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Improvement Dredging for Lamma Power Station Navigation Channel

Proposal on Enhancement of Water Quality Monitoring near the Project Site

October 2018

The Hongkong Electric Company Limited

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香港電燈有限公司
The Hongkong Electric Co., Ltd.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ORDINANCE, CAP. 499

ENVIRONMENTAL PERMIT NO. EP-535/2017

IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

Report Title	Proposal on Enhancement of Water Quality Monitoring near the Project Site (October 2018)
Date	31 October 2018
Certified by	(Mr. Kenneth Fung, Environmental Team Leader)
Verified by	Mr. Y T Tang (AECOM Asia Company Limited, Independent Environmental Checker)

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1 Introduction

An application for Environmental Permit (EP) for the “Improvement Dredging for Lamma Power Station Navigation Channel” (the Project) was submitted on 29 March 2017 (Application No. AEP- 535/2017) with the support of an Environmental Impact Assessment (EIA) Report. The EIA Report (Register No.: AEIAR-212/2017) was exhibited for public inspection from 9 June 2017 to 8 July 2017 and a consultation with the Advisory Council on the Environment (ACE) was held on 14 August 2017. On 10 October 2017, the Director of Environmental Protection (DEP) approved the EP application with conditions under Section 8(3) of the EIA Ordinance.

The Hongkong Electric Company Limited (HK Electric) has commissioned Mott MacDonald Hong Kong Limited as the environmental consultant for undertaking pre-construction phase baseline review services. This proposal is prepared in accordance with the requirements specified in Clause 2.12 of the EP (No. EP-535/2017) and details the specifications for enhancement of water quality monitoring near the Project site.

2 Proposal for Enhancement of Water Quality Monitoring

2.1 Enhanced Monitoring Locations near Project Site (Near Stations)

As required by the EP for this Project, additional location(s) of water quality monitoring stations near the Project site boundary are proposed.

To represent the 'near the Project site' boundary, and taking into account the proximity of the nearest sensitive receivers, which are approx. 600m away from the Project boundary, a 300m buffer distance was adopted for placing the 'near' stations.

A total of 5 near stations are proposed, the locations are shown in **Figure 1**. These near stations are strategically located based on the following requirements:

- At least one near station along the boundary of each dredging zone
- The near station should lie between the project and the nearest sensitive receiver

Based on the latest information on the sensitive receivers representing marine ecological habitats as reviewed in the latest Marine Ecological Baseline Review (MEBR) Report for the Project, the location of the sensitive receiver stations as specified in the EM&A Manual are still representative. Therefore, no change to the sensitive receiver locations are required, and the proposed locations of the near stations are aligned according to the nearest sensitive receivers as shown in **Figure 1**. The locations of the near stations in 1:5,000 scale are shown in **Figures 2 to 5**. The coordinates of the near stations are shown in **Table 1**.

Table 1: Near Station Locations

ID	Station	Easting	Northing	Remarks
A1	Near station for Zone 1	828543	809573	For monitoring potential impacts to SR5 and SR4 during flood tide
A2	Near station for Zone 2	829053	807945	For monitoring potential impacts to SR1 and SR2 during flood tide
A3	Near station for Zone 3	829187	807100	For monitoring potential impacts to SR3 during both flood and ebb tide
A4	Near station for Zone 4 (east)	829427	805520	For monitoring potential impacts to SR6 during ebb tide
A5	Near station for Zone 4 (south)	829267	805134	For monitoring potential impacts to SR7 during ebb tide

It is noted that the EM&A Manual for the Project specified three gradient stations (A1 to A3), which are located far away from the Project boundary, and were intended as simply additional water quality data points for facilitating investigations of exceedances at sensitive receiver stations (i.e. to provide additional information for verifying whether exceedances are due to Project activities).

With the adoption of these near stations which are located adjacent to the Project site boundary (and hence are able to provide more representative information for verifying exceedances at sensitive receivers), the original gradient station locations as specified in the EM&A Manual becomes unnecessary. Therefore, the three original gradient stations A1 to A3 are effectively

re-located to become near stations A1 to A3, and along with two new near stations (A4 and A5), make up the enhanced monitoring locations as listed in **Table 1**. The full list of water quality monitoring stations is shown in **Table 2**.

Table 2: List of Water Quality Monitoring Stations

ID	Station
SR1	HK Electric Power Station intake
SR2	Hung Shing Yeh beach
SR3	Lo So Shing beach
SR4	Marine ecological habitat at Pak Kok
SR5	Marine ecological habitat at Shek Kok Tsui
SR6	Marine ecological habitat at Ha Mei Wan
SR7	Marine ecological habitat at southwest of Lamma
SR8	Fish culture zone at Lo Tik Wan
SR9	Fish culture zone at Sok Kwu Wan
SR10	Fish culture zone at Cheung Sha Wan
A1	Near station for Zone 1
A2	Near station for Zone 2
A3	Near station for Zone 3
A4	Near station for Zone 4 (east)
A5	Near station for Zone 4 (south)
C1	Control station 1
C2	Control station 2
C3	Control station 3

As the location of the sensitive receivers representing marine ecological habitats may change as a result of subsequent updates to the MEBR Report for the Project, the locations of the near stations should be reviewed after each update of the MEBR Report and where necessary, the ET shall propose updated locations for the near stations for verification by IEC and agreement by EPD.

2.2 Water Quality Monitoring Parameters

Parameters to be measured are dissolved oxygen (DO), dissolved oxygen saturation (DO%), pH, temperature, turbidity, salinity and water depth. Other relevant data should also be recorded, including monitoring location, time, tidal stages, weather conditions, sea conditions and any special phenomena and work underway at the Project site.

2.3 Sampling Procedures and Monitoring Equipment

All parameters shall be measured in-situ. The sampling procedures and monitoring equipment shall follow those specified in Section 2.3 of the EM&A Manual. The monitoring requirements specified in Section 2.6 of the EM&A Manual shall also apply.

2.4 Baseline Monitoring

Baseline monitoring at the near stations should be conducted at the same time as the baseline monitoring for the sensitive receiver stations, following the requirements specified in Section 2.6.1 and Table 2-2 of the EM&A Manual. However, the baseline data will not be used to

determine Action and Limit Levels at the near stations. At the near stations, Alert Levels will be set. Details of the method for deriving Alert Levels is presented in **Section 3**.

2.5 Impact Monitoring

Impact monitoring at the near stations should be conducted at the same time as the impact monitoring for the sensitive receiver stations, following the requirements specified in Section 2.6.2 of the EM&A Manual. In case of exceedances of Alert Levels at the near stations, the Alert Action Plan shall be instigated immediately.

2.6 Alert Action Plan

The Alert Action Plan applies to exceedances of Alert Levels at the near stations only. Exceedances at the impact monitoring stations (i.e. the SR stations listed in **Table 2**) shall follow the Event and Action Plan in Table 2-4 of the EM&A Manual.

Upon identification of an exceedance of Alert Level, the actions specified in **Table 3** shall be implemented. Where applicable, the alert related actions shall proceed in parallel with the Event and Action Plan in Section 2.7 of the EM&A Manual.

Table 3: Alert Action Plan

Action	Action By	Outcome	Follow Up Action	Follow Up Action By
1. Repeat in-situ measurement to confirm findings	ET	No exceedance in repeat measurement	No further action required	
		Exceedance identified in repeat measurement	*Proceed to Action 2*	
2. Check impact monitoring station results	ET	a. No exceedance of Action or Limit Level	Notify IEC, Engineer and Contractor	ET
			Obtain and record Contractor's working methods and the status of existing mitigation measures implemented	ET
			Identify any unacceptable practice	ET, IEC, Engineer
			Rectify any unacceptable practice	Contractor
			Proceed to Action 3	
		b. Exceedance of Action or Limit Level	Initiate Event and Action Plan in Table 2-4 of the EM&A Manual	ET, IEC, Engineer, Contractor
			Proceed to Action 3	

Action	Action By	Outcome	Follow Up Action	Follow Up Action By
3. Check for repeated cases of Outcome 2a or 2b	ET	No consecutive repeats of Outcome 2a or 2b	No further action required	
		Consecutive repeats of Outcome 2a	Review Contractor's working methods / mitigation measures and discuss with IEC, Engineer and Contractor	ET
			Identify and agree on improvements such as changes in working methods and/or additional mitigation measures	ET, IEC, Engineer, Contractor
			Implement the recommended improvements	Contractor
		Consecutive repeats of Outcome 2b	Review alert levels and propose revised alert levels where necessary to prevent exceedances at impact stations (due to project activities)	ET
			Verify the revised alert levels	IEC
			Notify and agree with EPD on revised alert levels	ET, Project Proponent

2.7 Reporting

All instances of exceedance of Alert Levels and the subsequent actions under the Alert Action Plan shall be recorded by the ET and verified by the IEC.

3 Method for Deriving Alert Levels

3.1 Purpose of Alert Levels

The purpose of the Alert Levels is to provide indication of potential water quality impacts arising from the Project, so that relevant Alert Action can be taken. Data from the near stations would also be used to facilitate exceedance investigations of Action and/or Limit Level exceedances at the sensitive receiver stations in accordance with the EM&A Manual.

Alert Levels will be set for DO (in mg/l) and turbidity (in NTU), as these parameters are measured in-situ, enabling the results to be analysed relatively quickly to facilitate timely actions if necessary. Turbidity would be used as an indicator of suspended solid (SS) concentrations arising from the Project's dredging activities.

3.2 Method for Deriving Alert Levels for Turbidity

To meet the purpose as specified in **Section 3.1**, the values set for Alert Levels should be relatable to the predicted and/or actual concentrations at the nearest sensitive receiver stations. However, prior to commencing the first improvement dredging works for the Project, it is recognised that there is a lack of real (field) data on the relationship between turbidity at the near station versus turbidity at the sensitive receivers.

To address this issue, a method for deriving Initial Alert Levels is proposed. Once there is adequate field data (e.g. at least 2 months' worth of impact monitoring field data taken during the dredging activities of the Project) to verify the adequacy of the Initial Alert Levels, the Alert Levels would be finalised and applied for the remaining duration of the Project. If there is a large discrepancy between Initial Alert Levels and field data, calculation of new Alert Levels shall be carried out and submitted to EPD for approval under Clause 2.12 of the EP.

3.2.1 Initial Alert Levels for Turbidity

With reference to Appendix 3.7 of the approved EIA Report, the water quality model predicted the maximum SS concentrations arising from the Project's activities that would not cause exceedance of criteria limits at the sensitive receivers. While turbidity was not modelled, it is reasonable to assume that turbidity arising from Project's activities would be mostly (if not entirely) attributed to the release of SS due to the dredging works. Therefore, the modelled results for SS can be used to estimate the Alert Levels for turbidity, based on the following formula:

AML = (AS / SR) * ACL

whereby:

AML – Alert Level of turbidity at the near station

AS – Maximum SS concentration at 300m from Project boundary in the direction of the near station (approximated from the depth-averaged SS concentration contours extracted from Appendix 3.7 of the approved EIA report, as shown in **Appendix A**)

SR – Maximum SS concentration at the nearest SR station (depth-averaged SS concentration taken from Table 3.23 and Table 3.24 of the approved EIA report)

ACL – Action Level of turbidity derived at the nearest SR station (which will be determined from the baseline monitoring)

Taking into account the near station locations and the sensitive receiver locations as shown in **Figure 1**, the combination of values for AS and SR as extracted from the approved EIA report that would provide the smallest AS / SR ratio (i.e. the most conservative AML) are presented in **Appendix B** and summarised in **Table 4** for reference.

