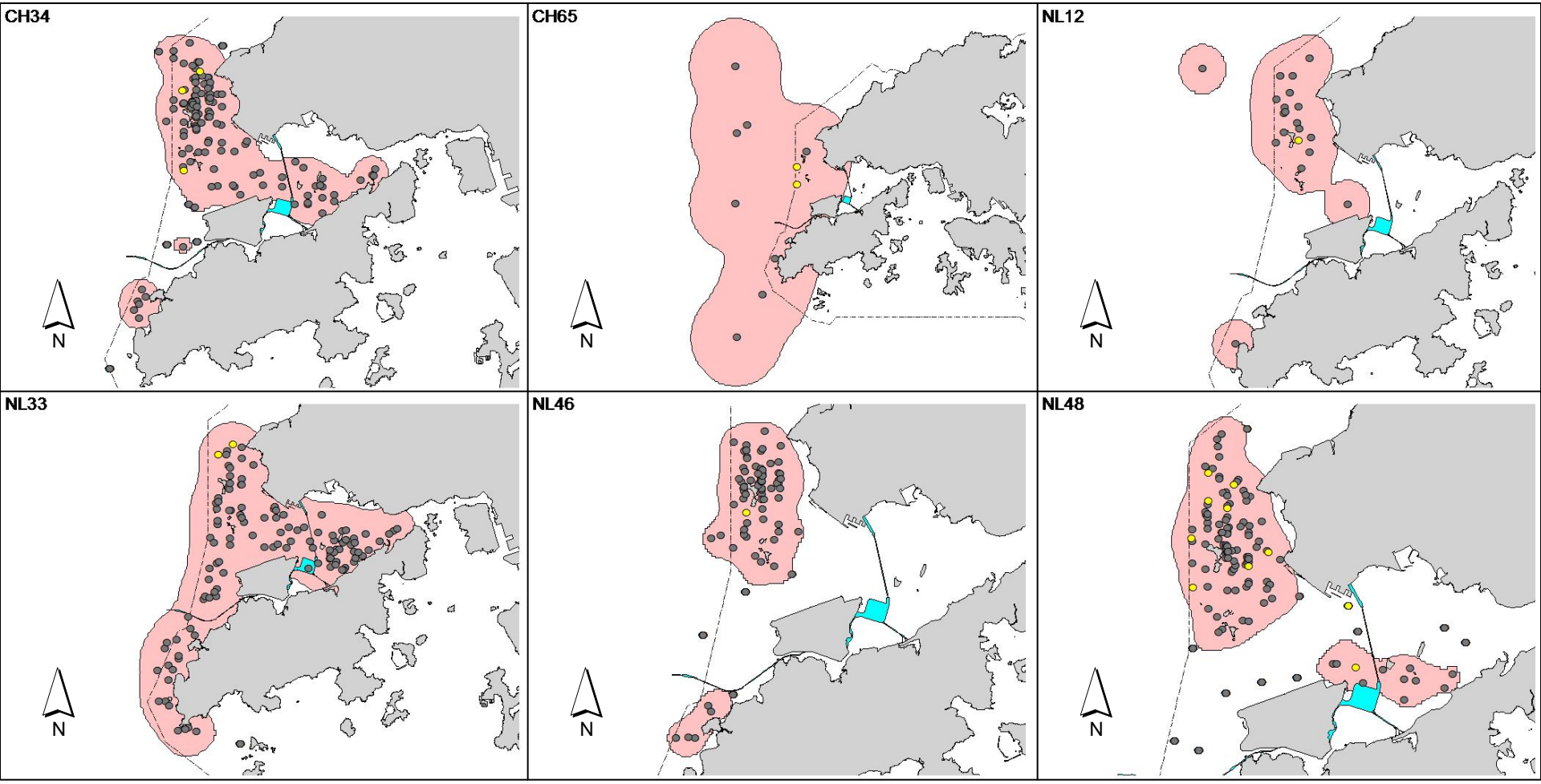
ID#	DATE	STG#	AREA
CH34	09/12/15	1	NW LANTAU
	12/07/16	2	NW LANTAU
	13/10/16	1	NW LANTAU
CH65	05/04/16	1	NW LANTAU
	05/08/16	1	NW LANTAU
NL12	21/09/16	3	NW LANTAU
NL33	07/12/15	1	NW LANTAU
	09/12/15	1	NW LANTAU
NL46	10/11/15	1	NW LANTAU
NL48	02/11/15	1	NW LANTAU
	16/11/15	1	NW LANTAU
	09/12/15	1	NW LANTAU
	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	03/02/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
	11/03/16	1	NW LANTAU
	05/04/16	1	NW LANTAU
	12/07/16	1	NW LANTAU
NL98	02/11/15	1	NW LANTAU
NL103	21/09/16	3	NW LANTAU
NL104	09/12/15	1	NW LANTAU
	15/12/15	3	NW LANTAU
	17/08/16	1	NW LANTAU
	13/10/16	1	NW LANTAU
NL120	05/04/16	1	NW LANTAU
NL123	02/11/15	1	NW LANTAU
	11/01/16	1	NW LANTAU
	23/03/16	1	NW LANTAU
	05/04/16	1	NW LANTAU
NL136	02/11/15	1	NW LANTAU
	09/12/15	1	NW LANTAU
	16/02/16	1	NW LANTAU
	12/07/16	2	NW LANTAU
	21/09/16	3	NW LANTAU
	04/10/16	2	NW LANTAU
NL145	05/04/16	1	NW LANTAU
NL150	17/08/16	1	NW LANTAU

ID#	DATE	STG#	AREA
NL182	02/11/15	1	NW LANTAU
	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
	12/07/16	2	NW LANTAU
	04/10/16	2	NW LANTAU
NL202	16/11/15	1	NW LANTAU
	07/12/15	1	NW LANTAU
	19/01/16	1	NW LANTAU
	19/04/16	1	NW LANTAU
	05/08/16	3	NW LANTAU
	21/09/16	2	NW LANTAU
	07/10/16	1	NW LANTAU
	13/10/16	1	NW LANTAU
NL210	02/11/15	1	NW LANTAU
	16/11/15	1	NW LANTAU
	07/12/15	1	NW LANTAU
	13/01/16	2	NW LANTAU
	03/02/16	1	NW LANTAU
NL220	09/12/15	1	NW LANTAU
	15/12/15	3	NW LANTAU
	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
NL224	05/04/16	1	NW LANTAU
	21/09/16	2	NW LANTAU
NL233	07/12/15	1	NW LANTAU
NL255	05/08/16	1	NW LANTAU
NL259	05/04/16	1	NW LANTAU
	21/09/16	3	NW LANTAU
NL261	15/12/15	2	NW LANTAU
	03/02/16	1	NW LANTAU
	05/04/16	1	NW LANTAU
	21/09/16	2	NW LANTAU
NL264	05/04/16	1	NW LANTAU
	21/09/16	3	NW LANTAU
NL269	09/12/15	1	NW LANTAU
NL272	07/12/15	1	NW LANTAU
	15/12/15	2	NW LANTAU
	21/09/16	2	NW LANTAU
NL280	07/12/15	1	NW LANTAU
	17/08/16	1	NW LANTAU

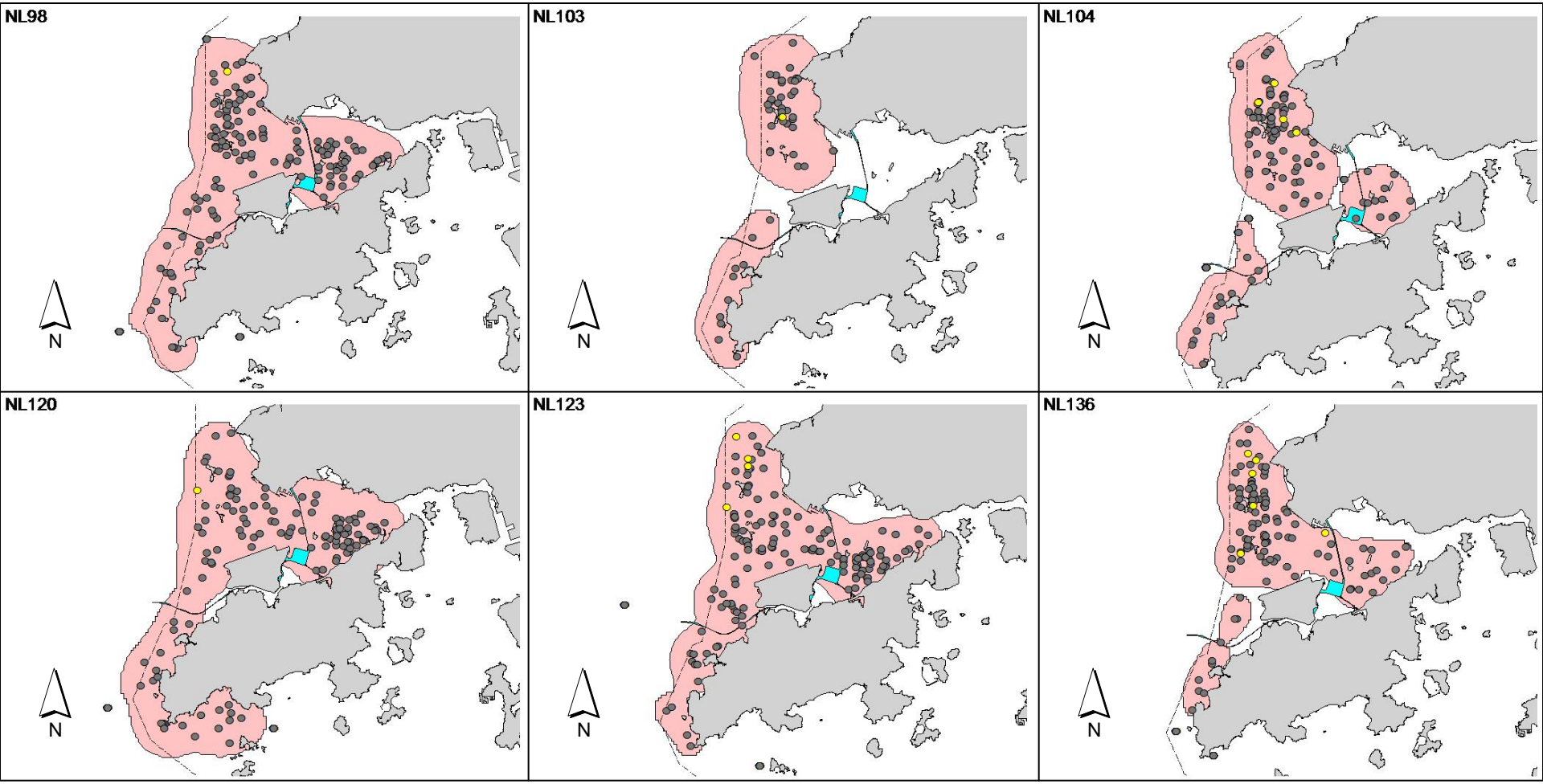
Appendix III. (cont'd)

ID#	DATE	STG#	AREA
NL281	05/08/16	1	NW LANTAU
NL284	07/12/15	1	NW LANTAU
	19/01/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
NL285	08/01/16	1	NW LANTAU
	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	03/02/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
	23/03/16	1	NW LANTAU
	05/04/16	1	NW LANTAU
NL286	16/11/15	1	NW LANTAU
	02/12/15	1	NW LANTAU
	02/12/15	2	NW LANTAU
	07/12/15	1	NW LANTAU
	19/04/16	1	NW LANTAU
	05/08/16	3	NW LANTAU
	21/09/16	2	NW LANTAU
	07/10/16	1	NW LANTAU
	13/10/16	1	NW LANTAU
NL287	05/04/16	1	NW LANTAU
NL288	05/04/16	1	NW LANTAU
	21/09/16	3	NW LANTAU
NL293	18/07/16	1	NW LANTAU
NL302	13/01/16	2	NW LANTAU
	05/07/16	1	NW LANTAU
NL307	05/07/16	1	NW LANTAU
	21/09/16	2	NW LANTAU
NL308	19/04/16	3	NW LANTAU
NL319	21/09/16	2	NW LANTAU
NL320	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	03/02/16	1	NW LANTAU
	23/03/16	1	NW LANTAU
	21/09/16	2	NW LANTAU
	07/10/16	1	NW LANTAU
NL321	13/10/16	1	NW LANTAU
WL17	16/02/16	1	NW LANTAU
WL243	07/10/16	2	NW LANTAU

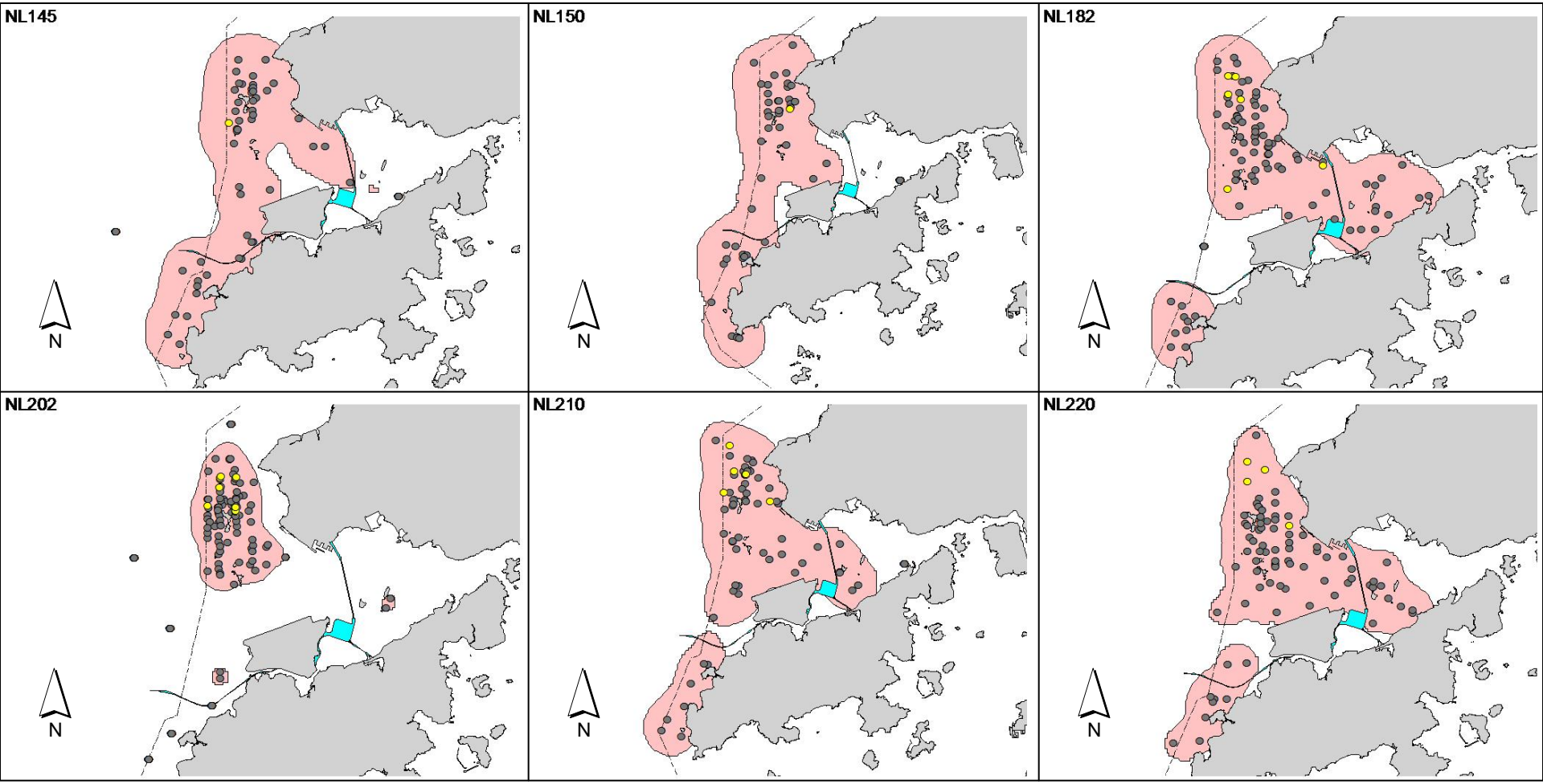
Appendix IV. Ranging patterns (95% kernel ranges) of 42 individual dolphins that were sighted during the third year of TMCLKL construction works, utilizing the HKLR03 and HKLR09 monitoring data
(note: yellow dots indicates sightings made in November 2015 to October 2016)



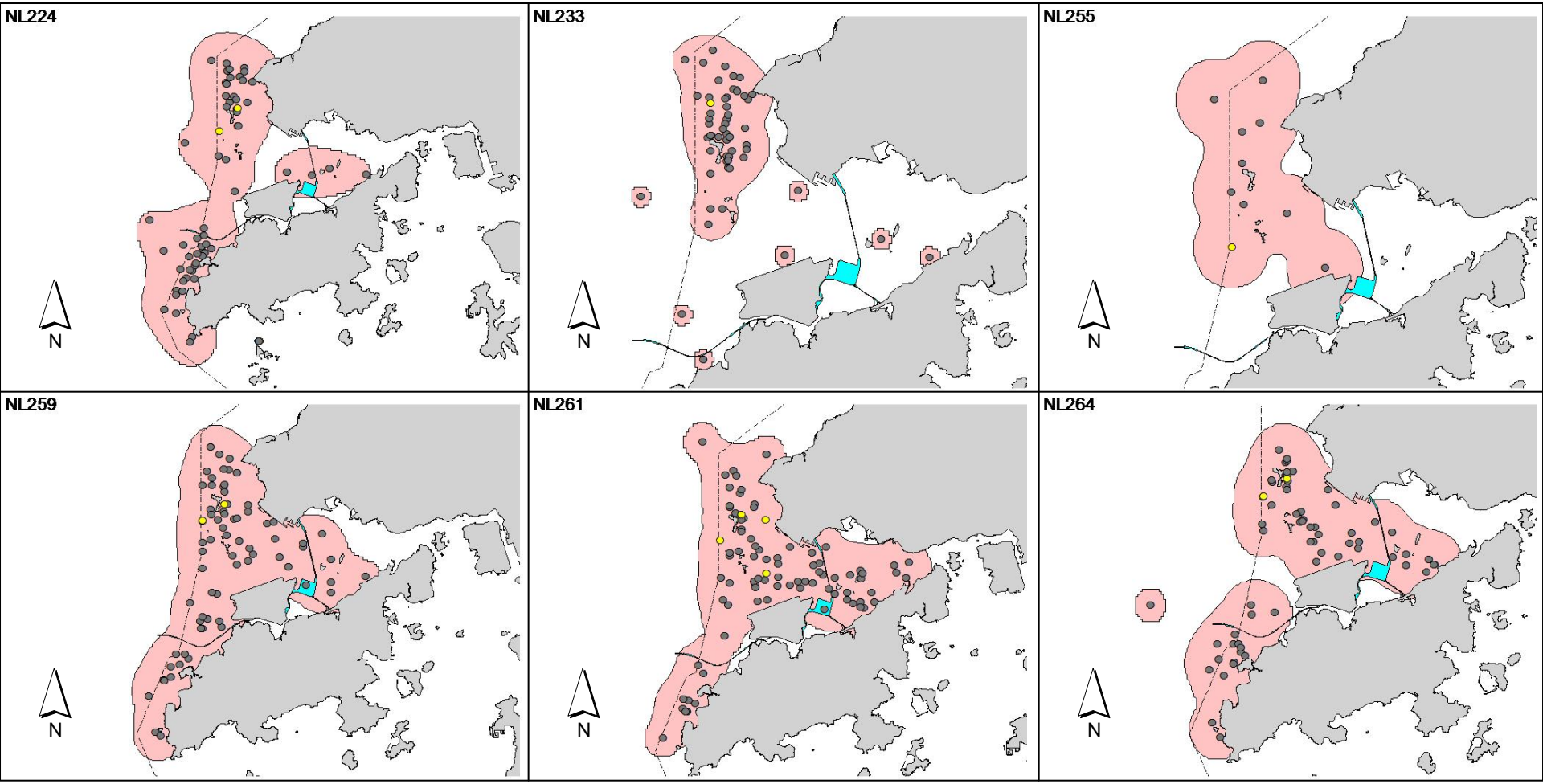
Appendix IV. (cont'd)



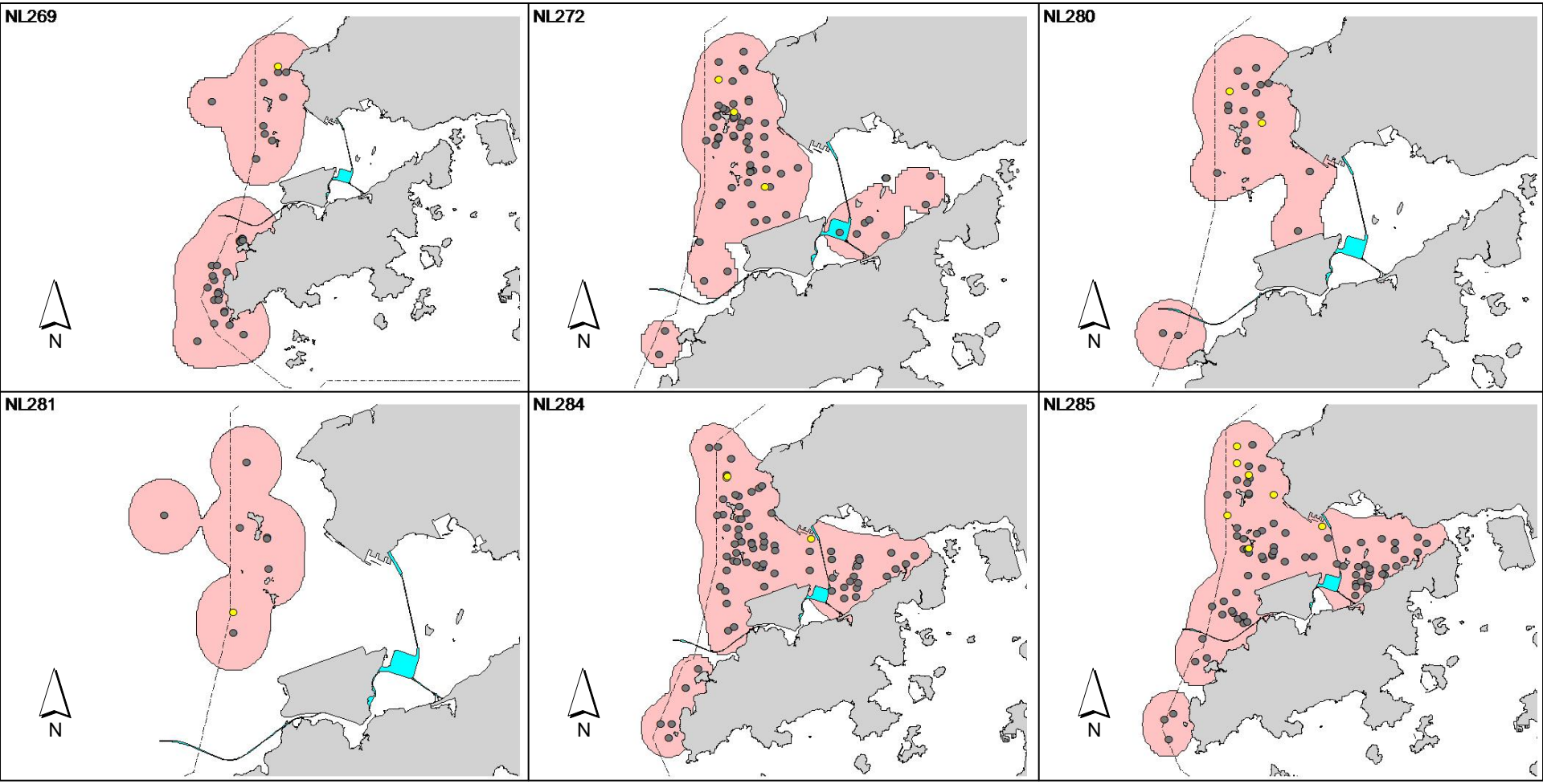
Appendix IV. (cont'd)



