



Consultancy Ref.: 13/WSD/17 Design, Build and Operate 1st Stage of Tseung Kwan O Desalination Plant

Supplementary Environmental Monitoring
and Audit Manual

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Supplementary Environmental Monitoring and Audit Manual



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1. INTRODUCTION

1.1 Purpose of the Manual

This **Supplementary Environmental Monitoring and Audit (EM&A) Manual** (“the Manual”) has been prepared by ERM-Hong Kong, Limited (ERM) on behalf of The Acciona Agua S.A.trading, Jardine Engineering Corporation, limited and China State Construction Engineering (Hong Kong) Limited as Joint Venture (hereafter refer to as the AJC JV). The Manual is a supplementary document to the approved Environmental Monitoring and Audit (EM&A) Manual (“the approved EM&A Manual”) for the Environmental Impact Assessment (EIA) Report of the construction and operation of a desalination plant using Seawater Reverse Osmosis (SWRO) technology in Tseung Kwan O (TKO) Area 137 (hereafter referred to as the Project) proposed by the Water Supplies Department (WSD). The EIA Report was approved with conditions by the Environmental Protection Department (EPD) on 4 November 2015 under Register No. AEIAR-192/2015.

The Manual has been prepared in accordance with Condition 3.1 of the Environmental Permit (EP), EP-503/2015/A, and the Further EP (FEP), FEP-01/503/2015/A. In accordance with Condition 3.1 of the EP and FEP, the Manual, which shall be certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC), shall be submitted to the Director of Environmental Protection no later than 6 months before the commencement of operation of the Project. The Manual shall include at least the following information:

- (i) details of EM&A programme on corals identified in the vicinity of the submarine outfall areas to ensure that the health status of the corals is kept in good condition during operation of the Project;
- (ii) details of EM&A programme on fisheries in the vicinity of the seawater intake and submarine outfall areas to ensure no significant impacts on fisheries resources during operation of the Project;
- (iii) mechanisms to propose and implement mitigation measures(s), if necessary, to rectify the problems in case of identifying any adverse ecological impacts on corals or fisheries resources.

Updates to the details of EM&A requirements for water quality as described in the approved EM&A Manual are also proposed in this Manual based on latest information regarding the type of anti-scalant as advised by the AJC JV. In accordance with Condition 3.2 of the EP and FEP, any changes to the EM&A requirements shall be supported with justifications by the ET leader and verified by the IEC, and approved by the Director of Environmental Protection before their implementation.

Apart from those detailed in this Manual, all EM&A requirements for the Project, including air quality, noise, water quality, waste management and land contamination, sewerage and sewage implication, ecology, fisheries, landscape & visual, landfill gas hazard and hazard to life, shall follow those as stated in the approved *EM&A Manual*.

2. WATER QUALITY

2.1 Proposed Updates to Monitoring Method for Anti-scalant

With reference to Table 5.2 of the approved *EM&A Manual*, the standard method and detection limit for monitoring of anti-scalant were stated as “to be determined” as the type of anti-scalant to be used could not be confirmed at the time of preparation of the approved *EM&A Manual*.

Based on the latest information provided by AJC JV, the anti-scalant to be used during the operation of the Project is ACUMER 4035, a proprietary product consisting of sodium salt of poly-acrylic acid. The material safety data sheet (MSDS) of this anti-scalant is provided in **Appendix A**.

It is proposed to update the standard method and detection limit for monitoring of anti-scalant in Table 5.2 of the approved *EM&A Manual*, to those as summarised in **Table 2.1**.

Table 2.1 Standard Method and Detection Limit for Anti-scalant for Water Quality Monitoring during Operation Phase

Parameters	Standard Method	Detection Limit	Reporting Limit	Precision
Anti-scalant (ACUMER 4035) (mg/L)	No known standard method is available for this product. According to the supplier, testing can be conducted through infrared spectroscopy.	0.2	-	±25%

2.2 Proposed Updates to Action and Limit Level for Anti-scalant

The Action and Limit Level for monitoring of anti-scalant as mentioned in Table 5.4 of the approved *EM&A Manual* are proposed to be updated as presented in **Table 2.2**.

Table 2.2 Action and Limit Level for Anti-scalant

Parameters	Action Level	Limit Level
Anti-scalant in mg/L (Depth-averaged)	0.2 ^(a)	0.2 ^(a)

(a) The action and limit level for anti-scalant was based on assessment factor of 50 (for available long term No Observed Effect Concentration (NOEC) for two trophic levels, following the guideline under *Technical Guidance Document on Risk Assessment* (Part 2) by the European Chemical Bureau of the Institute for Health and Consumer Protection under the European Commission), with the lowest NOEC being 10 mg/L. Please refer to the MSDS in **Appendix A** for the mentioned ecotoxicology data.

2.3 Justifications

At the time of preparation of the approved *EM&A Manual*, the type of anti-scalant to be used was not known. As the Project design progresses, it is confirmed that the anti-scalant to be used during the operation of the Project is ACUMER 4035, a proprietary product consisting of sodium salt of poly-acrylic acid. According to the MSDS, this substance is low in toxicity and the lowest NOEC is reported to be 10 mg/L. Following the guideline under *Technical Guidance Document on Risk Assessment* (Part 2) by the European Chemical Bureau of the Institute for Health and Consumer Protection under the European Commission, an assessment factor of 50 (for available long term NOEC for two trophic levels) is applied such that the action and limit levels for this anti-scalant (depth-averaged) are proposed to be 0.2 mg/L. The levels of the anti-scalant will be determined by infrared spectroscopy based on the information of the supplier.

3. ECOLOGY

Under the approval conditions of the EIA Report for the Project, an EM&A programme on coral for the operational phase of the Project is recommended. Pursuant to these EIA approval conditions and Condition 3.1 of the EP and FEP, details of the regular coral monitoring programme have been proposed based on the baseline coral monitoring results in the *Report on Baseline Coral Monitoring and Regular Coral Monitoring Methodology (Appendix B)*. The Report was submitted for agreement with the Agriculture, Fisheries and Conservation Department (AFCD) in December 2018.

3.1 Scope of Regular Coral Monitoring for Operation Phase

The purpose of this regular coral monitoring programme is to ensure that the health status of the corals in the vicinity is kept in good condition. It is proposed to conduct regular coral monitoring at two indirect impact sites and on control sites at a frequency of once per month during the first year of Project operation. Where appropriate, pre-operation coral survey should be conducted before commencement of the Project operation, and ten selected coral colonies with the similar species should be tagged at each of the control and indirect impact sites. A Pre-operation Coral Survey Report should be prepared and submitted before the commencement of the Project operation and within 10 working days after the completion of the survey. The Pre-operation Coral Survey Report should be certified by the ET Leader and verified by the IEC. The verified Pre-operation Coral Survey Report should be submitted to the Supervising Officer's Representative (SOR), EPD and AFCD for approval.

During the first year of operational phase, coral colonies tagged during the pre-operation survey should be monitored. Monitoring result should be reviewed and be compared against the Action Level or Limit Level as set out in Table 5-3 of the *Report on Baseline Coral Monitoring and Regular Coral Monitoring Methodology (Appendix B)*. Should there be exceedances of Action Level or Limit Level, actions specified on Table 5-4 of the *Report on Baseline Coral Monitoring and Regular Coral Monitoring Methodology* shall be taken (**Appendix B**). The results and findings of all regular coral monitoring works should be recorded in the monthly EM&A reports prepared by the ET. The frequency of the operational phase coral monitoring should be reviewed annually taking into account the past coral monitoring results and the latest trends of production rate or brine discharge rate of this Project. Any proposed changes to the monitoring shall be submitted to EPD and AFCD for approval. The monitoring frequency for subsequent years will be reviewed and agreed with EPD and AFCD.

Details of the regular coral monitoring method, locations and frequency are presented in the *Report on Baseline Coral Monitoring and Regular Coral Monitoring Methodology* provided in **Appendix B**.

4. FISHERIES

Under the approval conditions of the EIA Report for the Project, an EM&A programme of regular fisheries monitoring is recommended. The purpose of the EM&A programme is to monitor the fisheries impact of the Project. Pursuant to these EIA approval conditions and Condition 3.1 of the EP and FEP, details of the regular fisheries monitoring programme have been presented in the *Methodology Paper on Regular Fisheries Monitoring (Appendix C)*. The Paper was submitted in August 2018 and subsequently approved by EPD.

4.1 Scope of Regular Fisheries Monitoring for Operation Phase

The purpose of this regular fisheries monitoring programme is to monitor the potential impacts on fisheries resources in the vicinity of the project site. Fisheries monitoring shall be carried out for at least one year at a frequency of 2 times in wet season (April to October) and 2 times in dry season (November to March) during the operation phase. The frequency of regular fisheries monitoring in the subsequent years shall be reviewed and agreed with EPD and AFCD as and when necessary (e.g. when there is significant increase in water production from the Project) at no less than bi-annually interval. Under each fisheries monitoring event, survey on adult fish, juvenile fish and ichthyoplankton shall be carried out to examine the following:

- Fish species composition;
- Abundance: number of fish captured;
- Diversity of fish resources: species diversity and evenness;
- Size: range of total length;
- Biomass in weight; and
- Values of catches of commercial species: catch per unit effort (CPUE) and yield per unit effort (YPUE).

The proposed fisheries monitoring will provide information on the conditions of fisheries resources in terms of key parameters as listed above. Thus, the results for these key parameters can be compared between different time periods to evaluate whether or not the Project implementation will cause any impact on the fisheries resources.

Details of the regular fisheries monitoring method, monitoring locations and schedule are presented in the *Methodology Paper on Regular Fisheries Monitoring in Appendix C*. The fisheries survey protocols, gear specifications and survey locations are the same as those conducted in the pre-construction and construction stages.

Apart from the regular fisheries monitoring programme, additional water quality monitoring programme is also proposed to (i) provide supplementary information in the interpretation of the findings of the fisheries monitoring and (ii) assist the monitoring of the potential impact on the Tung Lung Chau Fish Culture Zone (FCZ) in Joss House Bay. The additional water quality monitoring programme is proposed to be carried out at the same frequency and locations of the fisheries monitoring programme during operation phase in order to provide supplementary information in the interpretation of the findings of the fisheries monitoring. Details of the additional water quality monitoring are presented in Section 2.4 of the *Methodology Paper on Regular Fisheries Monitoring* provided in **Appendix C**. Action and Limit levels for water quality as stated in the approved *Baseline Water Quality Monitoring Report*, as well as those for anti-scalant as stated in this Manual, are used to determine whether operational modifications are necessary to mitigate impacts to water quality. In the event that the levels are exceeded, appropriate actions in Event and Action Plan (see approved *EM&A Manual*) should be undertaken and a review of works will be carried out by the Contractor.

5. REPORTING

5.1 Regular Fisheries Monitoring Report for Operation Phase

Regular Fisheries Monitoring Report for Operation Phase shall be prepared and submitted within 2 months of completion of each fisheries monitoring event. The regular monitoring report shall include at least the following:

- Brief Project background information;
- Purpose of regular fisheries monitoring and report;
- Record of any Project effluent discharge (e.g. brine) into the marine environment during the monitoring period with graphical illustrations (such as the types, locations and timing of discharge, flow rate etc.)
- Summary of the marine water quality monitoring results and continuous Project effluent quality monitoring results separately collected under additional water quality monitoring programme as described in Section 2.4 of the *Methodology Paper on Regular Fisheries Monitoring* in **Appendix C** and the EM&A programme of the Project for the monitoring period including the record of any complaints on marine water quality (written or verbal) and non-compliances (exceedances) of the water quality performance limits (Action and Limit Levels) including the locations and nature of exceedances / complaints, investigation, follow-up actions taken, results and summary;
- Record of any complaints on fisheries impact received (written or verbal) during the monitoring period for each media, including locations and nature of complaints, investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Methodology of regular fisheries monitoring including monitoring locations, dates, time, frequency, durations, equipment and procedures;
- Results of data analysis for data collected under each fisheries monitoring event during the monitoring period;
- Comparison of the data analysis results for the monitoring period with all relevant past available fisheries data obtained in the monitoring area to analyze the temporal trends of fisheries conditions in Joss House Bay, identify any potential impact on fisheries resources such as Tung Lung Chau FCZ and any other factors which might affect the monitoring results for the monitoring period;
- Comments (on the potential fisheries impact of the Project), recommendations (with respect to the need for any new mitigation measures and improvement to the Project operation and changes to the regular fisheries monitoring programme) and conclusions; and
- Review the frequency of the regular fisheries monitoring for subsequent years of Project operation.

APPENDIX A ANTI-SCALANT MATERIAL SAFETY DATA SHEET



SAFETY DATA SHEET

DOW CHEMICAL (SHANGHAI) COMPANY LIMITED

according to GB/T 16483 and GB/T 17519

Product name: ACUMER™ 4035 Polymer
SDS Number: 11072590

Date of first issue: 02.02.2011
Issue Date: 20.12.2019
Print Date: 16.08.2022

DOW CHEMICAL (SHANGHAI) COMPANY LIMITED encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: ACUMER™ 4035 Polymer

Recommended use of the chemical and restrictions on use

Identified uses: Water and process additives

COMPANY IDENTIFICATION

DOW CHEMICAL (SHANGHAI) COMPANY LIMITED
PART 425 FLOOR 4, NO.125, NORTH FUTE ROAD
CHINA (SHANGHAI) FREE TRADE PILOT
200131 SHANGHAI
CHINA

Customer Information Number:

(86) 21-3851-4988
SDSQuestion@dow.com

Fax:

(86) 21-5895-4612

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 86-21-5838-2516

Local Emergency Contact: 021-5838-2516

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid clear
Color	No data available
Odor	Mild odor
This product is not hazardous per the Globally Harmonized System of Classification and Labelling (GHS).	

GHS Classification

This product is not hazardous per the Globally Harmonized System of Classification and Labelling (GHS).

Physical and chemical hazards

Not classified based on available information.

Health hazards

Not classified based on available information.

Environmental hazards

Not classified based on available information.

Other hazards

No data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CASRN	Concentration
2-Propenoic acid, homopolymer, sodium salt	9003-04-7	>= 30.0 - < 50.0 %

4. FIRST AID MEASURES

Description of first aid measures

Protection of first-aiders:

If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air; if effects occur, consult a physician.

Skin contact: Wash off with plenty of water. Suitable emergency safety shower facility should be available in work area.

Eye contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Ingestion: No emergency medical treatment necessary.

Most important symptoms and effects, both acute and delayed:

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed

Notes to physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIREFIGHTING MEASURES

Extinguishing media

Suitable extinguishing media: Use extinguishing media appropriate for surrounding fire..

Unsuitable extinguishing media: Not applicable.

Special hazards arising from the substance or mixture

Hazardous combustion products: No data available

Unusual Fire and Explosion Hazards: Material can splatter above 100C/212F.. Dried product can burn..

Advice for firefighters

Fire Fighting Procedures: No data available

Special protective equipment for firefighters: Wear self-contained breathing apparatus and protective suit..

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Use personal protective equipment. Keep people away from and upwind of spill/leak. Material can create slippery conditions.

