

Asia-America Gateway (AAG) Cable Network, South Lantau

Enviromental Monitoring & Audit (EM&A) Manual

July 2008

Asia-America Gateway (AAG)

Cable Network, South Lantau



**Environmental Monitoring & Audit (EM&A)
Manual**

July 2008

ATKINS

Project Title: Asia-America Gateway (AAG) Cable Network, South Lantau	Project No.: 4293
Document No.: 4293-OR006	Controlled Copy No.:
Document Title: Environmental Monitoring & Audit (EM&A) Manual (Final)	
Covering Letter/Transmittal Ref. No.: 4293/OC017/SB/PC/nt	Date of Issue: 21 July 2008

Revision, Review and Approval Records

		/	/	/
		/	/	/
		/	/	/
				
00	EM&A Manual (Final)	Various/ Jul 08	Pearl Chung/ 21 Jul 08	Susana Bezy/ 21 Jul 08
Revision	Description	Prepared by / date	Reviewed by / date	Approved by / date

Distribution (if insufficient space, please use separate paper)

Controlled Copy No.	Issued to
1 -4	EPD
5	AFCD
6 (electronic copy)	REACH Networks Hong Kong Ltd
7 (electronic copy)	NEC Corporation
8 (electronic copy)	EGS
9	ACL

Table of Contents

1.	INTRODUCTION.....	1-1
1.1	Background of the Project.....	1-1
1.2	Environmental Monitoring & Audit Requirements	1-1
1.3	Project Location and Programme.....	1-2
2.	PROJECT ORGANISATION.....	2-1
2.1	Key Parties and Organisation Chart.....	2-1
2.2	Reach Networks Hong Kong Ltd.	2-1
2.3	Environmental Protection Department.....	2-1
2.4	Environmental Team	2-1
2.5	Engineer’s Representative	2-2
2.6	The Contractor	2-2
3.	WATER QUALITY	3-1
3.1	Introduction	3-1
3.2	Monitoring Programme.....	3-2
3.3	Action and Limit Levels	3-7
3.4	Event and Action Plan.....	3-8
4.	CORAL SURVEY.....	4-1
4.1	Background and Objective	4-1
4.2	Monitoring Requirement.....	4-1
4.3	Methodology	4-2
5.	MARINE MAMMALS INSPECTION	5-1
5.1	Monitoring Requirement.....	5-1
5.2	Methodology and Event and Action Plan.....	5-1
5.3	Precautionary Measures	5-1
6.	COMPLIANCE AUDIT PROCEDURES.....	6-1
6.1	Site Surveillance	6-1
6.2	Environmental Complaints	6-2
6.3	Documentation.....	6-2
7.	REPORTING.....	7-1
7.1	General.....	7-1
7.2	Baseline Monitoring Report	7-1
7.3	Regular Weekly Impact Monitoring Report.....	7-1
7.4	Post Project Monitoring Report	7-2
7.5	Summary EM&A Report.....	7-3

7.6	Electronic Reporting of EM&A Information	7-3
7.7	Typical Forms to be Adopted	7-3
7.8	Interim Notifications of Environmental Quality Limit Exceedances	7-3

List of Tables

Table 3-1	Action and Limit Levels for Water Quality	3-7
Table 3-2	Event Action Plan for Water Quality	3-8

List of Figures

Figure 1-1	Location of the Project (1 of 2)
Figure 1-2	Location of the Project (2 of 2)
Figure 2-1	Organisation Chart
Figure 3-1	Indicative Location of Water Quality Monitoring Stations for Marine Based Cable Installation Works at First 400m Offshore
Figure 4-1	Photo Showing the Locations of Site S1 at Tong Fuk.
Figure 6-1	Flow Chart of Site Inspection, Deficiency and Action Reporting System
Figure 6-2	Flow Chart of Complaint Investigation Procedures