Table 4: Calculated AS / SR Ratio

Near Station	Nearest Sensitive Receiver Station	WSR ID (in EIA Report)	AS Value	SR Value	AS / SR
A1	SR5	CR2	8	2.6	3.1
A2	SR1	S1	10	5.2	1.9
A3	SR3	B2	6	0.2	30.0
A4	SR6	GT2	3	0.9	3.3
A5	SR7	FP3	3	1.2	2.5

As shown in **Table 4**, this method derives a reasonable AS / SR ratio for all near stations except for A3, whereby the derived ratio is very high due to the very low SS value at B2 from the approved EIA report. To address this issue, the AS / SR ratio at A3 is proposed to be obtained via interpolation of the AS / SR ratios from the nearest near stations, i.e. via interpolation of the values for A2 and A4 (based on the scenario of grab dredger in wet season, which corresponds with the worst case scenario for A3 as presented in **Appendix B**). The interpolated result for A3 is shown in **Table 5**.

Table 5: Interpolation of AS / SR Ratio for A3

Near Station	Distance from A3	Calculated AS / SR Ratio
A2	856m	4.3
A4	1,598m	3.3
Interpolated Result at A3		4.0

Once the ACL is determined from the baseline monitoring, the AS and SR values derived in **Table 4** (for A1, A2, A4 and A5) and in **Table 5** (for A3) can be used to determine the appropriate alert level at each near station.

It should be noted that this approach for deriving Initial Alert Levels for turbidity is founded on the basis that the greater the sediment plume generated by the Project, the greater the concern on potential impacts at sensitive receiver locations. The AS value, which represents the worst case elevated SS at 300m from the Project boundary, is thus providing a conservative estimate of the Project's potential for causing elevated SS.

Similarly, the SR value represents the highest modelled concentration of SS detected at sensitive receivers due to Project activities, hence this is also representing a worst case with respect to the potential impact at sensitive receivers.

Adoption of these two worst case assumptions thus provides a reasonable initial estimate of the Alert Level to adopt for each near station.

3.2.1.1 Updates to AS and SR Values

Given that the values for SR are dependent on the individual location of the sensitive receivers, these values will need to be re-determined if there are any subsequent changes to the locations as a result of updates to the MEBR Report.

For re-determining the SR value for any updated sensitive receiver locations, the maximum depth-averaged SS at the new sensitive receiver location should be interpolated from the maximum depth-averaged SS for the two nearest sensitive receivers (SS taken from Table 3.23 and Table 3.24 of the approved EIA report).

3.2.2 Final Alert Levels for Turbidity

Once the Project has accumulated at least 2 months' worth of impact monitoring field data, the Initial Alert Levels should be reviewed and updated by the ET if necessary. Any changes proposed by the ET should be verified by IEC and notified to EPD prior to implementation.

3.3 Method for Deriving Alert Levels for DO

Based on the findings of the approved EIA Report, there was no apparent depletion of DO due to the Project at any of the WSRs (modelled DO depletion was at least 3 orders of magnitude lower than baseline DO levels and therefore is insignificant). On this basis, it is not necessary to set the DO levels to be relatable to the predicted and/or actual concentrations at the nearest sensitive receiver stations. Instead, a simpler approach will be adopted.

The Alert Level for DO will be dependent on one of three factors:

F1 = WQO requirement for Southern Water Control Zone (marine waters)

F2 = Minimum DO level from baseline and EPD's monitoring stations data (from WM1, SM5, SM6 and SM7) from the last 5 years

F3 = DO levels at the control stations at the same tide, on the same day

F1 represents the minimum requirement from a general water quality perspective, while F2 and F3 represents the actual DO levels that occur around the Project area due to factors not affected by the Project. Therefore, it is reasonable to conclude that any reduction of DO levels below either of the three factors above warrants further investigation as to potential effects associated with the Project.

On the basis of the above, the formula for deriving the Alert Levels for DO is as follows:

Alert Level for DO = one measurable unit lower than the lowest value of the three factors (F1, F2 and F3)

For DO which is typically measured to an accuracy of 0.1 mg/L (i.e. this being the lowest measurable unit), the formula can be revised as follows:

Alert Level for DO = the lowest value of the three factors (F1, F2 and F3) – 0.1 mg/L

Same as for turbidity, the ET may choose to review the Alert Levels for DO once the Project has accumulated at least 2 months' worth of impact monitoring field data. Any changes proposed by the ET should be verified by IEC and notified to EPD prior to implementation. If there is a large discrepancy between Initial Alert Levels and field data, calculation of new Alert Levels shall be carried out and submitted to EPD for approval under Clause 2.12 of the EP.

820000 E
825000 E
830000 E
835000 E
810000 N
805000 N

C1
C2
C3
SR1
SR2
SR3
SR4
SR5
SR6
SR7
SR8
SR9
SR10
A1
A2
A3
A4
A5
ZONE 1
ZONE 2
ZONE 3
ZONE 4
EXISTING PIPELINE

WEST LAMMA CHANNEL 西博海峽
EAST LAMMA CHANNEL
ADAMASTA CHANNEL 北長洲海峽

CHEUNG CHAU 長洲
TUNG WAN
SHEK PAI WAN
HA MEI WAN 下尾灣
TUNG O WAN
SHAM WAN
LUK CHAU WAN
PICNIC BAY
SANDY BAY
Hes Lung Chau Typhoon Shelter
Cheung Chau Typhoon Shelter
Coal Depot
Luk Chau
Lung Shan Pui
Ap Lei Pui
Magazine Island
Adamasta Rock
Resistance Rock

0 500 1000 1500 2000 m
1 : 25 000 SCALE BAR

J:\392653\REPORT\ENV\PWQM\FIG 1_P1.dgn DATE: 13/06/2018 TIME: 14:34:28 USER: yim42169

Notes

Key to symbols

- HKSAR BOUNDARY
- PROJECT BOUNDARY
- 300m BUFFER
- WATER QUALITY MONITORING LOCATION

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	JUN 18	MING	FIRST ISSUE	DC	EC

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Project
IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

Title
WATER QUALITY MONITORING LOCATIONS

Designed	DC		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	DC		Approved	EC	
Scale at A1	1:25000	Status	PRE	Rev	P1

Drawing Number
FIGURE 1

828000 E

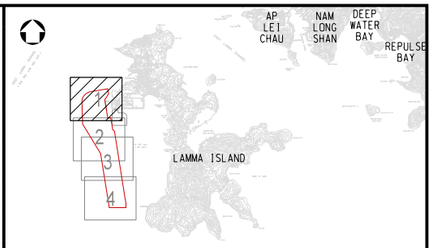
809000 N

A1

ZONE 1

0 50 100 150 200 m

1 : 5000 SCALE BAR



KEY PLAN (1:200000)

LEGEND:

- PROJECT BOUNDARY
- 300m BUFFER
- WATER QUALITY MONITORING LOCATION

Reference drawings

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IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

Title

WATER QUALITY MONITORING LOCATIONS (SHEET 1 OF 4)

Designed	DC		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	DC		Approved	EC	

Scale	Status	Rev
1:5000	PRE	P1

Drawing Number

FIGURE 2

828000 E

829000 E

808000 N

807000 N

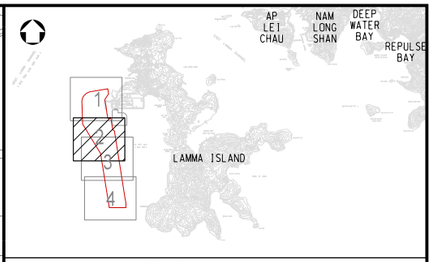
A2

ZONE 2

EXISTING PIPELINE

0 50 100 150 200 m

1 : 5000 SCALE BAR



KEY PLAN (1:200000)

LEGEND:

- PROJECT BOUNDARY
- 300m BUFFER
- WATER QUALITY MONITORING LOCATION

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IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

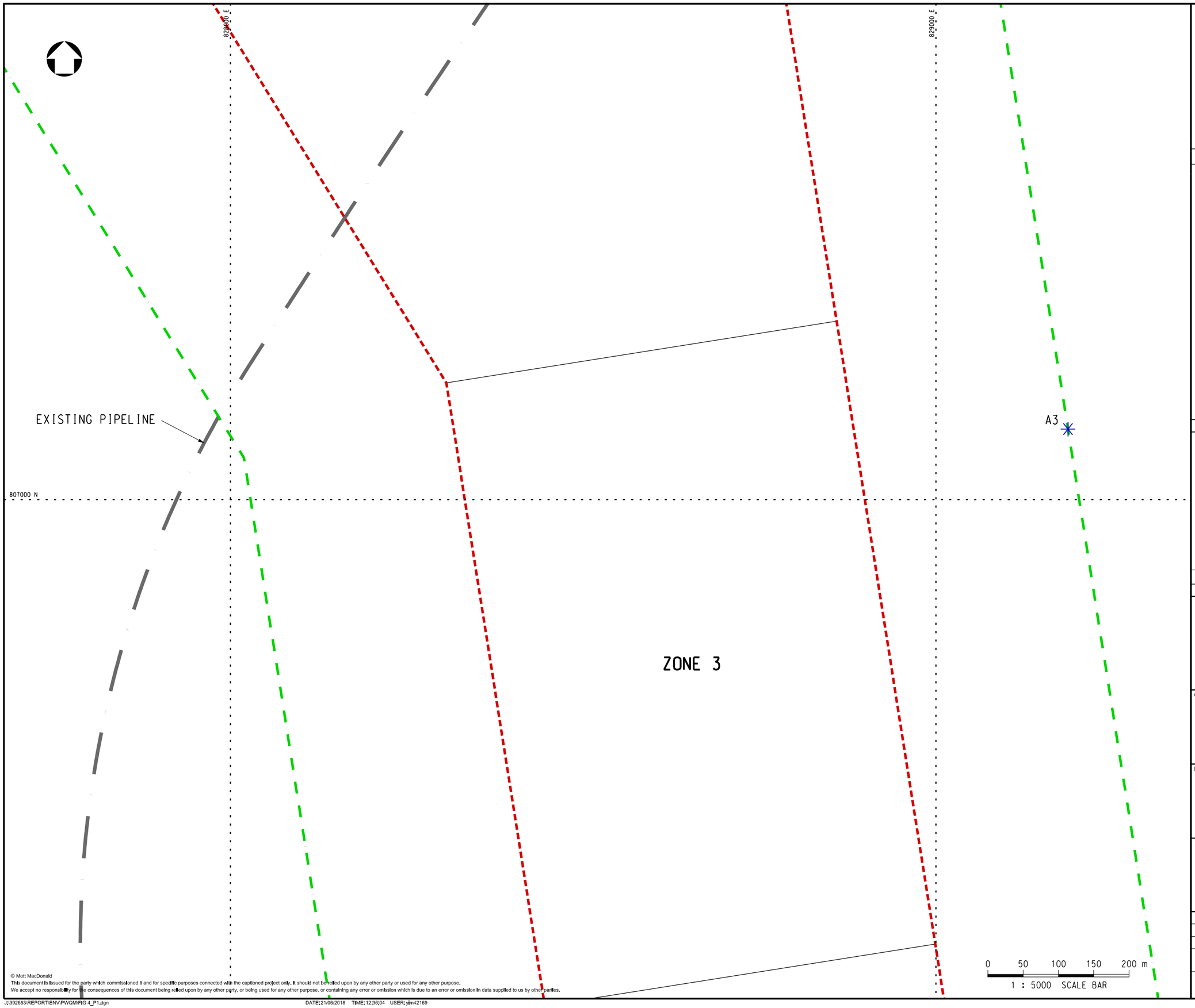
Title

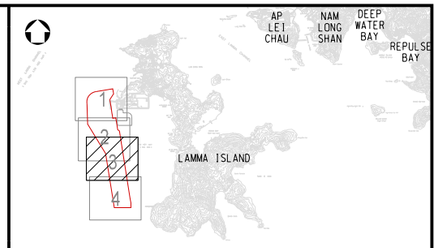
WATER QUALITY MONITORING LOCATIONS (SHEET 2 OF 4)