Environmental precautions: CAUTION: Keep spills and cleaning runoff out of municipal sewers and open bodies of water.

Methods and materials for containment and cleaning up: Contain spills immediately with inert materials (e.g., sand, earth). Transfer liquids and solid diking material to separate suitable containers for recovery or disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Monomer vapors can be evolved when material is heated during processing operations. See SECTION 8, for types of ventilation required.

Conditions for safe storage: Keep from freezing - product stability may be affected. STIR WELL BEFORE USE.

Storage stability

Storage temperature: 1 - 49 °C

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

Component	Regulation	Type of listing	Value
2-Propenoic acid, homopolymer, sodium salt	Dow IHG	TWA Respirable fraction	0.5 mg/m ³

Exposure controls

Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields).

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Polyvinyl chloride ("PVC" or "vinyl"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Avoid gloves made of: Polyvinyl alcohol ("PVA"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	liquid clear
Color	No data available
Odor	Mild odor
Odor Threshold	No data available
pH	3.0 - 4.0

Melting point/range	No data available
Freezing point	No data available
Boiling point (760 mmHg)	100.00 °C Water
Flash point	Noncombustible
Evaporation Rate (Butyl Acetate = 1)	<1.00 Water
Flammability (solid, gas)	Not Applicable
Lower explosion limit	Not Applicable
Upper explosion limit	Not Applicable
Vapor Pressure	22.6648080 Pa at 20.00 °C Water
Relative Vapor Density (air = 1)	<1.0000 Water
Relative Density (water = 1)	1.2000
Water solubility	completely soluble
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	Not Applicable
Decomposition temperature	> 230.00 °C
Dynamic Viscosity	100.000 mPa.s maximum
Kinematic Viscosity	No data available
Explosive properties	No data available
Oxidizing properties	No data available
Molecular weight	1,800.00 - 2,000.00 g/mol
Percent volatility	64.000 - 66.000 %
Particle size	Not Applicable

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: No data available

Chemical stability: Stable

Possibility of hazardous reactions: None known.
Product will not undergo polymerization.

Conditions to avoid: No data available

Incompatible materials: There are no known materials which are incompatible with this product.

Hazardous decomposition products: Thermal decomposition may yield acrylic monomers..

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Exposure routes

Ingestion, Inhalation, Skin contact, Eye contact.

Acute toxicity (represents short term exposures with immediate effects - no chronic/delayed effects known unless otherwise noted)

Acute oral toxicity

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

For this family of materials:

LD50, Rat, male and female, > 5,000 mg/kg

Information for components:

2-Propenoic acid, homopolymer, sodium salt

LD50, Rat, > 5,000 mg/kg

Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

For this family of materials:

LD50, Rat, male and female, > 2,000 mg/kg No deaths occurred at this concentration.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

LD50, Rat, > 2,000 mg/kg

Acute inhalation toxicity

Brief (minutes) exposure to vapor, mist or dust is not likely to cause adverse effects.

The LC50 has not been determined.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

The LC50 has not been determined.

Skin corrosion/irritation

Typical for this family of materials.

Brief contact may cause slight skin irritation with local redness.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

Prolonged contact may cause slight skin irritation with local redness.
Material may stick to skin causing irritation upon removal.

Serious eye damage/eye irritation

Typical for this family of materials.
May cause slight temporary eye irritation.
Corneal injury is unlikely.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

May cause slight eye irritation.
Corneal injury is unlikely.

Sensitization

For this family of materials:
Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant data found.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

Available data are inadequate to determine single exposure specific target organ toxicity.

Aspiration Hazard

Based on physical properties, not likely to be an aspiration hazard.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

Based on physical properties, not likely to be an aspiration hazard.

Chronic toxicity (represents longer term exposures with repeated dose resulting in chronic/delayed effects - no immediate effects known unless otherwise noted)

Specific Target Organ Systemic Toxicity (Repeated Exposure)

For this family of materials:
Based on available data, repeated exposures are not anticipated to cause significant adverse effects.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

No relevant data found.

Carcinogenicity

No relevant data found.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

No relevant data found.

Teratogenicity

No relevant data found.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

No relevant data found.

Reproductive toxicity

No relevant data found.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

No relevant data found.

Mutagenicity

For this family of materials: In vitro genetic toxicity studies were negative.

Information for components:

2-Propenoic acid, homopolymer, sodium salt

No relevant data found.

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Ecotoxicity

Acute toxicity to fish

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

For this family of materials:

LC50, Zebra fish (Danio/Brachydanio rerio), 96 Hour, > 100 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates

For this family of materials:
EC50, Daphnia magna (Water flea), 48 Hour, > 100 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants

For this family of materials:
EC50, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), 96 Hour, Growth inhibition, 990 mg/l

For this family of materials:
NOEC, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), 96 Hour, Growth inhibition, 500 mg/l

Long-term (chronic) aquatic hazard

Chronic toxicity to fish

For this family of materials:
NOEC, Oncorhynchus mykiss (rainbow trout), 21 d, 90 mg/l

For this family of materials:
LC50, Oncorhynchus mykiss (rainbow trout), 21 d, > 90 mg/l

Chronic toxicity to aquatic invertebrates

For this family of materials:
NOEC, Daphnia magna, 21 d, number of offspring, 10 mg/l

Persistence and Degradability

Biodegradability: No relevant data found.

Bioaccumulative Potential

Bioaccumulation: No relevant data found.

Mobility in Soil

No relevant data found.

Results of PBT and vPvB assessment

This substance has not been assessed for persistence, bioaccumulation and toxicity (PBT).

Other adverse effects

This substance is not on the Montreal Protocol list of substances that deplete the ozone layer.

13. DISPOSAL CONSIDERATIONS

Disposal methods: For disposal, incinerate or landfill at a permitted facility in accordance with local, state, and federal regulations.

Contaminated packaging: Empty containers retain product residues. Follow label warnings even after container is emptied. Improper disposal or reuse of this container may be dangerous and illegal. Refer to applicable federal, state and local regulations.

14. TRANSPORT INFORMATION

Classification for ROAD and Rail transport:

Not regulated for transport

Classification for SEA transport (IMO-IMDG):

**Transport in bulk
according to Annex I or II
of MARPOL 73/78 and the
IBC or IGC Code**

Not regulated for transport

Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Not regulated for transport

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

The following statutes, regulations and standards have the related prescribes on chemicals in terms of safe use, storage, transportation, loading and unloading, classification and symbol etc. Provisions on the Environmental Administration of New Chemical Substances.

The Regulation on Chemicals Safe Use at Working Site

Law on Prevention and Control of Environmental Pollution Caused by Solid Waste.

Occupational Exposure Limits for Hazardous Agent in The workshop Chemical Hazardous Agents(GBZ 2.1).

China. Inventory of Existing Chemical Substances in China (IECSC) (IECSC)

All intentional components are listed on the inventory, are exempt, or are supplier certified.

16. OTHER INFORMATION

Revision

Identification Number: 11072590 / A160 / Issue Date: 20.12.2019 / Version: 2.0

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

Dow IHG	Dow Industrial Hygiene Guideline
TWA	Time weighted average

Full text of other abbreviations

AICS - Australian Inventory of Chemical Substances; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECS - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

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APPENDIX B REPORT ON BASELINE CORAL MONITORING AND REGULAR CORAL MONITORING METHODOLOGY

OUR REF 190495-0733

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BY HAND

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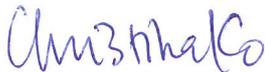
First Stage of Desalination Plant at Tseung Kwan O - Investigation, Design and Construction

Submission of Report on Baseline Coral Monitoring and Regular Coral Monitoring Methodology (Final)

We are pleased to submit the Report on Baseline Coral Monitoring and Regular Coral Monitoring Methodology - Issue 2 (Final) for the above Assignment for your retention.

Should you have any queries, please feel free to contact our Ms. Amy Cheung at 2601-1000.

Yours faithfully,
for and on behalf of
BLACK & VEATCH HONG KONG LIMITED



CHRISTINA KO
PROJECT MANAGER

AC
Encl.



OUR REF 190495-0733

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| PAGE 2

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ISSUE 2

REPORT ON BASELINE CORAL MONITORING AND REGULAR CORAL MONITORING METHODOLOGY (DRAFT)

Agreement No. CE 8/2015 (WS)

First Stage of Desalination Plant at

Tseung Kwan O

– Investigation, Design and Construction

B&V PROJECT NO. 190495/29.2170

Report Authorized For
Issue By:

Christina Go

For and on Behalf of
Black & Veatch Hong Kong Limited

PREPARED FOR

Water Supplies Department

27 DECEMBER 2018



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	Name	Signature	Date
Prepared	Keith Kei / Sarah Yau	<i>P.P. AC</i>	27 December 2018
Checked	Amy Cheung	<i>P.P. AC</i>	27 December 2018
Reviewed	Christina Ko	<i>Christina Ko</i>	27 December 2018

1 Introduction

1.1 Background

- 1.1.1 Water Supplies Department (WSD) appointed Black & Veatch Hong Kong Limited (B&V) to undertake the consultancy “Agreement No. CE 8/2015 (WS) First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design, and Construction” on 16 November 2015.
- 1.1.2 The purpose of the Project is to construct a sea water reverse osmosis (SWRO) desalination plant at Tseung Kwan O (TKO) Area 137, together with all ancillary facilities and the slope mitigation works in the adjoining Clear Water Bay Country Park.
- 1.1.3 The first stage of the proposed SWRO desalination plant will have a water production capacity of 135,000 cubic meters (m³) per day with provision for future expansion to the ultimate capacity up to 270,000 m³ per day when necessary.
- 1.1.4 The Project is classified as a Designated Project (DP) under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Impact Assessment (EIA) was completed in accordance with the EIAO under the Feasibility Study (FS) stage of the Project. The EIA Report for the Project (Register No.: AEIAR-192/2015) was approved with conditions on 4 November 2015 under the EIAO. Following the approval of the EIA Report, the Environmental Permit (EP) (No: EP- 503/2015), covering the construction and operation of Project, was granted on 4 December 2015. The EP for this Project was subsequently amended and the amended EP (No. EP-503/2015/A) was granted on 26 January 2018 under the EIAO.

1.2 Purpose of this Report

- 1.2.1 An Environmental Monitoring and Audit (EM&A) programme of regular coral monitoring is recommended under the approval conditions of the EIA Report for the Project. The purpose of the EM&A programme is to monitor the coral impact of the Project.
- 1.2.2 This Paper presents the baseline coral monitoring results, which will form part of the regular coral monitoring programme to provide baseline coral data for impact monitoring.
- 1.2.3 This Paper is also prepared to set out the methodology for regular coral monitoring during the construction and operation stages for agreement with the Agriculture, Fisheries and Conservation Department (AFCD).

1.3 Structure of this Report

- 1.3.1 The remainder of this Report is organized as follows:
 - a) Section 2 describes the baseline coral conditions from literature review;
 - b) Section 3 presents the baseline coral monitoring methodology;
 - c) Section 4 gives the baseline coral monitoring results; and
 - d) Section 5 provides the regular coral monitoring methodology.

2 Review of Baseline Condition

2.1 Study Area

- 2.1.1 The Project comprises submarine utilities including a seawater intake and a submarine outfall in Joss House Bay as shown in **Figure 2.1**. The submarine pipelines of the intake and outfall

will be constructed with trenchless technologies. Only minor dredging works will be required for construction of the proposed seawater intake structure and outfall diffusers.

- 2.1.2 The approved EIA Report predicted that the potential impacts on marine ecological resources would be confined within close proximity of the minor dredging works with proper implementation of the recommended water quality mitigation measures. Based on literature review and baseline surveys undertaken during the EIA stage, no coral colonies were identified under the footprint of the proposed minor dredging works, and no significant construction or operation phase impacts to corals were predicted.
- 2.1.3 Tseung Kwan O (TKO) Area 137, where the proposed desalination plant is located, is an existing reclamation area. The coastlines of Area 137 mainly consist of artificial seawalls. Only a small section of natural coast (left from the original Tit Cham Chau Island) is found at the southern end of Area 137. The remaining natural coasts of Tit Cham Chau Island were lost as a result of the Area 137 reclamation.
- 2.1.4 The proposed submarine pipelines of the intake and outfall of this Project extend from an existing artificial sloping seawall at the southeast side of Area 137. The Study Area of this baseline coral monitoring mainly covered the potential Project impact zone near the proposed submarine utilities and the surrounding subtidal habitats along the natural coastlines of Fat Tong Chau, Joss House Bay and north of Tung Lung Chau.

2.2 Baseline Condition

Desalination Plant at Tseung Kwan O (TKO) EIA

- 2.2.1 Subtidal coral survey was conducted in 2014 as part of the approved EIA study for the Project. This Project-specific survey was designated to encompass subtidal hard bottom habitat within the Study Area with a focus on the natural coastline of Fat Tong Chau (C1), proposed submarine pipelines of the Project (C2 and C3), natural coastlines in the northern Joss House Bay (including C4 – northeast of proposed submarine utilities, C5 – further northeast of proposed submarine utilities next to Tai Miu Wan and C6 – east of Tai Miu Wan) and north of Tung Lung Chau Island (C7) as shown in Figure 2.1.
- 2.2.2 C1 is located on the natural coast of Fat Tong Chau to the northwest of the Project site. Seven species of corals were recorded including six (6) species of hard coral (including *Coscinaraea* sp. which was reported as “undescribed” ⁽¹⁾) and one (1) species of common gorgonian (*Guaiaigorgia* sp.). The remaining hard coral species recorded at the site are all common, dominant or abundant in Hong Kong. The coral coverage was less than 5%.
- 2.2.3 The alignments of the proposed submarine outfall and intake pipelines (C2 and C3) were mostly sandy substrate without coral colonization. No coral colony was found on the artificial seawall near the proposed submarine pipelines. Corals were however recorded on the natural coastlines near the Project areas. Thirteen (13) species of hard corals (all common, dominant or abundant in Hong Kong) were recorded on the natural coast of Tit Cham Chau near C2. Ten (10) species of hard corals were recorded along the seabed of the small island near C3 including one uncommon species (*Favites flexuosa*). All other hard coral species recorded near the small island are common, dominant or abundant in Hong Kong. The coral coverage recorded at the two sites was between 5-10%. No corals were found under the footprint of the proposed minor dredging works.

⁽¹⁾ Chan, A.L.K., Choi, C.L.S., McCorry, D., Chan, K.K., Lee, M.W. and Ang, P.J. 2005. Field Guide to Hard Corals of Hong Kong. Friends of the Country Parks, Hong Kong.