List of Appendices

Appendix 1	Proforma for EM&A
------------	-------------------

1. INTRODUCTION

1.1 Background of the Project

- 1.1.1 The Asia-America Gateway (AAG) is the first submarine cable system linking South East Asia directly with the USA. The AAG system will assist in meeting the forecasted growth in bandwidth requirements in the Hong Kong Special Administrative Region (HKSAR) and has the ability to be expanded in the future to Australia, India, Africa, and Europe.
- 1.1.2 The Project is classified as a Designated Project under Item C12 of Part I Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO): “A dredging operation which is (a) less than 500 metres from the nearest boundary of an existing or planned (iii) bathing beach; and (vii) coastal protection area”.
- 1.1.3 In accordance with the EIAO, an environmental assessment was undertaken and a Project Profile was submitted to the Environmental Protection Department (EPD) (PP-331/2007) to seek permission to apply directly for Environmental Permit. Permission was granted and an Environmental Permit for the project was granted by EPD on the 20th of December 2007 (EP-298/2007) for the construction and operation of the project.

1.2 Environmental Monitoring & Audit Requirements

- 1.2.1 As stated in the Environmental Permit Conditions, an Environmental Monitoring and Audit (EM&A) Manual and EM&A Programme are required as described below:

Condition 2.5: *The Permit Holder shall, no later than four weeks before the commencement of construction, deposit with the Director four hard copies and one electronic copy of an EM&A Manual for the construction of the Project. The EM&A Manual shall include the following EM&A Programme:*

- (i) water quality monitoring with details on methodology, locations, frequency and duration for baseline, impact and post-construction monitoring, and water quality performance limits (Action and Limit Levels);*
- (ii) marine ecological monitoring with details on dive surveys on corals and visual inspections of marine mammal species of Chinese White Dolphin and Finless Porpoise, and recommendations to protect the corals and marine mammals;*
- (iii) Event and Action Plans;*
- (iv) compliance audit procedures of mitigation measures as recommended in the Project Profile No. PP-331/2007; and*
- (v) procedures and flow charts for handling complaints or enquires on environmental nuisances or pollution caused by the Project.*

Condition 2.6: *The EM&A programme shall be implemented in accordance with the procedures and requirements set out in the EM&A Manual deposited under Condition 2.7 of this Permit and shall include:*

- (i) baseline water quality monitoring and coral surveys;*
- (ii) water quality impact monitoring and visual inspections of marine mammals; and*
- (iii) post-construction water quality monitoring and if necessary post-construction coral surveys.*

1.2.2 This EM&A Manual describes the EM&A programme and specifies the environmental monitoring and audit requirements to:

- ensure that the mitigation measures recommended in the Project Profile are implemented and the whole EM&A programme is properly managed;
- verify that the project works do not result in impacts to water quality at sensitive receivers in the vicinity of the works including the Tong Fuk Gazetted Bathing Beach and ecological sensitive receivers; and
- ensure that adverse impacts are identified during the cable laying process and that necessary actions are undertaken in the event that sensitive receivers are found to be impacted by cable installation works.

1.3 Project Location and Programme

1.3.1 The proposed cable system includes two cables: one cable leading from the existing manhole at Tong Fuk Gazetted Bathing Beach and the other from the existing manhole south west of Tong Fuk Village (**Figure 1-1** refers). Both cables will extend southwards out to sea beyond the boundary of HKSAR waters (approximately 10km) to connect with the rest of the AAG which extends out into the South China Sea (**Figure 1-2** refers).

1.3.2 Only small scale excavation works will be required on the cable landing sections in order to enable the cables to enter the existing manholes.