Designed	DC		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	DC		Approved	EC	
Scale 1:5000		Status PRE		Rev P1	

Drawing Number

FIGURE 3





KEY PLAN (1:200000)

LEGEND:

- PROJECT BOUNDARY
- 300m BUFFER
- WATER QUALITY MONITORING LOCATION

Reference drawings

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IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

Title

WATER QUALITY MONITORING LOCATIONS (SHEET 3 OF 4)

Designed	DC		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	DC		Approved	EC	

Scale	Status	Rev
1:5000	PRE	P1

Drawing Number

FIGURE 4

828000 E

829000 E

806000 N

ZONE 4

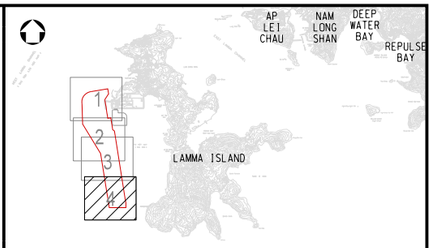
EXISTING PIPELINE

A4

A5

0 50 100 150 200 m

1 : 5000 SCALE BAR



KEY PLAN (1:200000)

LEGEND:

- PROJECT BOUNDARY
- 300m BUFFER
- WATER QUALITY MONITORING LOCATION

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Title

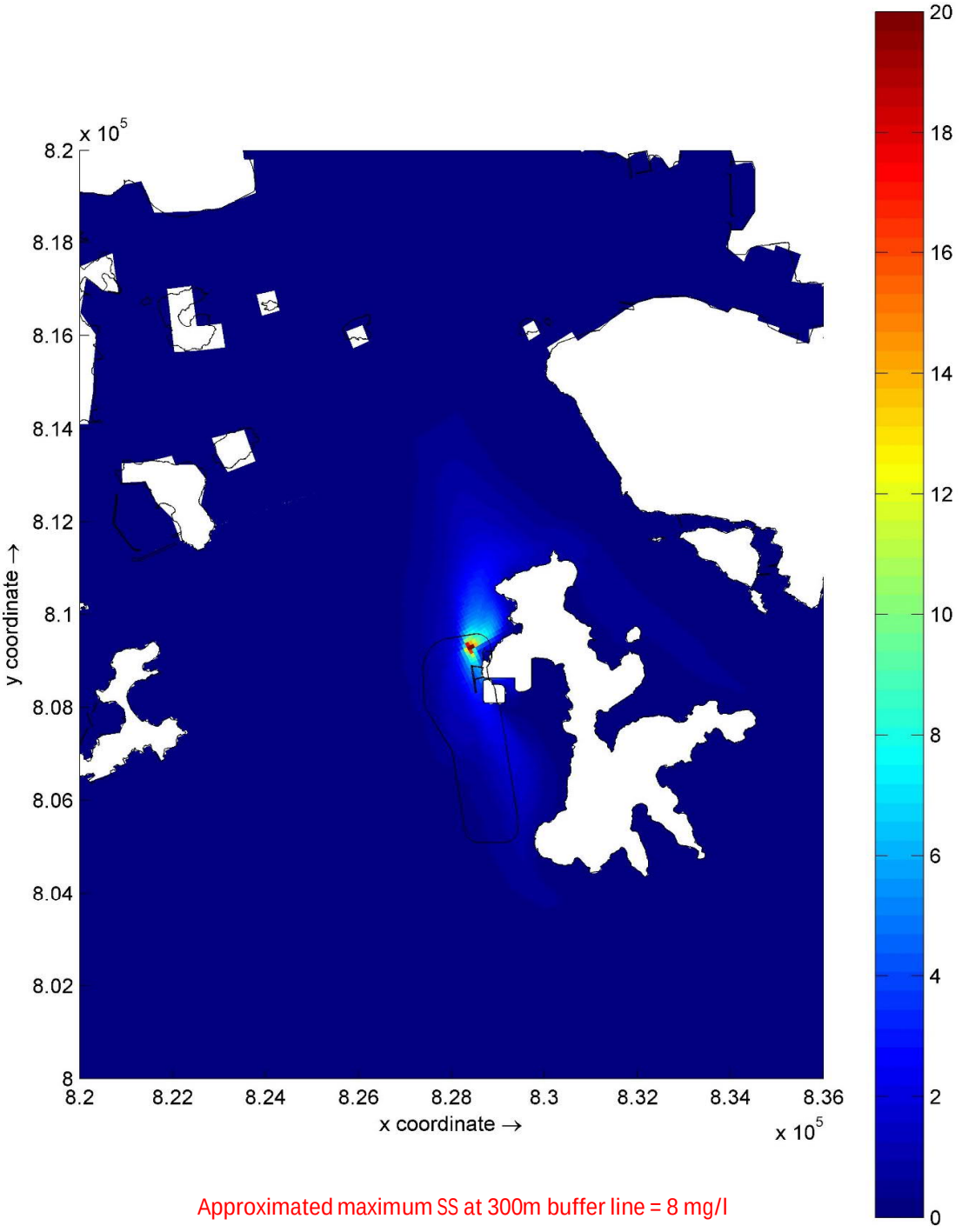
WATER QUALITY MONITORING LOCATIONS (SHEET 4 OF 4)

Designed	DC		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	DC		Approved	EC	
Scale	1:5000	Status	PRE	Rev	P1

Drawing Number

FIGURE 5

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

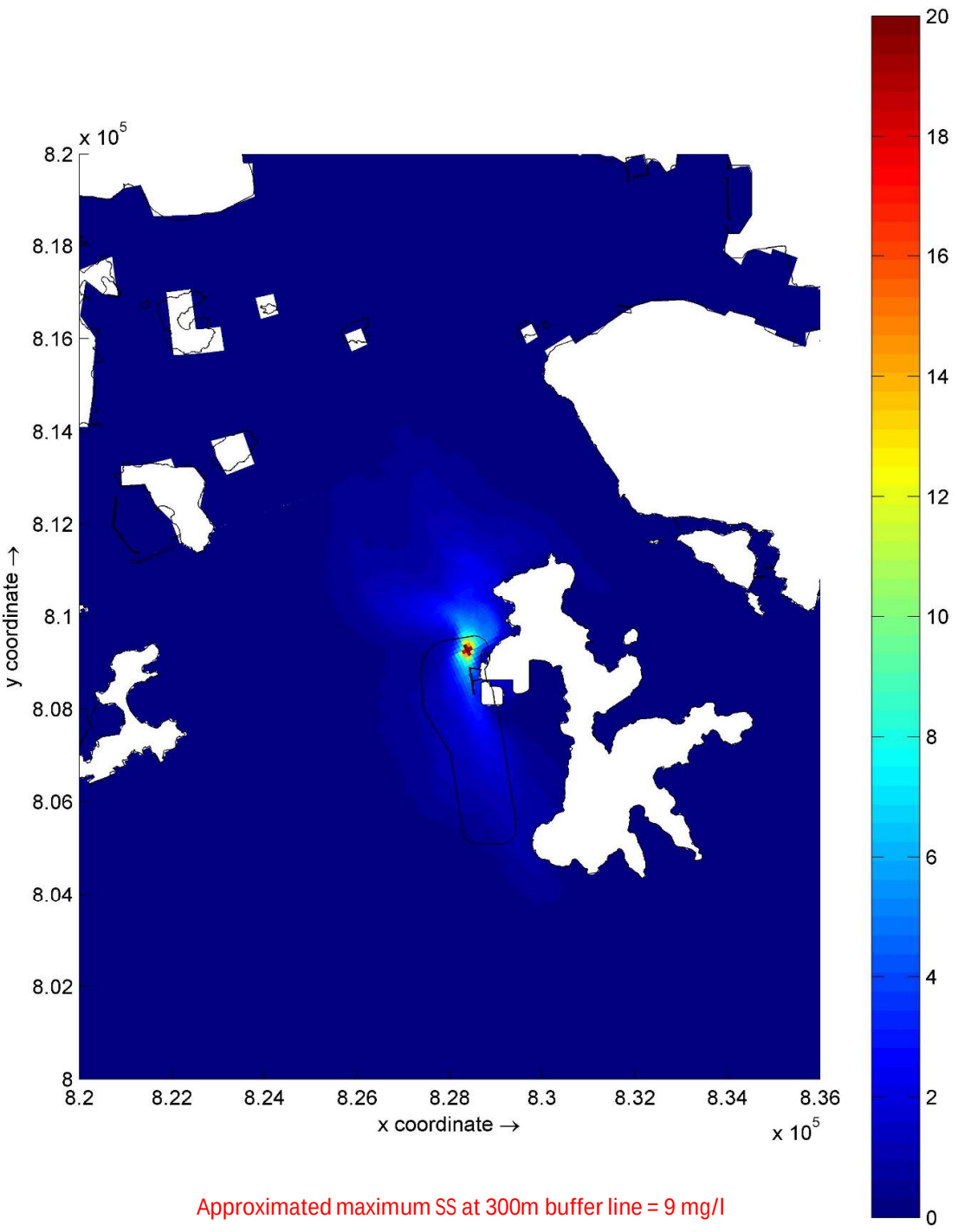


Approximated maximum SS at 300m buffer line = 8 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season Grab dredger, estimated maximum dredge rate at location A (Zone 1)	EIA Ref:	Figure 003
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