- 2.2.4 C4, C5 and C6 are on the natural coastlines of Joss House Bay, which is an embayment at the southern shore of Clear Water Bay Peninsula. At C4, seventeen (17) species of hard corals were recorded (the highest no. of coral species among all the survey sites), with three “uncommon” species (*Acropora solitaryensis*, *Favites flexuosa* and *Psammocora haimeana*) and the “undescribed” *Coscinaraea* sp. The coral coverage at C4 was between 5-10%. C5 also had a relatively high coral diversity, with 14 species of hard corals including two “uncommon” species (*Favites flexuosa* and *Psammocora haimeana*) together with the “undescribed” *Coscinaraea* sp. The coral coverage at C5 was below 10%. C6 however was the lowest in terms coral diversity among all survey sites. Only one species of “Dominant” hard coral (*Porites lutea*) of less than 1 % coverage was recorded.
- 2.2.5 The northern coast Tung Lung Chau Island (C7) is located to the south of the Project site. The coastlines at Tung Lung Island are basically all natural except at the few piers on the island. There is an existing fish culture zone just offshore to the survey site (C7) as shown in Figure 2.1. The recorded coral diversity at C7 was however low. Only three species of hard corals (all common, abundant or dominant in Hong Kong) were recorded and the coverage was also very low (less than 1%).
- 2.2.6 No other dive surveys covering the Study Area have been identified since the 2014 dive surveys carried out under this Project.

2.3 Summary

- 2.3.1 Among the seven dive survey sites of the approved EIA study, the highest diversity of corals was recorded on the natural coastline of Joss House Bay to the northeast of the proposed submarine utilities of this Project (namely C4 and C5). The intake and outfall pipeline (C2 and C3), though the two alignments were mostly sandy substrate without coral colonization, the natural coastlines nearby were also of certain coral diversity. The rest of the dive survey sites (including C1 – Fat Tung Chau, C6 – east of Tai Miu Wan and C7 – north of Tung Lung Chau) are not found of significant coral diversity or coverage.

3 Baseline Coral Monitoring Methodology

- 3.1.1 A baseline coral survey was conducted in August and September 2018 to verify the validity of the previous EIA findings as well as to provide updated baseline coral data for impact monitoring during the construction and operational phases. The baseline coral monitoring was carried out by coral specialist with over five years of relevant working experience in coral field survey and identification. This Section presents the baseline coral survey methodology.

3.2 Identification of Indirect Impact and Control Sites

- 3.2.1 It is recommended to carry our regular coral monitoring at the indirect impact and control sites during construction and operational phases. The indirect impact site should be potentially affected indirectly during the construction and operational phases (preferably close to the proposed submarine utilities). The control site should be far away from the Project area to avoid any potential indirect impact during construction and operational phases. To verify the suitability of control and indirect impact sites, data collected including environmental conditions, bathymetry, benthic composition at the control site have been compared with those collected at the indirect impact site. Both sites should preferably share the following characteristics:
- Presence of a healthy coral community of the similar coral species at both control and indirect impact sites; and
 - Similar environmental conditions, such as bathymetry, water depth, benthic composition.

3.3 Spot-check Reconnaissance Dives

- 3.3.1 The baseline coral monitoring covered specific spot dive checks at the same seven sites (namely C1 to C7) surveyed under the approved EIA study and one potential control site (namely C8) at Ninepins. Each site was surveyed by SCUBA diving prior to the commencement of the Project construction.
- 3.3.2 A spot dive reconnaissance check was conducted within the spot dive check areas (namely C1 to C8) as shown in **Figure 3.1** to record the distance surveyed, visibility, water depth, substrate type, estimate of % coral coverage, conservation status of coral species in Hong Kong waters. Under the spot dive reconnaissance check, suitable locations to carry out the REA surveys were also determined.

3.4 Rapid Ecological Assessment Survey

- 3.4.1 Rapid Ecological Assessment (REA) survey was then conducted for the sites where corals were recorded by the spot dive reconnaissance check and are of concerns to this Project, to collect semi-quantitative ecological information of the coral communities. Three sites (namely C2 – proposed submarine outfall, C3 – proposed seawater intake and C8 – potential control site at Ninepins) were recommended for REA survey.
- 3.4.2 Three 100-m horizontal transects were set up along the contour of the seabed at areas C2, C3 and C8 respectively as shown in **Figure 3.2**.
- 3.4.3 The benthic cover, taxon abundance, and ecological attributes of the REA transects were recorded in a swathe 2 m wide, 1 m either side of the transects, following the standardized REA survey technique specified in the EIAO Guidance Note No.11/2010.
- 3.4.4 Photographs of representative coral species in the surveyed areas were also taken using an underwater digital camera as shown in **Appendix A**.
- 3.4.5 Information concerning the physical nature of the surveyed site was recorded during the survey. This consisted of observations regarding the degree of exposure of the site to wave action, the nature of the substrate type and the topographic profile of the sites.

4 Baseline Coral Monitoring Results

4.1 Spot-check Reconnaissance Dives

- 4.1.1 The spot-check dives were carried out on 20, 21 and 22 August 2018 as well as 21 September 2018 and the weather conditions are summarized in **Table 4-1**.

Table 4-1: Weather Condition for Spot Check Dives

Date	Condition	Average Underwater Visibility
20 August 2018	- East force 5, - Sunny intervals	1 m
21 August 2018	- East force 4 to 5, - Sunny	1 m
22 August 2018	- Northeast force 4 - Sunny	0.5 m – 1 m
21 September 2018	- Northeast force 4-5 - Sunny	0.5 m – 1 m

- 4.1.2 The GPS coordinates, route distance, maximum depth, bottom substrate and bottom visibility of each of the surveyed areas (namely C1 to C8) are summarized in **Table 4-2**.

Table 4-2: GPS Coordinates, Route Distance, Maximum Depth, Minimum Depth, Bottom Substrate and Bottom Visibility of Spot-Check Dive Sites

Site (Figure 3.1)	Location (GPS) (Starting Point)	Route Distance (m)	Minimum Depth (m)	Maximum Depth (m)	Bottom Substrate	Visibility (m)
C1	E 114°15'52.76" N 22°16'35.36"	400	1.5	3.8	Natural Bedrock and Boulders	<0.5
C2	E 114°16'36.67" N 22°15'44.96"	300	2	5.5	Natural Bedrock, Boulders, Artificial Slopping Boulders, Rocks	<0.5
C3	E 114°16'41.87" N 22°15'54.15"	450	1.5	4	Natural Bedrock, Boulders, Artificial Slopping Boulders, Rocks	<0.5
C4	E 114°16'54.54" N 22°16'06.03"	420	2.2	3.2	Natural Bedrock and Boulders	<0.5
C5	E 114°16'15.61" N 22°16'14.14"	230	2	3.3	Natural Bedrock and Boulders	<0.5
C6	E 114°17'30.39" N 22°16'00.76"	200	2.3	5	Natural Bedrock and Boulders	<0.5
C7	E 114°17'06.67" N 22°15'17.25"	250	1.5	5.4	Natural Bedrock and Boulders	<0.5
C8	E 114°20'45.58" N 22°16'02.49"	350	2.3	4.6	Natural Bedrock and Boulders	<0.5

4.1.3 The survey sites are mainly composed with natural bedrock and boulders except C2 and C3 where part of the survey areas are artificial slopping boulders. Hard coral *Oulastrea crispata* and *Psammocora superficialis* were the dominant species during the survey in which they appeared in 6 sites (Table 4-3). Uncommon species *Acropora solitaryensis* was recorded in sites C4 and C8; undescribed species *Coscinaraea* sp. was recorded in sites C1, C5 and C8 while uncommon species *Acanthastrea echinata*, and *Platygyra ryukyuensis* were recorded in site C8 only. Other coral species recorded during the spot check divers are common to abundant species in Hong Kong waters. No corals were found under the footprint of the proposed minor dredging works.

4.1.4 The proposed control site C8 showed the highest coral species diversity (29 species), while site C6 showed the lowest (1 species) among all survey sites. The proposed outfall pipeline is located inside spot check area C2, while the proposed intake pipeline is located inside spot check area C3. Both sites C2 and C3 showed similar coral species diversity (13 and 10 species respectively) and all coral species recorded during spot check are all common to abundant species. Both C2 and C3 showed low coral coverage (5% to 10%). Coral coverages recorded during the sport check survey are summarized in Table 4-4.

Table 4-3: Coral Species Recorded during Spot Check Survey

	Site								Abundance in Hong Kong
	C1	C2	C3	C4	C5	C6	C7	C8	
HARD CORAL									
<i>Acanthastrea echinata</i>								x	Uncommon
<i>Acropora solitaryensis</i>				x				x	Uncommon

	Site								Abundance in Hong Kong
	C1	C2	C3	C4	C5	C6	C7	C8	
<i>Bernardpora (Goniopora) stutchburyi</i>	x			x	x			x	Common
<i>Coscinaraea sp.</i>	x				x			x	Undescribed
<i>Cyphastrea serailia</i>		x	x	x			x	x	Dominant
<i>Dipsastraea (Favia) favus</i>				x	x			x	Abundant
<i>Dipsastraea (Favia) lizardensis</i>				x					Common
<i>Dipsastraea (Favia) rotumana</i>		x		x	x			x	Abundant
<i>Dipsastraea (Favia) speciosa</i>		x	x	x	x			x	Abundant
<i>Dipsastraea (Favia) veroni</i>		x							Common
<i>Favites abdita</i>	x	x	x	x				x	Common
<i>Favites chinensis</i>		x	x	x				x	Common
<i>Favites flexuosa</i>			x		x				Common
<i>Favites pentagona</i>				x	x			x	Dominant
<i>Goniastrea aspera</i>	x			x				x	Common
<i>Goniopora columna</i>								x	Abundant
<i>Hydnophora exesa</i>								x	Abundant
<i>Leptastrea pruinosa</i>								x	Abundant
<i>Leptastrea purpurea</i>								x	Abundant
<i>Montipora peltiformis</i>		x	x		x			x	Common
<i>Oulastrea crispata</i>	x	x	x		x		x	x	Common
<i>Pavonna descussata</i>				x				x	Common
<i>Platygyra acuta</i>								x	Dominant
<i>Platygyra carnosus</i>				x				x	Common
<i>Platygyra ryukyuensis</i>								x	Uncommon
<i>Plesiastrea versipora</i>		x		x	x			x	Abundant
<i>Porites lobata</i>								x	Common
<i>Porites lutea</i>			x		x	x			Common
<i>Psammocora haimeana</i>					x			x	Common
<i>Psammocora superficialis</i>	x	x		x	x		x	x	Common
<i>Turbinaria peltata</i>			x		x			x	Common
OCTOCORALS									Common
<i>Dendronephthya sp.</i>								x	Common
<i>Guaiaigorgia sp.</i>	x								Common
<i>Euplexaura sp.</i>								x	Common
Total No. of Coral Species	7	13	10	15	14	1	3	29	

Table 4-4: Coral Coverage during Spot Check Survey

Site	C1	C2	C3	C4	C5	C6	C7	C8
Coral Coverage (%)	<5	5 to 10	5 to 10	5 to 10	<10	<1	<1	25

Summary and Recommendation

- 4.1.5 Among the eight survey sites, the highest diversity of corals was recorded at the proposed control site at Ninepins (C8). The next highest coral diversity was recorded on the natural coastline of Joss House Bay to the northeast of the proposed submarine utilities of this Project (namely C4 and 5). The intake and outfall pipeline (C2 and C3), though the two alignments were mostly sandy substrate without coral colonization, the natural coastlines nearby were also of certain coral diversity. The rest of the dive survey sites (including C1 – Fat Tung Chau, C6 – east of Tai Miu Wan and C7 – north of Tung Lung Chau) are not found of significant coral diversity or coverage. This spot check verification survey reconfirm the findings of the approved EIA Report.
- 4.1.6 REA survey was recommended to be carried out within areas C2, C3 and C8. Areas C2 and C3 with certain coral diversity are closest to the Project areas and therefore they are the most critical sites in terms of the potential coral impact to be brought by this Project. Area C8 is the potential control site for regular monitoring and hence further survey in the form of REA was carried out at this site to collect more baseline information.

4.2 Rapid Ecological Assessment Survey

- 4.2.1 The REA survey was performed on 20 and 21 September 2018. The weather was sunny on both survey days. The sea was wavy and the visibility was fair (approximately 0.5 m to 1 m). Three 100-m transects were laid parallel to the coastline within the spot check areas C2, C3 and C8 (**Figure 3.2**). Relevant information of the REA surveys is provided in **Table 4-5** and **Table 4-6**.

Table 4-5: Weather Condition for the REA Survey

Date	Condition	Average Underwater Visibility
20 September 2018	- Southwest force 5 - Sunny	<0.5 m
21 September 2018	- Southwest force 4 to 5 - Sunny	<0.5 m

Table 4-6: GPS of Transect Starting and Ending, Maximum Depth, Bottom Substrate and Bottom Visibility of the Three REA Transects

Transect (Figure 3.2)	Location (GPS) (Starting Point)	Location (GPS) (End Point)	Maximum Depth (m)	Bottom Substrate	Visibility (m)
C2	E 114°16'39.88" N 22°15'49.91"	E 114°16'39.26" N 22°15'46.70"	2.5	Bedrock, Boulder, Rock and Sand	<0.5
C3	E 114°16'44.98" N 22°15'55.30"	E 114°16'48.57" N 22°15'55.04"	2.5	Bedrock, Boulder, Rock and Sand	<0.5
C4	E 114°20'46.16" N 22°16'01.61"	E 114°20'46.30" N 22°15'57.72"	4	Natural Bedrock and Boulders	<0.5

Transect C2

- 4.2.2 A 100-m transect was laid down along the coastline of Tit Cham Chau within the spot check dive area (C2) near the proposed outfall pipeline. The average depth for the transect was about 2.5 m and visibility around 0.5 m.
- 4.2.3 The substrate along the transect line is mainly composed of bedrock, boulders, rock and sand. Other than the hard corals recorded, this site supported limited marine life and only some common sponges, bryozoans, rock oyster *Saccostrea cucullata*, common green mussel *Perna viridis*, and tubeworm *Sabelastarte japonica* were found on the surface of boulders. The survey results for C2 are summarized in **Table 4-7** to **Table 4-9**.

Table 4-7: Ecological Attributes on Site C2 REA Transect

Ecological Attributes	Rank
Hard Corals	1
Dead Coral	0
Octocoral	0
Sea anemone beds	0
Dead Standing Corals	0
Other Benthos	1
Macroalgae	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30 %; 3 = 31-50%; 4= 51-75 %; 5 = 76-100%.

Table 4-8: Substratum Attributes on Site C2 REA Transect

Hard Substrata	Rank
Bedrock/continuous pavement	2
Boulder Blocks (diam.>50cm)	3
Boulder Blocks (diam.<50cm)	2
Rubble	0
Other	0
Soft Substrata	Rank
Sand	2
Mud/Silt	1
Mud	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30 %; 3 = 31-50%; 4= 51-75 %; 5 = 76-100%.

Table 4-9: Ranks of Taxon Abundance along the Site C2 REA Transect

Benthic Communities	Abundance in the Site
Hard Corals	
<i>Cyphastrea serailia</i>	3
<i>Favia speciosa</i>	3
<i>Favites abdita</i>	3
<i>Favites chinensis</i>	3
<i>Oulastrea crispata</i>	3
<i>Psammocora superficialis</i>	3
Other Benthos	
<i>Thais luteostoma</i>	3
<i>Septifer virgatus</i>	3
<i>Anthocidaris crassispina</i>	3
<i>Diadema</i> sp.	3

* Rank of Abundance: 0 = Absent; 1 = Rare; 2 = Uncommon; 3 = Common; 4= Abundant; 5 = Dominant.