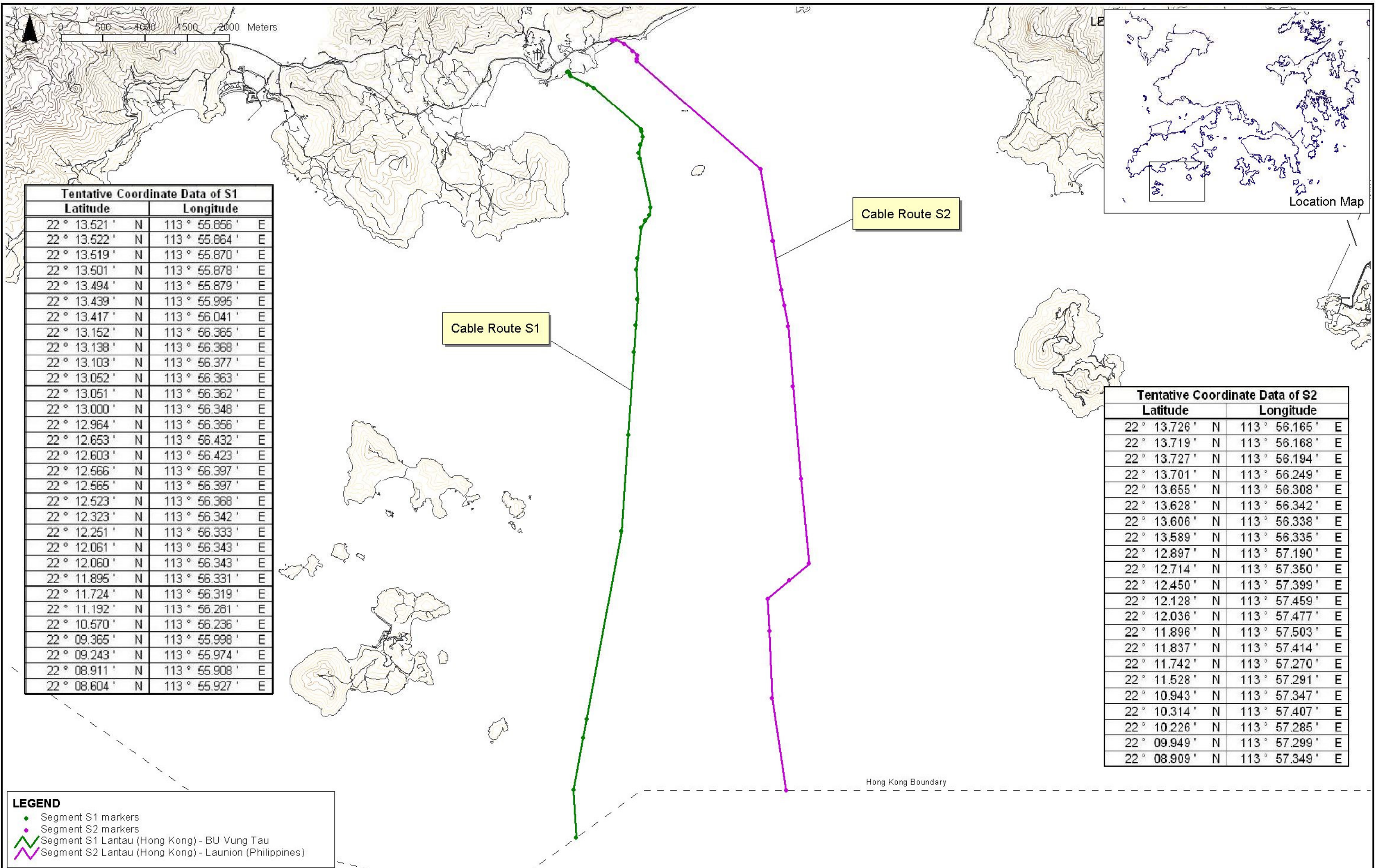
1.3.3 The offshore cable laying will be conducted by injection jetting techniques, similar to previous cable installations in this area. The intended burial depth for the offshore burial of the cable will be approximately 7m below seabed with a shallower burial depth from the beach manhole to approximately 400m off shore. Two methods will be used for the offshore cable laying. The first process involves diver assisted jetting for the first 400m from shore. The second process involves injection jetting by a cable laying vessel.

1.3.4 As the cable laying process will only require minor works within the marine environment, adverse water quality impact or marine ecological impact of the area are not anticipated.