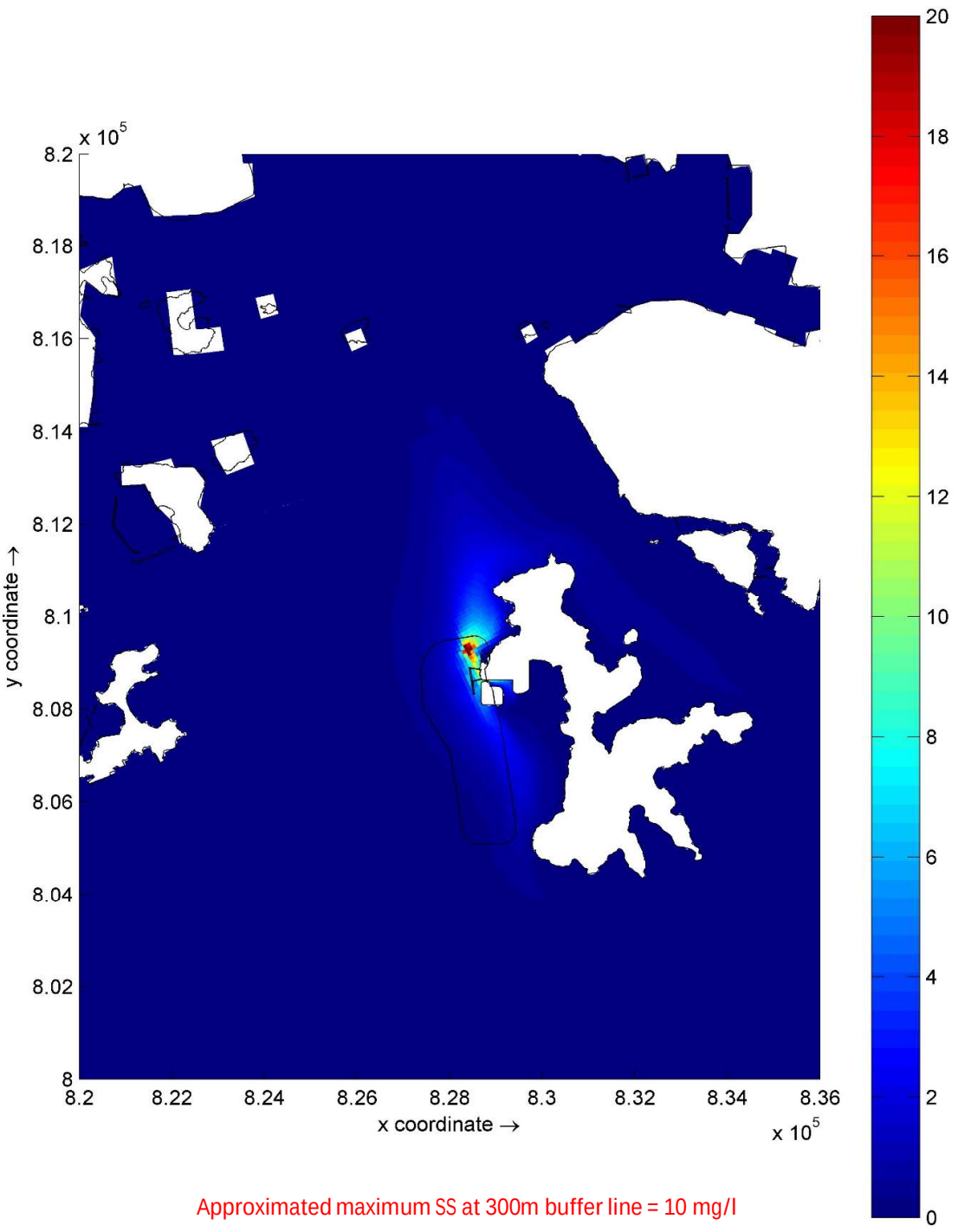


Approximated maximum SS at 300m buffer line = 9 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season Grab dredger, estimated maximum dredge rate at location A (Zone 1)	EIA Ref:	Figure 015
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

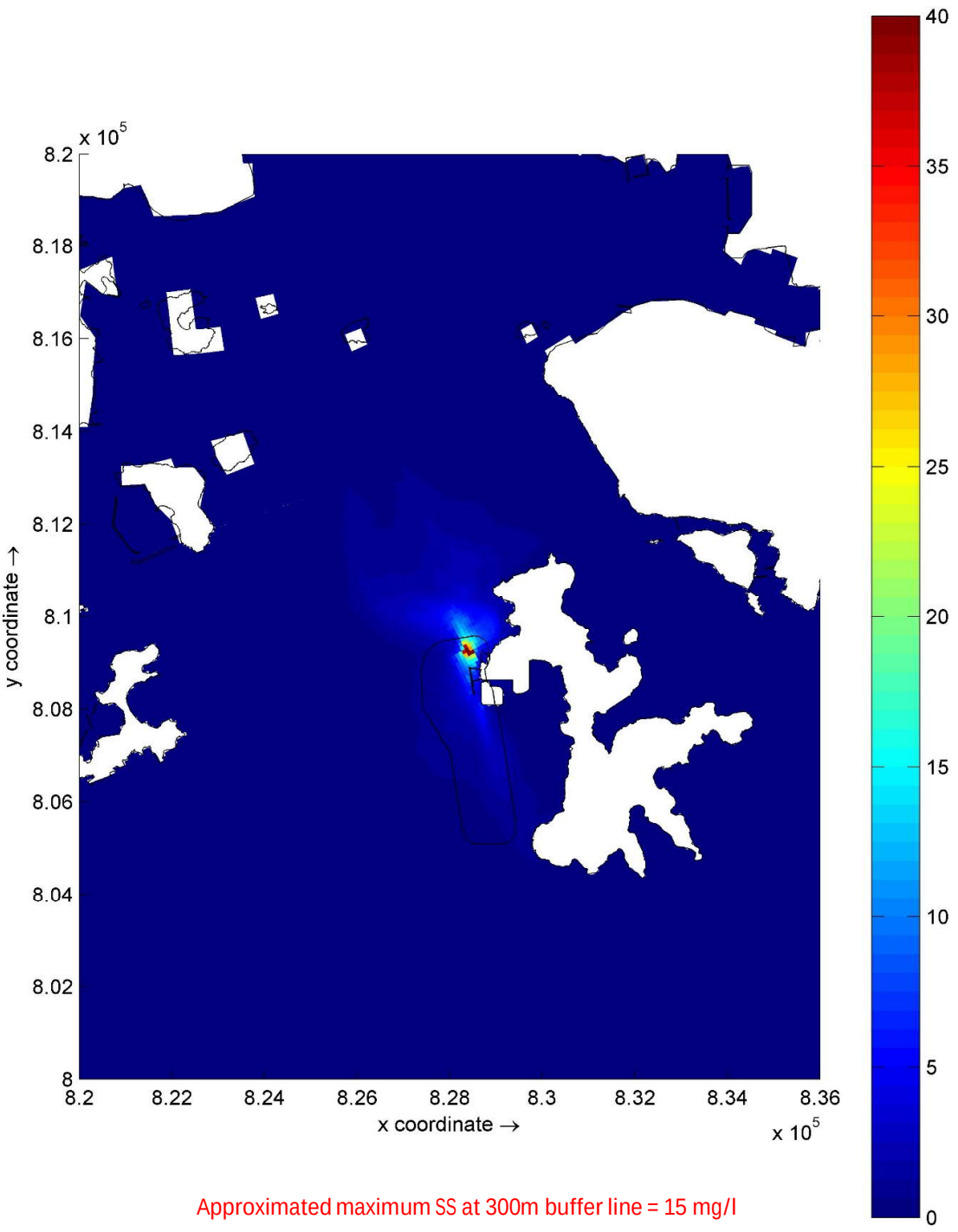


Approximated maximum SS at 300m buffer line = 10 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season TSHD, estimated maximum dredge rate at location A (Zone 1)	EIA Ref:	Figure 027
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

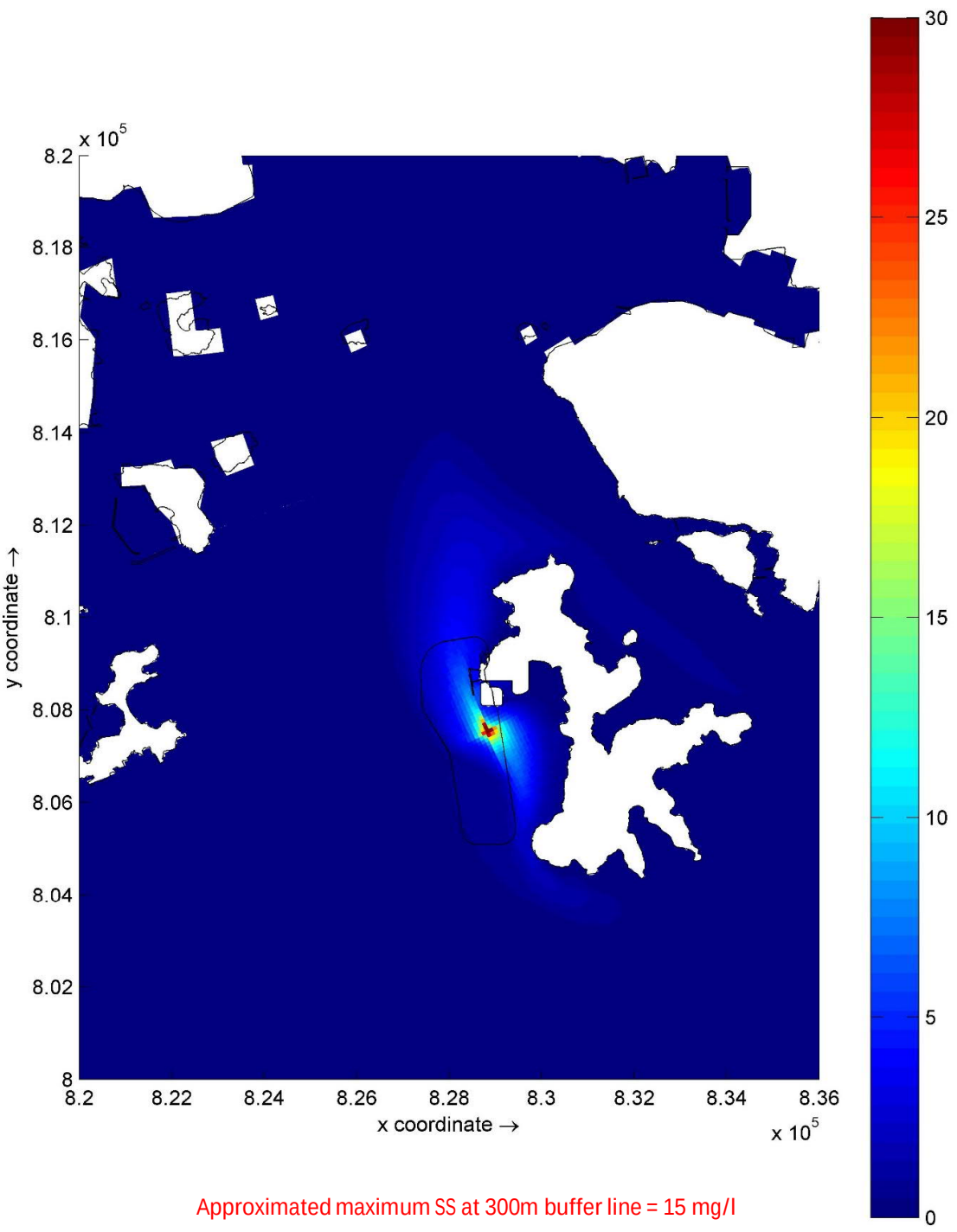


Approximated maximum SS at 300m buffer line = 15 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season TSHD, estimated maximum dredge rate at location A (Zone 1)	EIA Ref:	Figure 039
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