4.2.4 This site supported a sparse and patchy cover (around 5 to 10%) of hard coral. A total of 6 species of hard coral was recorded along the transect. They were of small size (about 5 to 15 cm in diameter) and in low coverage. All the coral colonies were in fair condition.

4.2.5 All coral colonies recorded along the transect are common hard coral species in Hong Kong. It is especially adapted to harsh environment and it can be found in many places in Hong Kong (from north-east, part, Tung Ping Chau to south-west part, Shek Kwu Chau).

- 4.2.6 The proposed outfall pipeline is located inside the area of C2 which may have indirect impact during construction and operational phase. Site C2 is proposed to be an indirectly impact monitoring site.

Transect C3

- 4.2.7 A 100-m transect was laid along the coastline of Kwun Tsai within the spot check dive area (C3) near the proposed intake pipeline. The average depth for the transect was 2.5 m and the visibility was around 0.5 m.
- 4.2.8 The bottom substrates along the transect line is mainly composed of bedrock, boulders, rocks and sand. Some common sponges, bryozoans, and common green mussel *Perna viridis* were found on the boulder surfaces. They are all common species, in low abundance and sparsely distributed in this area. The survey results for C3 are summarized in **Table 4-10** to **Table 4-12**.

Table 4-10: Ecological Attributes on Site C3 REA Transect

Ecological Attributes	Rank
Hard Coral	1
Dead Coral	0
Octocoral (Soft corals black and gorgonians)	0
Anemone Beds	0
Dead Standing Corals	0
Other Benthos (sponges, zoanthids, ascidinas and bryozoans)	1
Macro-algae	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30 %; 3 = 31-50%; 4= 51-75 %; 5 = 76-100%.

Table 4-11: Substratum Attributes on Site C3 REA Transect

Hard Substrata	Rank
Bedrock/continuous pavement	2
Boulder Blocks (diam.>50cm)	3
Boulder Blocks (diam.<50cm)	2
Rubble	2
Other	1
Soft Substrata	Rank
Sand	2
Mud/Silt	1
Mud	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30 %; 3 = 31-50%; 4= 51-75 %; 5 = 76-100%.

Table 4-12: Ranks of Taxon Abundance along the Site C3 REA Transect

Benthic Communities	Abundance in the Site
Hard Corals	
<i>Cyphastrea serailia</i>	3
<i>Favites chinensis</i>	3
<i>Favites abdita</i>	3
<i>Oulastrea crispata</i>	3
<i>Porties lutea</i>	3
<i>Montipora peltiformis</i>	3
Other Benthos	
<i>Thais luteostoma</i>	3

Benthic Communities	Abundance in the Site
<i>Septifer virgatus</i>	3
<i>Anthocidaris crassispina</i>	3
<i>Diadema</i> sp.	3

* Rank of Abundance: 0 = Absent; 1 = Rare; 2 = Uncommon; 3 = Common; 4 = Abundant; 5 = Dominant.

- 4.2.9 This site supported a sparse and patchy cover (<1%) of hard coral. A total of 6 species of hard coral were recorded during the REA survey and all of them were grown on the boulders or rocks. They were of small size (about 2 to 20 cm in diameter), in low coverage. All the coral colonies were in fair condition.
- 4.2.10 All coral colonies recorded along the transect are common hard coral species in Hong Kong. It is especially adapted to harsh environment and it can be found in many places in Hong Kong (from north-east, part, Tung Ping Chau to south-west part, Shek Kwu Chau).
- 4.2.11 The proposed intake pipeline is located inside the area of C3 which may have indirect impact during construction and operational phases. Site C3 is proposed as an indirectly impact monitoring site.

Transect C8

- 4.2.12 A 100-m transect was laid down along the coastline within the coral area of spot check site C8. The average depth of the transect was around 3.5 m and visibility was around 1 m.
- 4.2.13 Area along the transect was mainly composed of bedrock and big boulders. Some common organisms were found on the surface of the boulders. These included sponges, bryozoans, rock oyster *Saccostrea cucullata*, common green mussel *Perna viridis*, and tubeworm *Sabelastarte japonica*. They are all common species, in low abundance and sparsely distributed in the area. The survey results for C8 are summarized in **Table 4-13** to **Table 4-15**.

Table 4-13: Ecological Attributes on Site C8 REA Transect

Ecological Attributes	Rank
Hard Coral	2
Dead Coral	0
Octocoral (Soft corals black and gorgonians)	0
Anemone Beds	0
Dead Standing Corals	0
Other Benthos (sponges, zoanthids, ascidinas and bryozoans)	1
Macro-algae	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30 %; 3 = 31-50%; 4 = 51-75 %; 5 = 76-100%.

Table 4-14: Substratum Attributes on Site C8 REA Transect

Hard Substrata	Rank
Bedrock/continuous pavement	5
Boulder Blocks (diam.>50cm)	2
Boulder Blocks (diam.<50cm)	1
Rubble	0
Other	0
Soft Substrata	Rank
Sand	0
Mud/Silt	1
Mud	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30 %; 3 = 31-50%; 4 = 51-75 %; 5 = 76-100%.

Table 4-15: Ranks of Taxon Abundance along the Site C8 REA Transect

Benthic Communities	Abundance in the Site
Hard Corals	
<i>Acropora solitaryensis</i>	3
<i>Cyphastrea serailia</i>	3
<i>Favites chinensis</i>	3
<i>Favia speciosa</i>	3
<i>Favites abdita</i>	3
<i>Oulastrea crispata</i>	3
<i>Pavonna descussata</i>	3
<i>Platygyra acuta</i>	3
<i>Platygyra carnosus</i>	3
<i>Porties lutea</i>	3
<i>Psammocora superficialis</i>	3
<i>Turbinaria peltata</i>	3
Other Benthos	
<i>Thais luteostoma</i>	3
<i>Septifer virgatus</i>	3
<i>Anthocidaris crassispina</i>	3
<i>Diadema sp.</i>	3

* Rank of Abundance: 0 = Absent; 1 = Rare; 2 = Uncommon; 3 = Common; 4= Abundant; 5 = Dominant.

- 4.2.14 This site has a relatively higher coral cover (20-25%) of hard coral than other two sides. Twelve species of hard coral was recorded along this transect. and all of them were grown on boulders or rocks. They were of small to medium size (about 2 to 25 cm in diameter), in low coverage. All the coral colonies are in fair condition.
- 4.2.15 All coral colonies recorded along the transect are common hard coral species in Hong Kong and it can be found in many places in Hong Kong (from north-east, part, Tung Ping Chau to south-west part, Shek Kwu Chau).
- 4.2.16 Site C8 is located at Ninepins which is quite far away (about 7km) from the proposed Desalination Plant. With reference to the criteria set out in Section 3.2.1, C8 is proposed to be the control site during the construction and operational phase monitoring.

5 Regular Coral Monitoring Methodology

5.1 Monitoring Locations

- 5.1.1 Two indirect impact sites (C2 and C3) and one control site (C8) as shown in **Figure 3.2** should be monitored during the construction phase. Pre-construction coral survey should be conducted at the indirect impact and control sites. Ten selected hard coral colonies with the similar species should be tagged at each of the control and indirect impact sites before commencement of the construction work. Tagged hard coral colonies should be monitored during the dredging / marine construction works in open waters.
- 5.1.2 Where appropriate, pre-operation coral survey should be conducted before commencement of the Project operation, and ten selected coral colonies with the similar species should be tagged

at each of the control and indirect impact sites. Tagged hard coral colonies should be monitored during the operational phase.

- 5.1.3 The general health conditions (Size, Condition, Mortality, Bleaching and Sediment) should be recorded during each monitoring event. Photos of each tagged coral colonies at the control site and indirect impact sites should be taken.

5.2 Monitoring Frequency

- 5.2.1 Coral colonies tagged during pre-construction survey should be monitored weekly during the first month of dredging / marine construction works in open waters. In case the dredging / marine construction works in open waters take less than 1 month to complete, regular coral monitoring shall still be continued for the first month. If the dredging / marine construction works take more than 1 month to complete, the frequency of regular coral monitoring shall be reduced to monthly during the second and third month of the dredging / marine construction works and quarterly in the subsequent months. In any case, the monitoring frequency shall be weekly during the first month of any dredging works.
- 5.2.2 During the first year of operational phase, coral colonies tagged during the pre-operation survey should be monitored once per month. The frequency of the operational phase coral monitoring should be reviewed annually taking into account the past coral monitoring results and the latest trends of production rate or brine discharge rate of this Project. Any proposed changes on the monitoring shall be submitted to EPD and AFCD for approval. The regular coral monitoring frequency is summarized in **Table 5-1** and **Table 5-2**.

Table 5-1: Monitoring Frequency for Dredging and Marine Construction in Open Waters

Monitoring Month	Monitoring Frequency
First Month	Weekly
Second to Third months	Monthly
Subsequent Months	Quarterly

Table 5-2: Monitoring Frequency for First Year of Operation

Monitoring Year	Frequency
First year	Monthly
Subsequent years	To be reviewed and agreed with EPD and AFCD

- 5.2.3 The general health conditions (size, condition, mortality, bleaching and sediment) shall be recorded during the REA survey and regular coral monitoring. Photos of each tagged coral colonies at control and indirect impact sites shall be taken during each monitoring event.

5.3 Monitoring Staffing

- 5.3.1 The coral monitoring works shall be carried out by suitably trained and qualified SCUBA divers and marine ecologist with at least 5 years of experience in coral survey and monitoring and a relevant degree in marine biology or equivalent.

5.4 Reporting and Evaluation

- 5.4.1 The ET shall review and update the EM&A programme and EM&A Manual for operational stage by incorporating the coral monitoring programme and seek the approval of EPD and AFCD on the updated EM&A programme including the coral monitoring programme in accordance with the EP requirements.
- 5.4.2 A Pre-construction Coral Survey Report should be prepared and submitted before the commencement of the construction phase and within 10 working days after the completion of the pre-construction survey. The Pre-construction Coral Survey Report should be certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC). The verified Pre-construction Coral Survey Report should be submitted to the

Supervising Officer’s Representative (SOR) for approval and to the EPD and AFCD for information.

- 5.4.3 A Pre-operation Coral Survey Report should be prepared and submitted before the commencement of the Project operation and within 10 working days after the completion of the survey. The Pre-operation Coral Survey Report should be certified by the ET Leader and verified by the IEC. The verified Pre-operation Coral Survey Report should be submitted to the SOR, EPD and AFCD for approval.
- 5.4.4 The results and findings of all regular coral monitoring works should be recorded in the monthly EM&A reports prepared by the ET. The EM&A report should be prepared and submitted within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report should be submitted to the Contractor, the IEC, the SOR, the EPD and the AFCD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.
- 5.4.5 The ET shall review the number and location of coral monitoring stations and method every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.
- 5.4.6 Monitoring result should be reviewed and be compared against the Action Level and Limit Level (AL/LL) as set out in **Table 5-3**. Actions specified on **Table 5-4** should be taken by ET, IEC, SOR and Contractor shall there be exceedance of AL/LL.

Table 5-3: Action and Limit Levels for Construction Phase Coral Monitoring

Parameter	Action Level Definition	Limit Level Definition
Mortality	If during Impact Monitoring a 15% increase in the percentage of partial mortality on the corals occurs at more than 20% of the tagged indirect impact site coral colonies that is not recorded on the tagged corals at the control site, then the Action Level is exceeded.	If during Impact Monitoring a 25% increase in the percentage of partial mortality on the corals occurs at more than 20% of the tagged indirect impact site coral colonies that is not recorded on the tagged corals at the control site, then the Limit Level is exceeded.

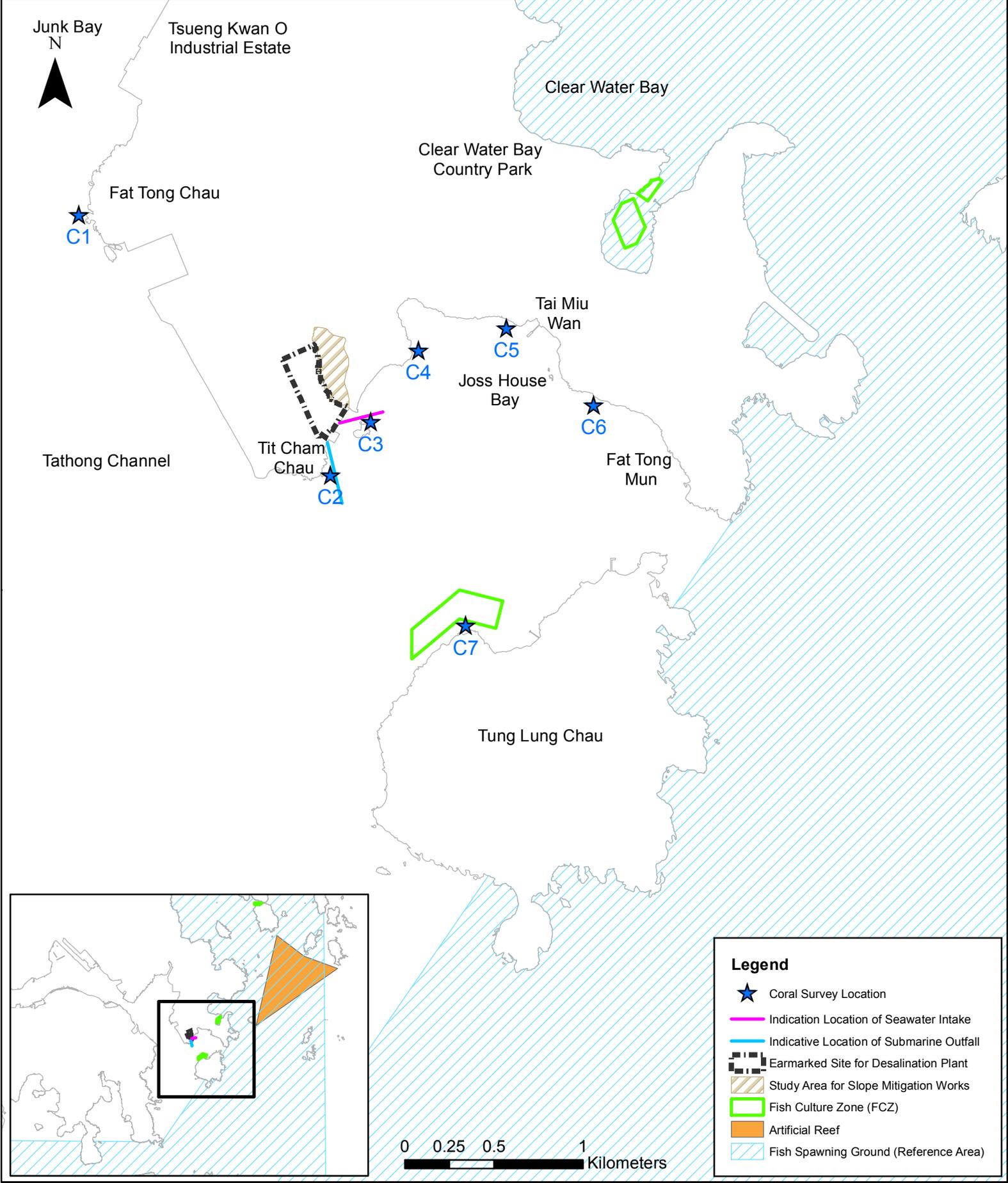
*Note: If the defined Action Level or Limit Level for coral monitoring is exceeded, the actions as set out in **Table 5-4** will be implemented.*

Table 5-4 Event and Action Plan for Construction Phase Monitoring

Event	Action			
	ET Leader	IEC	SOR **	Contractor
Action Level Exceedance	<ol style="list-style-type: none"> 1. Check monitoring data 2. Inform the IEC, SOR and Contractor of the findings; 3. Increase the monitoring to at least once a month to confirm findings; 4. Propose mitigation measures for consideration 	<ol style="list-style-type: none"> 1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly. 	<ol style="list-style-type: none"> 1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make agreement on the measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.
Limit Level Exceedance	<ol style="list-style-type: none"> 1. Undertake Steps 1-4 as in the Action Level Exceedance. If further exceedance of Limit Level, propose enhancement measures for consideration. 	<ol style="list-style-type: none"> 1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly. 	<ol style="list-style-type: none"> 1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make agreement on the measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.