1.3.5 Cable routes S1 and S2 will be undertaken sequentially and S1 is expected to be

installed first with S2 to be installed after the installation of S1. The initial cable-laying is targeted to commence as early as possible in year 2008, subject to completion of the necessary permits and approval by the Leisure and Cultural Services Department (LCSD) and the Director of EPD in accordance with Condition 2.2 of the Environmental Permit. The tentative programme for installation of S1 is August 2008 and S2 is September 2008. In accordance with Condition 1.12 of the Environmental Permit, the Permit Holder will inform the Director of EPD in writing the specific date of construction commencement no later than one week prior to the construction works.

- 1.3.6 The full completion of construction of cable routes namely S1 and S2 is expected to take less than two months within HKSAR waters. The on shore works to the low water mark are only expected to take between 1-3 days. The remaining off shore installation is expected to take between 7 to 14 days for diver assisted installation, and within one week for the injection jetting by a cable laying vessel.



Tentative Coordinate Data of S1	
Latitude	Longitude
22° 13.521' N	113° 55.856' E
22° 13.522' N	113° 55.864' E
22° 13.519' N	113° 55.870' E
22° 13.501' N	113° 55.878' E
22° 13.494' N	113° 55.879' E
22° 13.439' N	113° 55.995' E
22° 13.417' N	113° 56.041' E
22° 13.152' N	113° 56.365' E
22° 13.138' N	113° 56.368' E
22° 13.103' N	113° 56.377' E
22° 13.052' N	113° 56.363' E
22° 13.051' N	113° 56.362' E
22° 13.000' N	113° 56.348' E
22° 12.964' N	113° 56.356' E
22° 12.653' N	113° 56.432' E
22° 12.603' N	113° 56.423' E
22° 12.566' N	113° 56.397' E
22° 12.565' N	113° 56.397' E
22° 12.523' N	113° 56.368' E
22° 12.323' N	113° 56.342' E
22° 12.251' N	113° 56.333' E
22° 12.061' N	113° 56.343' E
22° 12.060' N	113° 56.343' E
22° 11.895' N	113° 56.331' E
22° 11.724' N	113° 56.319' E
22° 11.192' N	113° 56.281' E
22° 10.570' N	113° 56.236' E
22° 09.365' N	113° 55.998' E
22° 09.243' N	113° 55.974' E
22° 08.911' N	113° 55.908' E
22° 08.604' N	113° 55.927' E

Tentative Coordinate Data of S2	
Latitude	Longitude
22° 13.726' N	113° 56.165' E
22° 13.719' N	113° 56.168' E
22° 13.727' N	113° 56.194' E
22° 13.701' N	113° 56.249' E
22° 13.655' N	113° 56.308' E
22° 13.628' N	113° 56.342' E
22° 13.606' N	113° 56.338' E
22° 13.589' N	113° 56.335' E
22° 12.897' N	113° 57.190' E
22° 12.714' N	113° 57.350' E
22° 12.450' N	113° 57.399' E
22° 12.128' N	113° 57.459' E
22° 12.036' N	113° 57.477' E
22° 11.896' N	113° 57.503' E
22° 11.837' N	113° 57.414' E
22° 11.742' N	113° 57.270' E
22° 11.528' N	113° 57.291' E
22° 10.943' N	113° 57.347' E
22° 10.314' N	113° 57.407' E
22° 10.226' N	113° 57.285' E
22° 09.949' N	113° 57.299' E
22° 08.909' N	113° 57.349' E