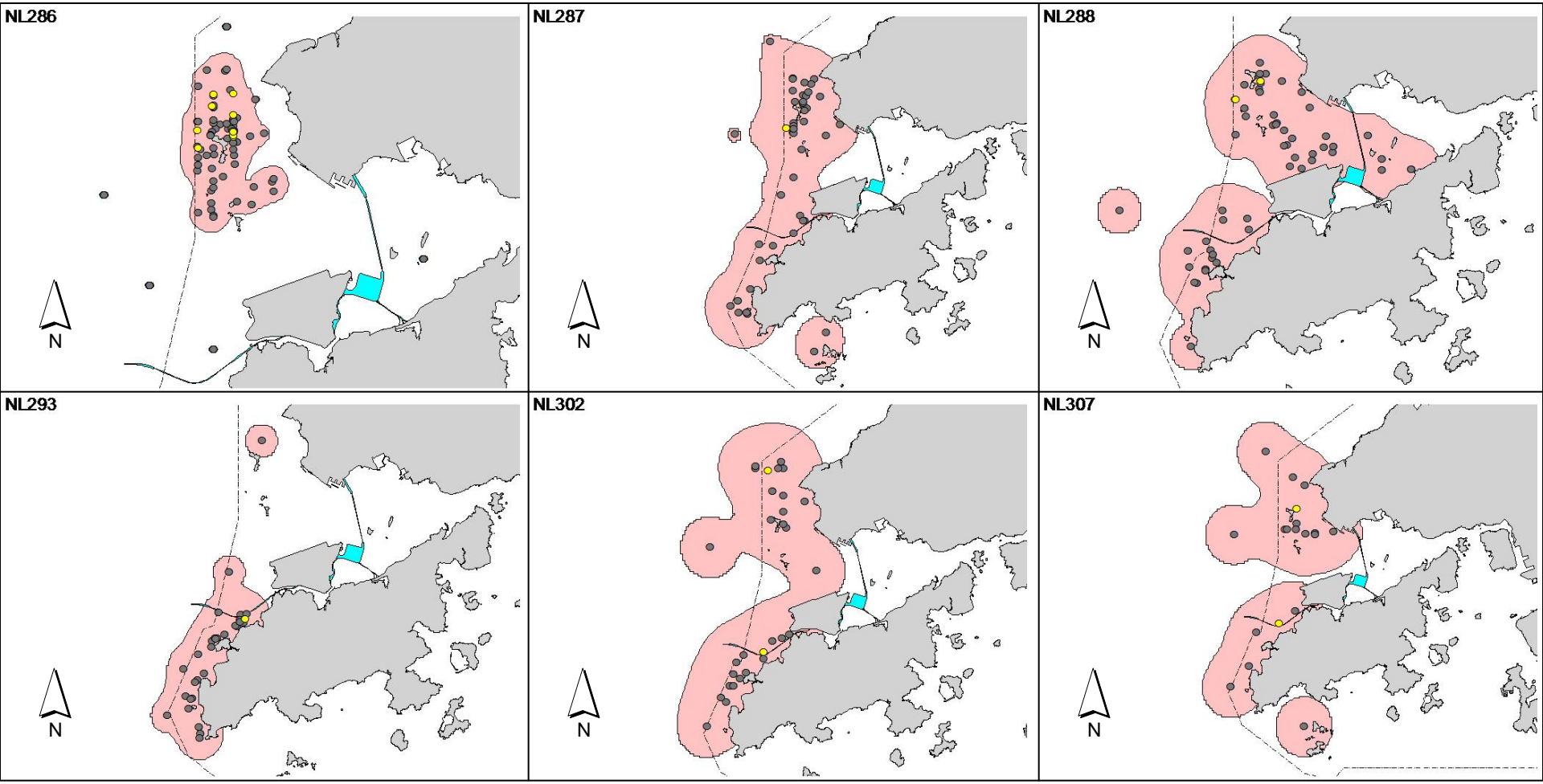
Appendix IV. (cont'd)



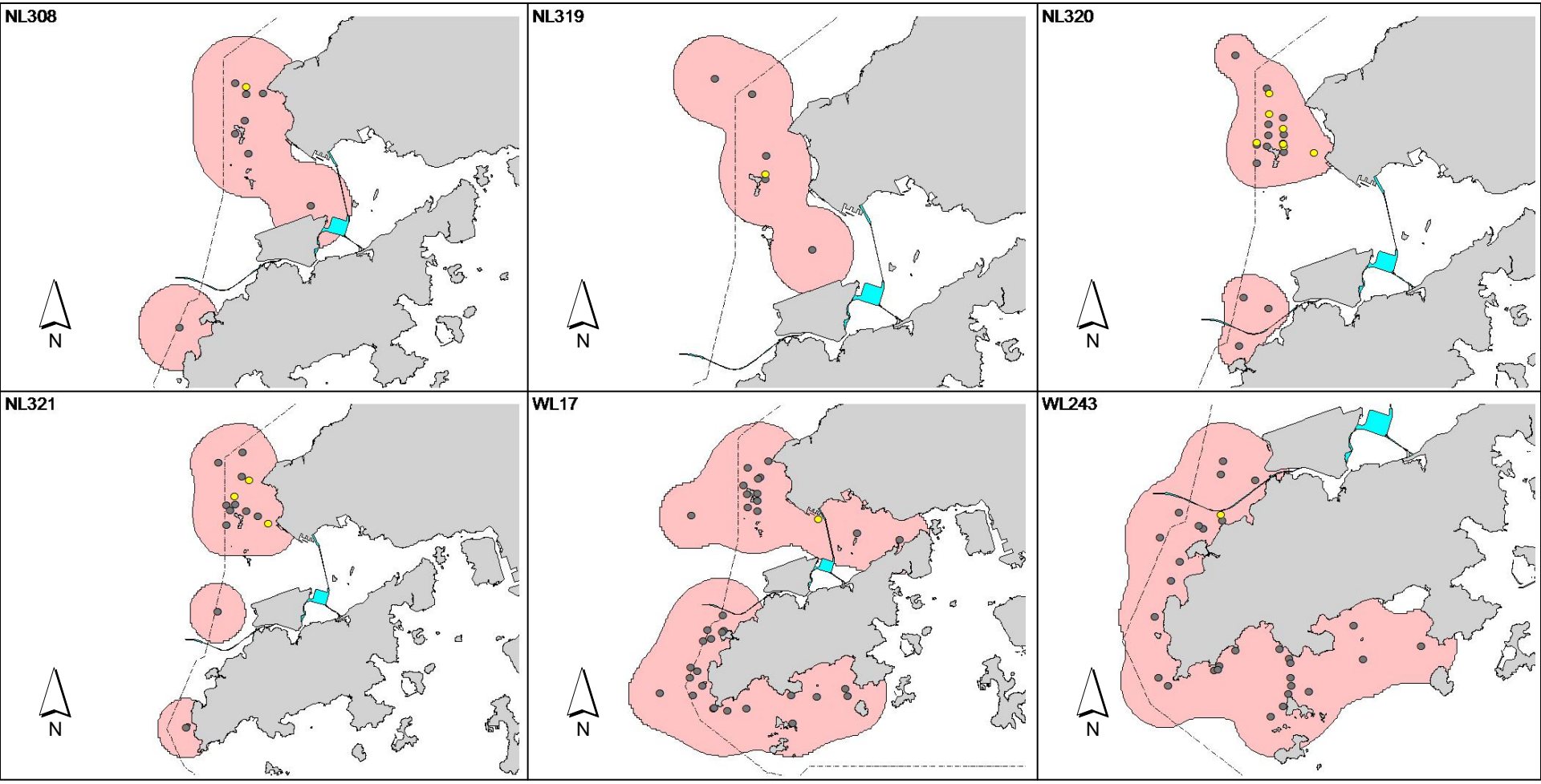
Appendix IV. (cont'd)

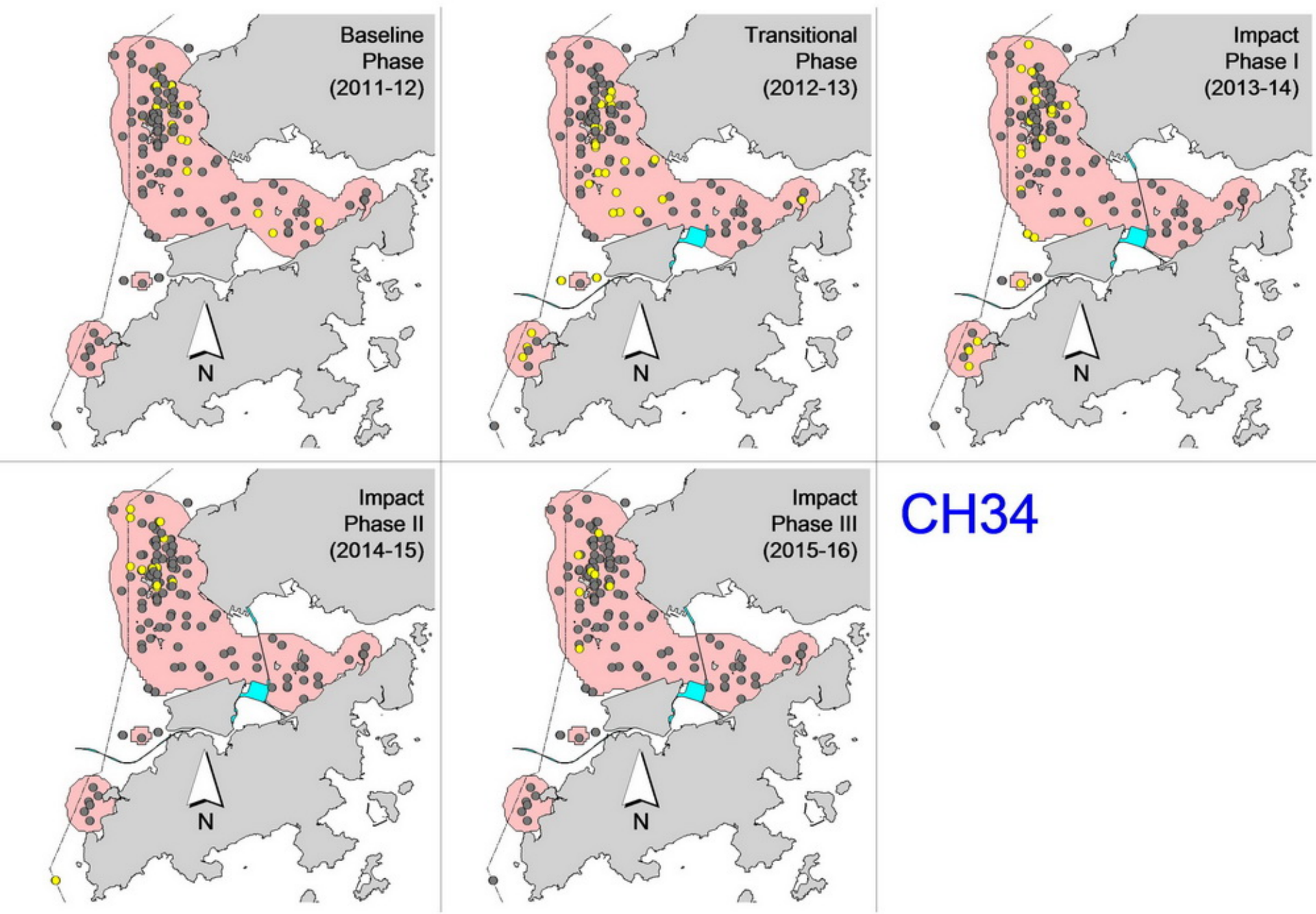


Appendix IV. (cont'd)

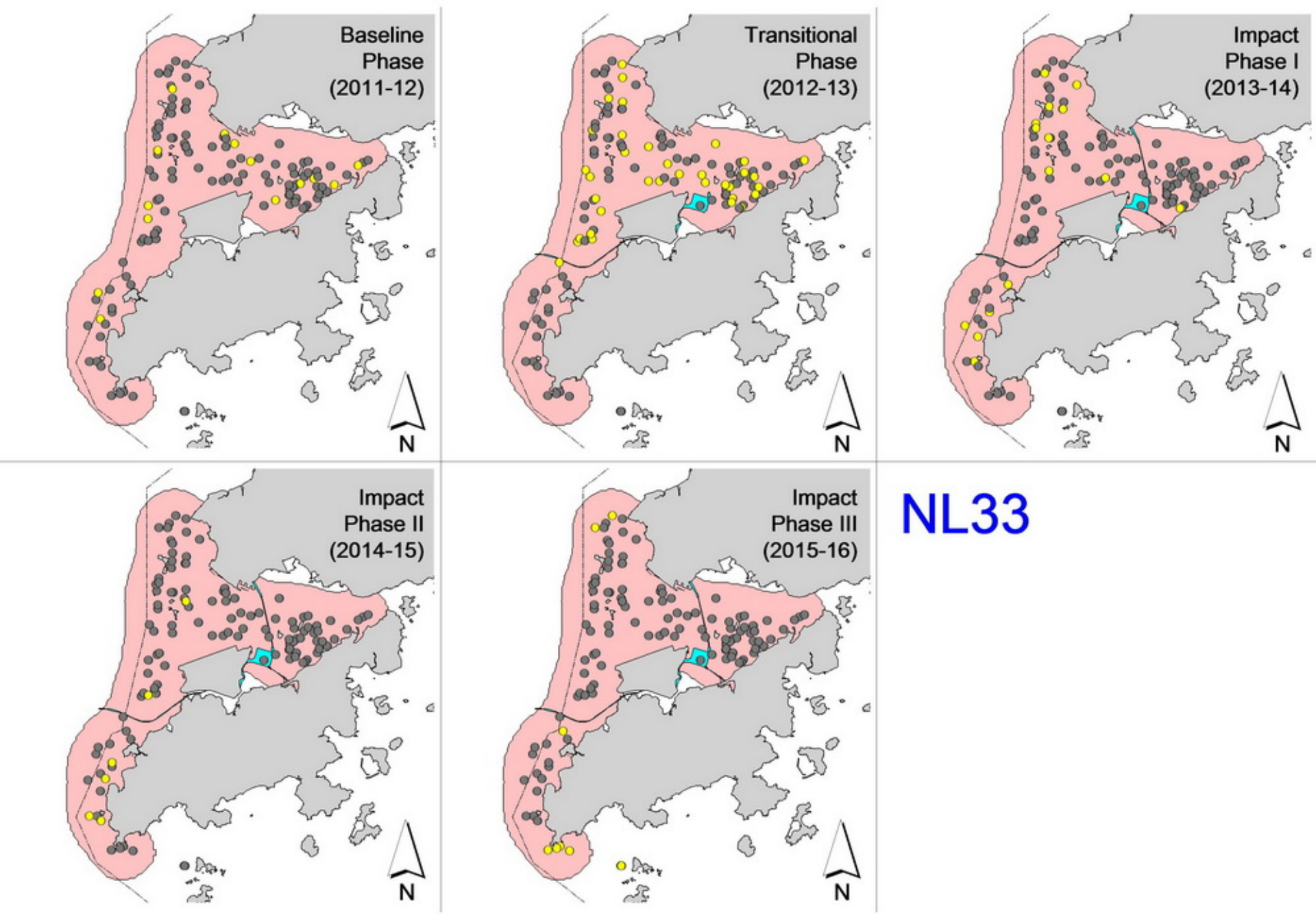


Appendix IV. (cont'd)

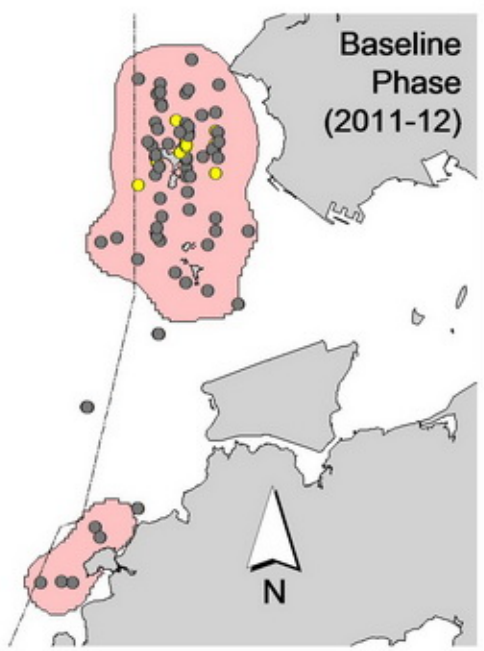


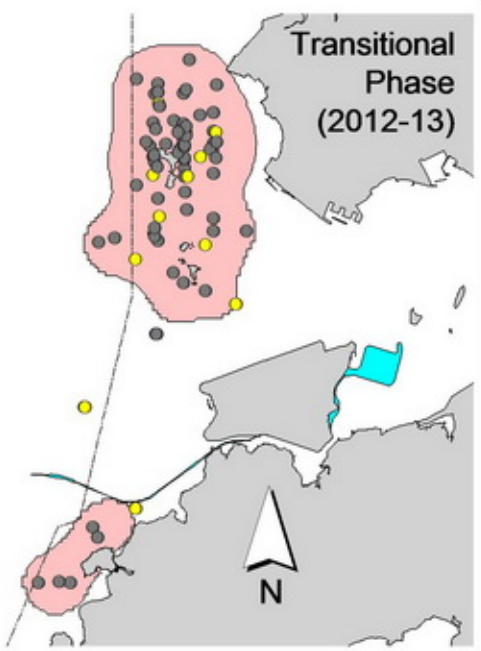


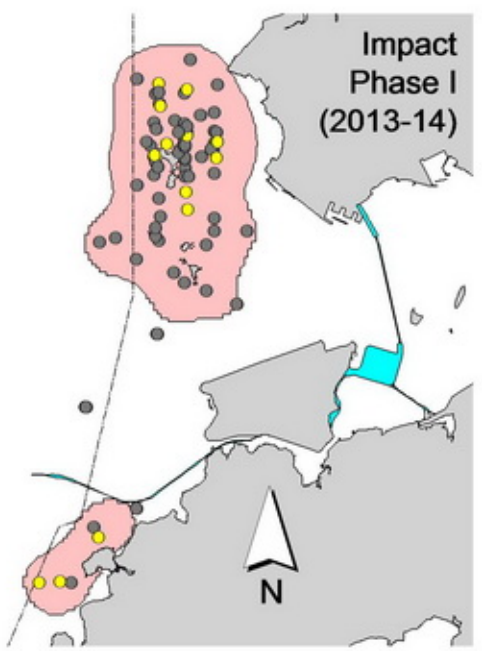
Appendix V. Temporal changes in range use patterns of 31 individual dolphins during baseline, transitional & three impact phases of TMCLKL construction (note: yellow dots indicates sightings made in corresponding period)

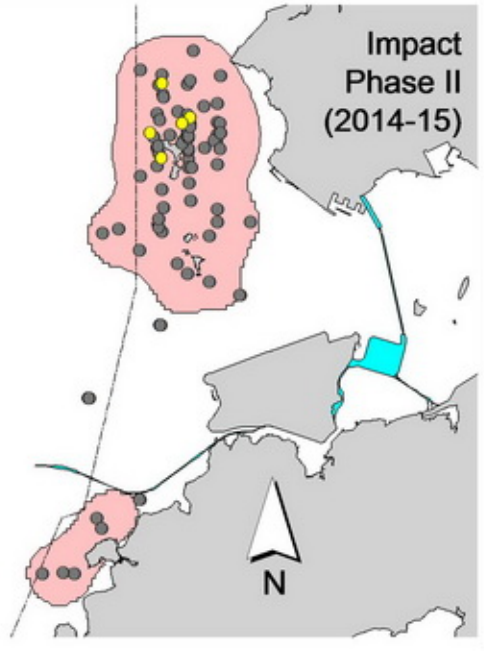


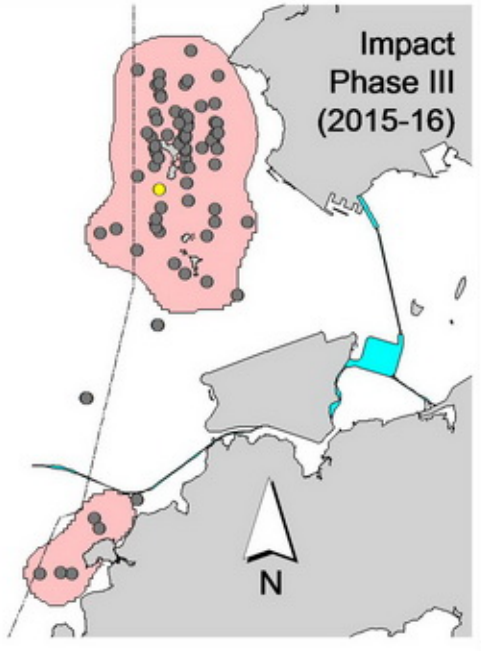
Appendix V. (cont'd)