Remark: ** The "SOR" is equivalent to the "ER" as defined in the EM&A Manual of the Project

FIGURES



Legend

- ★ Coral Survey Location
- Indication Location of Seawater Intake
- Indicative Location of Submarine Outfall
- Earmarked Site for Desalination Plant
- Study Area for Slope Mitigation Works
- Fish Culture Zone (FCZ)
- Artificial Reef
- Fish Spawning Ground (Reference Area)

Figure 2.1

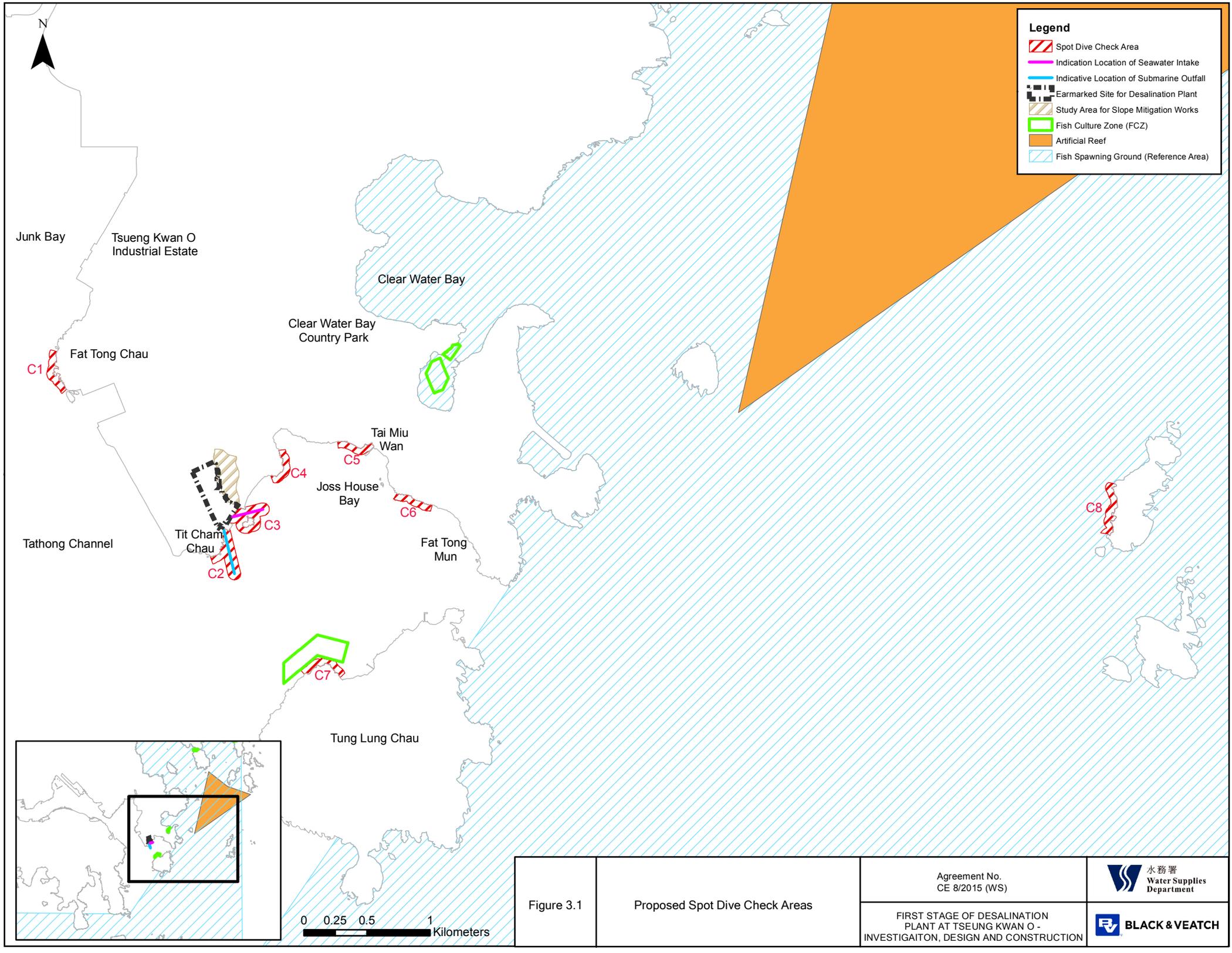
Coral Survey Locations

Agreement No.
CE 8/2015 (WS)

FIRST STAGE OF DESALINATION
PLANT AT TSEUNG KWAN O -
INVESTIGATION, DESIGN AND CONSTRUCTION

水務署
Water Supplies
Department

BLACK & VEATCH



Legend

-  Spot Dive Check Area
-  Indication Location of Seawater Intake
-  Indicative Location of Submarine Outfall
-  Earmarked Site for Desalination Plant
-  Study Area for Slope Mitigation Works
-  Fish Culture Zone (FCZ)
-  Artificial Reef
-  Fish Spawning Ground (Reference Area)

Junk Bay

Tsueng Kwan O Industrial Estate

Clear Water Bay

Clear Water Bay Country Park

Fat Tong Chau

Tai Miu Wan

Joss House Bay

Fat Tong Mun

Tung Lung Chau

Tathong Channel

Tit Cham Chau

C1

C2

C3

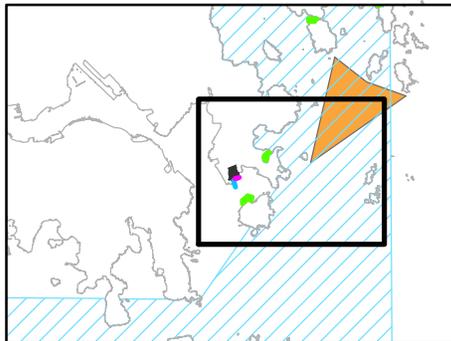
C4

C5

C6

C7

C8



0 0.25 0.5 1 Kilometers

Figure 3.1

Proposed Spot Dive Check Areas

Agreement No.
CE 8/2015 (WS)

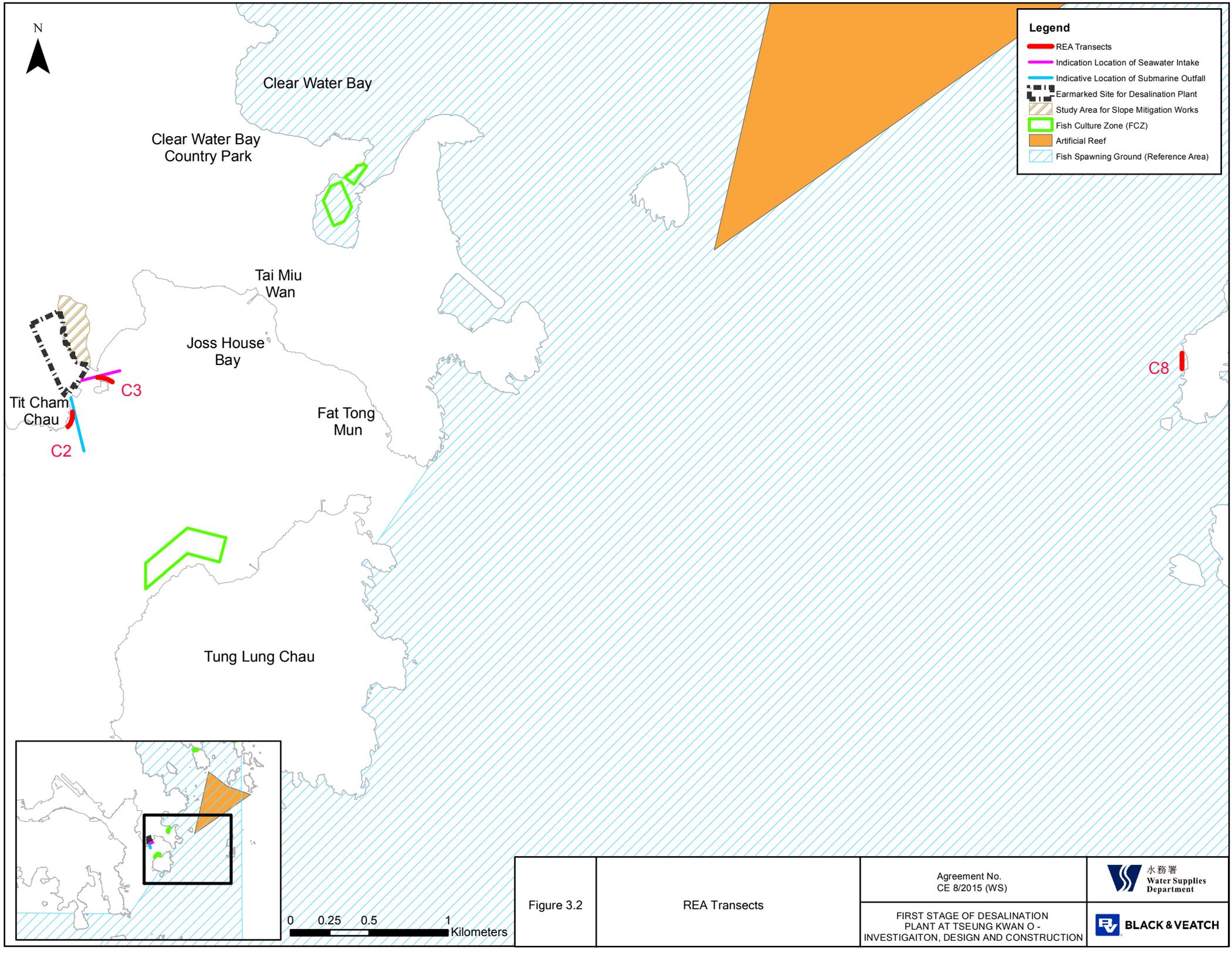
FIRST STAGE OF DESALINATION
PLANT AT TSEUNG KWAN O -
INVESTIGATION, DESIGN AND CONSTRUCTION



水務署
Water Supplies
Department



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Legend

- REA Transects
- Indication Location of Seawater Intake
- Indicative Location of Submarine Outfall
- Earmarked Site for Desalination Plant
- Study Area for Slope Mitigation Works
- Fish Culture Zone (FCZ)
- Artificial Reef
- Fish Spawning Ground (Reference Area)

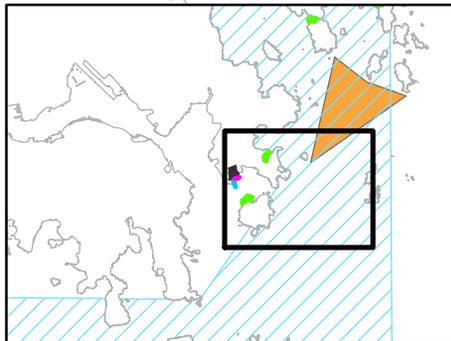


Figure 3.2	REA Transects	Agreement No. CE 8/2015 (WS)	水務署 Water Supplies Department
		FIRST STAGE OF DESALINATION PLANT AT TSEUNG KWAN O - INVESTIGATION, DESIGN AND CONSTRUCTION	

APPENDIX A

Appendix A Selected Photos taken during the Spot Check Survey and REA Survey

	
Site C2	Site C3
	
Site C4	Site C5
	
Site C6	Suggested Control Site C8
	
Natural Boulders	Sandy Bottom



Acropora solitaryensis



Pavonna descussata



Platygyra carnosus



Turbinaria peltata



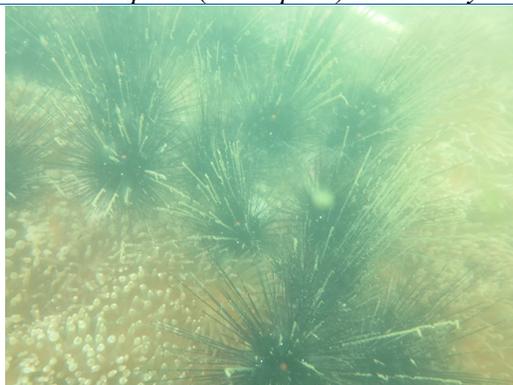
Oulastrea crispata



Bernardpora (Goniopora) stutchburyi



Sea Anemone Bed



Diadema sp.

APPENDIX C METHODOLOGY PAPER ON REGULAR FISHERIES MONITORING

ISSUE 2

METHODOLOGY PAPER ON REGULAR FISHERIES MONITORING

Agreement No. CE 8/2015 (WS)

First Stage of Desalination Plant at

Tseung Kwan O

– Investigation, Design and Construction

B&V PROJECT NO. 190495/29.2150

Report Authorized For
Issue By:

Chris Malco

For and on Behalf of
Black & Veatch Hong Kong Limited

PREPARED FOR

Water Supplies Department

31 AUGUST 2018



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Figure 2.1 Proposed Regular Fisheries Monitoring Locations

LIST OF APPENDICES

Appendix A Proposed Fisheries and Water Quality Monitoring Programme

Appendix B Comments and Responses

	Name	Signature	Date
Prepared	Sarah Yau		31.8.18
Checked	Amy Cheung		31.8.18
Reviewed	Christina Ko		31.8.18

1 Introduction

1.1 Background

- 1.1.1 Water Supplies Department (WSD) appointed Black & Veatch Hong Kong Limited (B&V) to undertake the consultancy “Agreement No. CE 8/2015 (WS) First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design, and Construction” on 16 November 2015.
- 1.1.2 The purpose of the Project is to construct a sea water reverse osmosis (SWRO) desalination plant at Tseung Kwan O (TKO) Area 137, together with all ancillary facilities and the slope mitigation works in the adjoining Clear Water Bay Country Park.
- 1.1.3 The first stage of the proposed SWRO desalination plant will have a water production capacity of 135,000 cubic meters (m³) per day with provision for future expansion to the ultimate capacity up to 270,000 m³ per day when necessary.
- 1.1.4 The Project is classified as a Designated Project (DP) under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Impact Assessment (EIA) was completed in accordance with the EIAO under the Feasibility Study (FS) stage of the Project. The EIA Report for the Project (Register No.: AEIAR-192/2015) was approved with conditions on 4 November 2015 under the EIAO. Following the approval of the EIA Report, the Environmental Permit (EP) (No: EP- 503/2015), covering the construction and operation of Project, was granted on 4 December 2015. The EP for this Project was subsequently amended and the amended EP (No. EP-503/2015/A) was granted on 26 January 2018 under the EIAO.