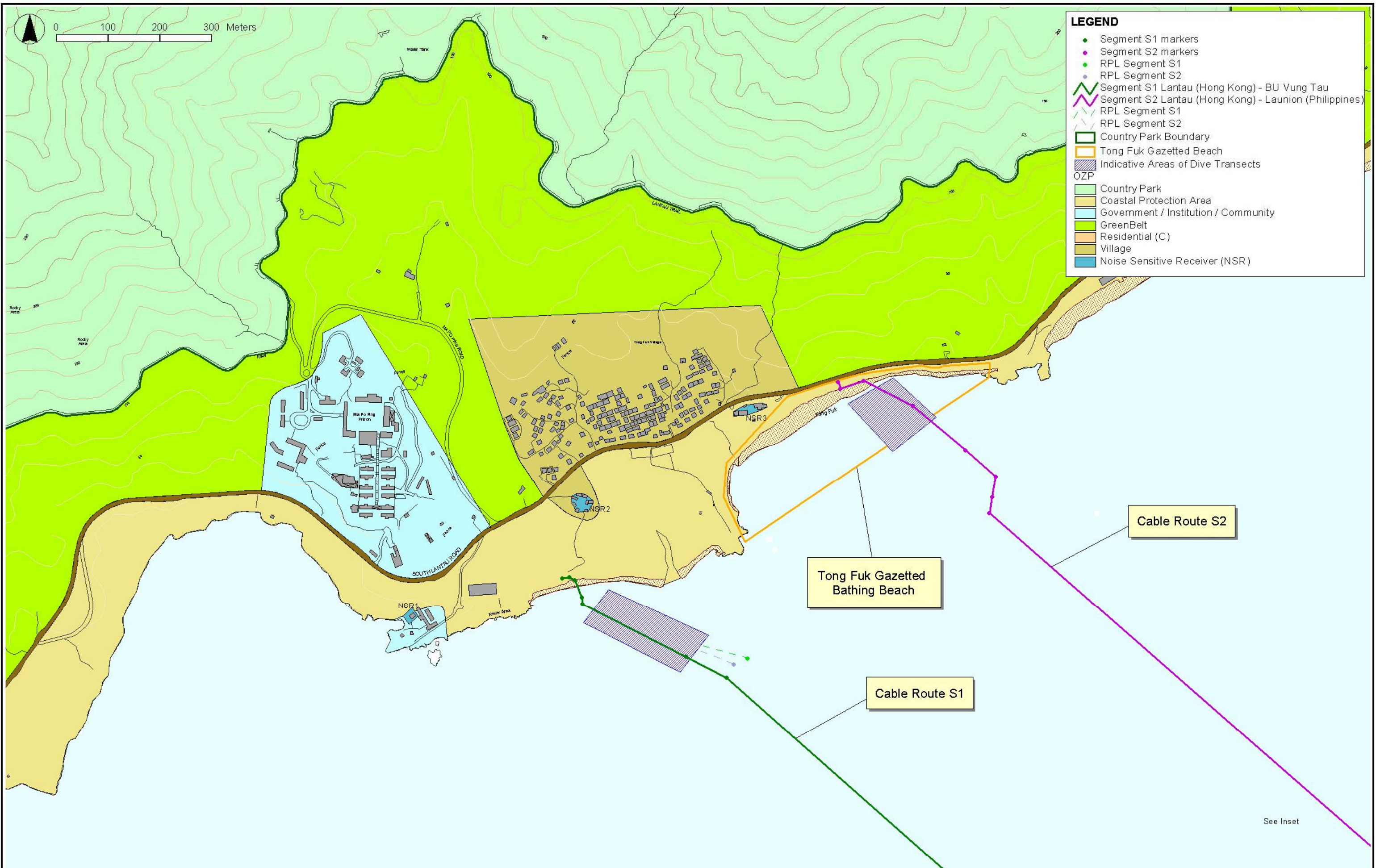
LEGEND

- Segment S1 markers
- Segment S2 markers
- Segment S1 Lantau (Hong Kong) - BU Vung Tau
- Segment S2 Lantau (Hong Kong) - Launion (Philippines)