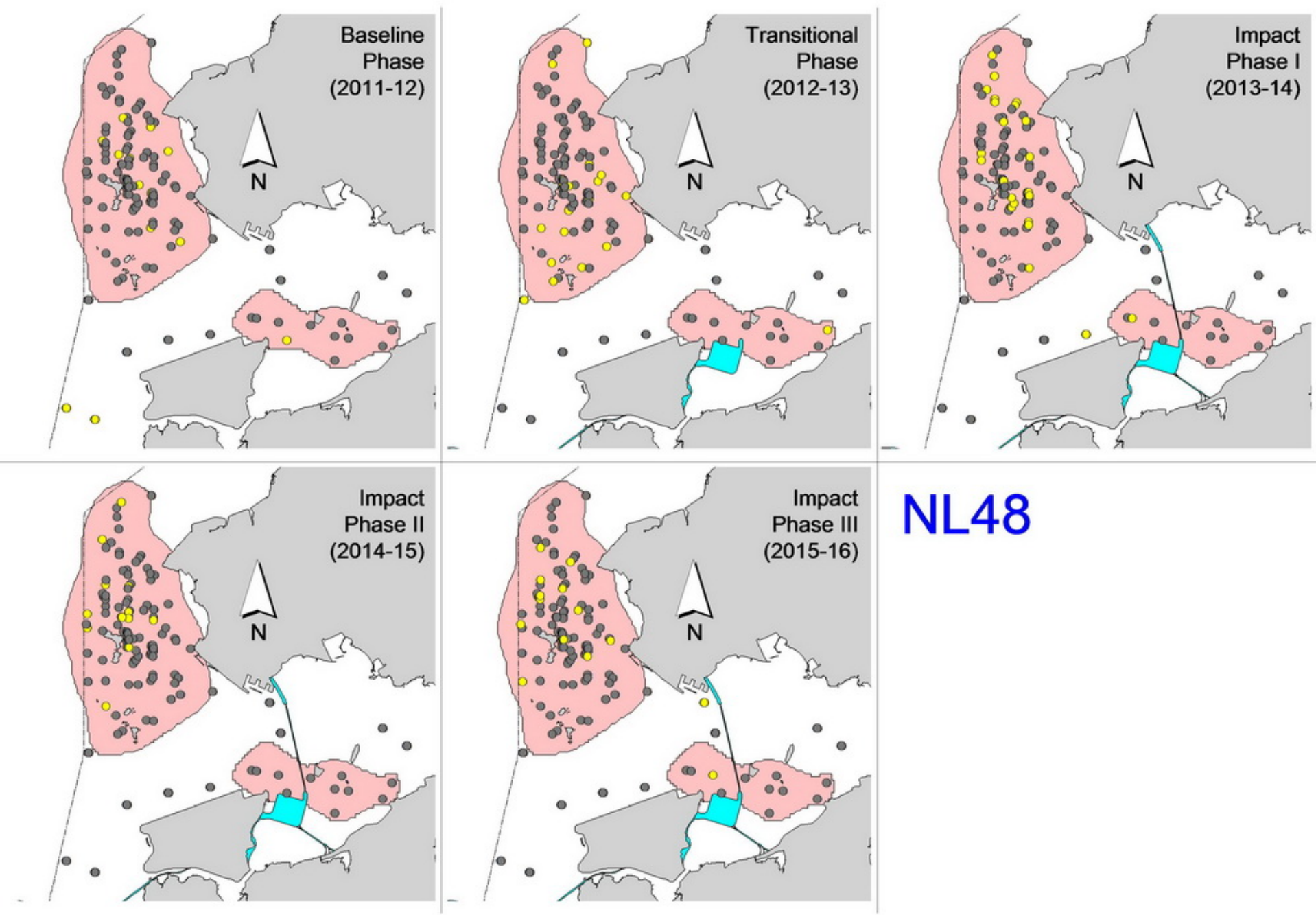




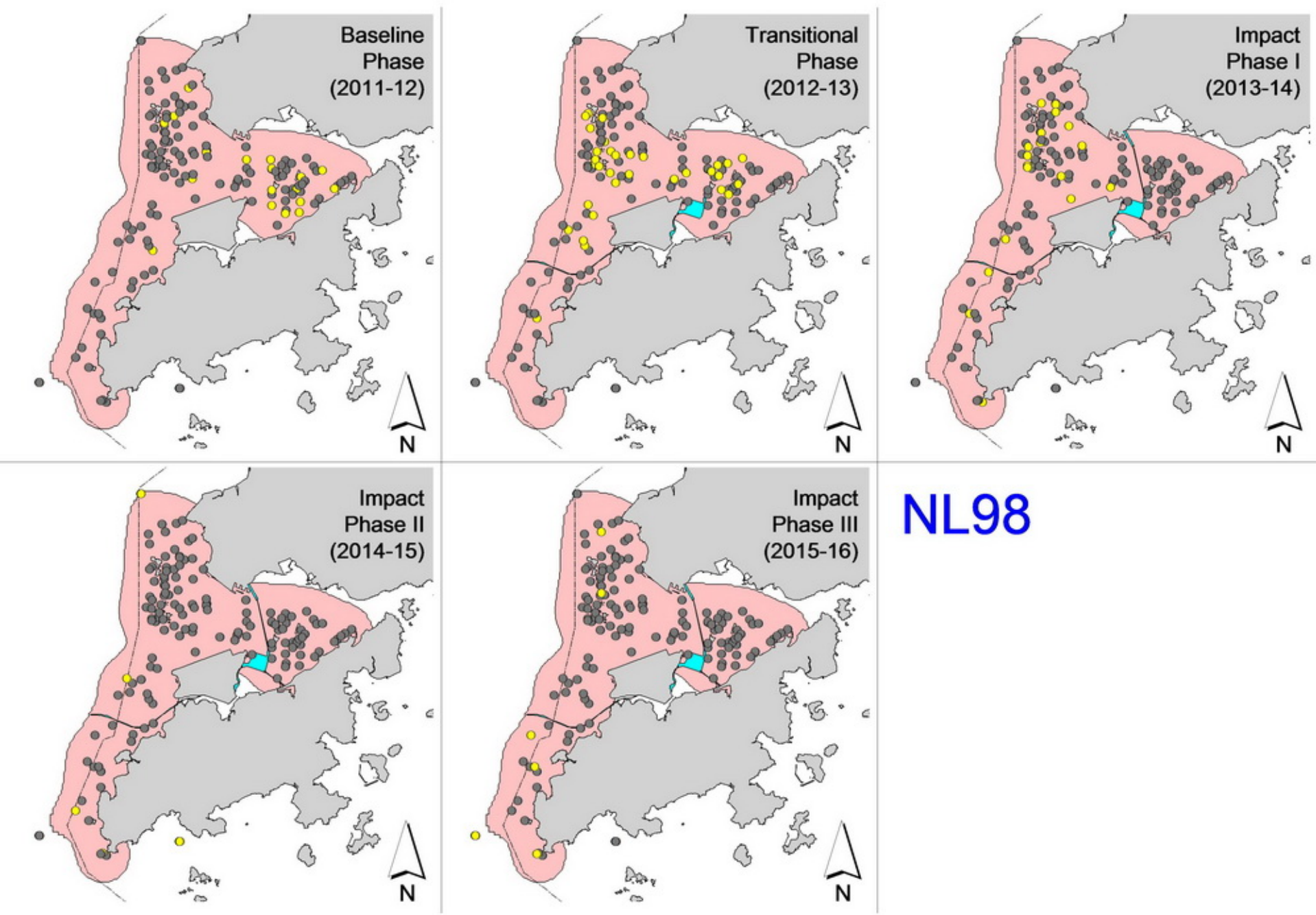


NL46

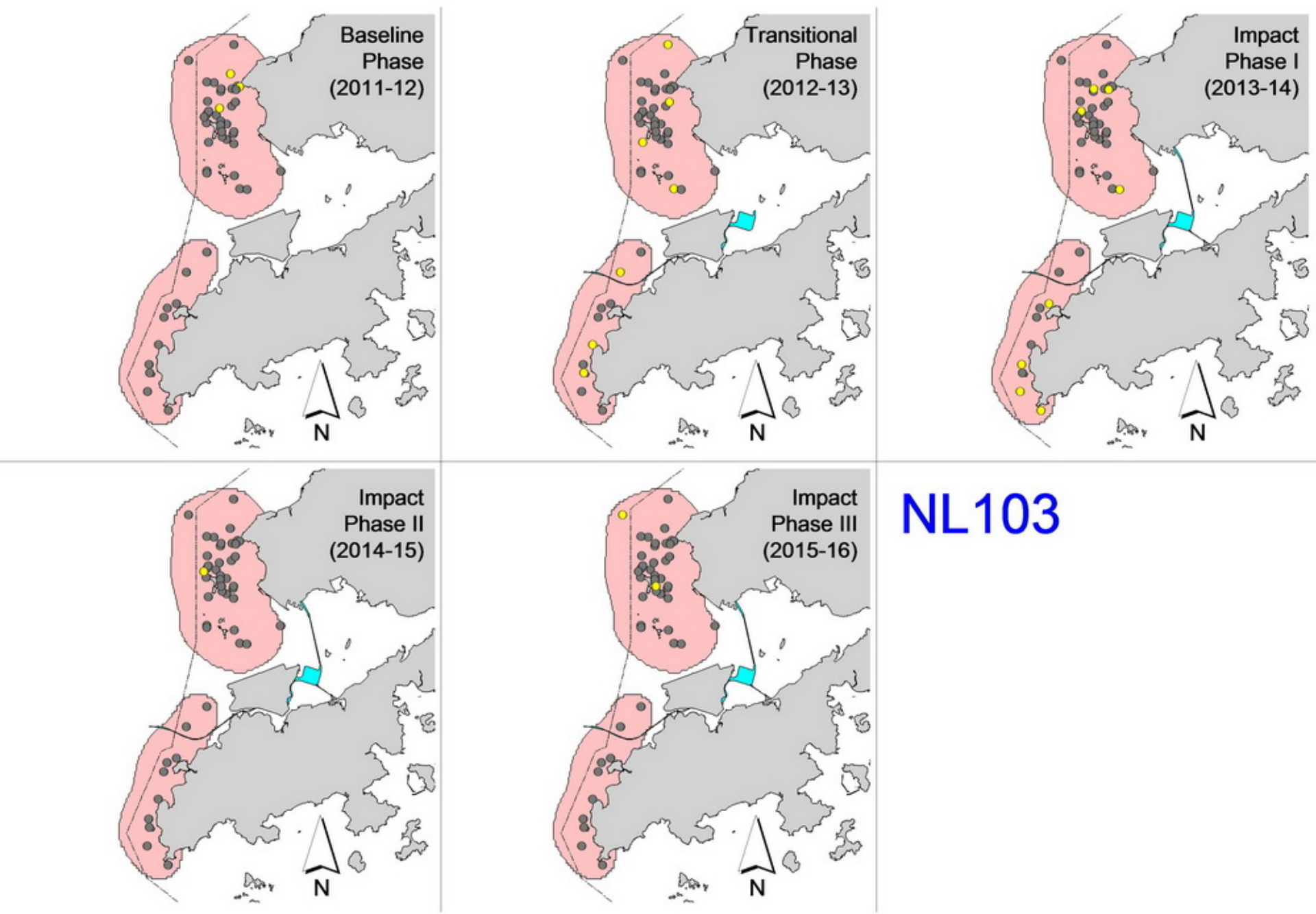
Appendix V. (cont'd)



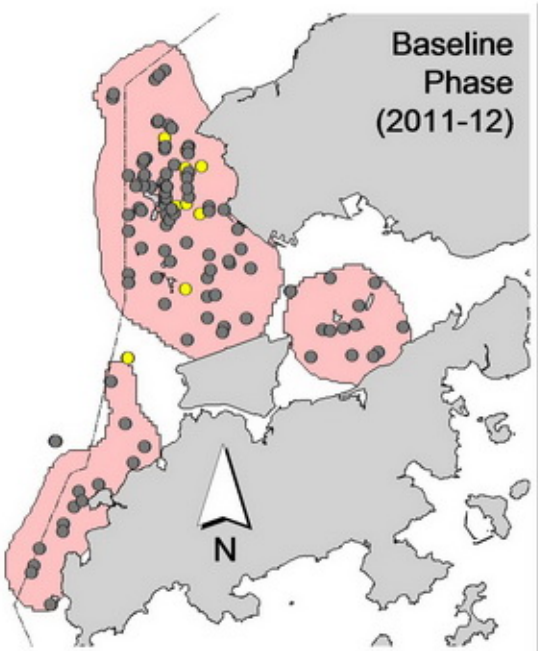
Appendix V. (cont'd)

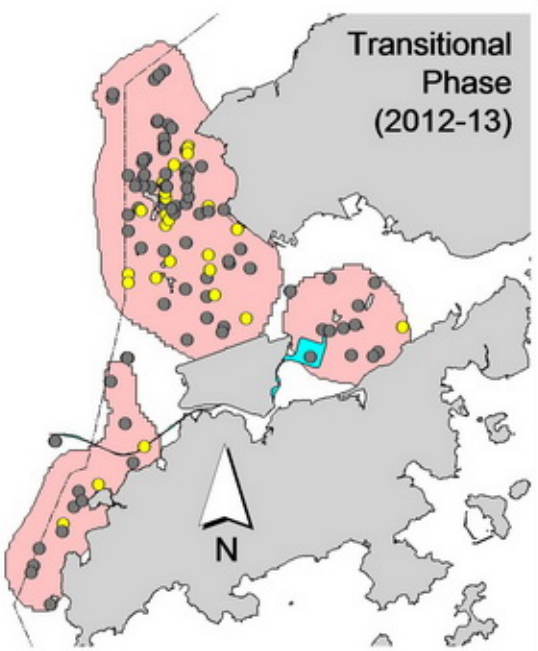


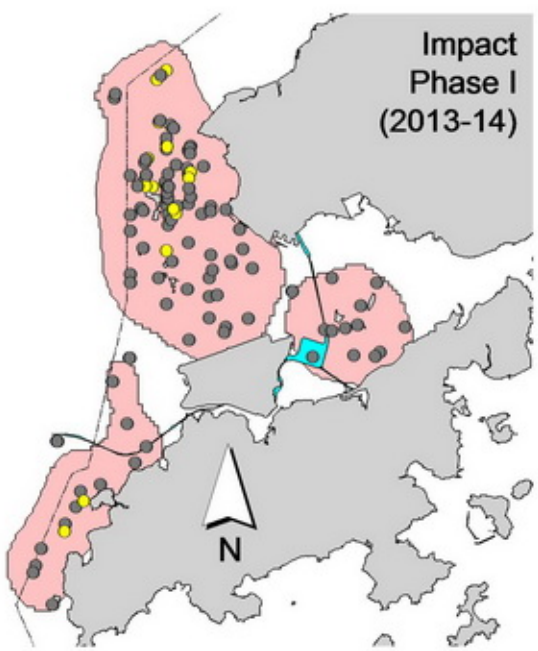
Appendix V. (cont'd)

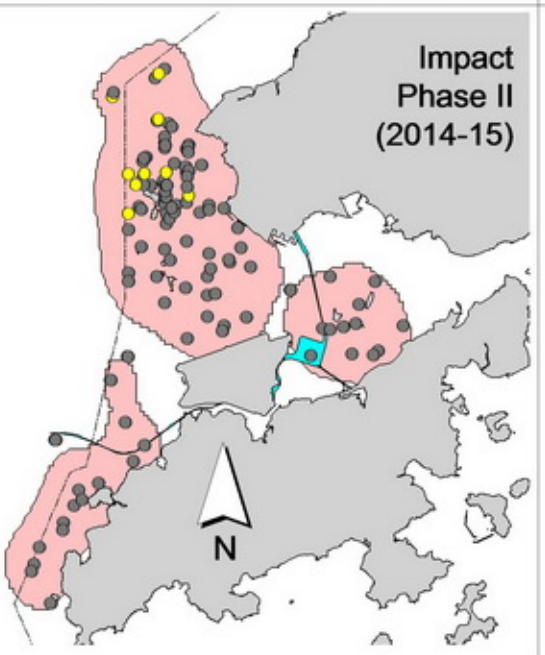


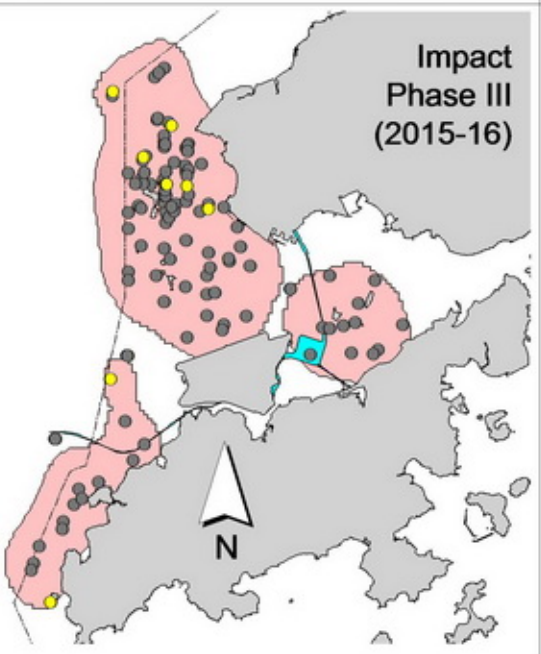
Appendix V. (cont'd)