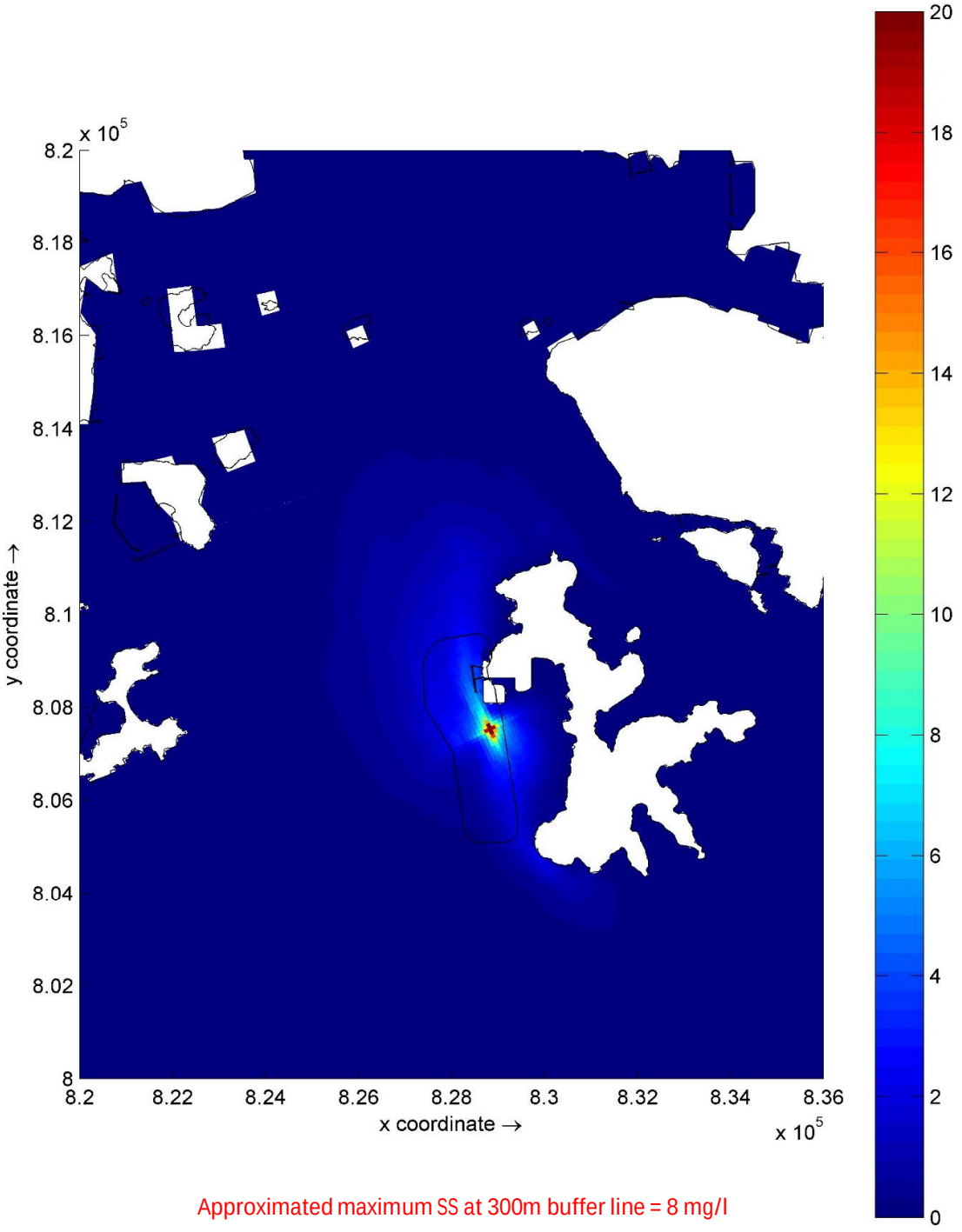


Approximated maximum SS at 300m buffer line = 15 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season Grab dredger, estimated maximum dredge rate at location B (Zone 2)	EIA Ref:	Figure 006
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

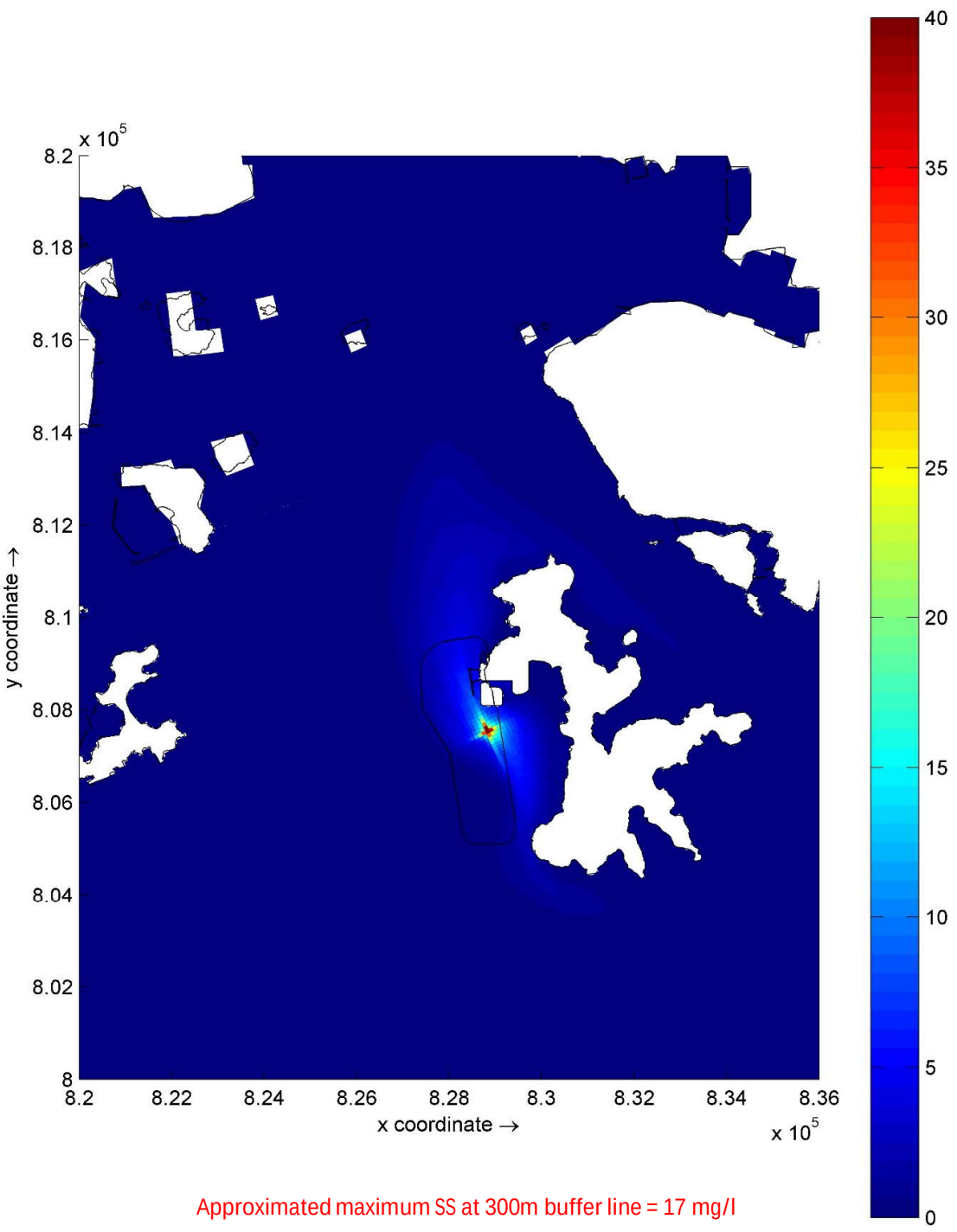


Approximated maximum SS at 300m buffer line = 8 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season Grab dredger, estimated maximum dredge rate at location B (Zone 2)	EIA Ref:	Figure 018
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

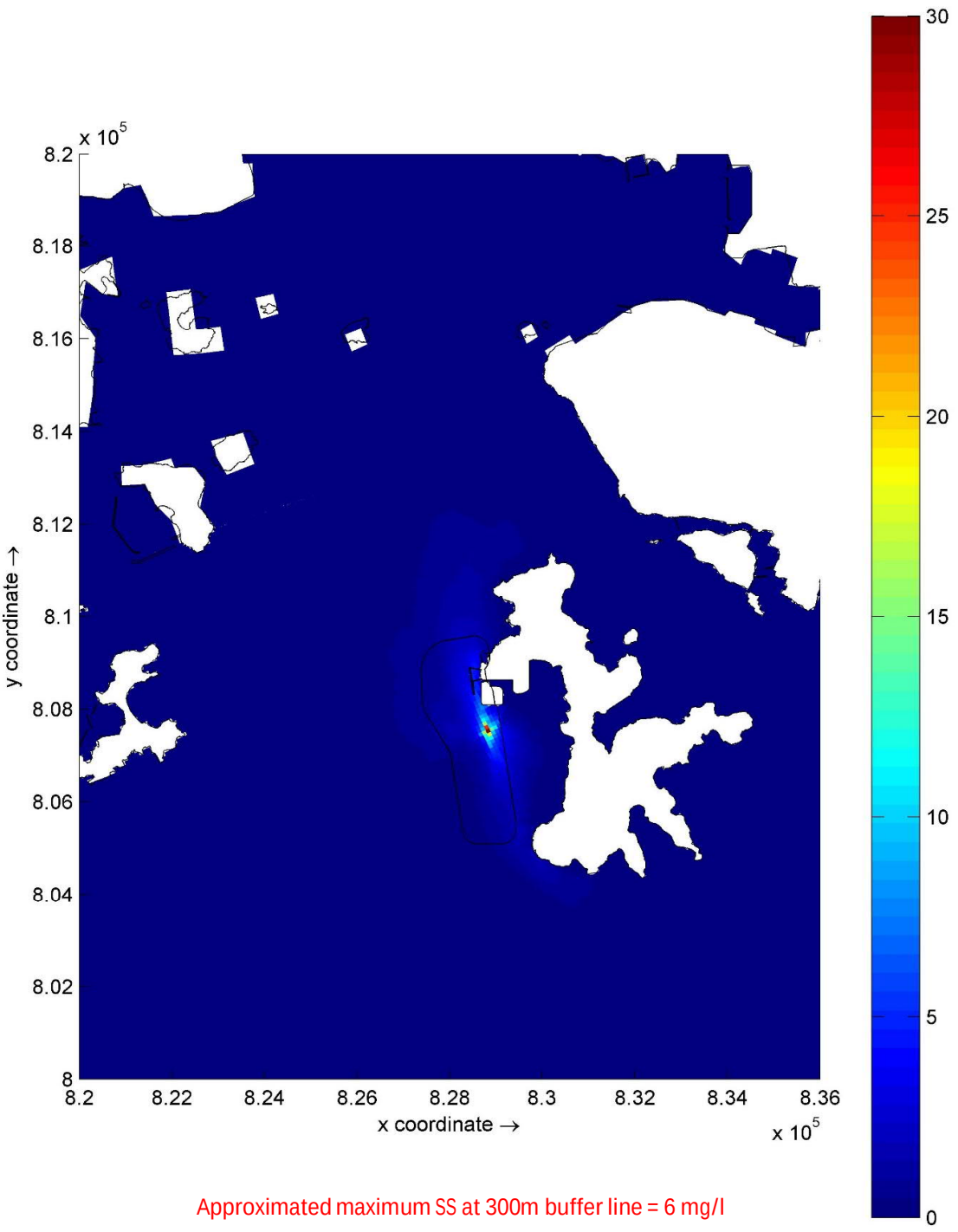


Approximated maximum SS at 300m buffer line = 17 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season TSHD, estimated maximum dredge rate at location B (Zone 2)	EIA Ref:	Figure 030
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