**Asia-America Gateway (AAG) Cable Network,
South Lantau**

Title:	Location of the Project (1 of 2)		
Date:	July 2008	Figure:	1-1



LEGEND

- Segment S1 markers
- Segment S2 markers
- RPL Segment S1
- RPL Segment S2
- Segment S1 Lantau (Hong Kong) - BU Vung Tau
- Segment S2 Lantau (Hong Kong) - Launion (Philippines)
- RPL Segment S1
- RPL Segment S2
- Country Park Boundary
- Tong Fuk Gazetted Beach
- ▨ Indicative Areas of Dive Transects
- OZP
- Country Park
- Coastal Protection Area
- Government / Institution / Community
- GreenBelt
- Residential (C)
- Village
- Noise Sensitive Receiver (NSR)



Asia-America Gateway (AAG) Cable Network,
South Lantau

Title:	Location of the Project (2 of 2)		
Date:	July 2008	Figure:	1-2

2. PROJECT ORGANISATION

2.1 Key Parties and Organisation Chart

2.1.1 The key parties in an EM&A programme include:

- Reach Networks Hong Kong Ltd (REACH) – Environmental Permit Holder;
- Environmental Protection Department (EPD) – Environmental Authority;
- Environmental Team (ET) – Atkins;
- Engineer’s Representative (ER) – NEC Corporation; and
- The Contractor and subcontractors.

2.1.2 An organisation chart that shows the relationships of the key parties and lines of communication is presented in **Figure 2-1**. The roles and responsibilities of the various parties involved in the EM&A process are described as follows:

2.2 Reach Networks Hong Kong Ltd.

2.2.1 REACH is the project permit holder and has the overall responsibility for ensuring the environmental conditions are implemented under the Environmental Permit (EP).

2.3 Environmental Protection Department

2.3.1 Environmental Protection Department (EPD) is the statutory enforcement body in relation to environmental protection matters in the HKSAR.

2.4 Environmental Team

2.4.1 Atkins have been appointed as the Environmental Team (ET) to execute the recommended EM&A programme for this Project responsible for planning, organising and managing the implementation of the EM&A programme in accordance with the EM&A requirements specified in this Manual and the EP.

2.4.2 In particular, the ET will be responsible for:

- Sampling, analysis and evaluation of monitoring parameters with reference to the recommendations in the Project Profile and requirements in the EP;
- Environmental site surveillance;
- Inspection and audit of compliance with environmental protection, and pollution prevention and control regulations;
- Inspection and audit of compliance with procedures established to enable an effective response to environmental incidents, exceedances or non-compliance;
- Assess the effectiveness of the environmental mitigation measures implemented;
- Complaint investigation, evaluation and identification of corrective measures;

- Liaison with the EPD on all environmental performance matters, and timely submission of all relevant EM&A proforma for EPD's approval;
- Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc. and;
- Timely submission of the EM&A report to the Project Proponent and the EPD and environmental reporting on the project.