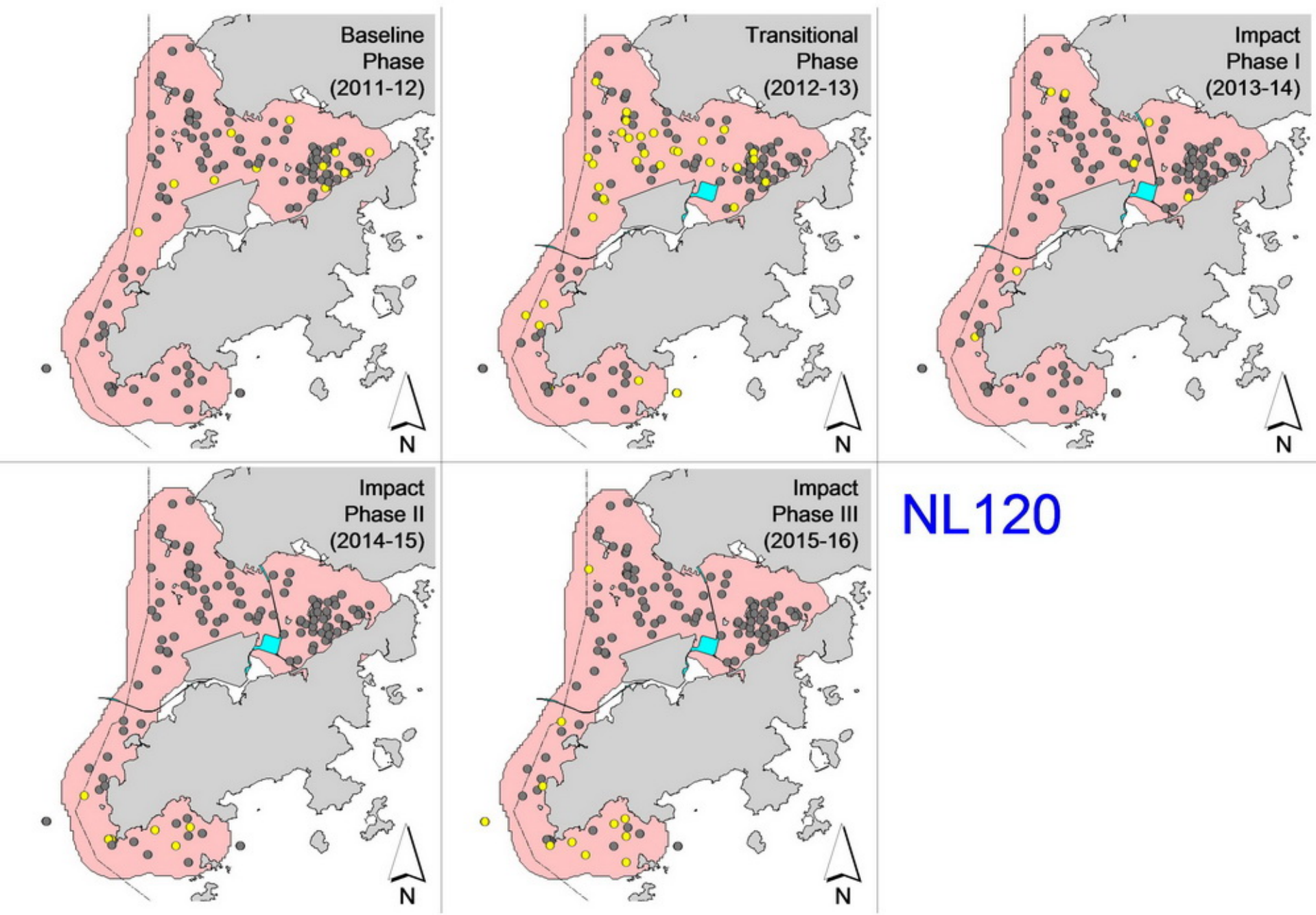




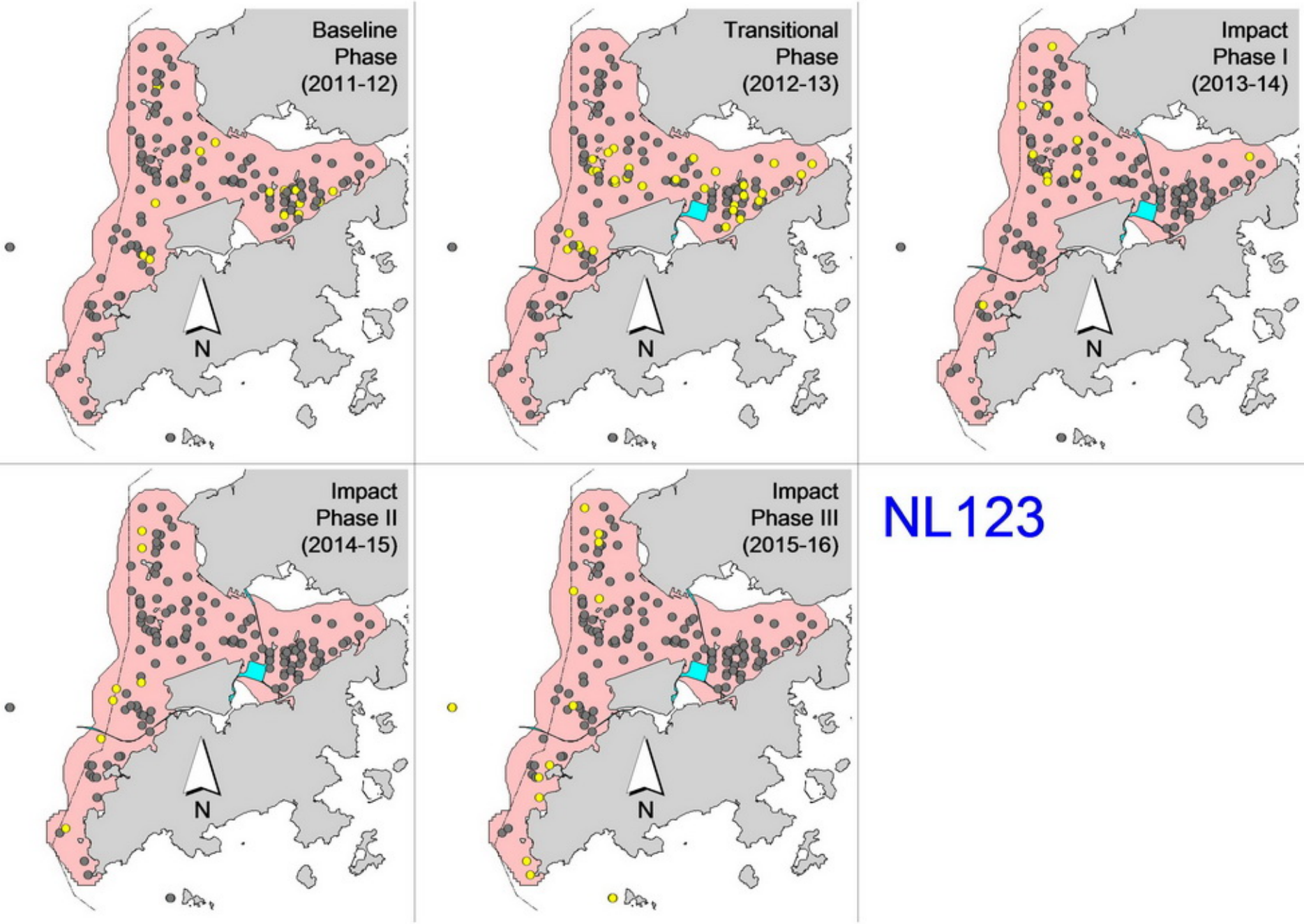


NL104

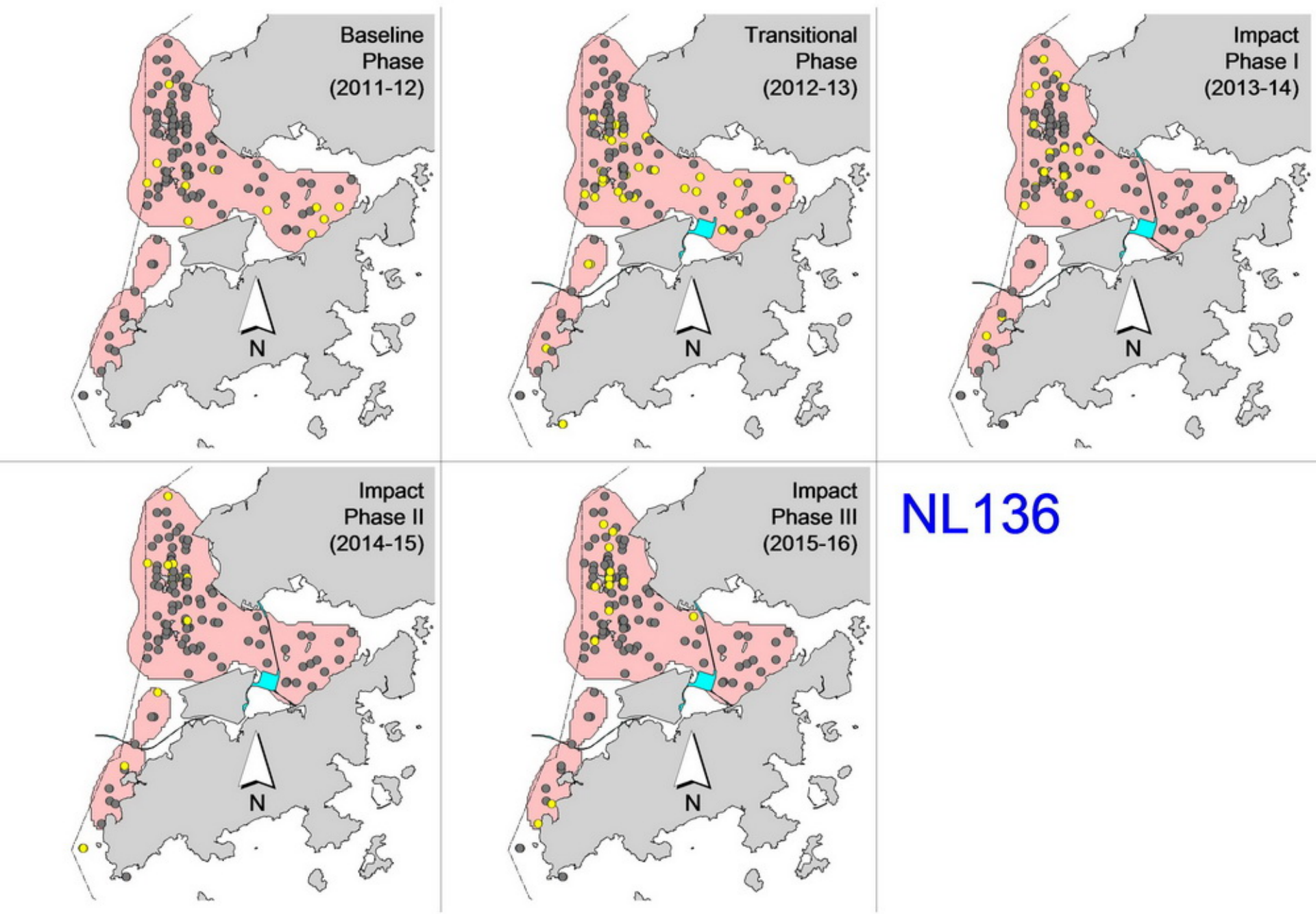
Appendix V. (cont'd)



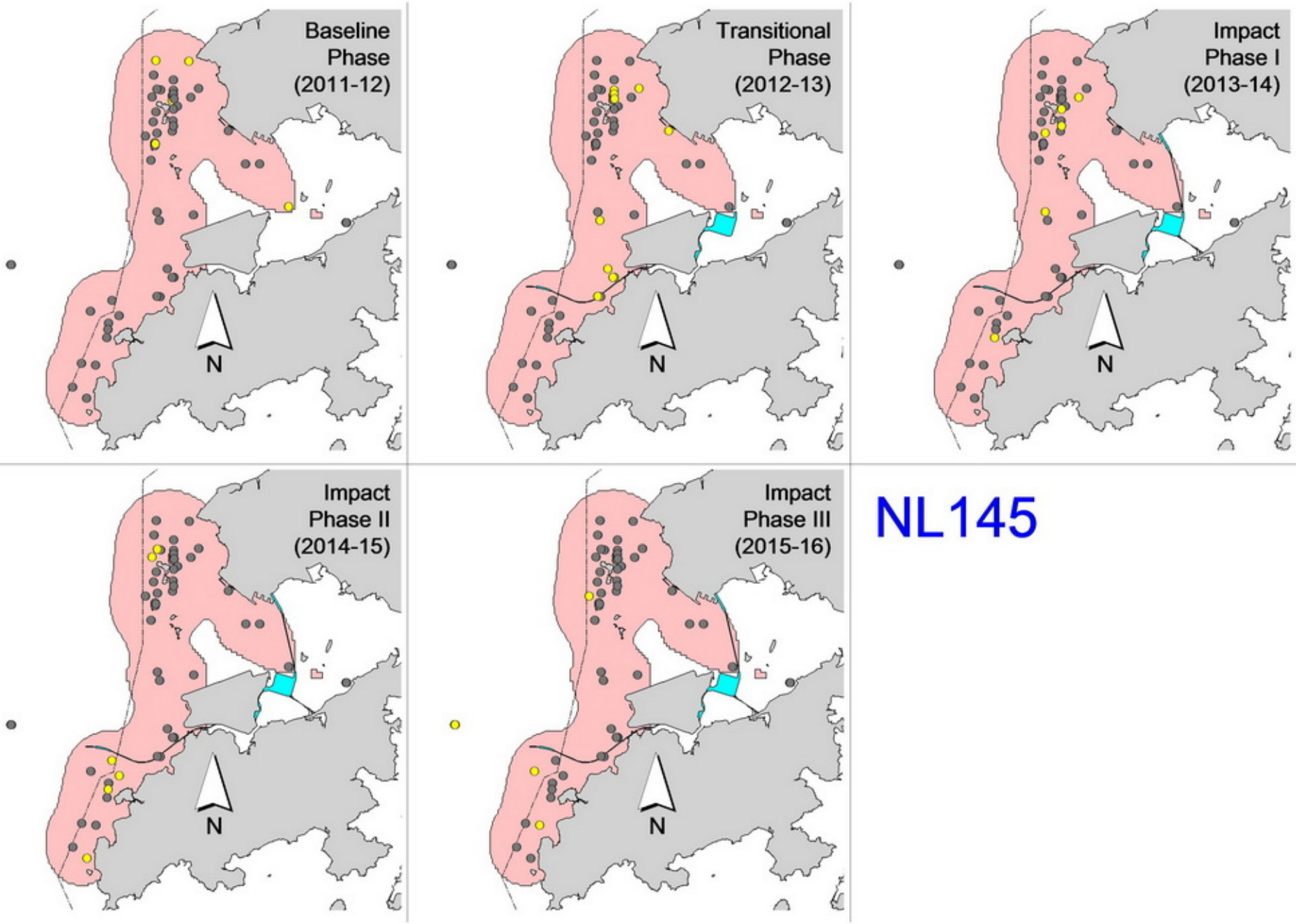
Appendix V. (cont'd)



Appendix V. (cont'd)



Appendix V. (cont'd)



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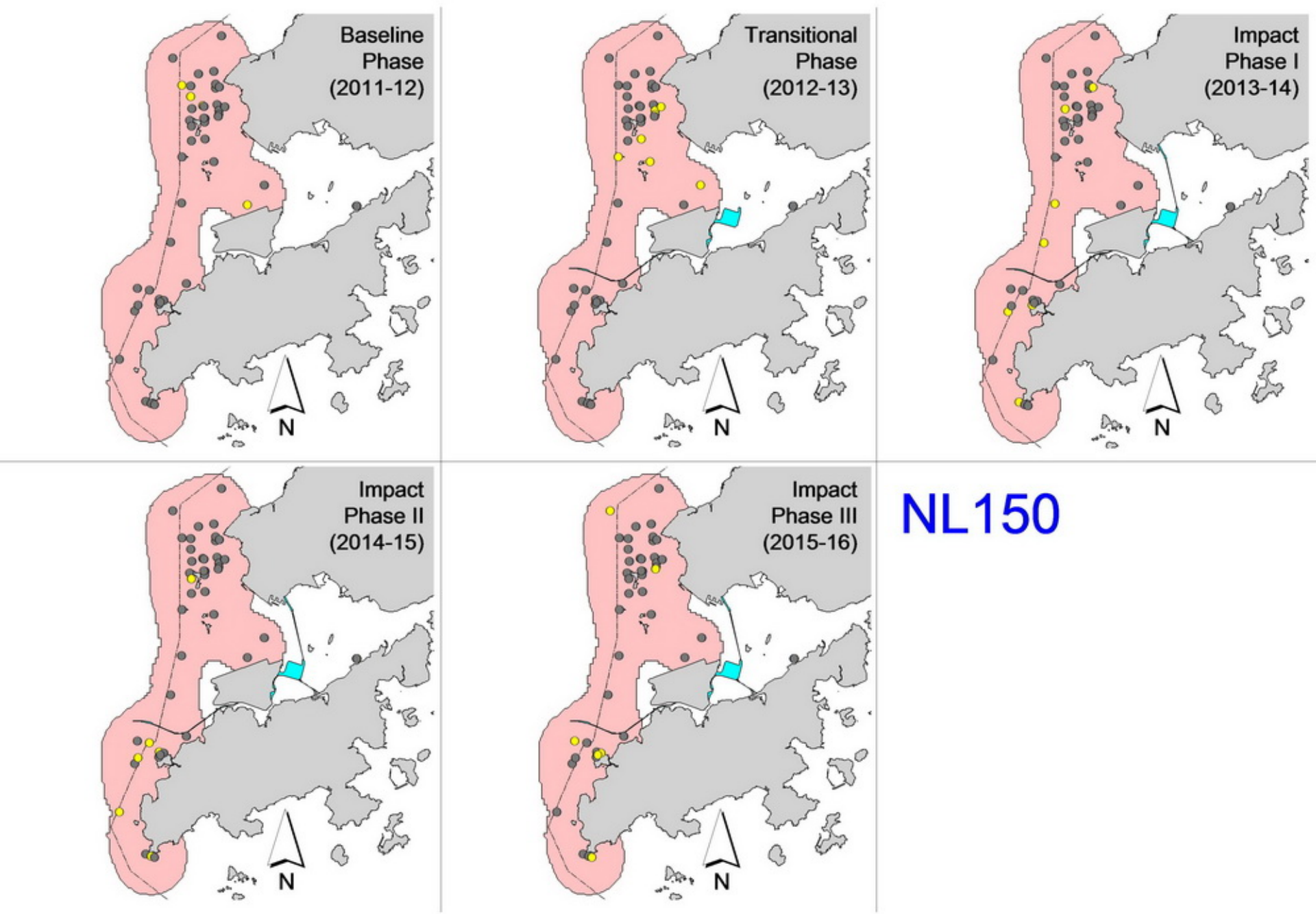
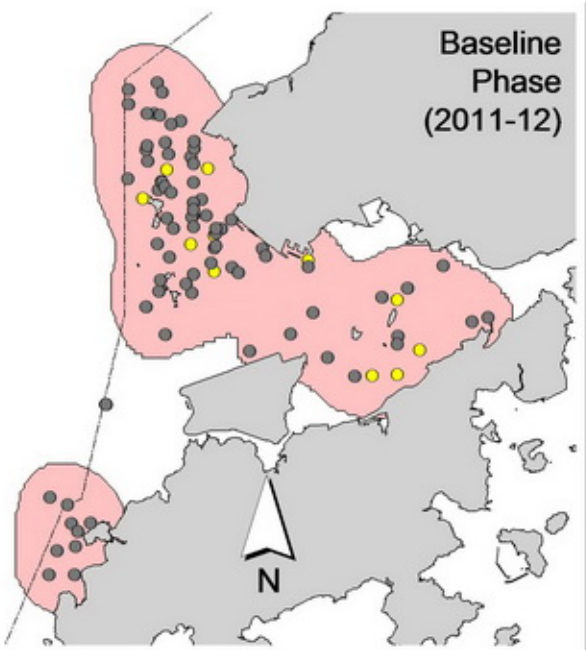
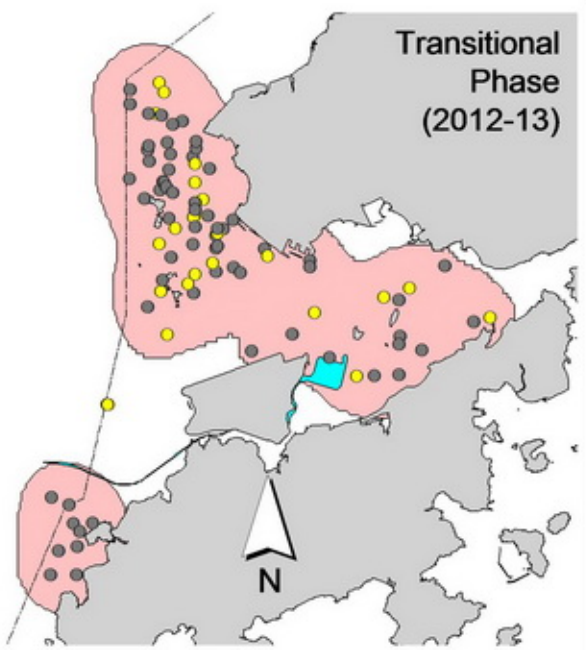
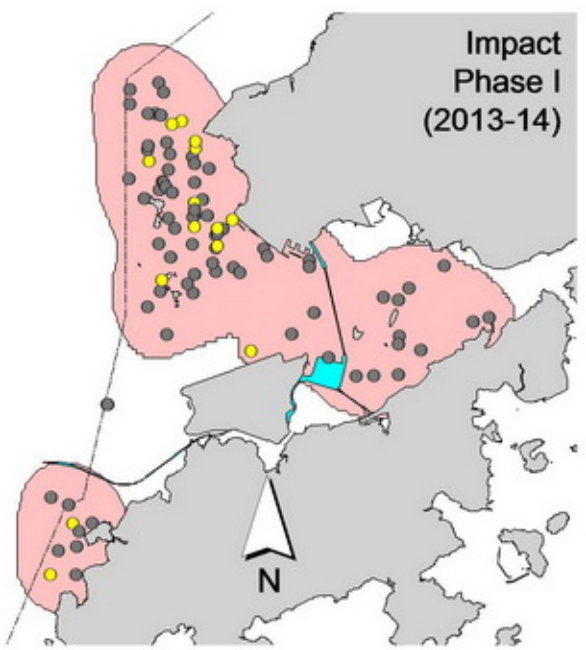
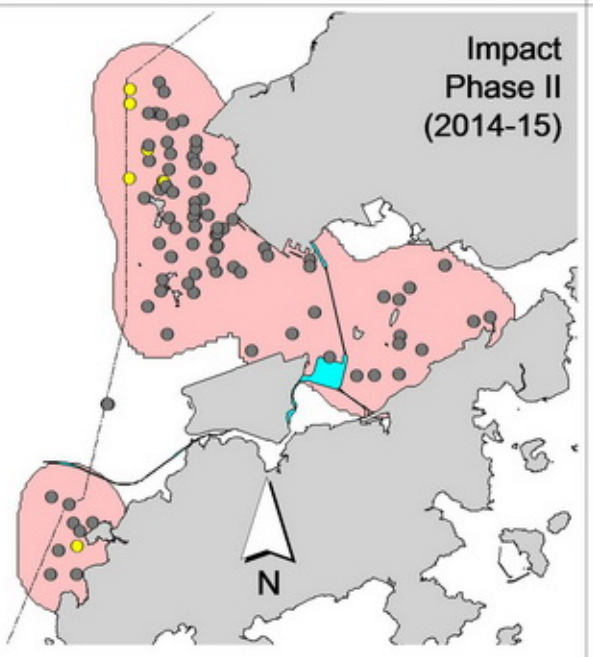


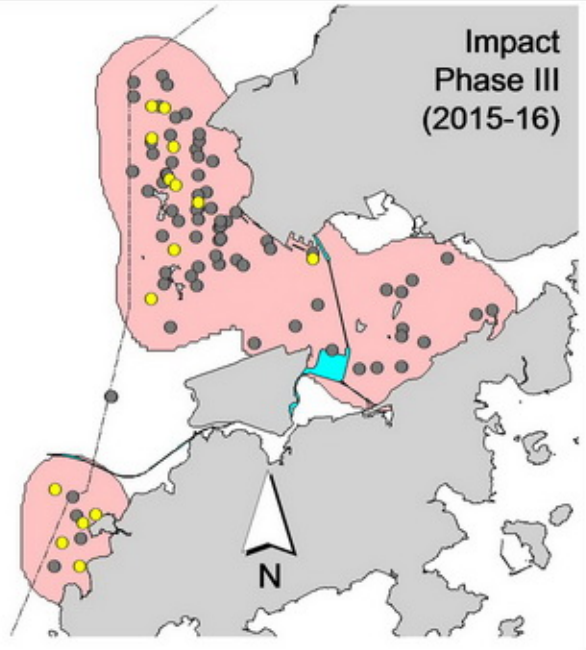
Appendix V. (cont'd)











NL182

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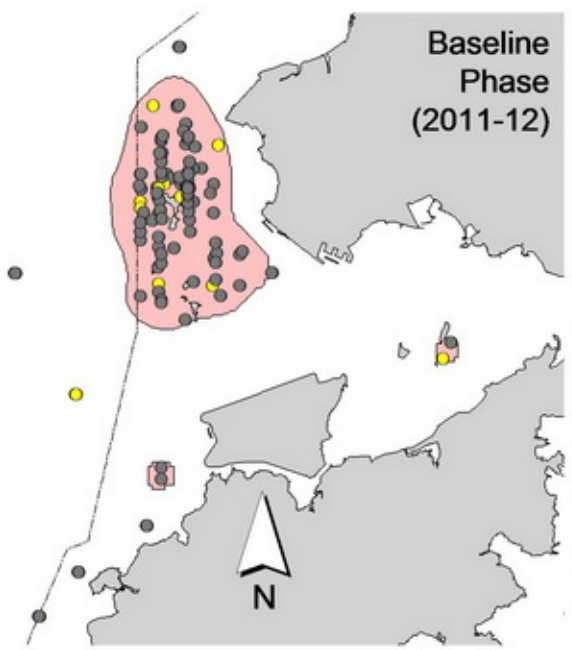