1.2 Purpose of this Methodology Paper

- 1.2.1 An Environmental Monitoring and Audit (EM&A) programme of regular fisheries monitoring is recommended under the approval conditions of the EIA Report for the Project. The purpose of the EM&A programme is to monitor the fisheries impact of the Project. Pursuant to these EIA approval conditions, details of the regular fisheries monitoring programme shall be submitted to the Director of Environmental Protection (DEP) for prior approval.
- 1.2.2 This Paper is prepared to present the details of regular fisheries monitoring programme.

1.3 Structure of this Methodology Paper

- 1.3.1 The remainder of this Report is organized as follows:
 - a) Section 2 describes the scope and locations of regular fisheries monitoring.
 - b) Section 3 presents the regular fisheries monitoring methodology.
 - c) Section 4 outlines the reporting requirements for regular fisheries monitoring.

2 Regular Fisheries Monitoring Programme

2.1 Findings of Approved EIA Report and Updated Fisheries Survey

- 2.1.1 This Project comprises submarine utilities including a seawater intake and a submarine outfall in Joss House Bay. The approved EIA Report predicted that the potential impacts on fisheries resources would be confined within close proximity of these submarine utilities. No important fish spawning and nursery grounds were identified near the proposed submarine utilities with reference to the findings of literature review undertaken during the EIA stage.

The EIA Report concluded that no significant fisheries impact would arise from construction and operation of the proposed submarine utilities.

- 2.1.2 In accordance with Condition 2.9 of the EP, an Updated Fisheries Survey was carried out in 2015 to 2016 to verify if any significant fish spawning and nursery grounds in the vicinity of the proposed submarine utilities. The results of this Updated Fisheries Survey revealed no important fish spawning and nursery grounds near the proposed submarine utilities and affirmed the conclusion made in the approved EIA Report.

2.2 Scope of Regular Fisheries Monitoring

- 2.2.1 The purpose of this regular fisheries monitoring programme is to monitor the potential impacts on fisheries resources in the vicinity of the project site. Apart from the regular fisheries monitoring programme, a water quality monitoring programme in addition to the water quality monitoring programme in the approved EM&A Manual is also described in Section 2.4 to (i) provide supplementary information in the interpretation of the findings of the fisheries monitoring and (ii) assist the monitoring of the potential impact on the Tung Lung Chau Fish Culture Zone (FCZ) in Joss House Bay.
- 2.2.2 Fisheries monitoring shall be carried out once before the commencement of the Project construction works to establish the baseline condition, once every year during the construction period to monitor the construction impact, and once every year during the first 10-year operation period to establish the post-construction condition. The need of regular fisheries monitoring in the subsequent years shall be agreed with EPD and AFCD based on the results of the first 10-year operation period. Under each fisheries monitoring event, survey on adult fish, juvenile fish and ichthyoplankton shall be carried out 2 times in wet season (April to October) and 2 times in dry season (November to March) to examine the following:
- Fish species composition;
 - Abundance: number of fish captured;
 - Diversity of fish resources: species diversity and evenness;
 - Size: range of total length;
 - Biomass in weight; and
 - Values of catches of commercial species: catch per unit effort (CPUE) and yield per unit effort (YPUE).
- 2.2.3 The methodology of regular fisheries monitoring proposed in this Paper is the same as that adopted in the Updated Fisheries Survey in 2015 and 2016. The proposed fisheries monitoring will provide information on the conditions of fisheries resources in terms of key parameters as listed above. Thus, the results for these key parameters can be compared between different time periods to evaluate whether or not the Project implementation will cause any impact on the fisheries resources. An outline of the regular fisheries monitoring method is summarized in Table 2-1 below.

Table 2-1: Outline of Regular Fisheries Monitoring Method and Schedule

Monitoring	Method	Monitoring Frequency			Sampling Frequency under Each Monitoring Event
		Baseline Period	Construction Period	Operation Period *	
Adult Fish Survey	Gill Netting Cage Trapping	Once before Project construction	Once every year	Once every year	2 times in dry season (November to March) and 2 times in wet season (April to October)

Monitoring	Method	Monitoring Frequency			Sampling Frequency under Each Monitoring Event
		Baseline Period	Construction Period	Operation Period *	
Juvenile Fish Survey	Purse-seining	Once before Project construction	Once every year	Once every year	2 times in dry season (November to March) and 2 times in wet season (April to October)
Ichthyoplankton Survey	Plankton Towing	Once before Project construction	Once every year	Once every year	2 times in dry season (November to March) and 2 times in wet season (April to October)

* The monitoring frequency in the operation period is recommended to be reviewed and confirmed with EPD and AFCD in a bi-annual basis.

2.3 Proposed Regular Fisheries Resource Monitoring Locations

- 2.3.1 It is recommended to set up six (6) fisheries monitoring locations in Joss House Bay and its vicinity to monitor the fisheries resources.
- 2.3.2 Two (2) sampling locations are set up in close proximity of the direct footprint of the proposed submarine utilities around TKO Area 137. These sampling locations represent the potential Project impact zones (i.e. areas at and in close proximity to the footprint of the proposed submarine utilities that will be directly affected by the Project works).
- 2.3.3 Two (2) gradient locations are proposed between the proposed submarine utilities and Tung Lung Chau FCZ to assist in the interpretation and identification of any potential fisheries impact in the vicinity of the FCZ.
- 2.3.4 Two (2) reference locations are proposed in the outer Joss House Bay between the waters of Tung Lung Chau and Fat Tong Mun. These reference locations are further away and will not be affected by the Project discharge (based on the EIA prediction) and will serve as control stations. Any significant fisheries impact identified at the reference locations should be caused by other natural factors or non-Project activities. The trends of fisheries conditions recorded in the reference locations will be used to assist in the interpretation of the trends of fisheries impact identified in the impact and gradient locations.
- 2.3.5 The proposed fisheries monitoring locations are summarized in Table 2-2. The coordinates of the proposed monitoring locations are shown in Figure 2.1.

Table 2-2: Proposed Fisheries Monitoring Locations

Monitoring	Sampling Location or Transect ID (see Figure 2.1)								
	Baseline Period			Construction Period			Operation Period		
	Impact Area	Gradient Area	Control Area	Impact Area	Gradient Area	Control Area	Impact Area	Gradient Area	Control Area
Adult Fish Survey	✓ P1, P2	✓ G1, G2	✓ R1, R2	✗	✓ G1, G2	✓ R1, R2	✓ P1, P2	✓ G1, G2	✓ R1, R2
Juvenile Fish Survey	✓ P1, P2	✓ G1, G2	✓ R1, R2	✗	✓ G1, G2	✓ R1, R2	✓ P1, P2	✓ G1, G2	✓ R1, R2
Ichthyoplankton Survey	✓ T1, T2	✓ T5, T6	✓ T3, T4	✗	✓ T5, T6	✓ T3, T4	✓ T1, T2	✓ T5, T6	✓ T3, T4

Notes:

- ✓ – Fisheries monitoring will be carried out within the areas.
- ✗ – No fisheries monitoring will be carried out within the impact areas during the construction of the submarine utilities due to safety reason.

2.4 Proposed Additional Water Quality Monitoring

Existing Water Quality Monitoring Specified in the Current EM&A Manual

2.4.1 Water quality monitoring programme recommended in the current EM&A Manual will cover (i) a continuous 4-week period during the preconstruction stage; (ii) the dredging period during the construction stage; and (iii) the first year of Project operation. The purpose of the existing water quality monitoring programme is to monitor the Project impact upon key water sensitive receivers in Joss House Bay including the Tung Lung Chau FCZ. The monitoring parameters include the following:

- Dissolved oxygen;
- Temperature;
- pH;
- Turbidity;
- Salinity;
- Suspended solids;
- Total residual Chlorine;
- Iron; and
- Anti-scalant

2.4.2 As the Project construction activities will not discharge any iron and anti-scalant, measurements of iron and anti-calant are not required during the construction phase as defined in the current EM&A Manual. Discharges of iron and anti-scalant are only associated with the desalination plant operation. Therefore, these two parameters will only be measured during the pre-construction stage (to provide baseline data) and Project operation as specified in the current EM&A Manual.

2.4.3 The existing water quality monitoring programme in the current EM&A Manual does not cover the regular fisheries resource monitoring locations proposed in Section 2.3. The water quality monitoring periods proposed in the current EM&A Manual are also different from the regular fisheries resource monitoring periods as shown in Table 2-1 above.

Additional Water Quality Monitoring

Impact on Fisheries Resources

2.4.4 To provide supplementary information in the interpretation of the findings of the fisheries monitoring, additional water quality monitoring programme is proposed to be carried out at the same frequency and locations of the fisheries monitoring programme during the pre-construction period, construction period and the first 10-year operation period. The water quality monitoring parameters will be same as those specified in current EM&A Manual. To meet the Project construction programme, the baseline fisheries monitoring will be carried out in the wet season of 2018 and the dry season of late 2018 or early 2019. Hence, additional water quality monitoring at the fisheries resource monitoring locations will also be carried out in 2018 / early 2019 to match the baseline fisheries monitoring schedule. As the types of anti-scalant to be used for the Project operation will not be confirmed in 2018 / early 2019 before the employment of the DBO contractor, anti-scalant is not measured during the additional water quality monitoring period in 2018 / early 2019. Instead, anti-scalant at the fisheries resource monitoring locations will be measured for a 4-week period during the baseline water quality monitoring period as specified in the current EM&A Manual, which is expected to be carried out in mid-2019 after the types of anti-scalant to be used for the Project is confirmed.

Impact on Tung Lung Chau FCZ

- 2.4.5 The existing water quality monitoring programme in the current EM&A Manual will address the water quality impact upon the Tung Lung Chau FCZ up to the first year of Project operation. To provide further water quality information to assist the monitoring of any potential impact on the Tung Lung Chau FCZ during the second to tenth years of Project operation, it is recommended to carry out additional water quality monitoring at the same water quality monitoring stations of the approved EM&A Manual during the second to tenth years of operation of the desalination plant. The proposed water quality monitoring frequency during the second to tenth years of Project operation will be 2 times in dry season and 2 times in wet season per year. The need of regular water quality monitoring in the subsequent years shall be agreed with EPD and AFCD based on the results of the first 10-year operation period.
- 2.4.6 A table summarizing the requirements of the proposed fisheries monitoring, the proposed additional water quality monitoring and the water quality monitoring programme in the approved EM&A Manual is shown in **Appendix A**.

3 Fisheries Survey Methodology

3.1 Introduction

- 3.1.1 This Section presents the methodologies for regular fisheries monitoring including the adult fish, juvenile fish and ichthyoplankton survey works and the associated data analysis. The regular fisheries monitoring shall be carried out by qualified marine ecologist(s) / fisheries specialist(s). The qualification and experience of qualified marine ecologist(s) / fisheries specialist(s) shall be at least five (5) years of experience in fish surveys with a relevant degree in biology or equivalent.

3.2 Adult Fish Survey

- 3.2.1 Two fishing methods, gill netting and cage trapping, will be used to sample pelagic and demersal adult fish resources at each sampling location. These methods are also commonly used by local fishermen in Hong Kong waters.

Pelagic Fish Survey – Gill Netting

- 3.2.2 Under each sampling event, a pair of trammel (gill) nets will be deployed for one (1) hour at each sampling location. The nets will be 1 m deep, 30 m in length and comprised of three (3) layers, with two 20 cm mesh stretches sandwiching a 5 cm mesh stretch. All fish species captured will be recorded and identified to species level as far as practicable. Each gill netting survey will be analysed for species composition, abundance, size (total length), biomass in weight and diversity of adult fish.

Demersal Fish Survey – Cage Trapping

- 3.2.3 Two sets of four metal wire cage traps, each ranged from 0.8 to 0.9 m³ in volume and mesh size of 25 mm, will be deployed for one (1) hour at each sampling location. Distance between the traps will be about 10 m, and the distance between each set of traps will be about 100 m. Bread or other suitable fish bait will be used as bait for cage trapping. All species caught in the cage trapping survey will be identified to species level as far as practical. Each cage trapping survey will be analysed for species composition, abundance, size (total length), biomass in weight and diversity of adult fish.

3.3 Juvenile Fish Survey

- 3.3.1 A typical purse-seine fishing method will be used to sample juvenile fish at each sampling location. The nets will be 5 to 15 m deep (depending on the water depth), 50 m in length, and with 6 mm mesh size (maximum stretched). For each sampling event, both a mother boat and a P4 sampan will deploy the seine net for approximately 30 to 45 minutes, with each boat holding one end of the net. The net will be pulled towards the fish resources in the form of a semi-circle. Fish catches will be concentrated and lifted onto the mother boat. All fishes captured will be recorded and identified to species level as far as practicable.

3.4 Ichthyoplankton Survey

- 3.4.1 To investigate spatial and seasonal or temporal variation of fish larvae composition, ichthyoplankton survey will be conducted at each sampling location using plankton towing. To collect representative samples.
- 3.4.2 A bongo plankton net, of 50 cm mouth diameter and with 0.5 mm mesh size, will be deployed to collect ichthyoplankton. A flow meter will be fitted at mouth of the net to record the volume of water filtered.
- 3.4.3 At each site, three (3) replicate tows will be conducted, and each tow with a duration of 15 minutes. The net will be deployed in a single oblique tow to a depth of 2m off the seabed and towed at a speed of 1-2 knots. Consequently the net will be gradually winched up towards the water surface in order to sample the entire water column.
- 3.4.4 The plankton will be immediately fixed in 70% ethanol. The ichthyoplankton will be sorted, number counted and size range measured in the laboratory. All fish larvae captured will be recorded and identified to the lowest taxonomic level, where possible. Larval fish individual without distinctive morphological features for taxonomic identification will be examined with the aid of DNA sequencing if deemed necessary. Species composition, abundance and diversity of species will be measured to describe and compare temporal and spatial changes.

3.5 Site Records and Sampling Time

- 3.5.1 For all the above survey methods, sampling locations will be recorded using global positioning system (GPS) and water depth will be measured at each sampling location. During each survey, the field conditions and observations (e.g. weather conditions, water depth (m) and temperature (°C) etc.) will be recorded at each proposed survey location. All surveys will be conducted during daytime at each of the selected locations.

3.6 Data Analysis

- 3.6.1 Data collected under each fisheries monitoring event will be analyzed to assess the spatial and temporal variations of species abundance and total biomass (for adult and juvenile fish)/ density (for ichthyoplankton). Temporal (e.g. wet vs. dry or construction & operation vs. baseline) and spatial (e.g. Impact Area vs. Control Area) differences in fish abundance will be compared using descriptive statistics and/ or inferential statistics (Microsoft Excel and/or Statistical Package for the Social Sciences (SPSS)), followed by multiple comparison procedures, as appropriate. Diversity of fish resources will be presented as species richness, Shannon-Weiner diversity (H') and Pielou's evenness (J'). Patterns of fish species composition will be presented and subject to statistical analyses as above. Values of catches of commercial species for adult and juvenile fishes will be presented in terms CPUE (number of individuals per fishing time and number of nets or cages) and YPUE (weight of fish per survey time and number of nets or cages).