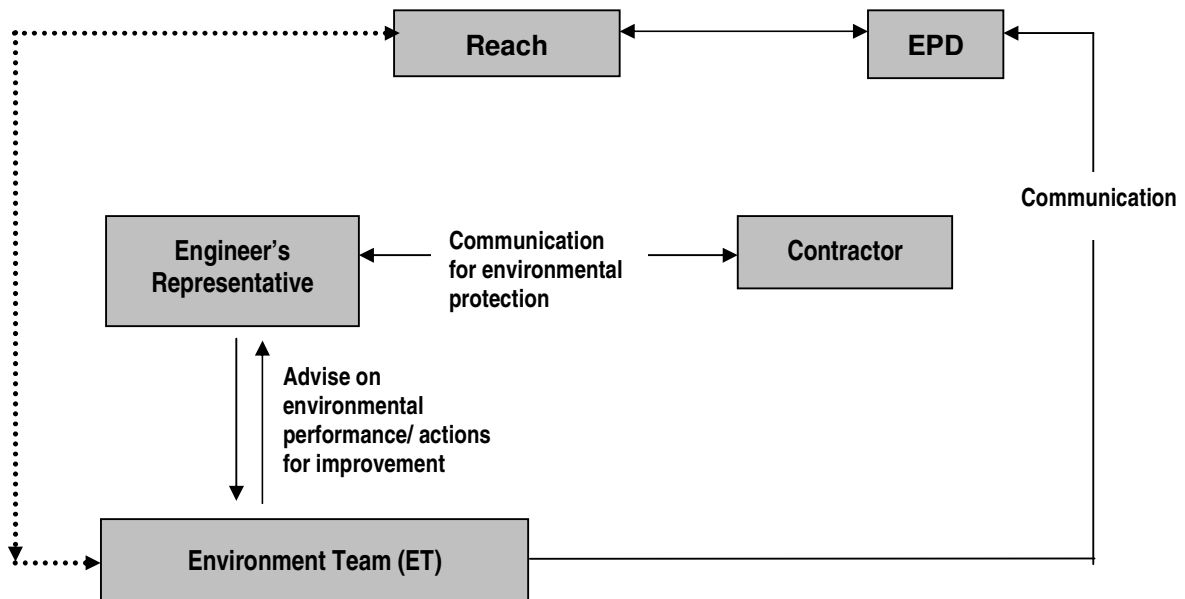
2.5 Engineer's Representative

2.5.1 NEC Corporation is responsible for overseeing the operations of the Contractor. The ER shall supervise the Contractor's activities and ensure that the requirements in the EP, Project Profile, EM&A Manual and other government's standards are fully complied with.

2.6 The Contractor

2.6.1 The Contractor is responsible for ensuring that their work is undertaken in accordance with the requirements of the EP, Project Profile, EM&A Manual and other government standards that are relevant.

Figure 2-1 Organisation Chart



3. WATER QUALITY

3.1 Introduction

- 3.1.1 The water quality assessment in the Project Profile (PP-331/2007) assessed shore based and marine based cable installation works and their potential to result in water quality impacts.

Shore Based Excavation

- 3.1.2 The shore based cable installation activities comprise only minor excavation of a single trench from each of the beach manholes to the Low Water Mark (LWM), using a small backhoe. The trenches will be backfilled with the excavated materials. Each trench section will take around 1-2 days to complete and backfilling will be undertaken as the cable is laid in the trench. The 38mm, single-armoured fibre-optic cable is to be encased with cast iron articulated pipe for additional protection and will be buried to a depth of 2m below ground. Such works are expected to be undertaken during daytime hours but should work be required in the evening or night time hours a construction noise permit shall be applied for.
- 3.1.3 Potential water quality impacts could be minimised by implementing the following applicable measures as per the *Practice Note for Professional Persons ProPECC PN1/94 - Construction Site Drainage* to minimise construction runoff and to ensure proper site management and good housekeeping practices.
1. Channels, earth bunds or sand bag barriers shall be provided on-site to properly direct stormwater away from the works;
 2. Backfilling for trenched areas on the shore shall be undertaken as the cable is installed as practicable to avoid exposed areas and reduce stockpiles;
 3. Open stockpiles of materials on site shall be avoided or where unavoidable covered with tarpaulin or similar fabric during rainstorms. Measures shall be taken to prevent the washing away of construction materials, soil, silt or debris (e.g. use of sandbags and other water diversions methods); and
 4. All construction waste shall be handled and disposed of in accordance with the *Waste Disposal Ordinance*.
- 3.1.4 The ET shall inspect the shore based excavation works on a daily basis as part of their site inspections to ensure that the recommended mitigation measures are properly and effectively implemented. This information will be reported in weekly site inspection reports.

Diver Assisted Cable Installation Works (First 400m)

- 3.1.5 From the LWM the cable-laying and burial will be carried out by divers using jet probes to sink the cable into the sediment for a distance of about 400m offshore, to such a point as to where the vessel can safely access the cable without disturbing the seabed with sufficient clearance from the sea bed. The target burial depth will be 2m and articulated pipe will also be used in this section for additional protection. For this segment, the burial duration is predicted to take around 7-14 days to complete each 400m section. Such works are expected to be undertaken during daytime hours. Should work be required in the evening, a construction noise permit

will be applied for.