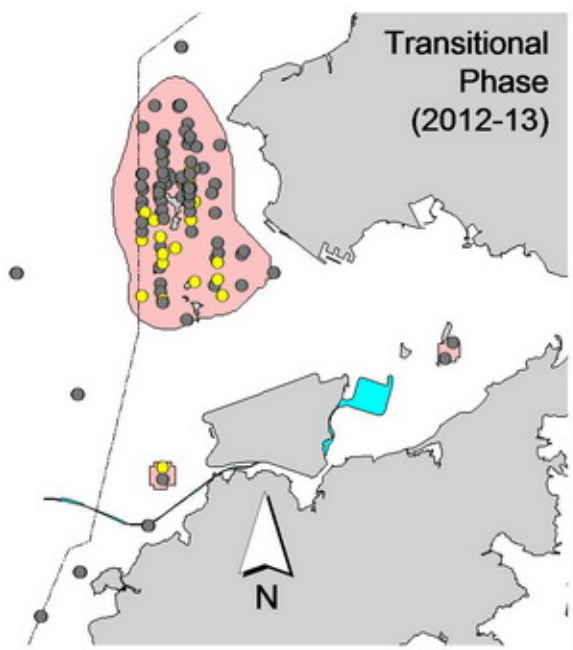

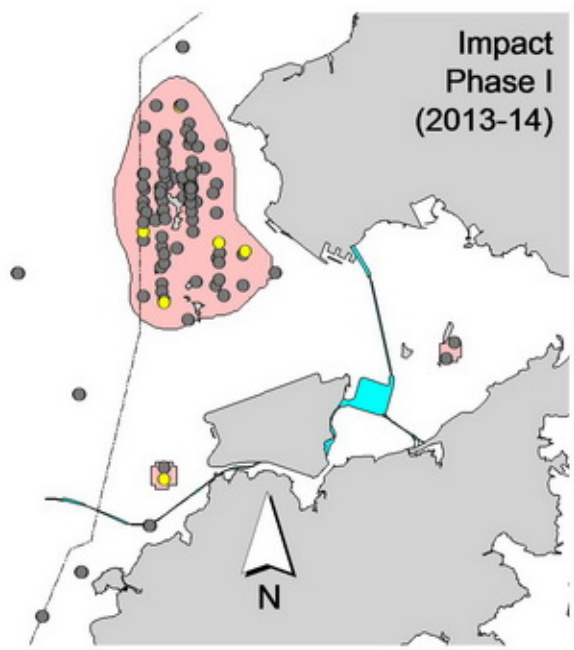

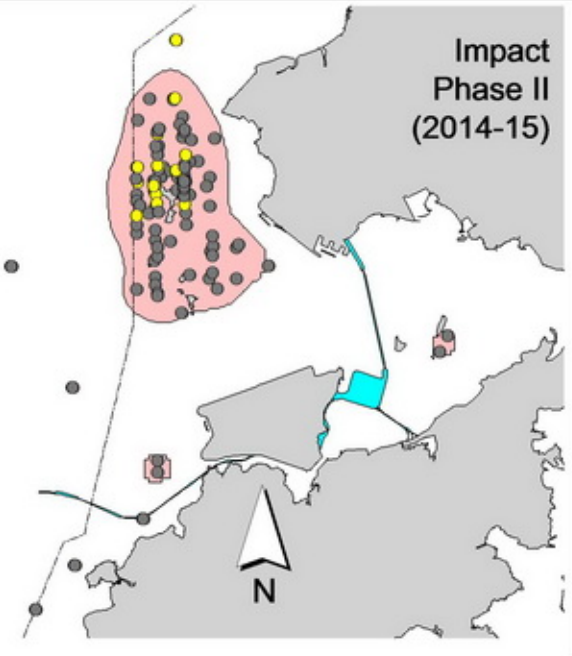

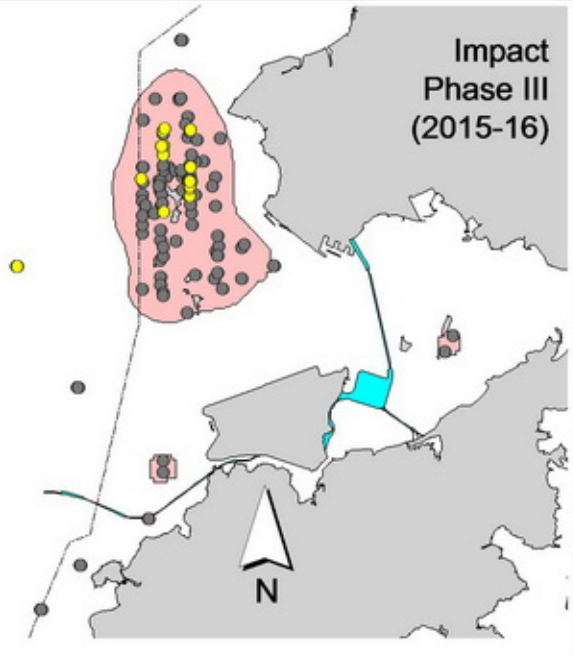

NL202

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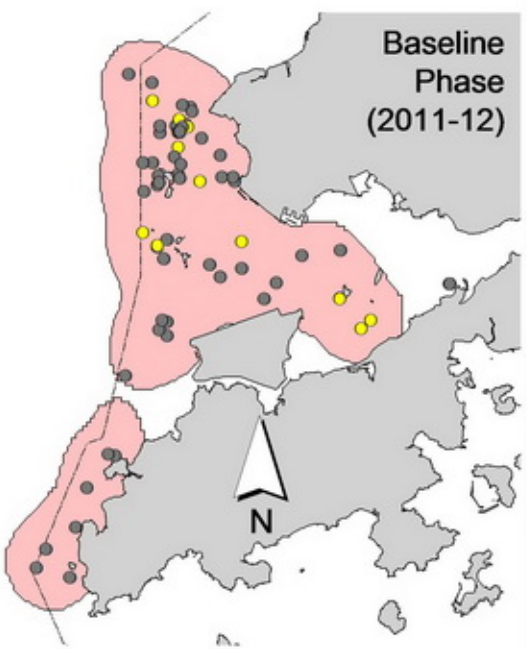

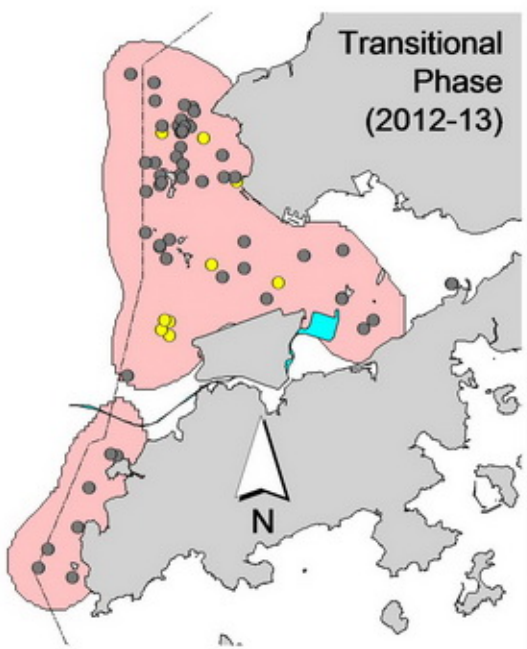

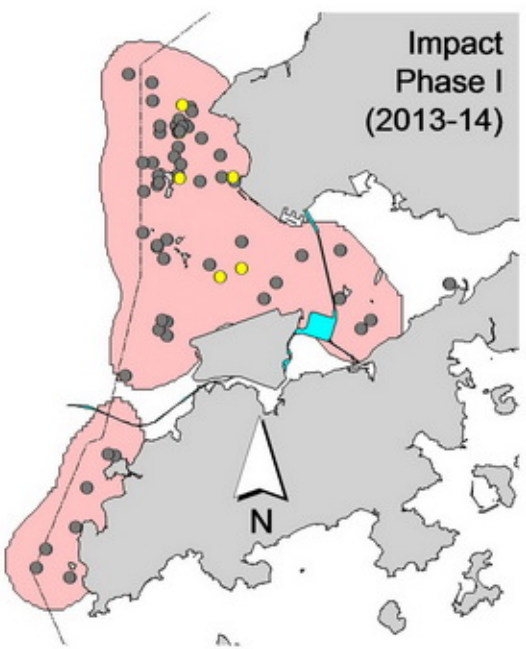

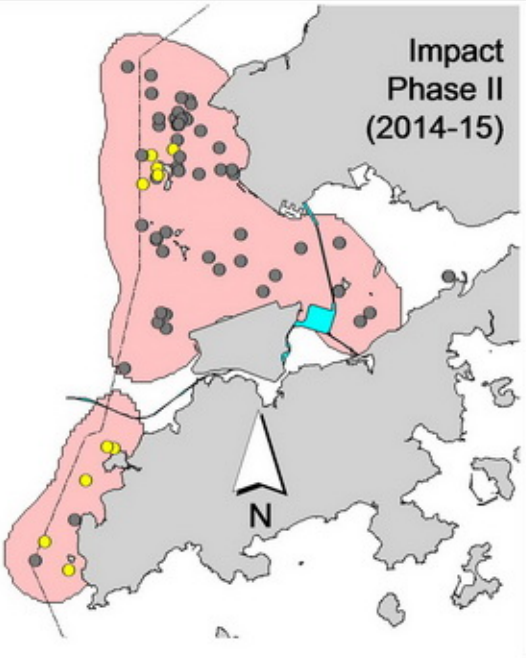

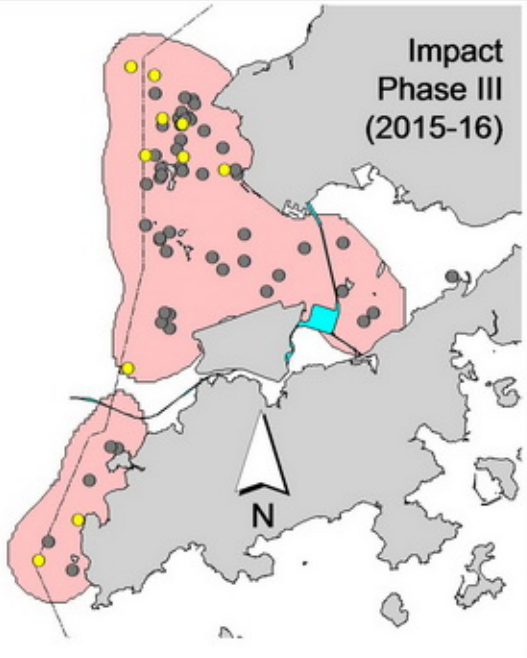

NL210

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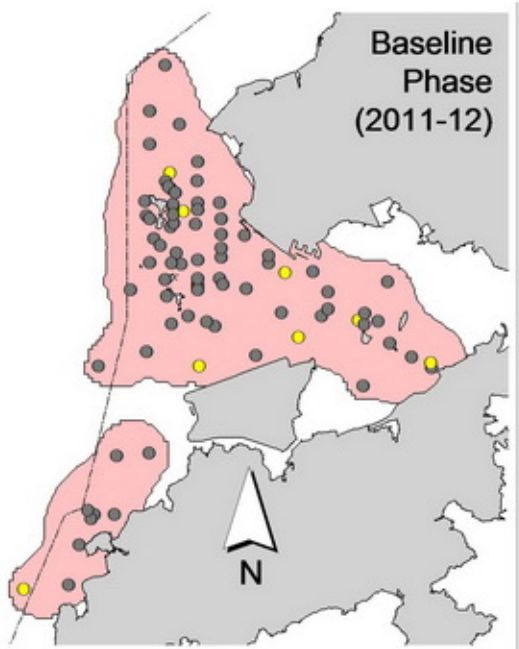
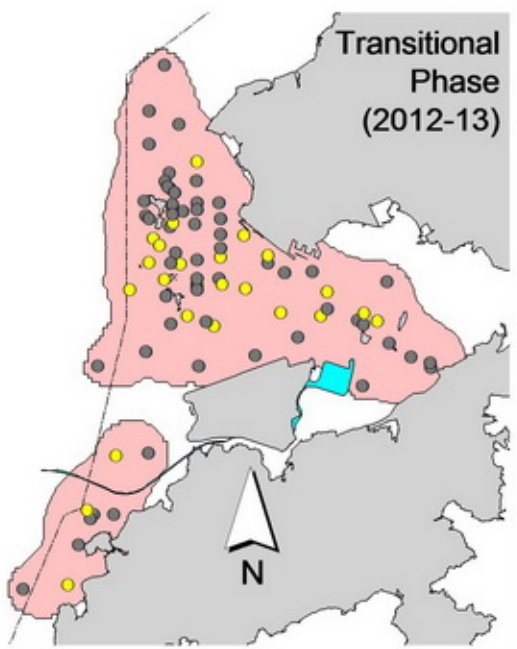
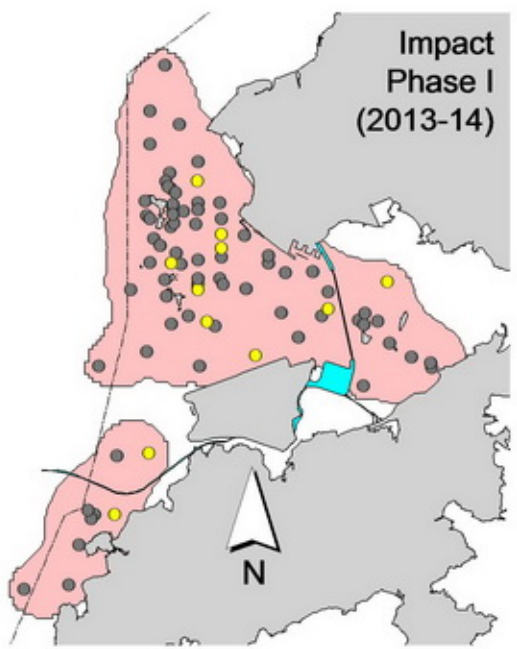
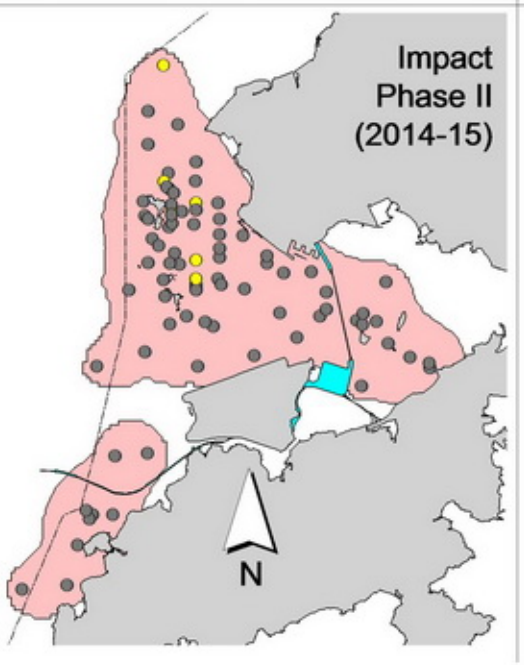
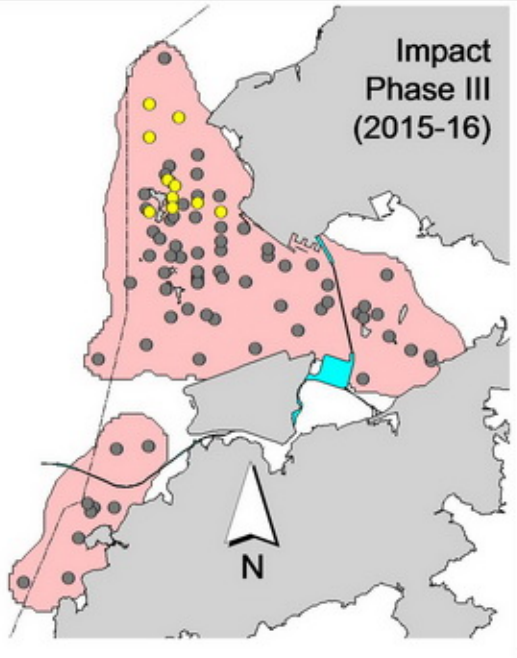




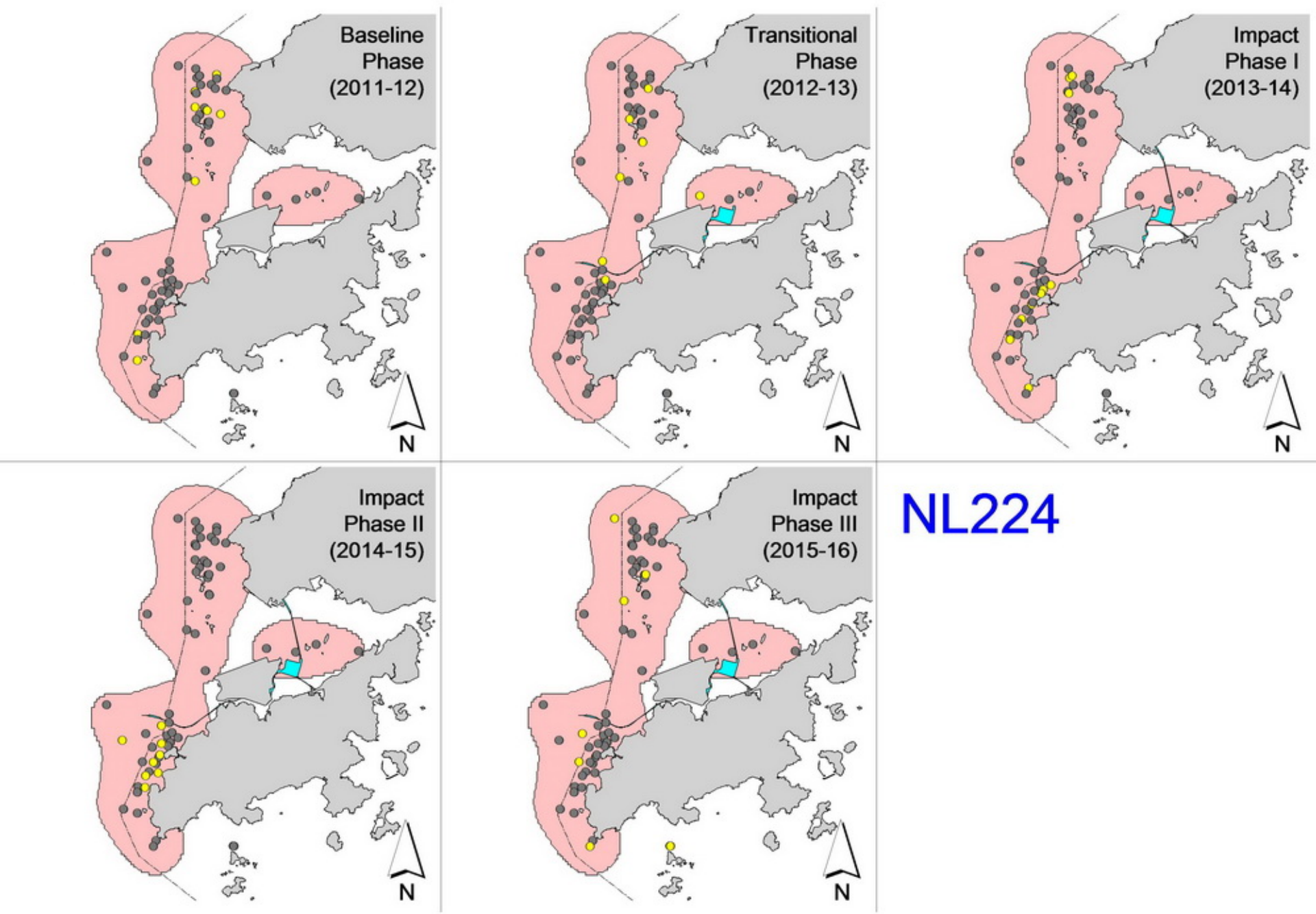




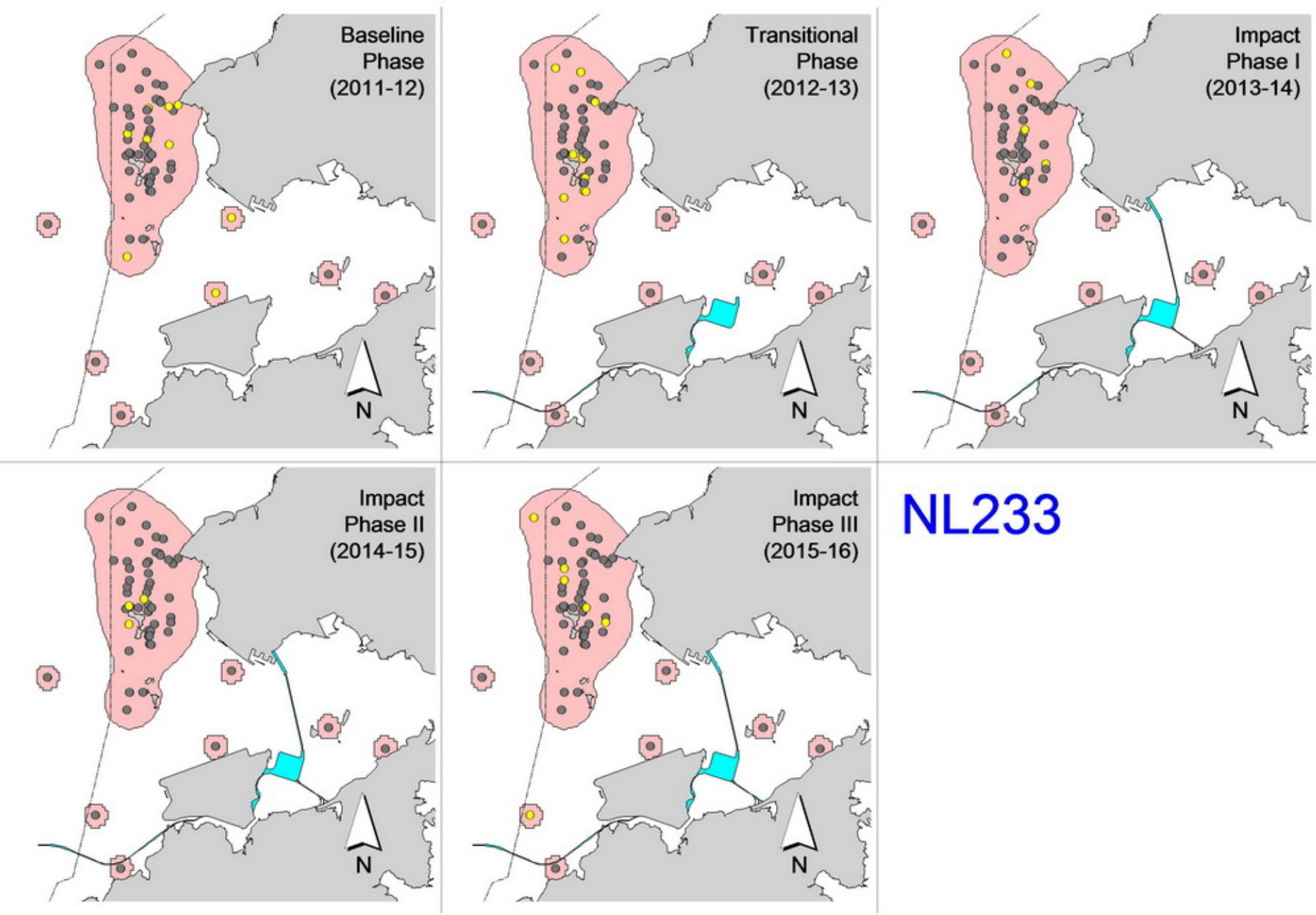


NL220

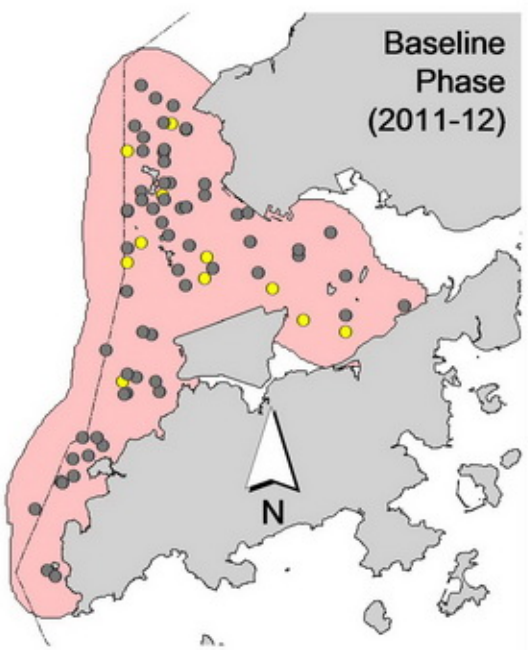
Appendix V. (cont'd)