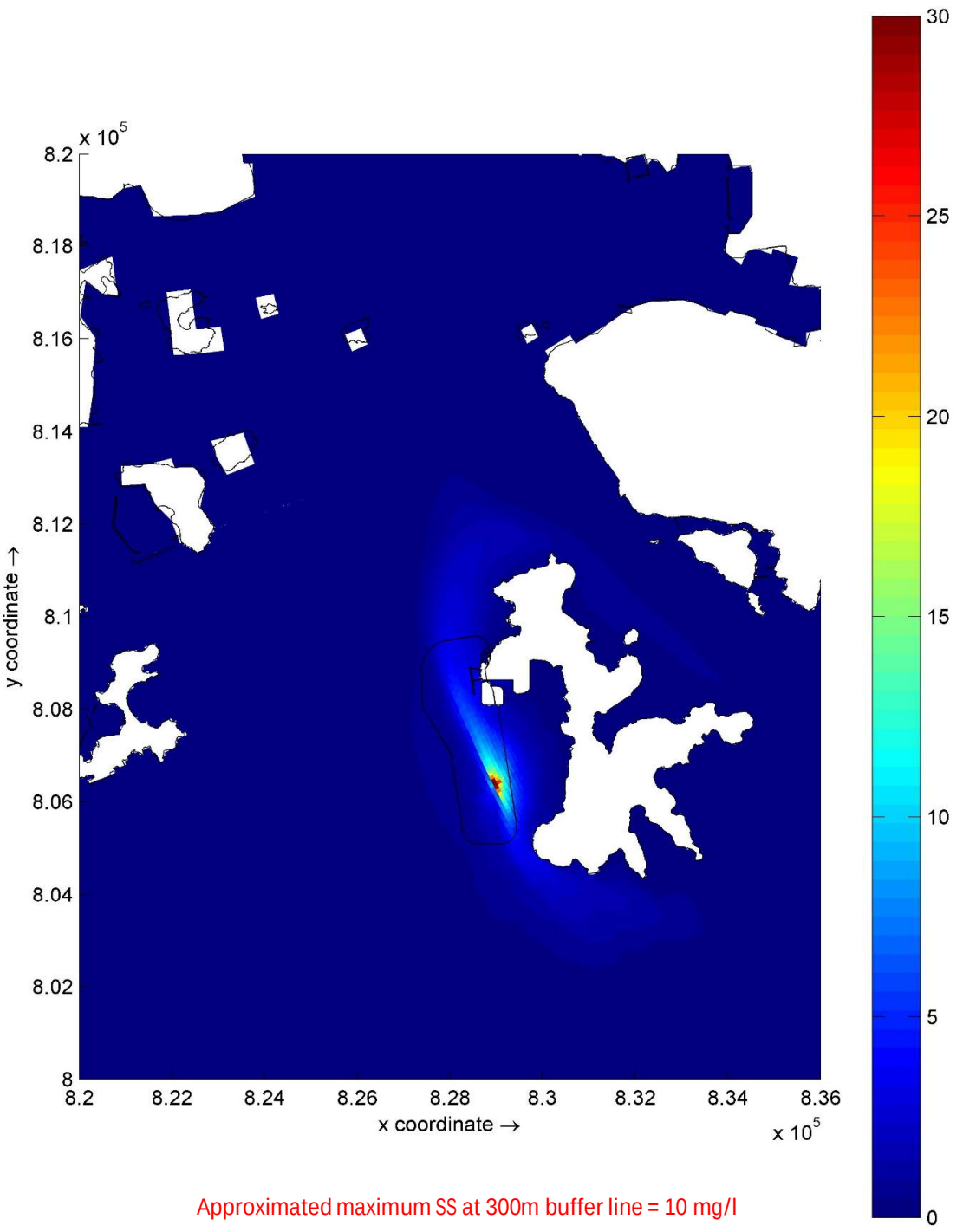


Approximated maximum SS at 300m buffer line = 6 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season TSHD, estimated maximum dredge rate at location B (Zone 2)	EIA Ref:	Figure 042
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

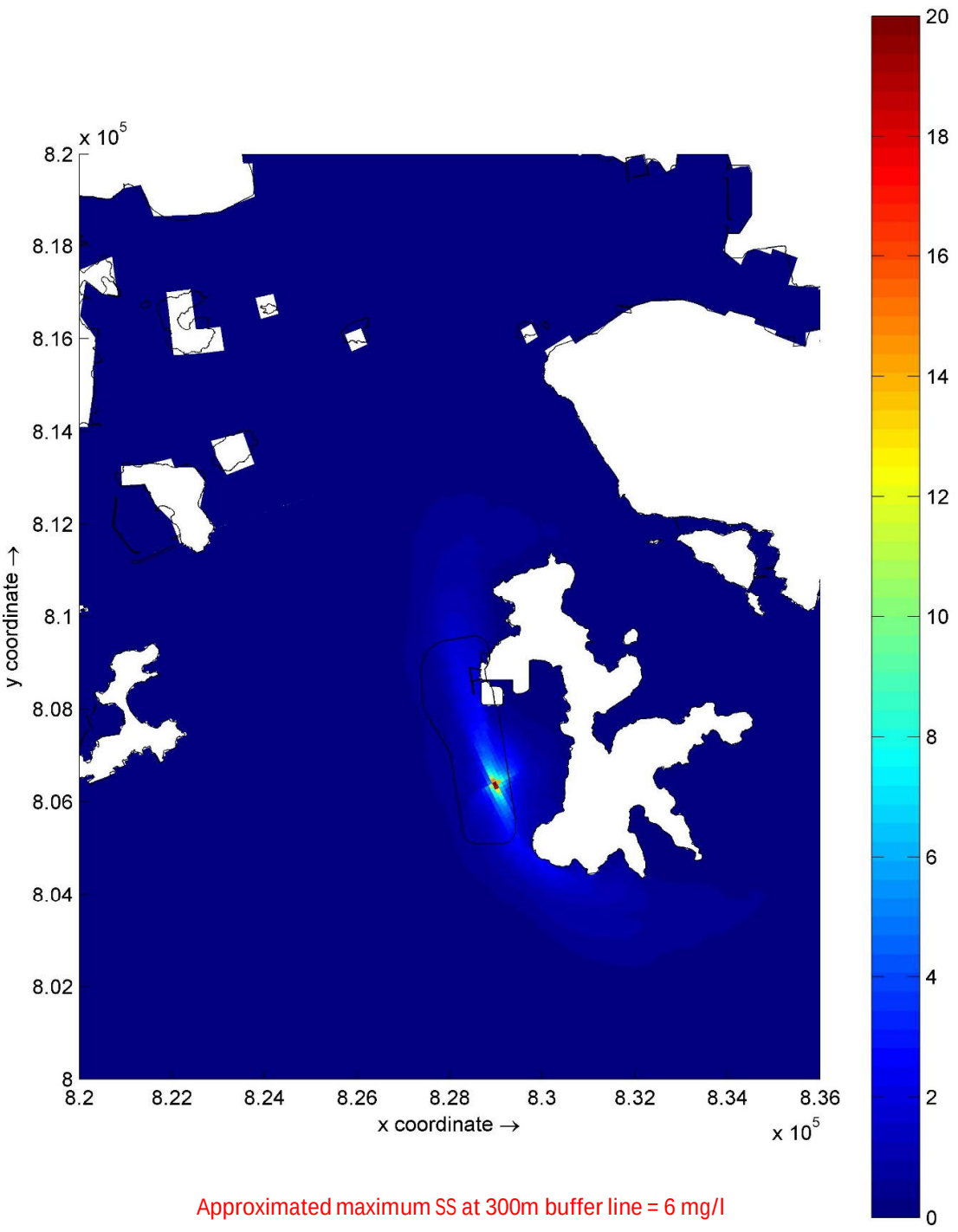


Approximated maximum SS at 300m buffer line = 10 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season Grab dredger, estimated maximum dredge rate at location C (Zone 3)	EIA Ref:	Figure 009
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

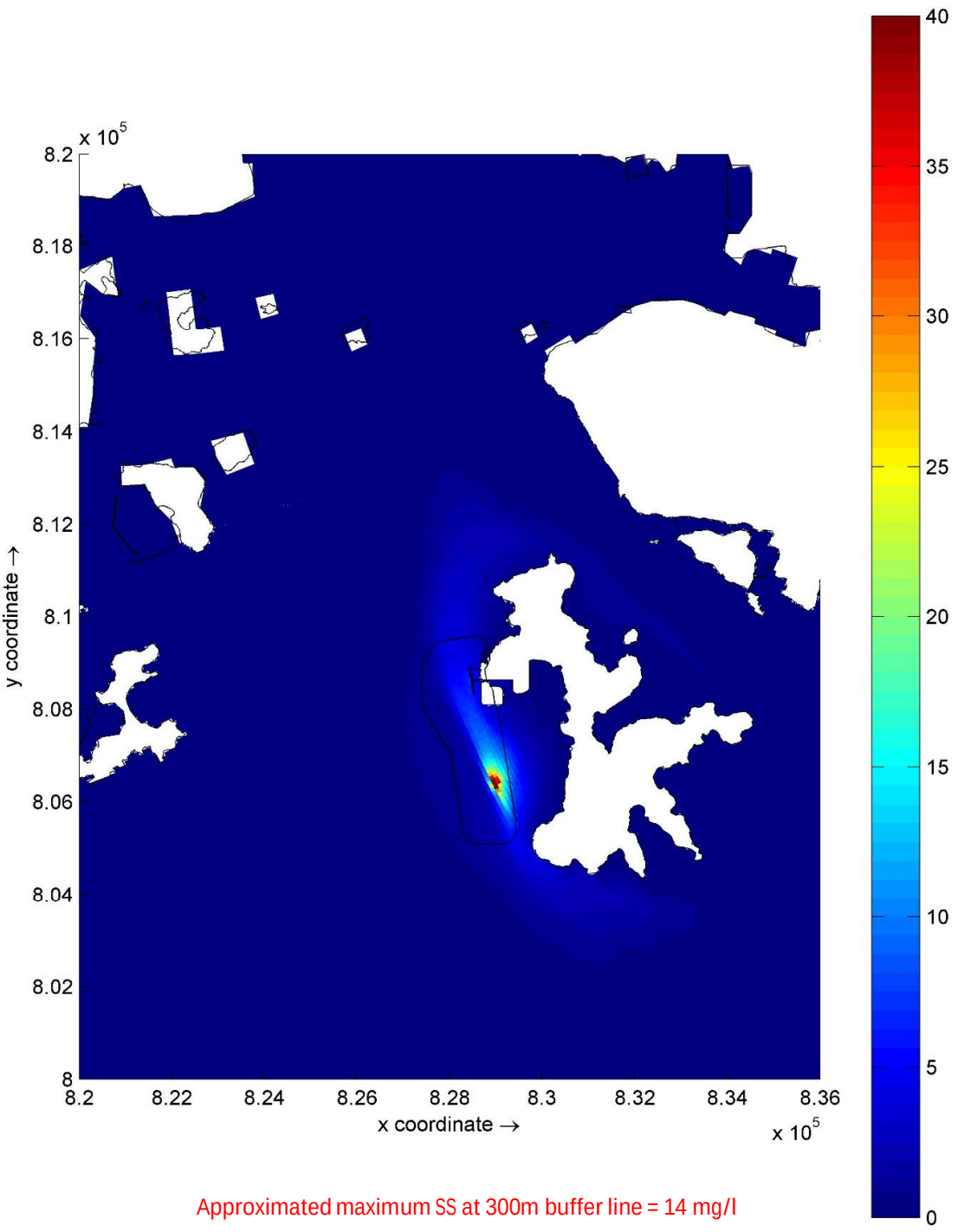


Approximated maximum SS at 300m buffer line = 6 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season Grab dredger, estimated maximum dredge rate at location C (Zone 3)	EIA Ref:	Figure 021
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