4 Reporting

- 4.1.1 This Section presents the reporting requirements for regular fisheries monitoring. All reports related to this regular fisheries monitoring programme shall be prepared by qualified marine ecologist(s) / fisheries specialist(s) as described in Section 3.1.1 above and submitted to AFCD and DEP for approval.

4.2 Baseline Fisheries Monitoring Report

- 4.2.1 A Baseline Fisheries Monitoring Report shall be prepared and submitted within 2 months of completion of the baseline monitoring event. The baseline monitoring report shall include at least the following:

- Brief Project background information;
- Purpose of regular fisheries monitoring and report;
- Methodology of baseline fisheries monitoring including monitoring locations, dates, time, frequency, durations, equipment and procedures;
- Results of fisheries data analysis described in Section 3.6;
- Results of additional water quality monitoring to be carried out at the fisheries resource monitoring locations during the baseline fisheries monitoring periods in 2018 / early 2019 (refer to Section 2.4.4); and
- Conclusions.

- 4.2.2 Results of the additional 4-week water quality monitoring to be carried out at the fisheries resource monitoring locations in mid-2019 (refer to Section 2.4.4) will be separately presented to provide baseline information for impact monitoring during construction and operational phase.

4.3 Regular Fisheries Monitoring Report for Construction Phase

- 4.3.1 Regular Fisheries Monitoring Report for Construction Phase shall be prepared and submitted within 2 months of completion of each fisheries monitoring event. The regular monitoring report shall include at least the following:

- Brief Project background information;
- Purpose of regular fisheries monitoring and report;
- Updated construction programme covering the monitoring period;
- Works undertaken during the monitoring period with graphical illustrations (such as the types, locations and timing of marine works, daily dredging rate, environmental protection measures etc.)
- Summary of the marine water quality monitoring results separately collected under the additional water quality monitoring programme as described in Section 2.4 and the EM&A programme of the Project for the monitoring period including the record of any complaints on marine water quality (written or verbal) and non-compliances (exceedances) of the water quality performance limits (Action and Limit Levels) including the locations and nature of exceedances / complaints, investigation, follow-up actions taken, results and summary;

- Record of any complaints on fisheries impact received (written or verbal) during the monitoring period for each media, including locations and nature of complaints, investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Methodology of regular fisheries monitoring including monitoring locations, dates, time, frequency, durations, equipment and procedures;
- Results of data analysis described in Section 3.6;
- Comparison of the data analysis results for the monitoring period with all relevant past available fisheries data obtained in the monitoring area to determine the temporal trends of fisheries conditions in Joss House Bay, identify any potential impact on fisheries resources such as Tung Lung Chau FCZ and any other factors which might affect the monitoring results; and
- Comments (on the effectiveness and efficiency of mitigation measures), recommendations (on any new mitigation measures and improvement in the regular fisheries monitoring programme) and conclusions.

4.4 Regular Fisheries Monitoring Report for Operation Phase

4.4.1 Regular Fisheries Monitoring Report for Operation Phase shall be prepared and submitted within 2 months of completion of each fisheries monitoring event. The regular monitoring report shall include at least the following:

- Brief Project background information;
- Purpose of regular fisheries monitoring and report;
- Record of any Project effluent discharge (e.g. brine) into the marine environment during the monitoring period with graphical illustrations (such as the types, locations and timing of discharge, flow rate etc.)
- Summary of the marine water quality monitoring results and continuous Project effluent quality monitoring results separately collected under additional water quality monitoring programme as described in Section 2.4 and the EM&A programme of the Project for the monitoring period including the record of any complaints on marine water quality (written or verbal) and non-compliances (exceedances) of the water quality performance limits (Action and Limit Levels) including the locations and nature of exceedances / complaints, investigation, follow-up actions taken, results and summary;
- Record of any complaints on fisheries impact received (written or verbal) during the monitoring period for each media, including locations and nature of complaints, investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Methodology of regular fisheries monitoring including monitoring locations, dates, time, frequency, durations, equipment and procedures;
- Results of data analysis described in Section 3.6;
- Comparison of the data analysis results for the monitoring period with all relevant past available fisheries data obtained in the monitoring area to analyze the temporal trends of fisheries conditions in Joss House Bay, identify any potential impact on fisheries resources such as Tung Lung Chau FCZ and any other factors which might affect the monitoring results for the monitoring period; and

- Comments (on the potential fisheries impact of the Project), recommendations (with respect to the need for any new mitigation measures and improvement to the Project operation and changes to the regular fisheries monitoring programme) and conclusions.

FIGURES

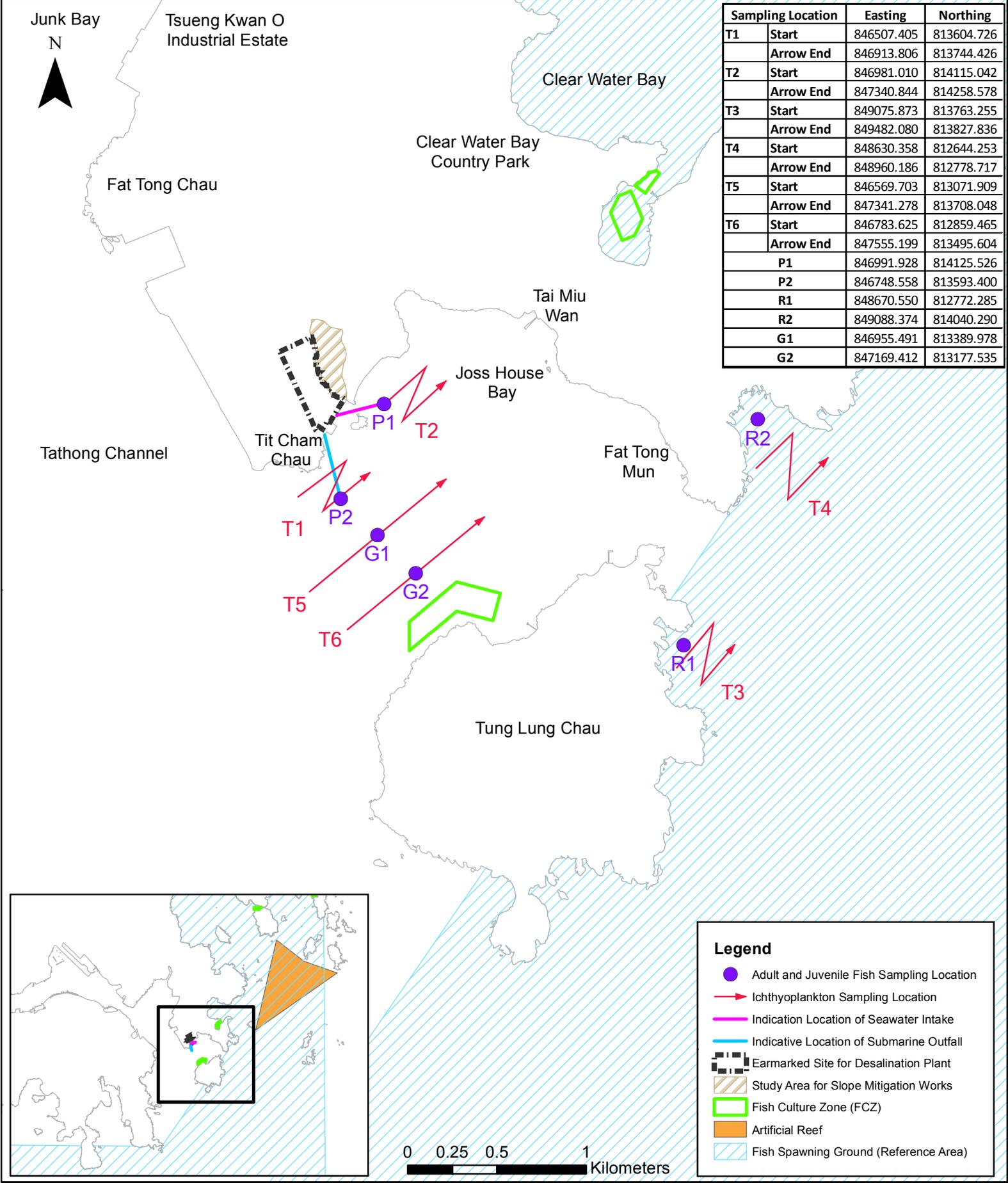


Figure 2.1

Proposed Regular Fisheries Monitoring Locations

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FIRST STAGE OF DESALINATION
PLANT AT TSEUNG KWAN O -
INVESTIGATION, DESIGN AND CONSTRUCTION



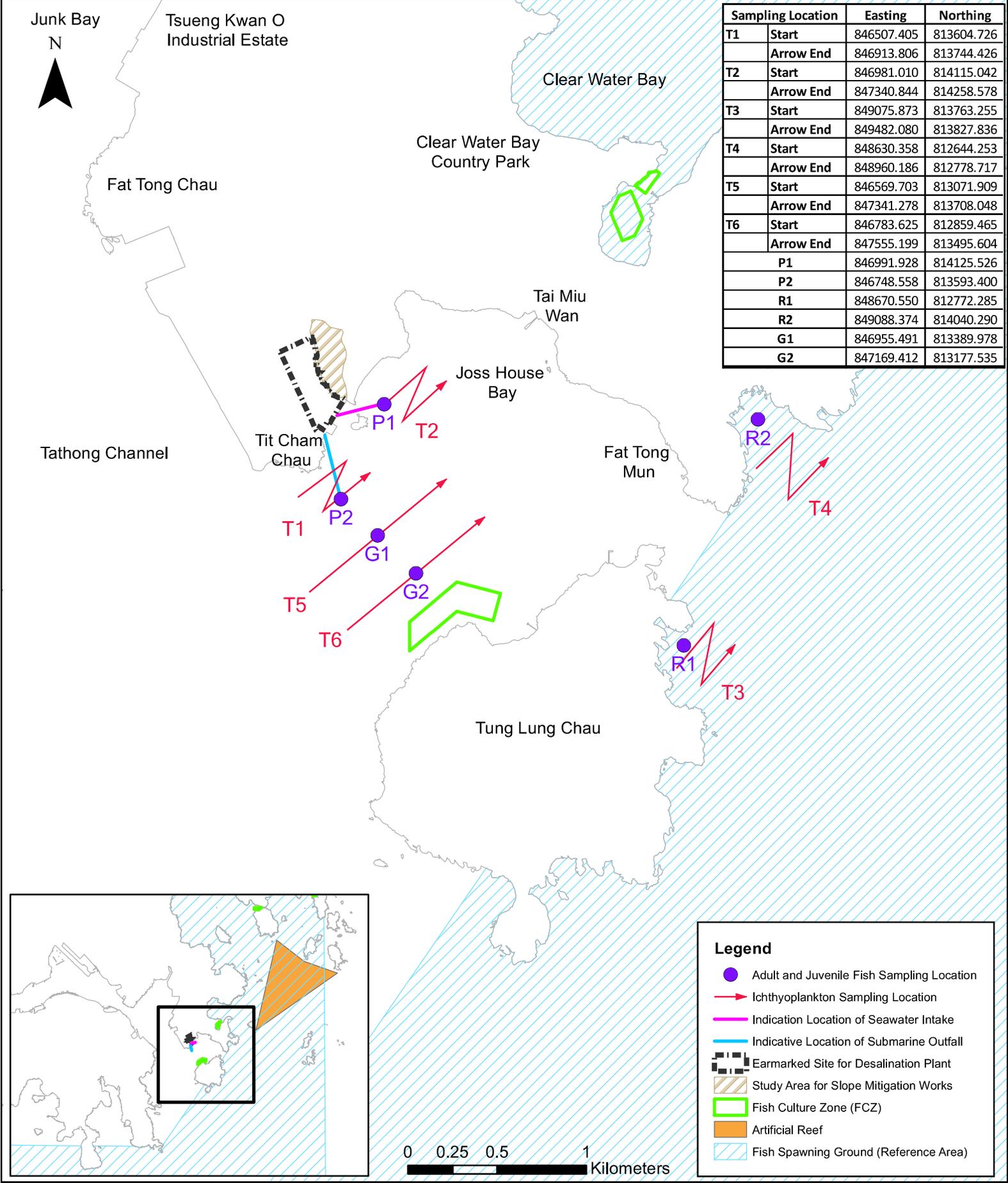
APPENDICES

APPENDIX A
PROPOSED FISHERIES AND WATER QUALITY MONITORING PROGRAMME

Appendix A Proposed Fisheries and Water Quality Monitoring Programme

Monitoring		Pre-construction Stage	Construction Period	First year of operation	Second to tenth years of operation	Subsequent years of operation
<p>Proposed Fisheries Monitoring (adult fish, juvenile fish and ichthyoplankton surveys)</p> <p>Note: The proposed fisheries monitoring during the operation stage will be included in the updated EM&A Manual to be prepared by the Contractor before commencement of the operation of the desalination plant as per EP Condition 3.1. The fisheries monitoring during construction stage is beyond EP requirement and is proposed for the better monitoring of the potential impact of fisheries resources during construction.</p>	<p>Frequency</p>	Two times in wet season of 2018; Two times in dry season of late 2018 or early 2019	Two times in wet season and two times in dry season per year	Two times in wet season and two times in dry season	Two times in wet season and two times in dry season per, the frequency of monitoring to be reviewed with EPD and AFCD in a bi-annual basis	Seek agreement with EPD and AFCD on the need of further monitoring based on the results of the first 10-year operation
	<p>Location</p>	6 locations as shown in Figure 1	4 locations as shown in Figure 1 (excluding P1, P2, T1 and T2)	6 locations as shown in Figure 1	6 locations as shown in Figure 1	-
<p>Proposed additional Water Quality monitoring</p> <p>Note: The water quality monitoring is beyond EP requirement and is proposed to provide supplementary information for the monitoring of potential impact on the fisheries resources and the Tung Lung Chau Fish Culture Zone.</p>	<p>Frequency</p>	<p>First Set of Monitoring Events: Two events in wet season of 2018 and two events in dry season of late 2018 or early 2019 (to match the pre-construction stage fisheries monitoring); Each event shall include in-situ measurements and water sampling for laboratory analysis at both mid-flood and mid-ebb tides on the same day.</p> <p>Second Set of Monitoring Events: Three times per week for four weeks (expected in mid-2019) before Project construction (to match the existing baseline water quality monitoring of the current EM&A Manual); Each event shall include in-situ measurements and water sampling for laboratory analysis</p>	<p>During the construction period, two events in wet season and two events in dry season will be carried out per year (to match the construction stage fisheries monitoring);</p> <p>Each event shall include in-situ measurements and water sampling for laboratory analysis at both mid-flood and mid-ebb tides on the same day</p>	<p>Two events in wet season and two events in dry season (to match the fisheries monitoring schedule);</p> <p>Each event shall include in-situ measurements and water sampling for laboratory analysis at both mid-flood and mid-ebb tides on the same day</p>	<p>Two events in wet season and two events in dry season per year (to match the operation stage fisheries monitoring), the frequency of monitoring to be reviewed with EPD and AFCD in a bi-annual basis;</p> <p>Each event shall include in-situ measurements and water sampling for laboratory analysis at both mid-flood and mid-ebb tides on the same day</p>	Seek agreement with EPD and AFCD on the need of further monitoring based on the results of the first 10-year operation
	<p>Location</p>	6 stations (P1, P2, G1, G2, R1, R2) as shown in Figure 1	4 stations (G1, G2, R1, R2) as shown in Figure 1	6 stations (P1, P2, G1, G2, R1, R2) as shown in Figure 1	6 stations (P1, P2, G1, G2, R1, R2) as shown in Figure 1 plus 13 stations as shown in Figure 2	
	<p>Parameters</p>	Dissolved oxygen, temperature, pH, turbidity, salinity, suspended solids, total residual chlorine, anti-scalant ** and iron	Dissolved oxygen, temperature, pH, turbidity, salinity, suspended solids, total residual chlorine	Dissolved oxygen, temperature, pH, turbidity, salinity and suspended solids, total residual chlorine, anti-scalant and	Dissolved oxygen, temperature, pH, turbidity, salinity and suspended solids, total residual chlorine, anti-scalant and iron	
		** Note 1: The types of				