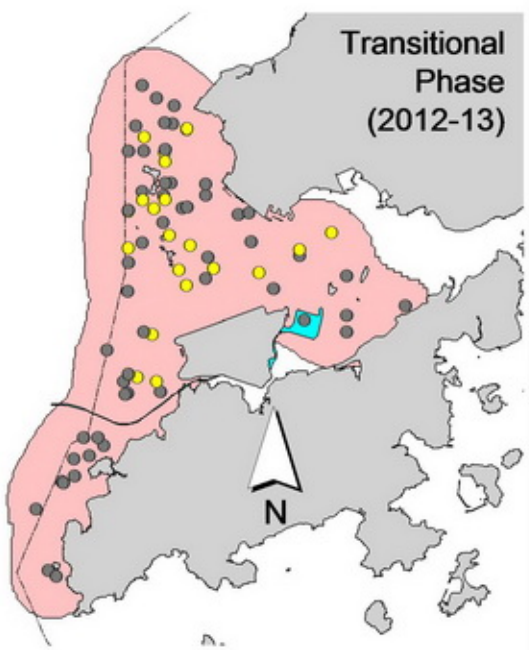


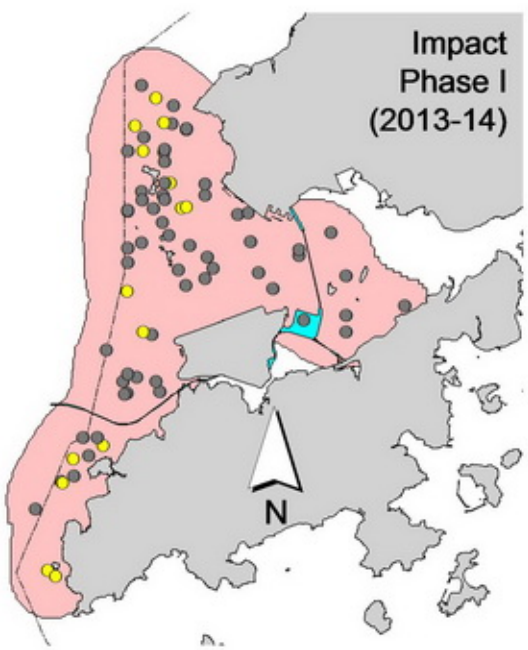
Appendix V. (cont'd)

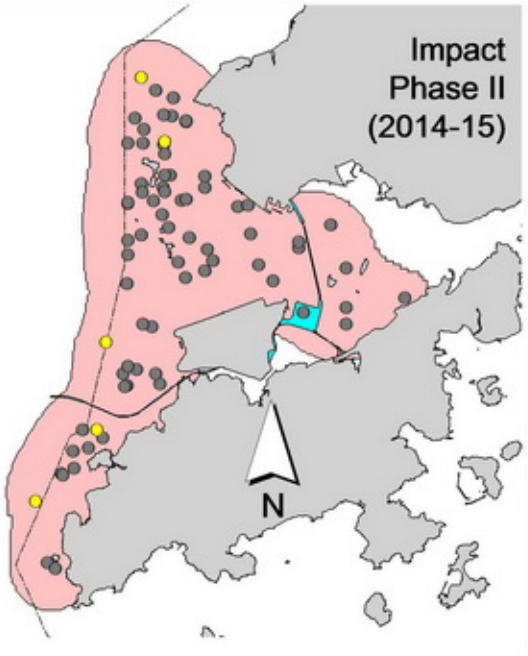


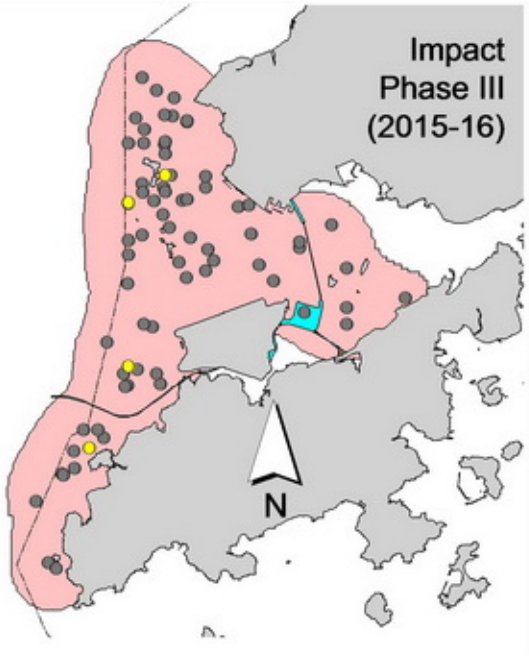
Appendix V. (cont'd)





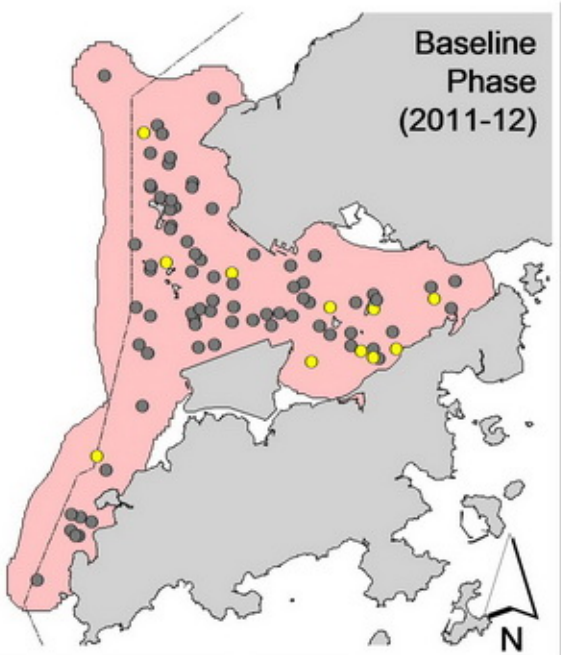


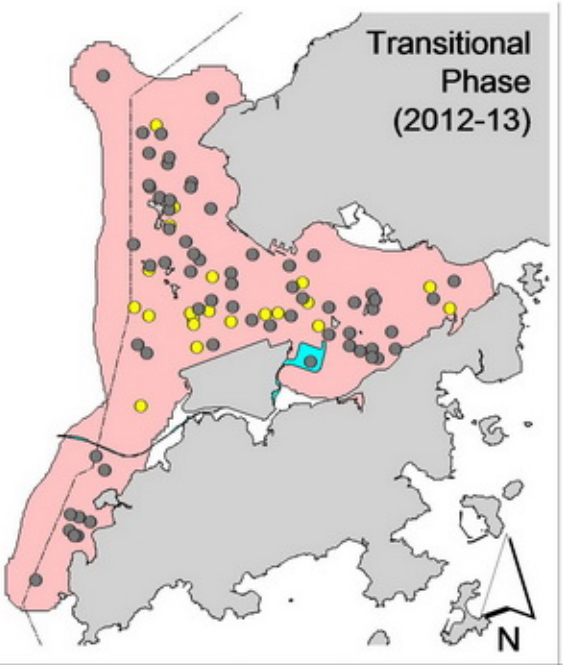


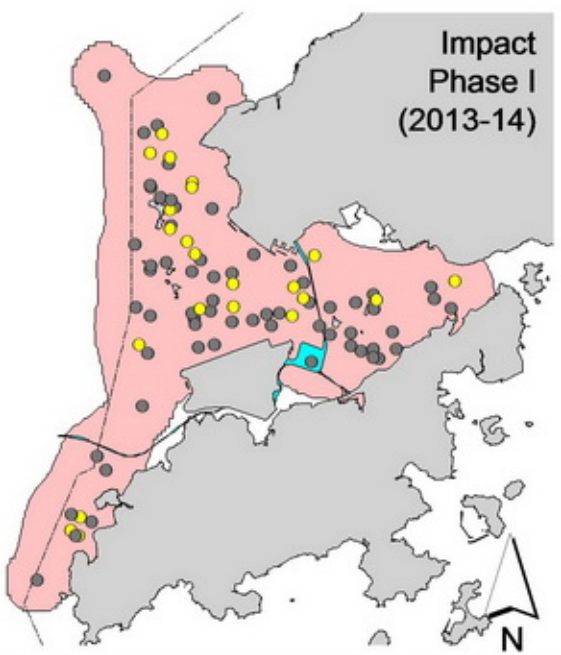


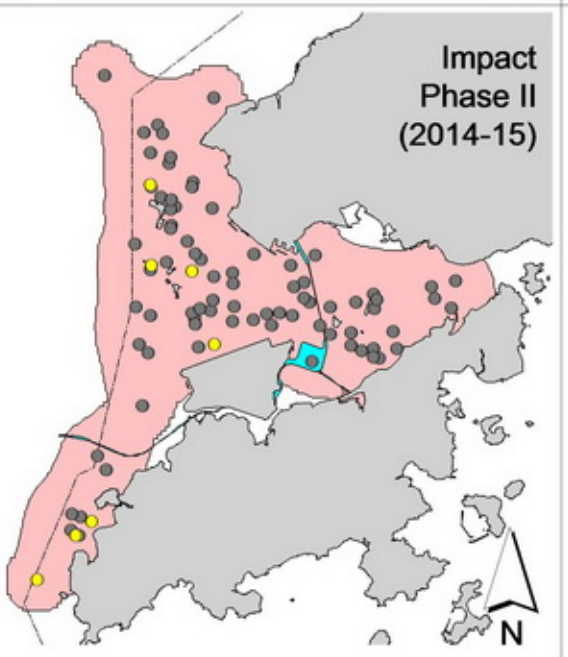
NL259

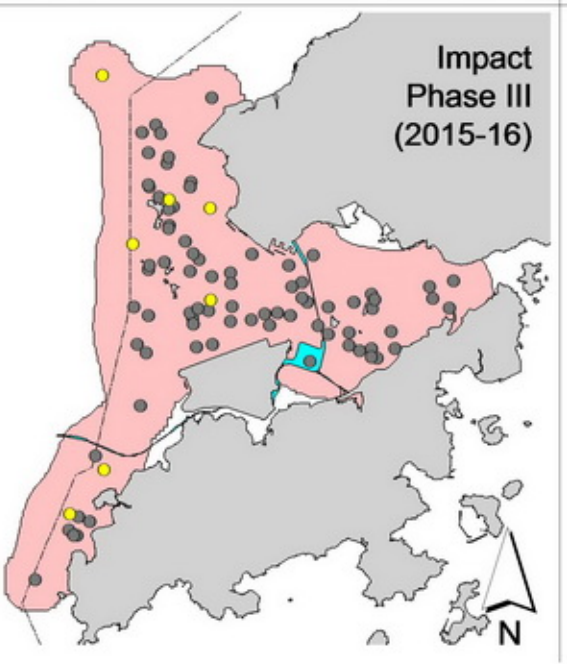
Appendix V. (cont'd)





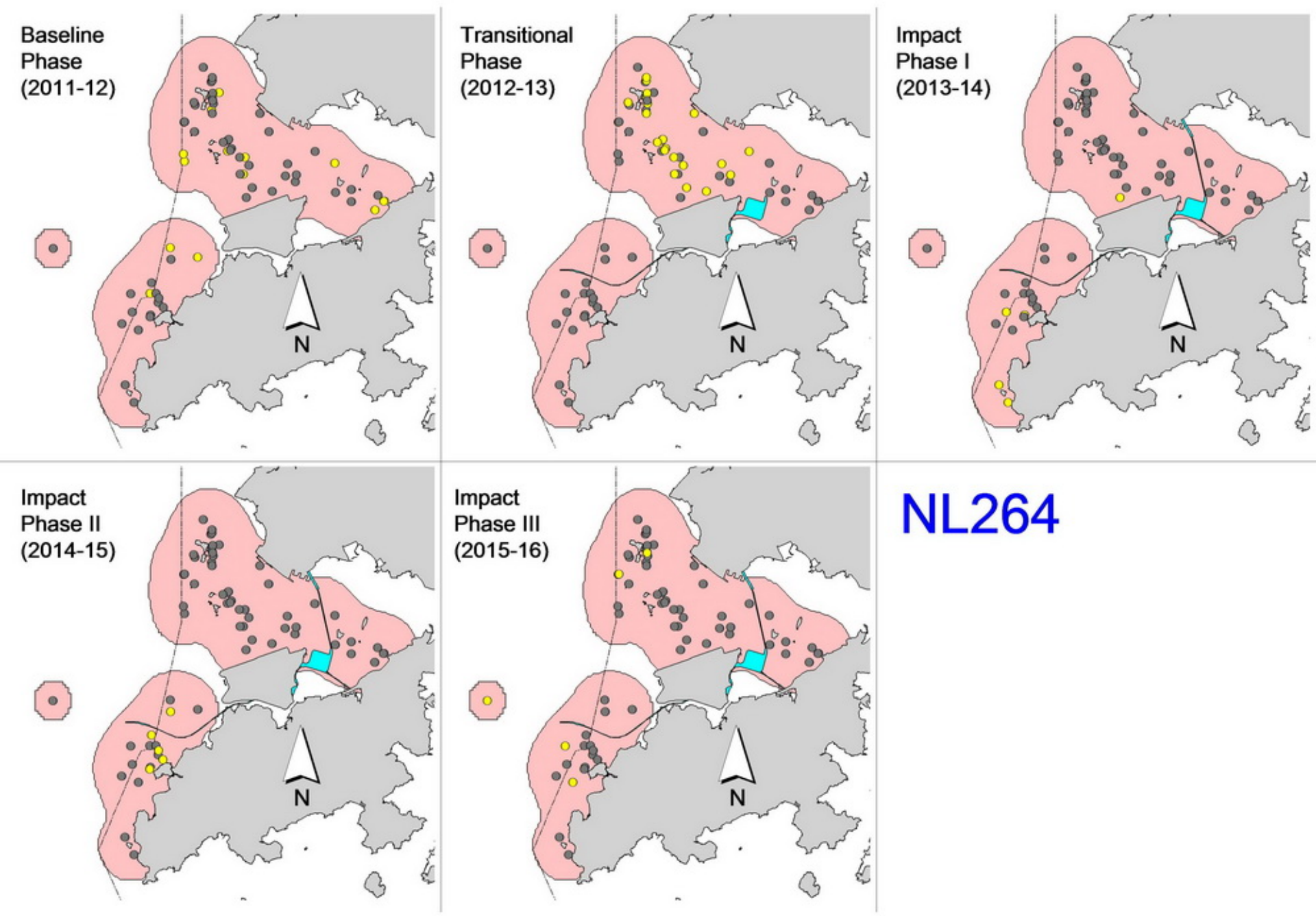




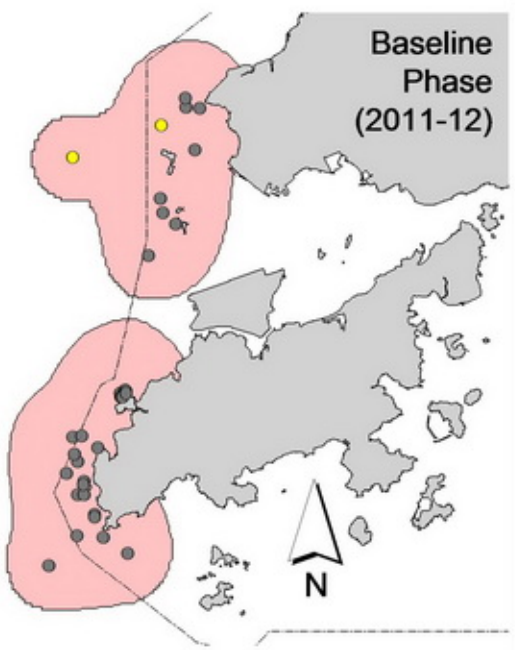


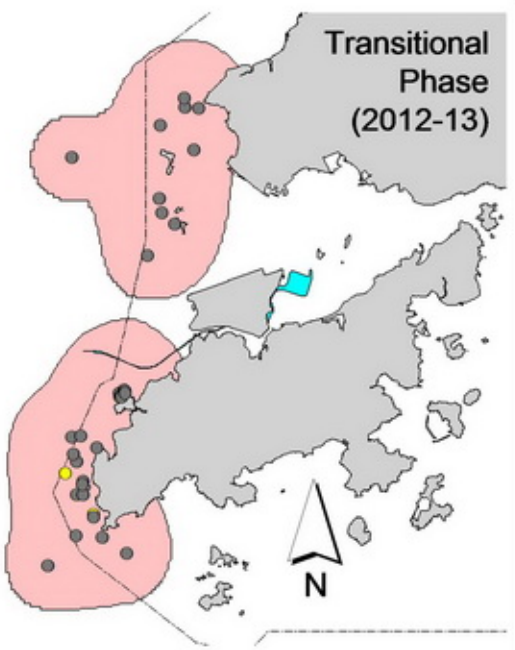
NL261

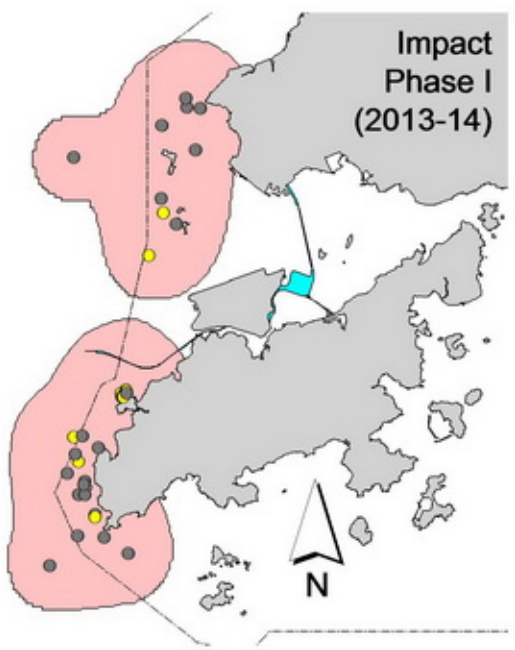
Appendix V. (cont'd)

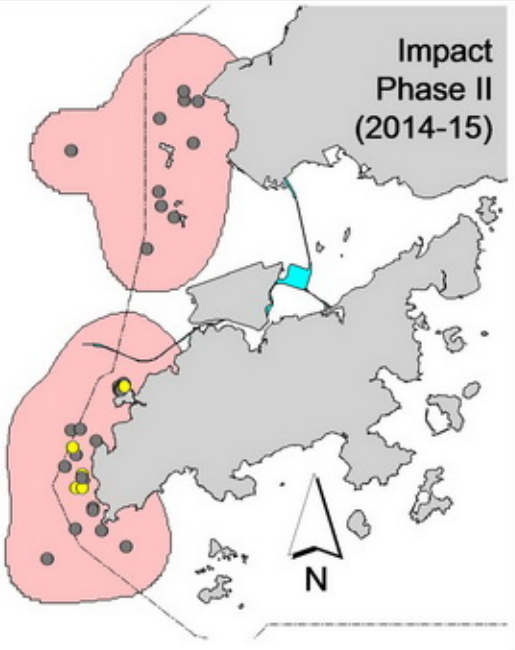


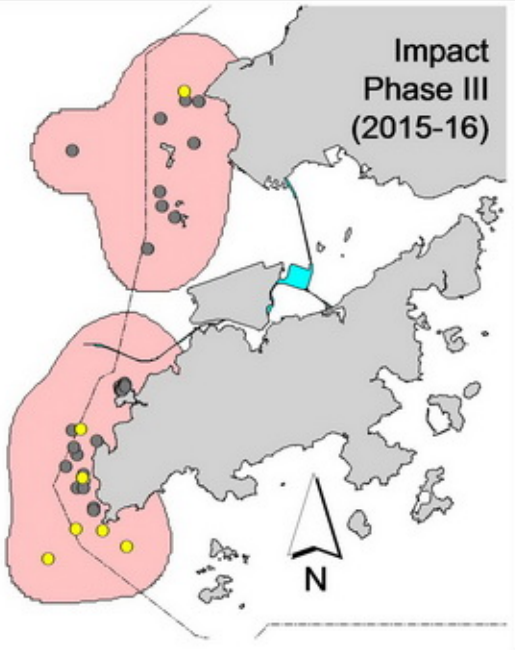
Appendix V. (cont'd)