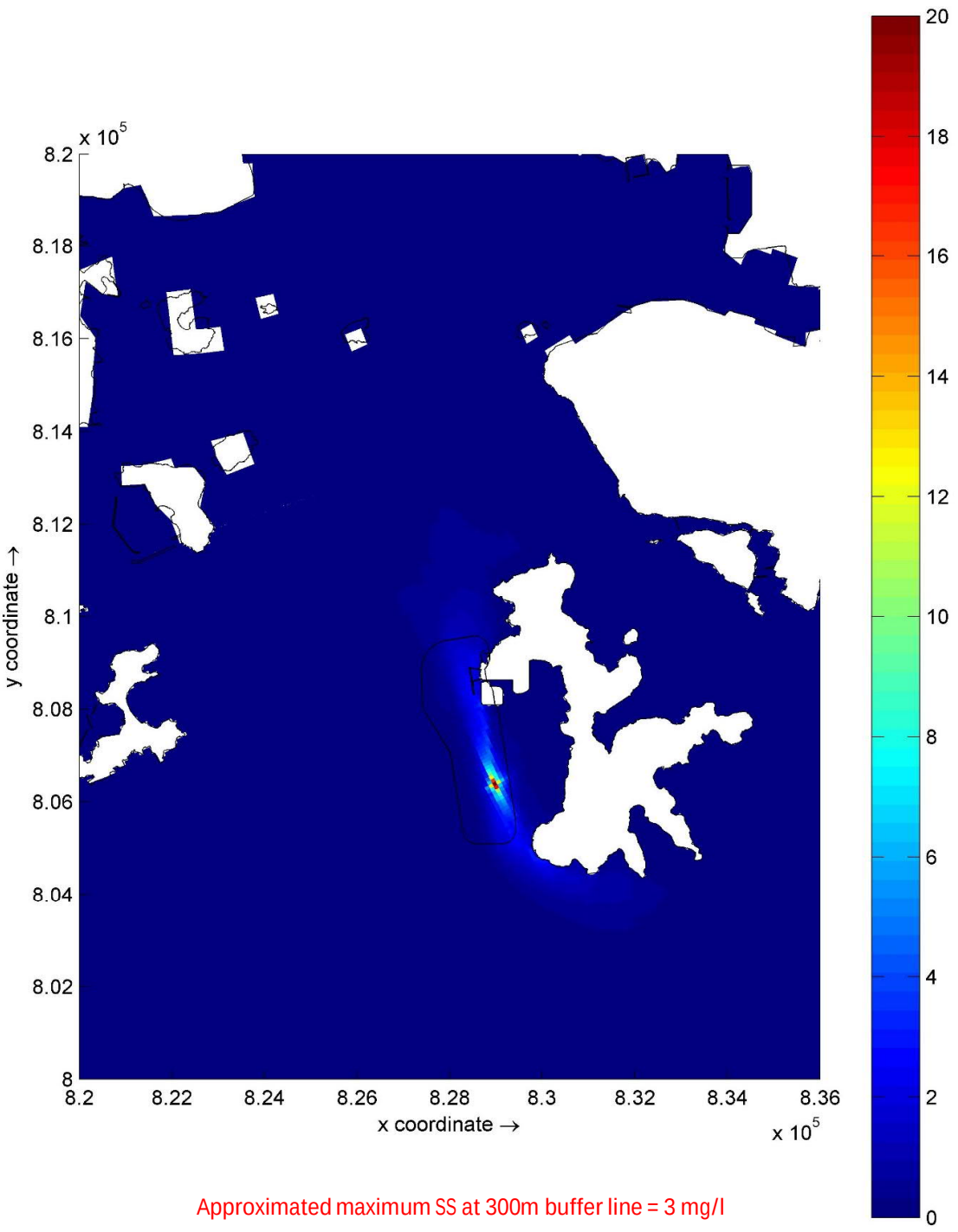


Approximated maximum SS at 300m buffer line = 14 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season TSHD, estimated maximum dredge rate at location C (Zone 3)	EIA Ref:	Figure 033
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

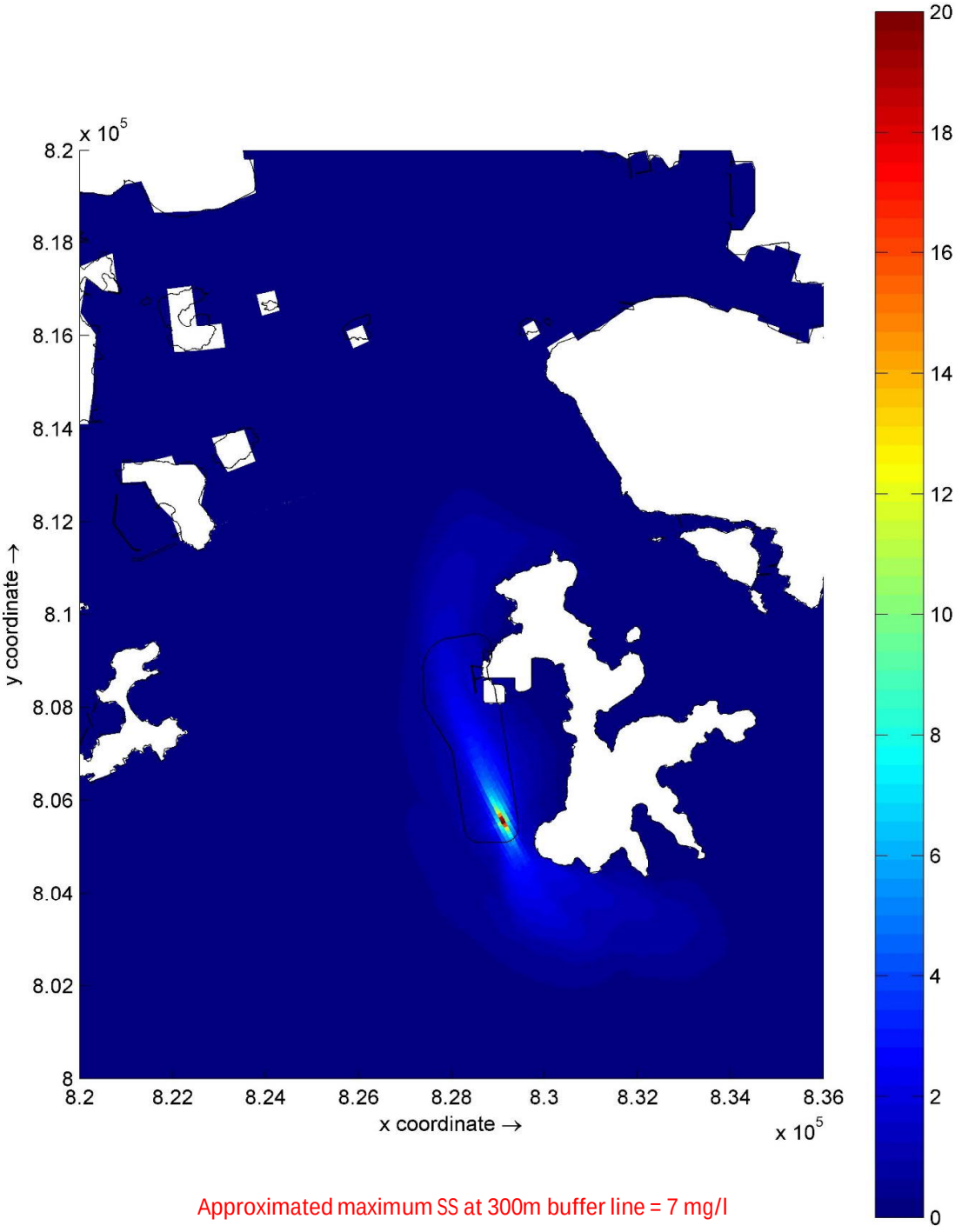


Approximated maximum SS at 300m buffer line = 3 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season TSHD, estimated maximum dredge rate at location C (Zone 3)	EIA Ref:	Figure 045
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

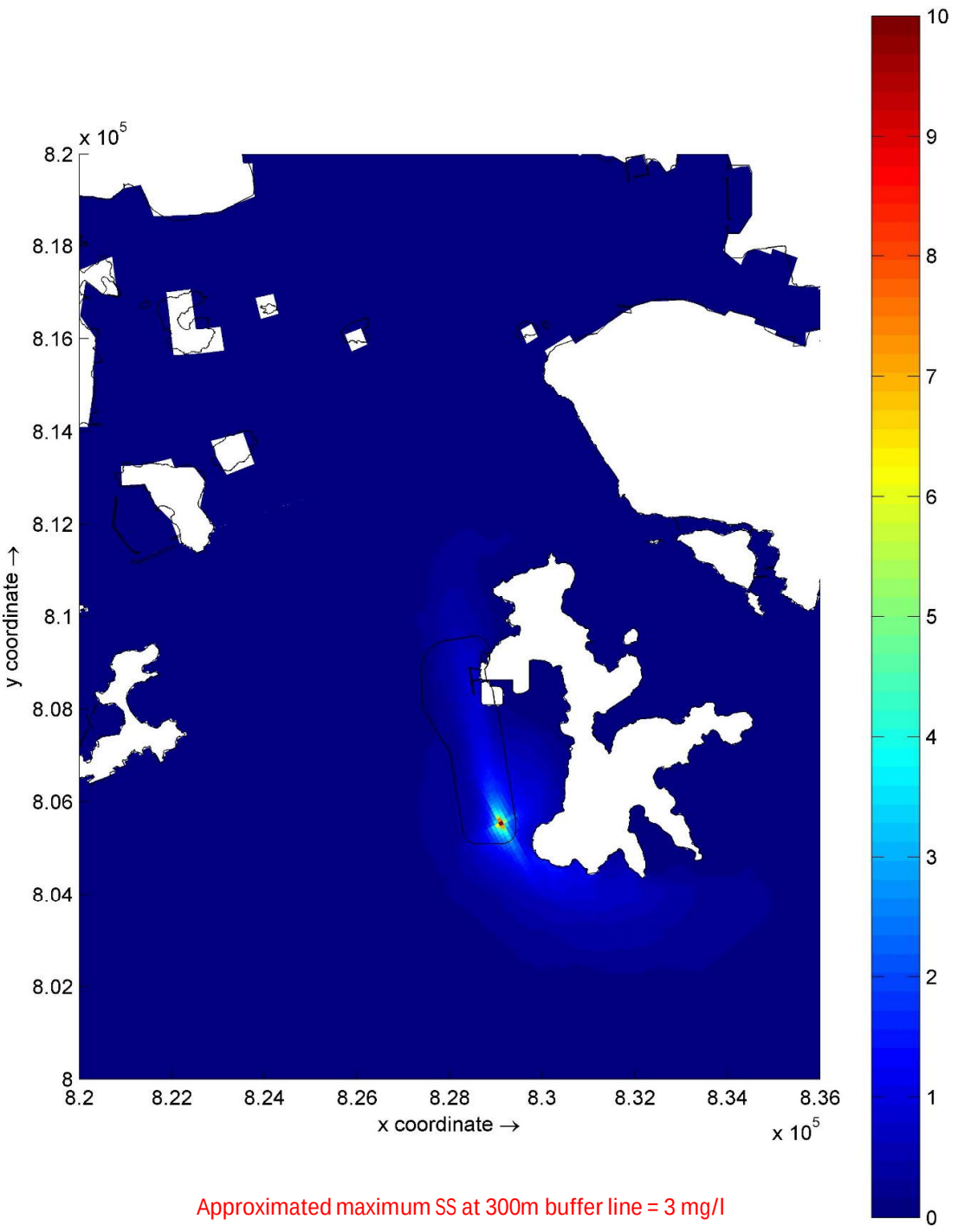


Approximated maximum SS at 300m buffer line = 7 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season Grab dredger, estimated maximum dredge rate at location D (Zone 4)	EIA Ref:	Figure 012
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