Monitoring		Pre-construction Stage	Construction Period	First year of operation	Second to tenth years of operation	Subsequent years of operation
		anti-scalant to be used for the Project are currently unconfirmed and will be determined by the DBO contractor to be employed in 2019. Anti-scalant is therefore not measured in the first set of monitoring to be carried out in 2018 / early 2019. It will be measured and included in the second set of monitoring (expected in mid-2019) after the types of anti-scalant to be used are confirmed.		iron		
Existing Water Quality monitoring already covered in the current EM&A Manual	Frequency	Three times per week for four weeks (expected in mid-2019) before Project construction (Requirements on monitoring season and tidal status are not specified)	Three events per week during the dredging period; Each event shall include in-situ measurements and sampling at both mid-flood and mid-ebb tides on the same day	Three times per week during the first year of operation (Requirements on monitoring season and tidal status are not specified)	-	-
	Location	13 stations as shown in Figure 2	10 stations as shown in Figure 2 (excluding NF1, NF2 and NF3)	13 stations as shown in Figure 2	-	-
	Parameters	Dissolved oxygen, temperature, pH, turbidity, salinity and suspended solids, total residual chlorine, anti-scalant, Iron	Dissolved oxygen, temperature, pH, turbidity, salinity and suspended solids, total residual chlorine	Dissolved oxygen, temperature, pH, turbidity, salinity and suspended solids, total residual chlorine, anti-scalant, Iron	-	-



Sampling Location		Easting	Northing
T1	Start	846507.405	813604.726
	Arrow End	846913.806	813744.426
T2	Start	846981.010	814115.042
	Arrow End	847340.844	814258.578
T3	Start	849075.873	813763.255
	Arrow End	849482.080	813827.836
T4	Start	848630.358	812644.253
	Arrow End	848960.186	812778.717
T5	Start	846569.703	813071.909
	Arrow End	847341.278	813708.048
T6	Start	846783.625	812859.465
	Arrow End	847555.199	813495.604
P1		846991.928	814125.526
P2		846748.558	813593.400
R1		848670.550	812772.285
R2		849088.374	814040.290
G1		846955.491	813389.978
G2		847169.412	813177.535

Legend

- Adult and Juvenile Fish Sampling Location
- Ichthyoplankton Sampling Location
- Indication Location of Seawater Intake
- Indicative Location of Submarine Outfall
- Earmarked Site for Desalination Plant
- Study Area for Slope Mitigation Works
- Fish Culture Zone (FCZ)
- Artificial Reef
- Fish Spawning Ground (Reference Area)

Figure 1

Proposed Regular Fisheries Monitoring Locations

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CE 8/2015 (WS)



FIRST STAGE OF DESALINATION
PLANT AT TSEUNG KWAN O -
INVESTIGATION, DESIGN AND CONSTRUCTION



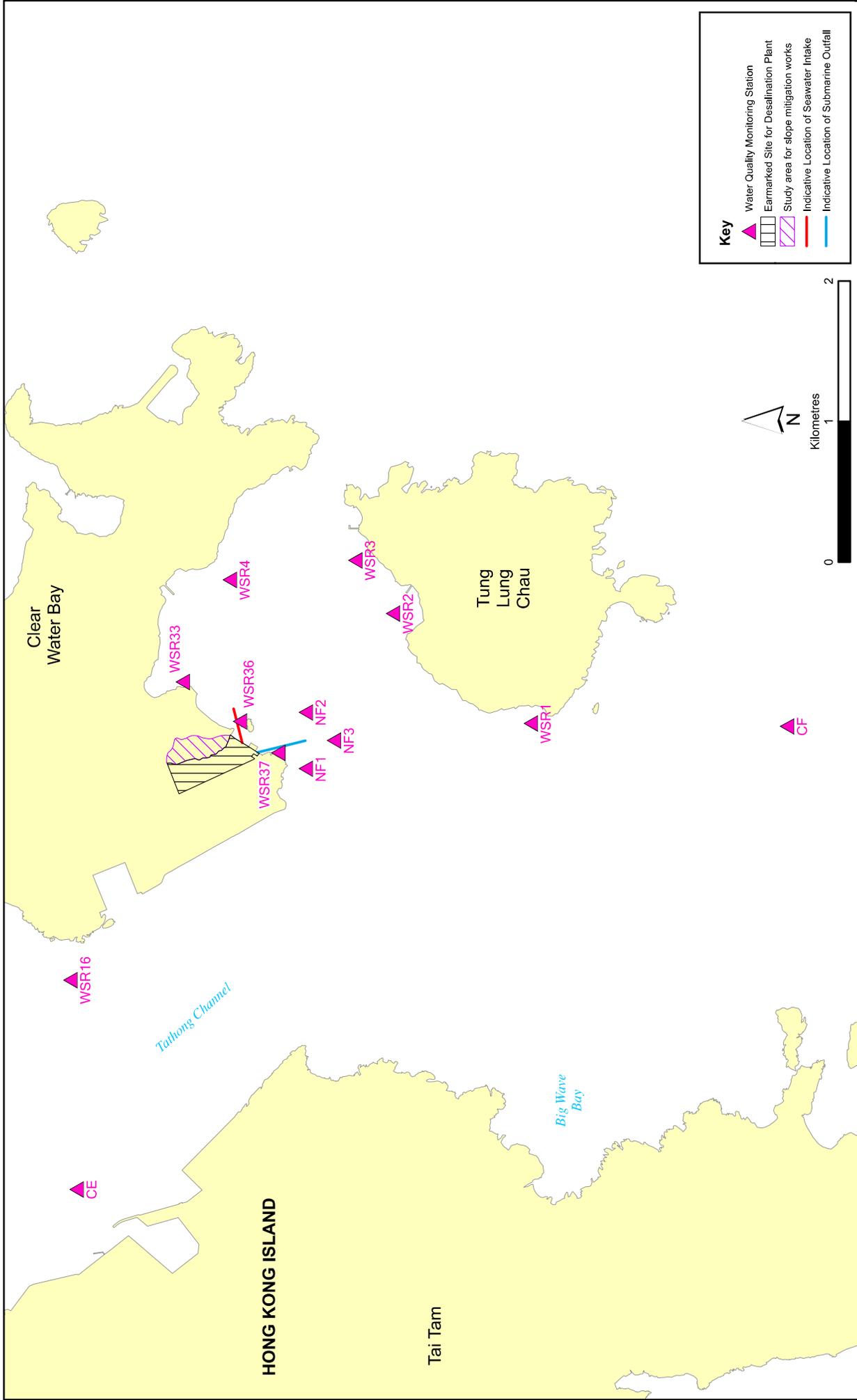


Figure 2 Proposed Water Quality Monitoring Stations (WSR2 is the Monitoring Point for Tung Lung Chau FCZ)
(Extracted from EM&A Manual)

**APPENDIX B
COMMENTS AND RESPONSES**

Appendix B Comments and Responses

Responses to Comments on Draft Report (Issue 1)

1. Comments from AFCD received on 10 August 2018 via email.....	2
2. Comments from AFCD received on 27 August 2018 via email.....	4
3. Comments from EPD received on 29 August 2018 via email.....	5
4. Comments from AFCD received on 30 August 2018 via email.....	5

1. Comments from AFCD received on 10 August 2018 via email

No.	Comments	Response
	<u>General comments</u>	
1)	We understand that this methodology paper on regular fisheries monitoring will form part of the update EM&A manual, which will be later submitted to the DEP for approval. We would like to comment on the update EM&A manual (include the fisheries part) in the future.	Noted. The update EM&A Manual will be submitted to AFCD for comment in due course.
2)	Please clarify if the. And please state the reasons of using the same methodology for regular fisheries monitoring.	The methodology of regular fisheries monitoring in this paper is the same as the updated fisheries survey conducted in 2015 and 2016. As stated in Section 2.2.2, the proposed fisheries monitoring (based on the methodology of the update fisheries survey) will provide information on the conditions of fisheries resources in terms of fish species abundance, diversity and values etc. Thus, the conditions of fisheries resources can be compared between different periods (baseline, construction and operational stages) to evaluate whether or not the Project implementation will cause any impact on the fisheries resources. Text has been added in Section 2.2.3 to clarify.
3)	Will the monitoring be long-term? Please state the monitoring duration	The monitoring period will cover the entire construction period as well as the first 10-year operation period of the Project.
	<u>Specific comments</u>	
4)	Section 1.2.2 Please delete	Section 1.2.2 has been amended.
5)	Section 2.2.2 According to the EP conditions, “the project proponent shall include in the EM&A programme of the post-construction regular monitoring on fisheries in the vicinity of seawater intake and submarine outfall areas so as to ensure no significant impacts on fisheries resources”. As the objective of the regular fisheries monitoring is to ensure no significant impacts on fisheries resources, please review the last bullet “Any significant fish spawning and nursery grounds within the monitoring area”.	The last bullet point has been deleted.
6)	Section 2.3.1 Please revise as “....and its vicinity to monitor the fisheries <u>resources</u> ”.	The text has been revised accordingly.
7)	Section 2.3.2	The text has been revised accordingly.

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No.	Comments	Response
	Please revise as” two <u>sampling</u> locations are set up.....” and “These <u>sampling</u> locations represent.....”	
8)	Section 2.3.3 Please explain further how fisheries data will be used to assist in the interpretation and identification of any potential fisheries impact upon the FCZ.	<p>A water quality monitoring programme will be carried out as recommended in the EM&A Manual to support the interpretation of any potential fisheries impact upon the FCZ. The water quality monitoring programme will include 13 no. of monitoring locations covering the FCZ and areas near the Project discharge to identify if the Project would cause any water quality changes at the FCZ. The water quality monitoring stations as defined in the EM&A Manual can be viewed in the EIAO website: https://www.epd.gov.hk/eia/register/report/eiareport/eia_2292015/2_Figure/EM&A/Figure%205.1.pdf</p> <p>The water quality monitoring programme as recommended in the EM&A Manual cover the baseline period (before construction commences), construction period and the first year operation period. The period of water quality monitoring programme in the EM&A Manual will be updated to cover the first 10-year operational period to match the regular fisheries monitoring programme. The updated EM&A Manual will be submitted to AFCD for comments in due course.</p> <p>Please also note that a separate baseline water quality monitoring programme will be carried out in the wet season of 2018 as well as in the coming dry season in 2018 / 2019 at 13 no. of monitoring stations as defined in Figure 5.1 of the EM&A Manual (as shown in the web link above). Two water quality monitoring events will be carried out at each of the dry and wet seasons and each monitoring event will cover water measurements at both mid-flood and mid-ebb tides. In addition, an Environmental Team (ET) will be separately appointed by WSD in accordance with the Environmental Permit condition. The ET will collect another set of baseline water quality monitoring data in 2019 at the same monitoring stations prior to the Project construction in accordance with the requirements of the EM&A Manual.</p>
9)	Section 2.3.4 Please clarify the meaning of “potential	“Project impact zones” mean the areas at and near the footprint of the proposed submarine

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No.	Comments	Response
	project impact zones” (in Section 2.3.2) and “the influence zone of the project”.	<p>utilities which will be directly affected by the Project.</p> <p>“influence zone of the Project” means area that will be indirectly affected by the Project discharge due to water quality changes as predicted in the EIA.</p> <p>Text has been revised accordingly.</p>

2. Comments from AFCD received on 27 August 2018 via email

(Further to the responses to comments from AFCD received on 10 August 2018)

No.	Comments	Response
1)	Present presentation of the paper with respect to the purposes of the existing WQM in the EM&A manual and additional WQM and how they are related to the design of the Fisheries Resource Monitoring and two WQM programs, is still a bit confusing. Please revisit.	The text in Section 2.4 has been amended to clarify.
2)	It is stated that the objectives of the proposed additional water monitoring programme is to (i) provide supplementary information in the interpretation of the findings of the fisheries monitoring (Section 2.3.6) , and (ii) to assist the monitoring of the potential impact on the Tung Lung Chau Fish Culture Zone in Joss House Bay (Section 2.2.1). Please revise Section 2.2.1, to include objectives (1). In addition, please combine Section 2.3.6 and Section 2.4.1.	The text has been revised accordingly.
3)	“Antiscalant” should spell as “antiscalant”. Please check.	The spelling has been corrected accordingly.
4)	Heading of Section 2.3 should be "Proposed Regular Fisheries Resources Monitoring Locations".	The heading has been revised accordingly.
5)	Section 2.4.2 – how about antiscalant?	Baseline antiscalant levels will not be measured during the baseline fisheries monitoring period scheduled in 2018 / early 2019. Instead, they will be separately measured at the fisheries resource monitoring locations in mid-2019 (after the types of anticalant to be used for the Project are confirmed) to provide baseline information. The text in Section 2.4 and Appendix A has been amended to clarify.
6)	Appendix - Regarding the additional water quality monitoring, it is stated that	Please see our response above. The text in Section 2.4 and Appendix A has been amended

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No.	Comments	Response
	antiscalant are not analysed during the construction phase. Please explain how you would get the baseline concentration of antiscalant (as reference for comparison during operation stage) during pre-construction stage. In addition, please include the justification of not measuring the antiscalant in the text in section 2.4.	to clarify.
7)	Appendix - Please put a “,” between antiscalant and iron under “second to tenth years of operation” of the proposed additional water quality monitoring.	Appendix A has been amended accordingly.

3. Comments from EPD received on 29 August 2018 via email

(Further to the responses to comments from AFCD received on 27 August 2018)

No.	Comments	Response
	Please be advised that the revised Appendix A attached in your email has already responded to our previous comments on water quality. Thus, we have no further comment on it.	Noted.

4. Comments from AFCD received on 30 August 2018 via email

(Further to the responses to comments from AFCD received on 27 August 2018)

No.	Comments	Response
	<p>One minor comment:</p> <p>Please delete "Fisheries data collect at the gradient locations will be used" in Section 2.3.3.</p> <p>I do not have comment on other part of the Methodology paper. Thank you.</p>	The text has been revised accordingly.