NL269

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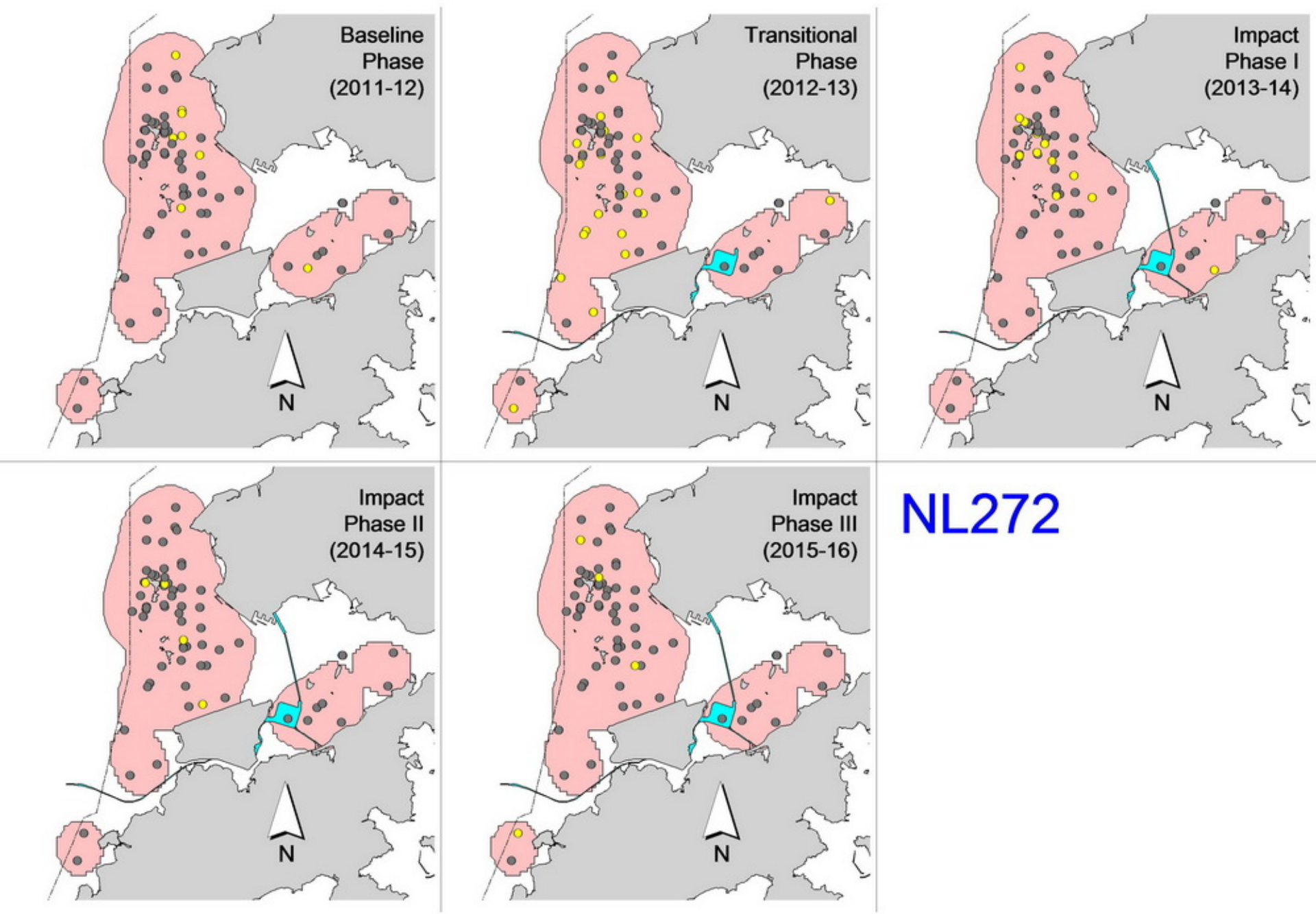
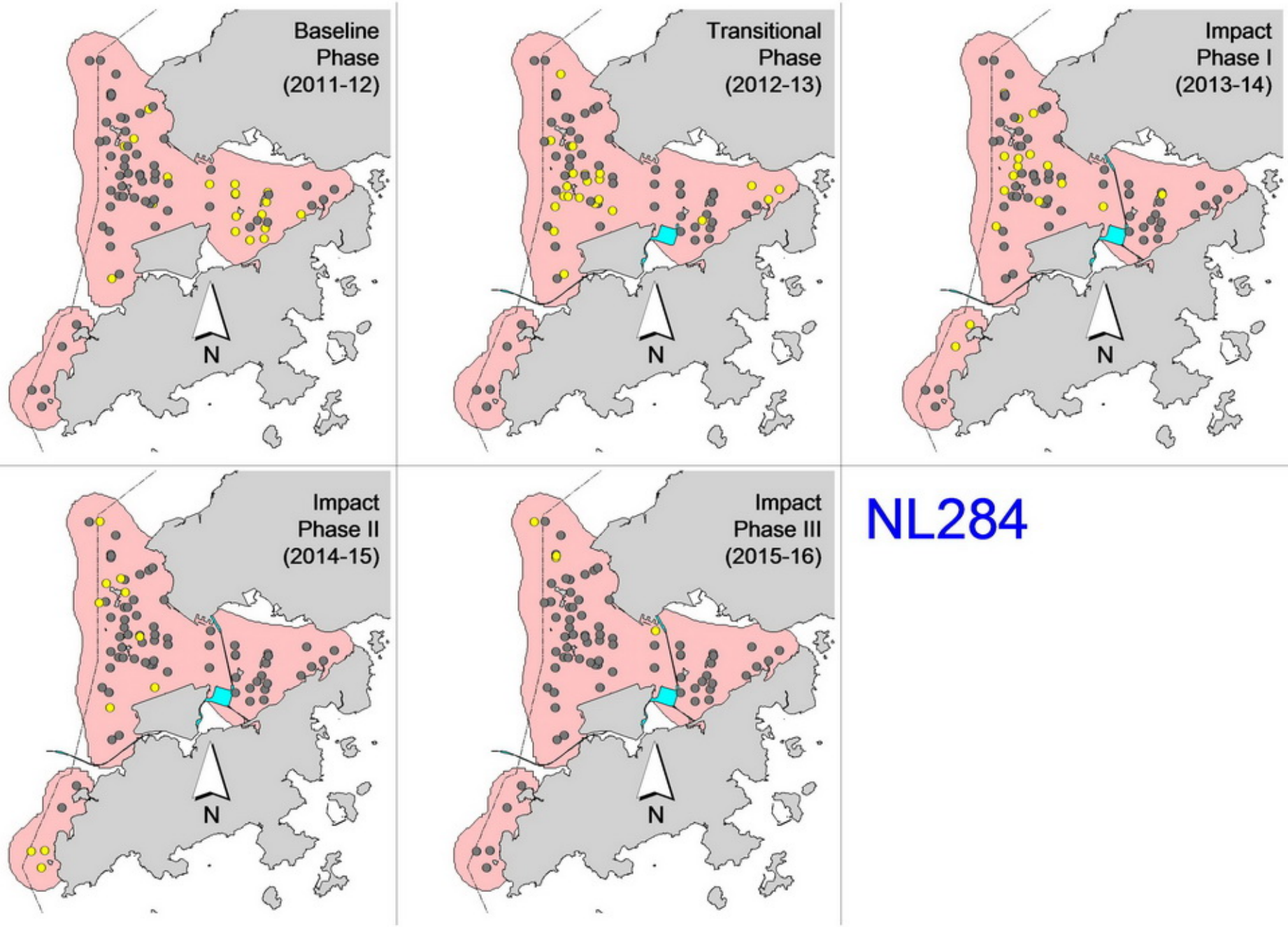


Appendix V. (cont'd)



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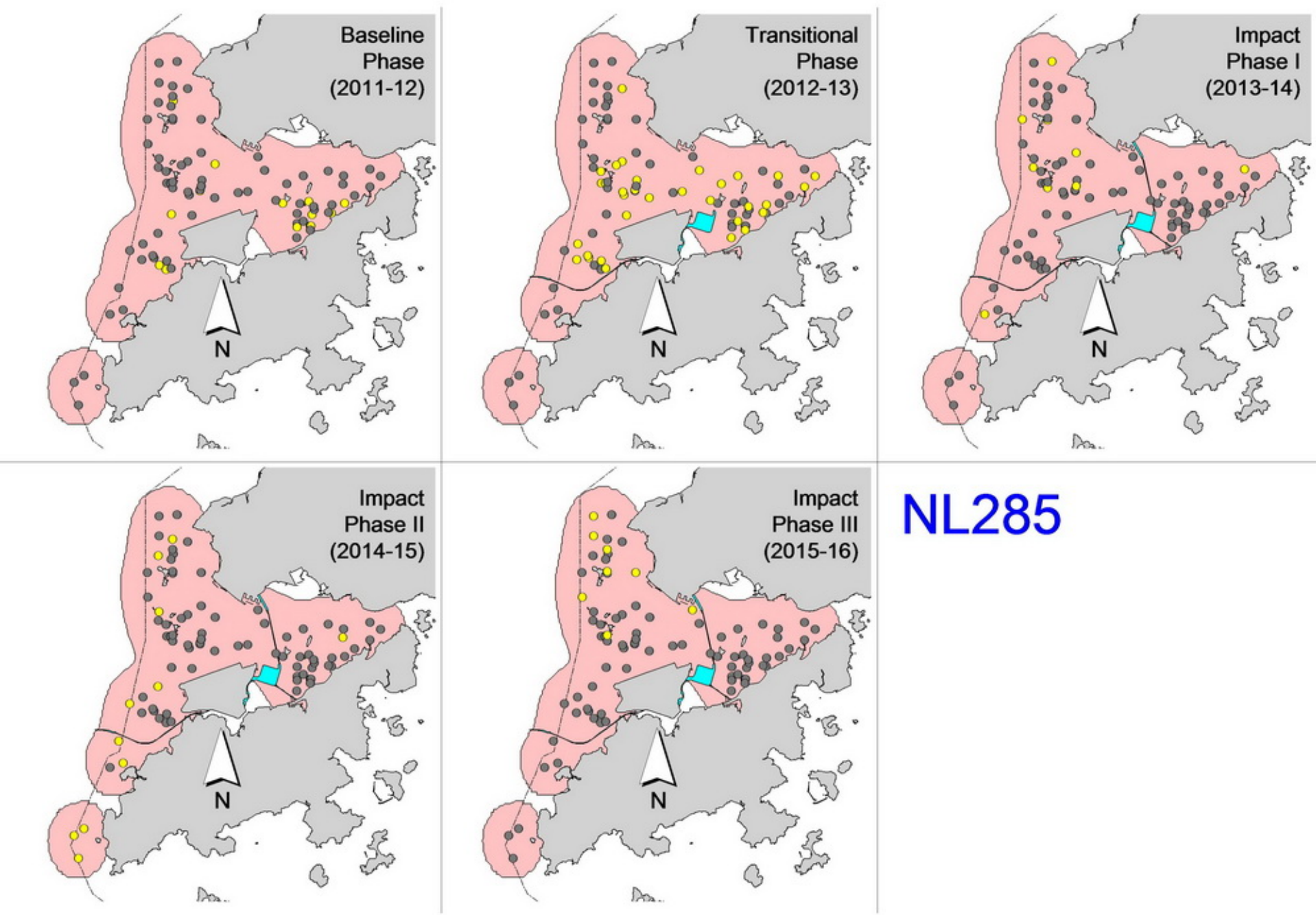

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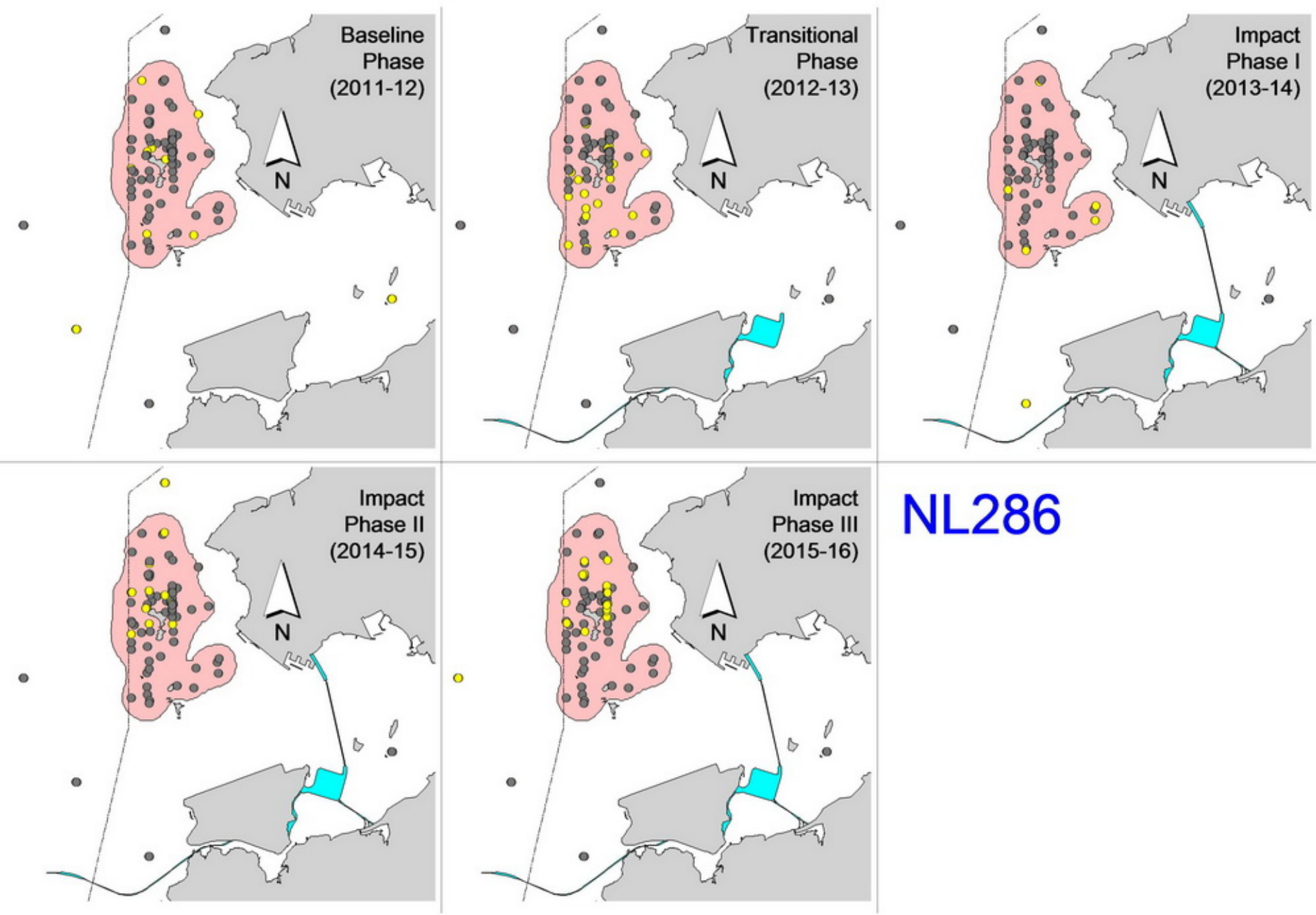

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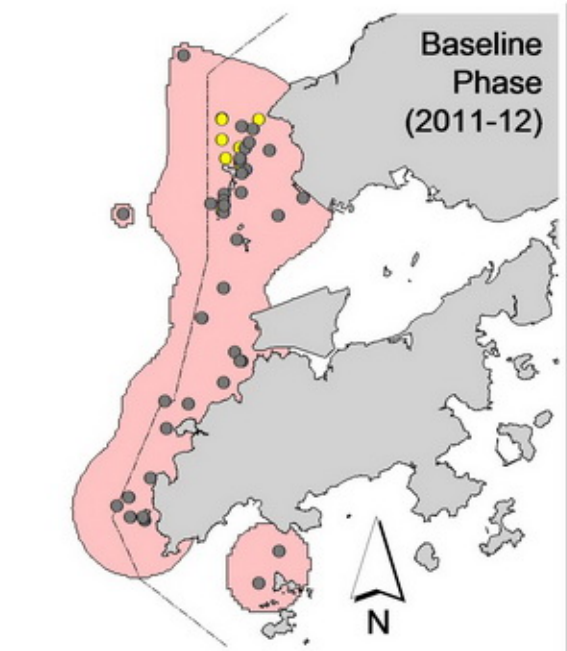

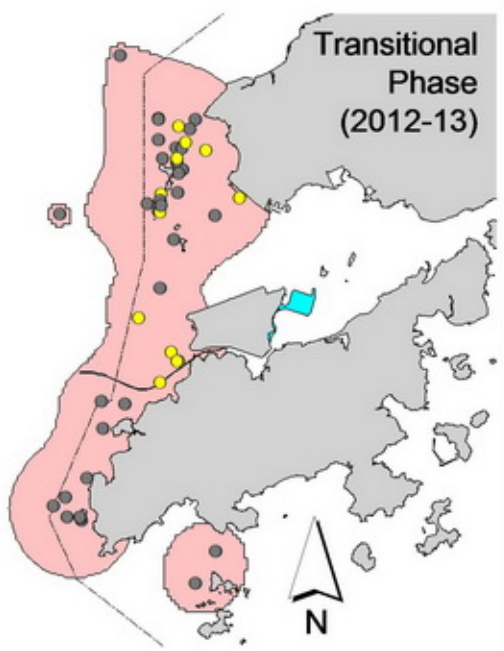

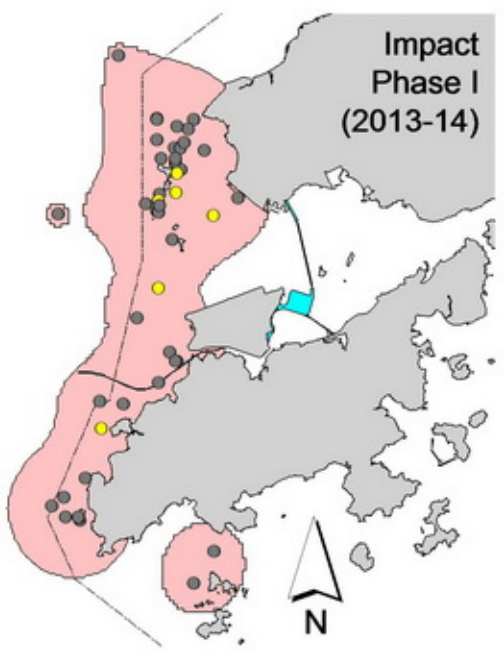

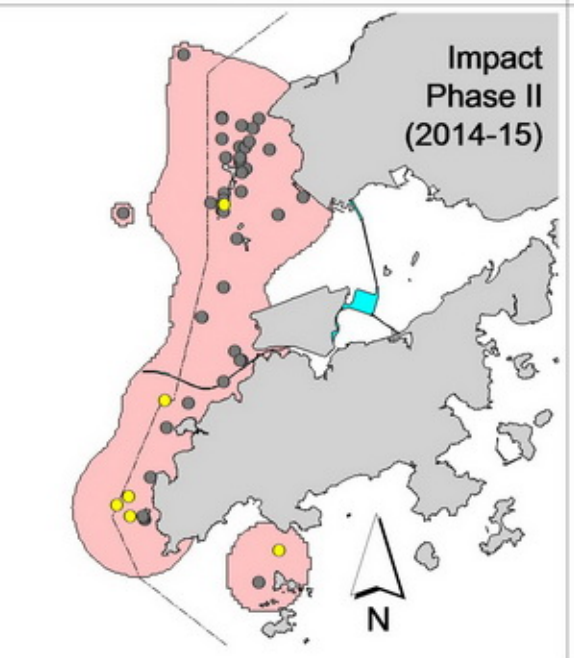

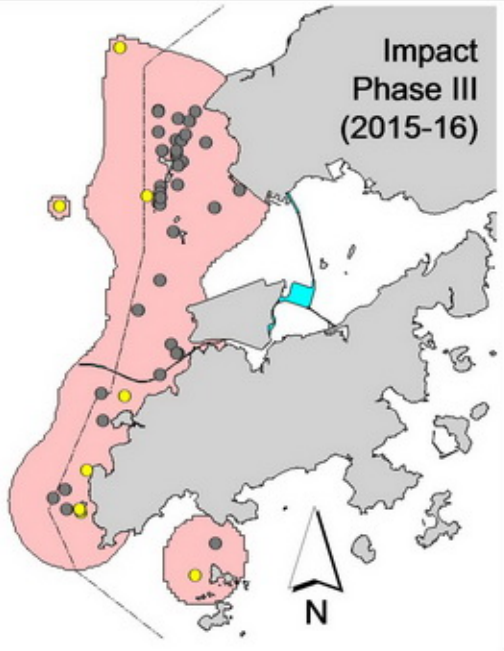

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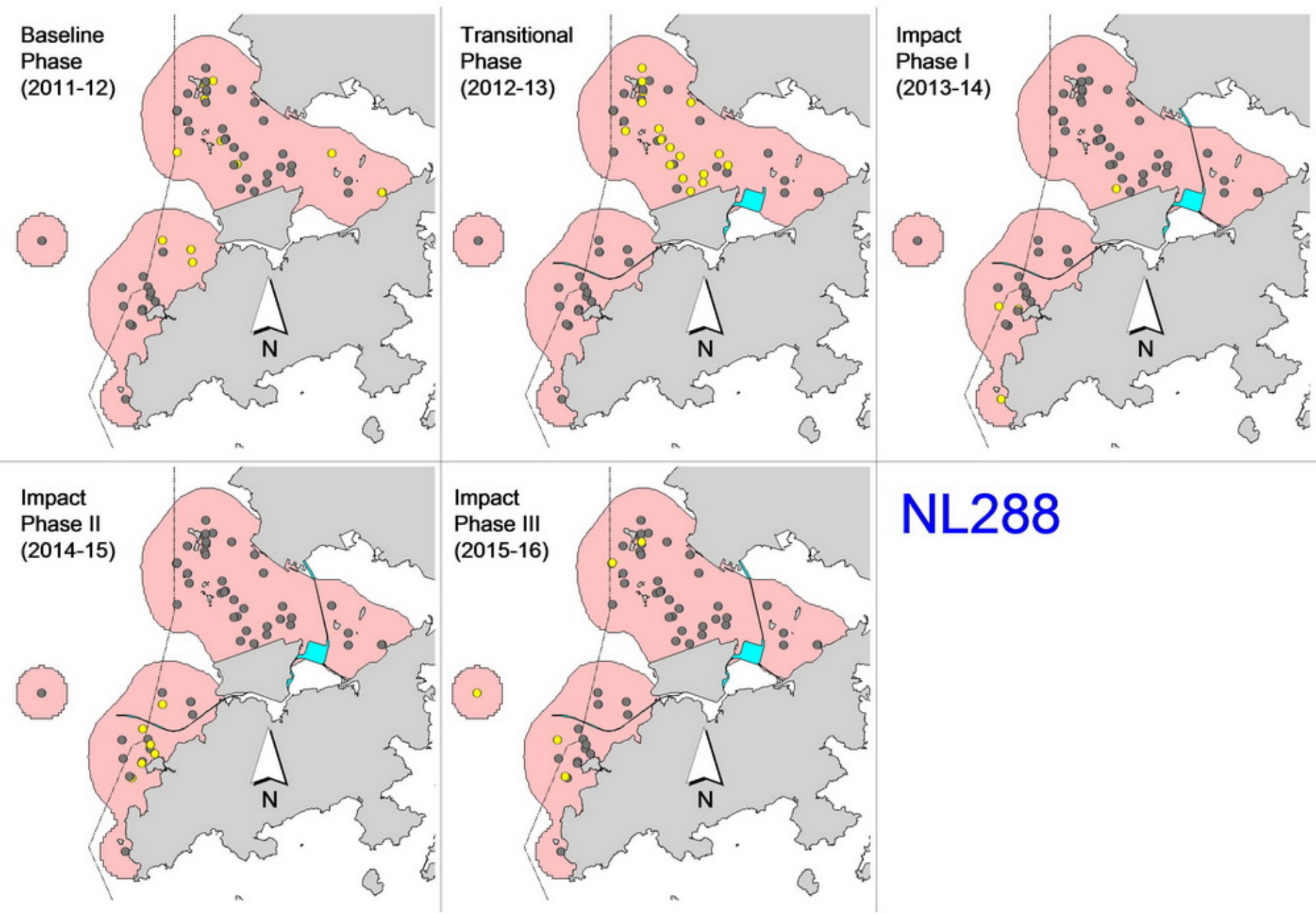