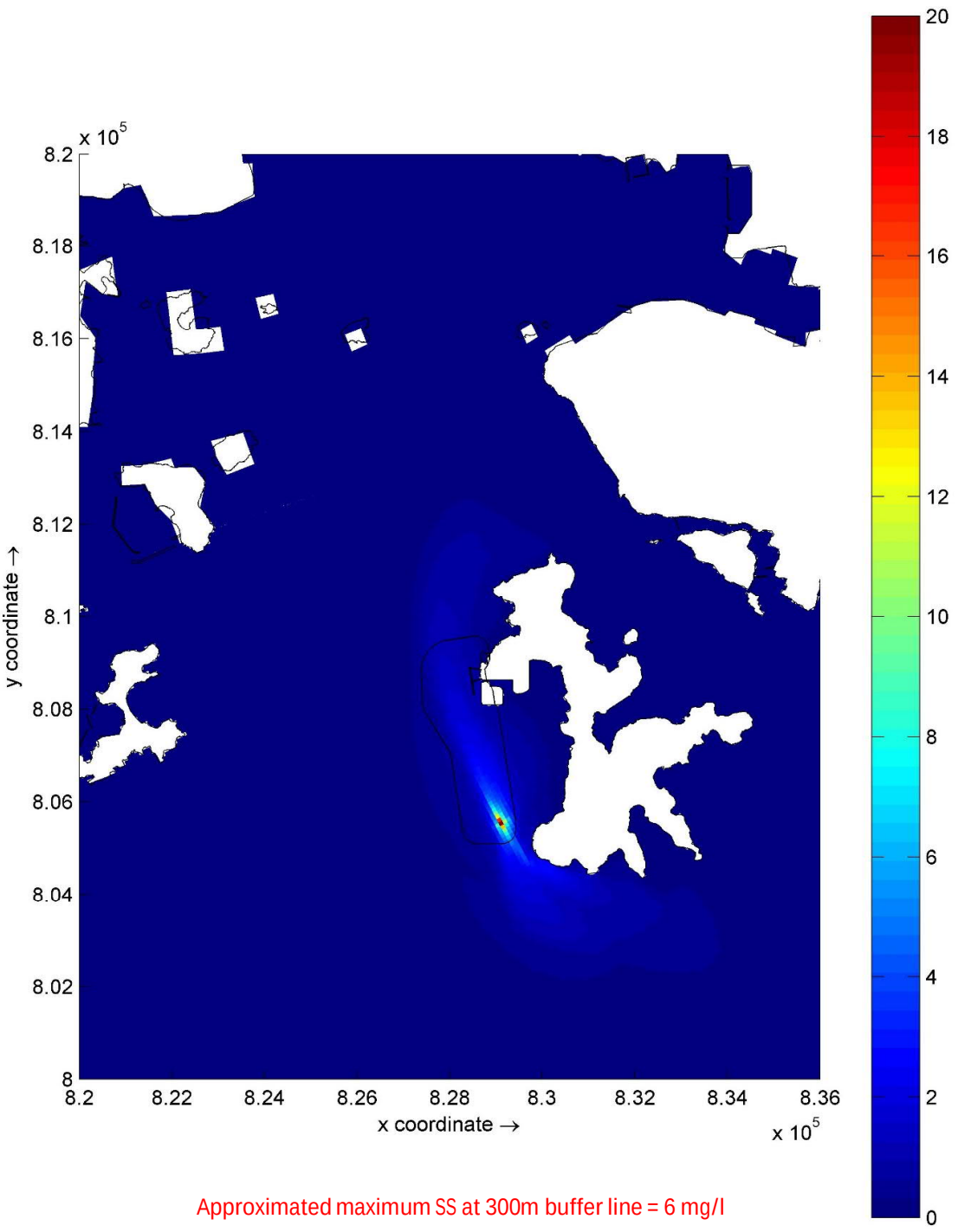


Approximated maximum SS at 300m buffer line = 3 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season Grab dredger, estimated maximum dredge rate at location D (Zone 4)	EIA Ref:	Figure 024
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown

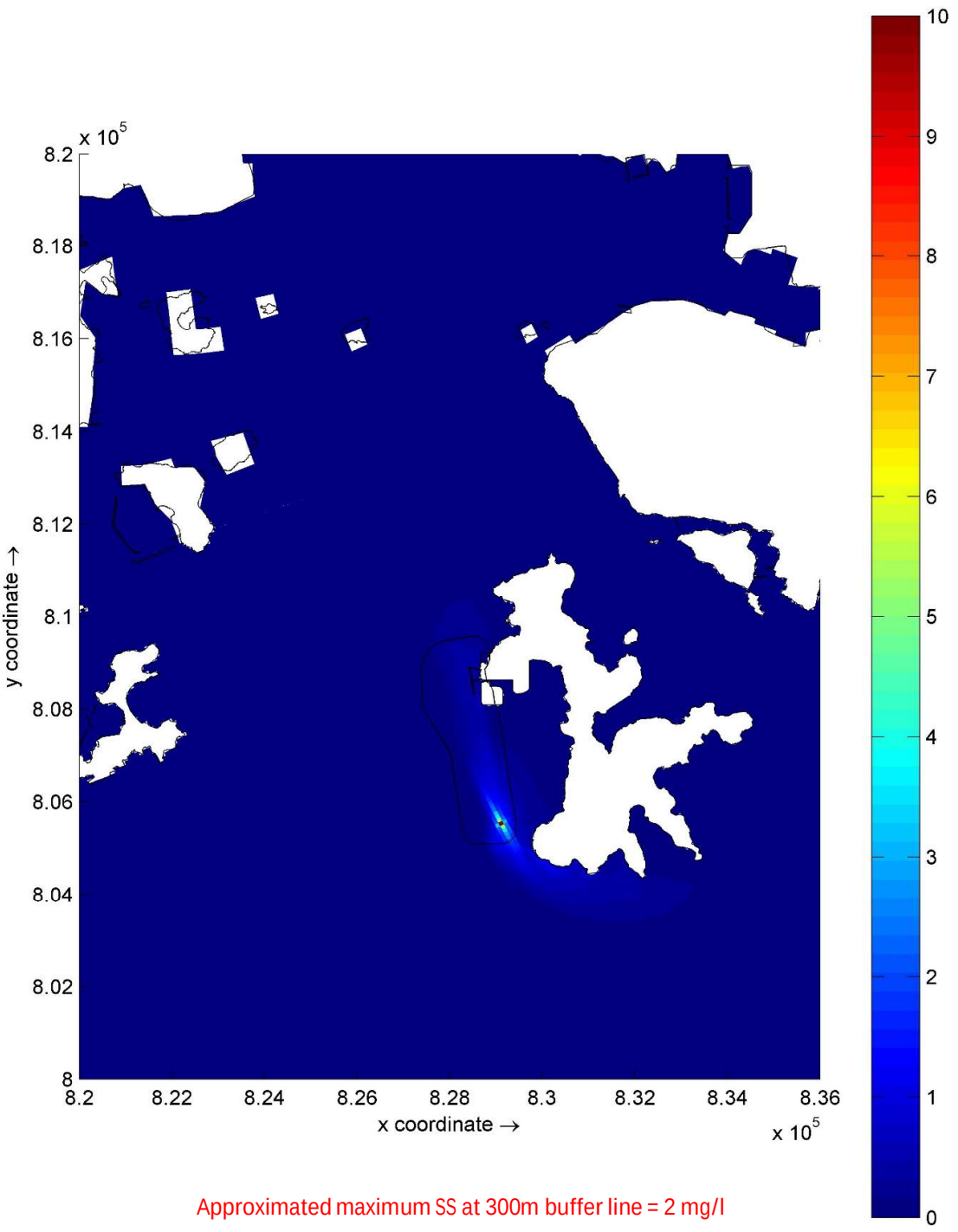


Approximated maximum SS at 300m buffer line = 6 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Dry Season TSHD, estimated maximum dredge rate at location D (Zone 4)	EIA Ref:	Figure 036
Mott MacDonald Hong Kong Limited		

Extracts from Appendix 3.7 of the EIA Report with 300m buffer around Project boundary shown



Approximated maximum SS at 300m buffer line = 2 mg/l

Note
These contour plots are the same as those presented in Appendix 3.7 of the approved EIA Report, except that the scale bar has been adjusted to enable easier visual comparison of SS levels at the 300m buffer line

Maximum depth-averaged SS concentration (mg/L) contour over 15 days Wet Season TSHD, estimated maximum dredge rate at location D (Zone 4)	EIA Ref:	Figure 048
Mott MacDonald Hong Kong Limited		

Appendix B

Calculation of AS / SR ratio for Grab Dredger scenarios

Table A1 - AS Value (data from Appendix A)

Near Station	Representative Zone	Approx. Max SS at 300m buffer	
		Dry	Wet
A1	Zone 1	8	9
A2	Zone 2	15	8
A3	Zone 3	10	6
A4	Zone 4	7	3
A5	Zone 4	7	3

Table A2 - SR Value (data from Table 3-23 of the approved EIA report)

Sensitive Receiver	Dry Season				Wet Season			
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
CR2	2.6	2.6	1.9	0.9	2.4	1.4	0.7	0.3
S1	2.9	3.1	2.2	2	1.9	1.1	0.8	0.7
B2	0	0.4	0.2	0.1	0.1	0.1	0.2	0.1
GT2	0.7	2.3	1.8	1	0.8	0.9	1.1	0.9
FP3	0.6	1.1	2.5	2.7	0.6	0.7	1.5	1.2

Table A3 - AS/SR Value (calculated from Table A1 and Table A2)

Sensitive Receiver	Dry				Wet			
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
CR2	3.1	5.8	5.3	7.8	3.8	5.7	8.6	10.0
S1	2.8	4.8	4.5	3.5	4.7	7.3	7.5	4.3
B2	-	37.5	50.0	70.0	90.0	80.0	30.0	30.0
GT2	11.4	6.5	5.6	7.0	11.3	8.9	5.5	3.3
FP3	13.3	13.6	4.0	2.6	15.0	11.4	4.0	2.5

Calculation of AS / SR ratio for TSHD Dredger scenarios

Table B1 - AS Value (data from Appendix A)

Near Station	Representative Zone	Approx. Max SS at 300m buffer	
		Dry	Wet
A1	Zone 1	10	15
A2	Zone 2	17	6
A3	Zone 3	14	3
A4	Zone 4	6	2
A5	Zone 4	6	2

Table B2 - SR Value (data from Table 3-24 of the approved EIA report)

Sensitive Receiver	Dry Season				Wet Season			
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
CR2	2.6	2.6	2.4	0.7	2	0.9	0.5	0.3
S1	5.2	3.4	2.4	1.9	1.1	0.8	0.7	0.6
B2	0	0.4	0.2	0.1	0.1	0	0	0
GT2	0.8	2.5	2.1	0.9	0.7	0.7	0.8	0.3
FP3	0.5	1.2	2.9	2.1	0.4	0.7	1.1	0.8

Table B3 - AS/SR Value (calculated from Table B1 and Table B2)

Sensitive Receiver	Dry				Wet			
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
CR2	3.8	6.5	5.8	8.6	7.5	6.7	6.0	6.7
S1	1.9	5.0	5.8	3.2	13.6	7.5	4.3	3.3
B2	-	42.5	70.0	60.0	150.0	-	-	-
GT2	12.5	6.8	6.7	6.7	21.4	8.6	3.8	6.7
FP3	20.0	14.2	4.8	2.9	37.5	8.6	2.7	2.5

Notes

Lowest AS/SR ratio for each sensitive receiver under each dredging method is shown in yellow highlighted cells

Lowest AS/SR ratio for each sensitive receiver overall is shown in yellow highlighted cells with red text