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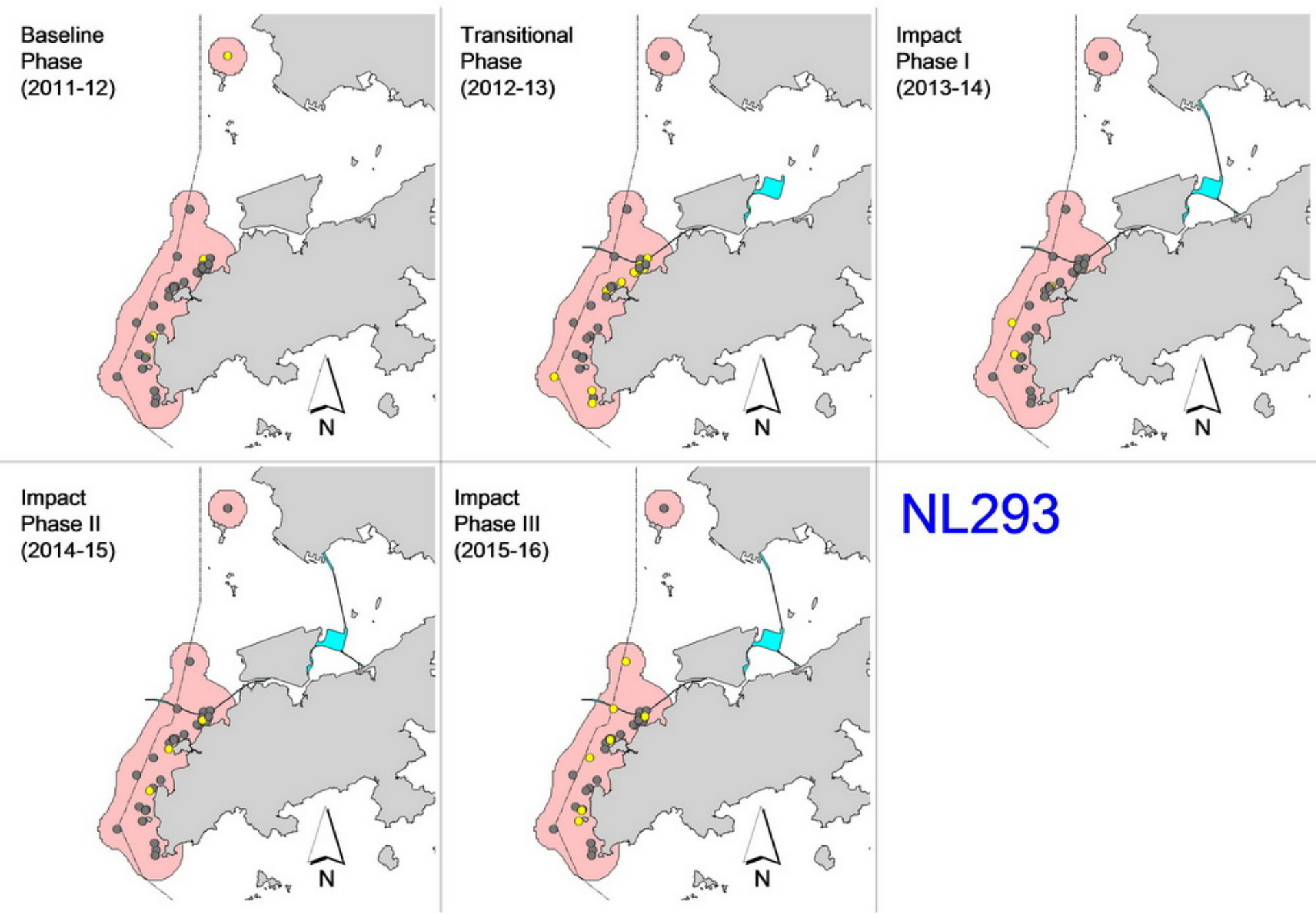

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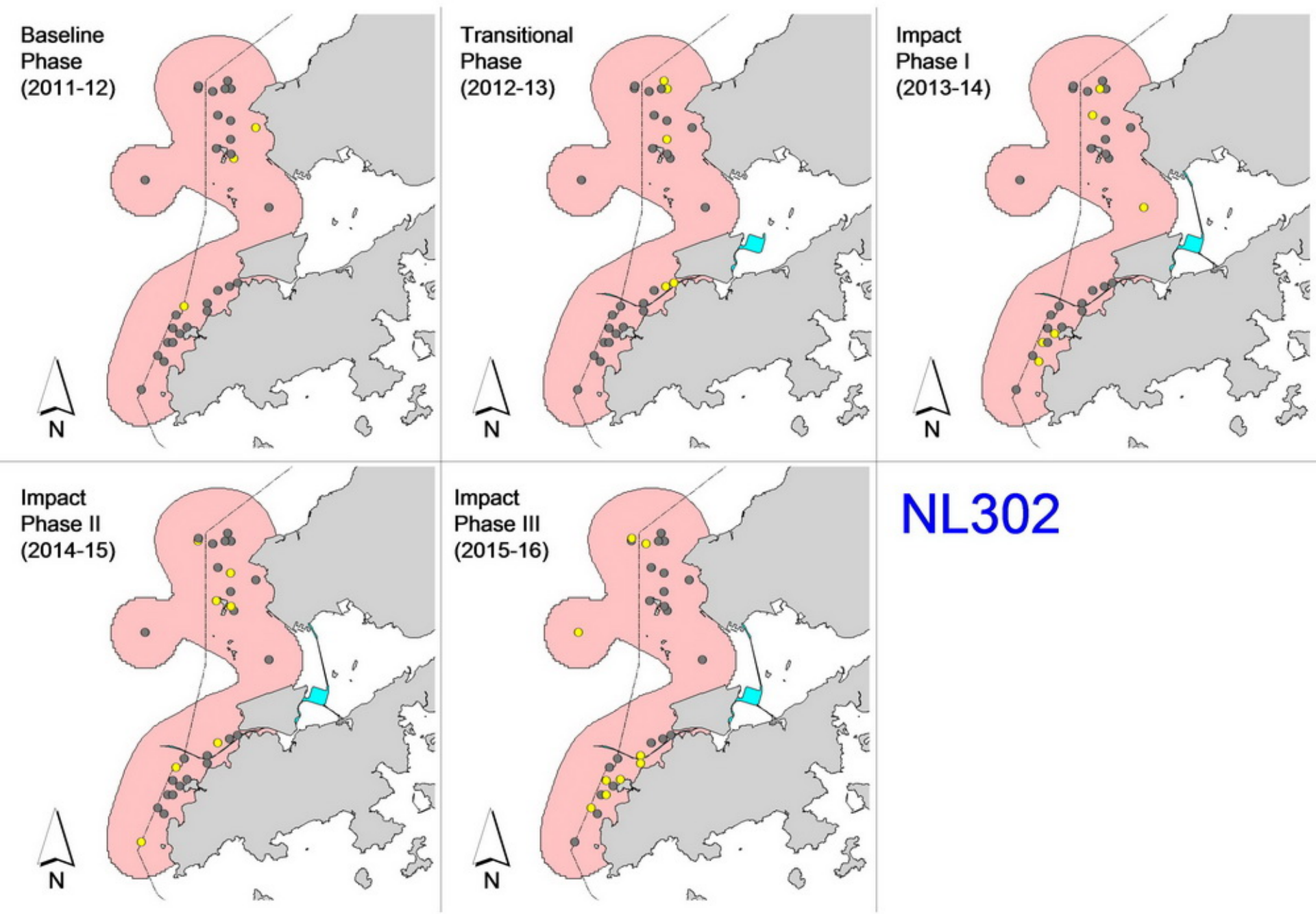

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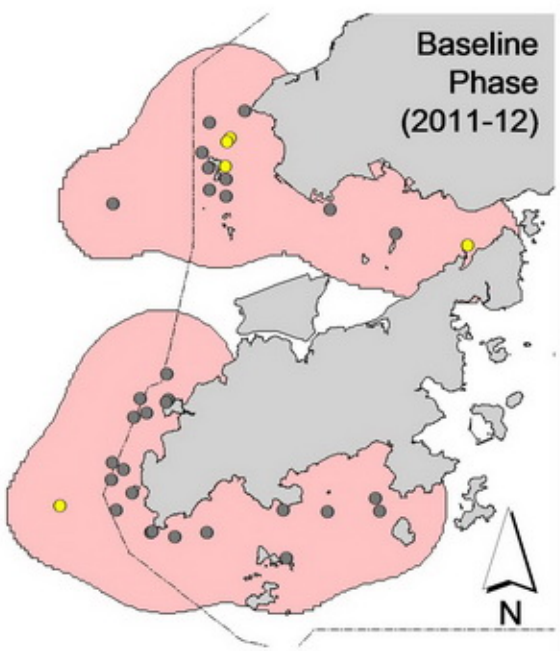

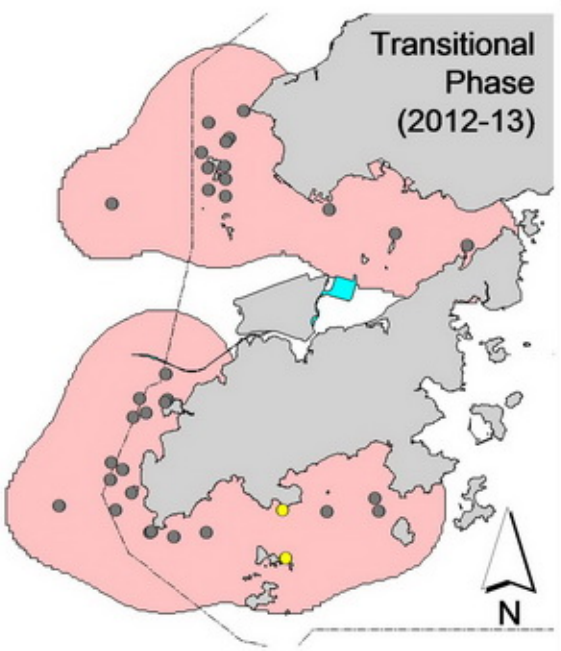

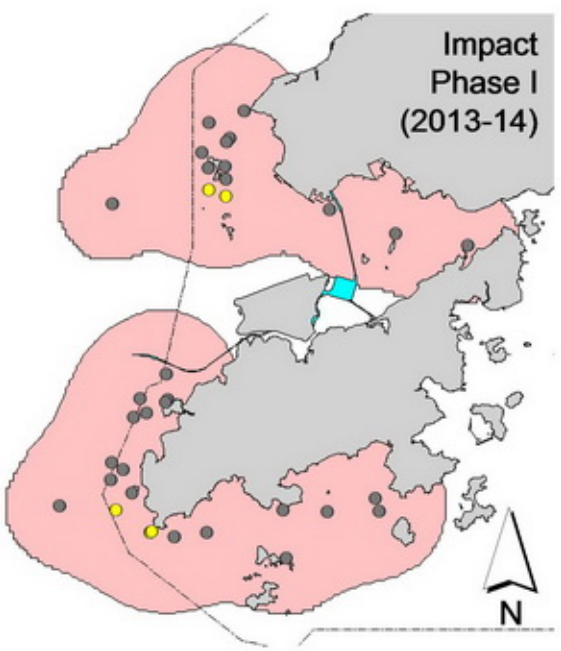

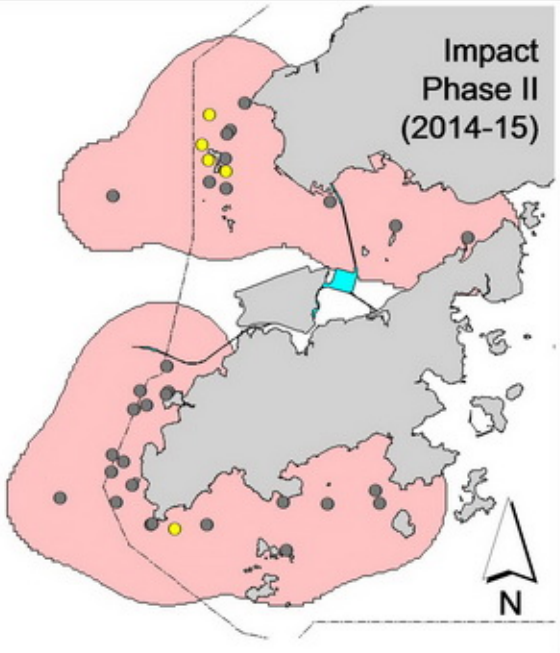

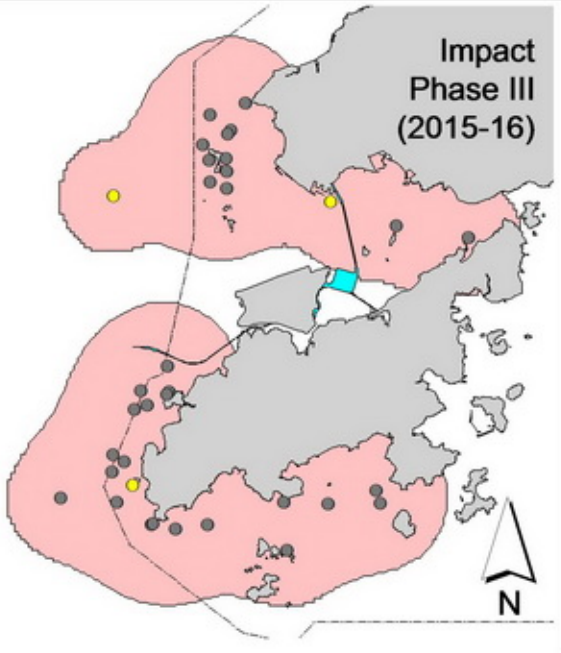

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Appendix V. (cont'd)

Appendix H

Event Action Plan

AppendixH1 Event/ Action Plan for Air Quality

	ACTION			
EVENT	**ET [(1)]**	**IEC [(1)]**	**SOR[(1)]**	**Contractor**
Action Level				
1. Exceedance for one sample	1. Identify the source. 2. Inform the IEC and the SOR. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2. Exceedance for two or more consecutive samples	1. Identify the source. 2. Inform the IEC and the SOR. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Discuss with the IEC and the Contractor on remedial actions required. 6. If exceedance continues, arrange meeting with the IEC and the SOR. 7. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check the Contractor's working method. 3. Discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial actions to IEC within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate

	ACTION			
EVENT	**ET** [(1)]	**IEC** [(1)]	**SOR** [(1)]	**Contractor**
Limit Level				
1. Exceedance for one sample	1. Identify the source. 2. Inform the SOR and the DEP. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily. 5. Assess effectiveness of Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. Discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures are properly implemented.	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	1. Notify the IEC, the SOR, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 6. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken. 7. Assess effectiveness of the Contractor's remedial actions	1. Discuss amongst the SOR, ET and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

and keep the IEC, the DEP and the SOR informed of the results. 8. If the exceedance stops, cease additional monitoring.	

Appendix H2 Event/ Action Plan for Construction Noise

	ACTION			
EVENT	**ET**	**IEC**	**SOR**	**Contractor**
Action Level	1. Notify the IEC and the Contractor. 2. Carry out investigation. 3. Report the results of investigation to the IEC and the Contractor. 4. Discuss with the Contractor and formulate remedial measures. 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET. 2. Review the proposed remedial measures by the Contractor and advise the SOR accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC 2. Implement noise mitigation proposals
Limit Level	1. Notify the IEC, the SOR, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurement to confirm findings. 4. Increase monitoring frequency. 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. 6. Inform the IEC, the SOR and the DEP the causes & actions taken for the exceedances. 7. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results. 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst the SOR, the ET and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

Appendix H3 Event/ Action Plan for Water Quality

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

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

Appendix H4 Implementation of Event-Action Plan for Dolphin Monitoring

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

Event	ET Leader	IEC	SOR	Contractor
Limit Level	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, ER/SOR and Contractor of findings; 5. Check monitoring data; 6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary; 7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, ER/SOR and Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to modify the perimeter silt curtain or consider to control/temporarily stop relevant construction activity etc.) and submit to IEC a proposal of additional dolphin monitoring and/or mitigation measures where necessary.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and findings with the ET and the Contractor; 3. Attend the meeting to discuss with ET, ER/SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures; 4. Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and advise ER/SOR of the results and findings accordingly; 5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise ER/SOR the results and findings accordingly.	1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures; 2. If ER/SOR is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, ER/SOR to signify the agreement in writing on such proposals and any other mitigation measures; 3. Supervise the implementation of additional monitoring and/or any other mitigation measures.	1. Inform the ER/SOR and confirm notification of the non- compliance in writing; 2. Attend the meeting to discuss with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other potential mitigation measures; 3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary; 4. Implement the agreed additional dolphin monitoring and/or any other mitigation measures.

Appendix H5 Event and Action Plan on Dolphin Acoustic Behaviour

EVENT	ACTION			
	ET Leader	**IEC**	**SO**	**Contractor**
Action Level With the numerical values presented in *Table 5.7* of *Baseline Monitoring Report*, when any of the response variable for dolphin acoustic behaviour recorded in the construction phase monitoring is 20% lower or higher than that recorded in the baseline monitoring (see *Table 5.8* of *Baseline Monitoring Report*), or when there is a difference of 20% in dolphin acoustic signal detection at nighttime period at Site C1 only, the action level should be triggered	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SO and Contractor; 5. Check monitoring data; 6. Carry out audit to ensure all dolphin protective measures are implemented fully and additional measures be proposed if necessary	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring with the ET and the Contractor;	1. Discuss with the IEC the repeat monitoring and any other measures proposed by the ET; 2. Make agreement on measures to be implemented.	1. Inform the SO and confirm notification of the non- compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SO; 3. Implement the agreed measures.

EVENT	ACTION			
	ET Leader	**IEC**	**SO**	**Contractor**
Limit Level With the numerical values presented in Table 5.7 of *Baseline Monitoring Report*, when any of the response variable for dolphin acoustic behaviour recorded in the construction phase monitoring is 40% lower or higher than that recorded in the baseline monitoring (see Table 5.8 of *Baseline Monitoring Report*), or when there is a difference of 40% in dolphin acoustic signal detection at nighttime at Site C1 only, the limit level should be triggered	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SO and Contractor; 5. Check monitoring data; 6. Carry out audit to ensure all dolphin protective measures are implemented fully and additional measures be proposed if necessary 7. Discuss additional dolphin monitoring and any other potential mitigation measures (eg consider to temporarily stop relevant portion of construction activity) with the IEC and Contractor.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring with the ET and the Contractor; 3. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise ER accordingly.	1. Discuss with the IEC the repeat monitoring and any other measures proposed by the ET; 2. Make agreement on measures to be implemented.	1. Inform the SO and confirm notification of the non- compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SO; 3. Implement the agreed measures.

Abbreviations: ET – Environmental Team, IEC – Independent Environmental Checker, SO – Supervising Office, DEP – Director of Environmental Protection

Appendix I

Summary of Waste Flow Table

Contract No. : HY/2012/07
Tuen Mun Chek Lap Kok Link – Southern Connection Viaduct Section
Monthly Summary Waste Flow Table for 2015 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation						Actual Quantities of Recyclables Generation			
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fills	Imported Fill	Marine Sediment, Cat. L	Marine Sediment, Cat. Mp	Marine Sediment, Cat. Mf	Marine Sediment, Cat. H	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
Unit	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	13.578	0.081	0.990	-	12.474	0.115	0.178	0.229	0.258	-	-	132.170	-	61.380	0.091	-
Feb	6.233	0.148	0.461	-	5.759	0.014	0.801	0.110	0.223	-	0.400	141.020	-	73.690	0.112	-
Mar	10.149	0.220	0.473	-	9.600	0.077	0.618	0.073	0.149	-	-	120.940	-	9.140	0.203	-
Apr	9.986	0.410	2.261	-	7.694	0.032	-	-	-	-	-	133.630	-	2.740	0.105	-
May	8.870	0.177	0.779	-	8.091	-	0.550	-	-	-	-	107.920	-	13.070	0.042	-
Jun	8.627	0.132	1.462	-	7.166	-	0.324	0.118	0.169	-	0.017	89.930	-	2.000	0.119	-
SUB-TOTAL	**57.444**	**1.168**	**6.424**	**-**	**50.782**	**0.238**	**2.471**	**0.530**	**0.799**	**-**	**0.417**	**725.610**	**-**	**162.020**	**0.672**	**-**
Jul	4.520	0.137	2.121	-	2.322	0.078	-	-	-	-	1.400	111.570	-	-	0.105	-
Aug	1.992	0.203	0.352	-	1.265	0.375	-	-	-	-	1.200	87.760	-	-	0.133	-
Sep	4.148	0.160	0.623	-	3.525	-	-	-	-	-	0.600	66.680	-	-	0.105	-
Oct	2.286	0.317	0.651	-	1.635	-	-	-	-	-	-	102.080	-	-	0.084	-
Nov	1.571	0.273	0.725	-	0.204	0.642	-	-	-	-	2.000	64.740	-	-	0.098	-
Dec	0.714	0.216	0.516	-	0.198	-	-	-	-	-	-	66.000	-	-	-	-
TOTAL	**72.675**	**2.476**	**11.412**	**-**	**59.930**	**1.333**	**2.471**	**0.530**	**0.799**	**-**	**5.617**	**1,224.440**	**-**	**162.020**	**1.197**	**-**

Notes :

1 - The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.

2 - Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.

3 - Broken concrete for recycling into aggregates.

4 - Assumed 5 kg per damaged water-filled barrier.

5 - 'Reused in the Contract' and 'Disposed as Public Fills' include 'Hard Rock and Large Broken Concrete'.

Contract No. : HY/2012/07
Tuen Mun Chek Lap Kok Link – Southern Connection Viaduct Section
Monthly Summary Waste Flow Table for 2016 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation						Actual Quantities of Recyclables Generation			
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fills	Imported Fill	Marine Sediment, Cat. L	Marine Sediment, Cat. Mp	Marine Sediment, Cat. Mf	Marine Sediment, Cat. H	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
Unit	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	1.941	0.263	0.606	-	1.334	-	-	-	-	-	-	69.400	-	-	0.105	-
Feb	0.783	0.185	0.092	-	0.692	-	-	-	-	-	-	85.890	-	-	0.112	-
Mar	1.502	0.429	0.537	-	0.965	-	-	-	-	-	2.000	88.360	-	-	-	-
Apr	1.354	0.402	0.789	-	0.565	-	-	-	-	-	3.000	79.580	-	8.640	0.084	-
May	1.057	0.192	0.617	-	0.440	-	-	-	-	-	3.000	75.620	-	-	-	-
Jun	0.499	0.277	0.116	-	0.383	-	-	-	-	-	-	103.270	-	-	0.105	-
SUB-TOTAL	**7.136**	**1.747**	**2.757**	**-**	**4.379**	**0.000**	**-**	**-**	**-**	**-**	**8.000**	**502.120**	**-**	**8.640**	**0.406**	**-**
Jul	0.507	0.211	0.230	-	0.277	-	-	-	-	-	2.200	94.760	-	1.540	0.350	-
Aug	1.294	0.144	0.684	-	0.610	-	-	-	-	-	-	116.990	-	9.790	0.098	-
Sep	2.584	0.155	0.270	-	2.314	-	-	-	-	-	-	130.060	-	-	0.105	-
Oct	2.338	0.180	0.156	-	2.183	-	-	-	-	-	-	141.300	-	-	0.028	-
Nov				-		-	-	-	-	-			-			-
Dec				-		-	-	-	-	-			-			-
TOTAL	**13.858**	**2.437**	**4.096**	**-**	**9.762**	**-**	**-**	**-**	**-**	**-**	**10.200**	**985.230**	**-**	**19.970**	**0.987**	**-**

Notes :

1 - The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.

2 - Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.

3 - Broken concrete for recycling into aggregates.

4 - Assumed 5 kg per damaged water-filled barrier.

5 - Disposed as Public Fills includes Hard Rock and Large Broken Concrete.

Appendix J

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

Appendix J1 Cumulative Statistics on Exceedances

		Total No. recorded in this reporting period	Total No. recorded since project commencement
1-Hr TSP	Action	0	0
	Limit	0	0
24-Hr TSP	Action	0	2
	Limit	0	0
Noise	Action	0	0
	Limit	0	0
Water Quality	Action	0	2
	Limit	0	0
Impact Dolphin Monitoring	Action	2	9
	Limit	3	6

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

Reporting Period	Cumulative Statistics		
	Complaints	Notifications of Summons	Successful Prosecutions
This Reporting Period (Nov 2015 – Oct 2016)	1	0	0
Total No. received since project commencement	5	0	0