- 3.1.6 Despite there being no specific mitigation measures for the diver installation of cable for the first 400m from the shore, special care shall be undertaken. When burying the cable by using articulated pipe, excessive disturbance of the seabed to generate the sediment plume shall be avoided.
- 3.1.7 In addition, two short sea earth cable/ plate segments are proposed to be installed within 400m of the shore. These would extend up to 50m to the east of the Route S1 alignment (see Figure 1-1) and would be installed by divers using jet probes. The cables and plates would be comprised of composite materials, all of which are inert within the marine environment.
- 3.1.8 A monitoring programme has been prepared to monitor the water quality impact and is described in Section 3.2.

Marine Based Cable Installation Works (Cable Laying Vessel)

- 3.1.9 The offshore cable laying process beyond 400m from shore within HKSAR waters will involve installation by injection jetting techniques. The cable is placed in an injector that is carefully laid into the seabed to the desired depth. The injection jetting helps to liquefy the sediments at the desired installation level to aid with the burial at the target depth (which will be approximately 7m below the sea bed). This method is designed to simultaneously lay and bury the cable within minimal disturbance to the seabed and with only localised impacts to the marine water quality. A dive team will be on standby during the installation to ensure proper functioning and positioning of the injector.
- 3.1.10 Once in the correct position, the cable laying vessel travels slowly (approximately 200-300m per hour) along the planned cable route. The offshore cable laying within HKSAR waters is expected to take about 5-7 days for each of the routes.
- 3.1.11 Once out of HKSAR waters, the first cable laying route (S1) will be completed (approximately 70km of cable) before returning to begin the second cable route (S2).
- 3.1.12 To reduce the potential water quality impact due to cable laying by vessel, the following measures are considered necessary:
1. Only injection jetting technique shall be used for the cable laying;
 2. Lowering the injector tool slowly to the seabed;
 3. Fluidising the sediment by the injector in a constant speed to ease of burial; and
 4. Travelling speed of the jetting machine shall not be faster than 300m per hour to ensure minimal disturbance of the seabed.

3.2 Monitoring Programme

Sampling and Testing Methodology

Parameters

- 3.2.1 Parameters to be measured *in situ* are:

- Dissolved oxygen (DO) (% saturation and mg/L);
- Temperature (°C);
- Turbidity (NTU); and
- Salinity (ppt or %).

3.2.2 The only parameter to be measured in the laboratory is the suspended solids (SS) (mg/L). Other data shall also be measured and recorded in the field logs, including the location of the sampling locations and cable burial activities at the time of sampling, water depth, time, weather conditions, sea conditions, tidal state, current direction and other aspects that may influence the monitoring results.

Monitoring Equipment

3.2.3 For water quality monitoring, the following equipment will be used:

Dissolved Oxygen and Temperature Measuring Equipment

3.2.4 The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and shall be operable from a DC power source. It shall be capable of measuring dissolved oxygen levels in the range of 0-20 mg/L and 0-200% saturation, and a temperature of 0-45 degrees Celsius.

3.2.5 It shall have a membrane electrode with automatic temperature compensation. Sufficient stocks of spare electrodes and cable shall be available for replacement where necessary (for example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

Turbidity Measurement Equipment

3.2.6 Turbidity shall be measured from a split water sample from the SS sample. A suitable turbidity test kit shall be used to measure the turbidity level.

Salinity Measurement Instrument

3.2.7 A portable salinometer capable of measuring salinity in the range of 0-40 ppt shall be provided for measuring salinity of the water at each monitoring location.

Water Depth Gauge

3.2.8 No specific equipment is recommended for measuring the water depth.

Positioning Device

3.2.9 A Global Positioning System (GPS) shall be used during monitoring to ensure the accurate recording of the position of the monitoring vessel before taking measurements.

Water Sampling Equipment

3.2.10 A water sampler, consisting of a transparent PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, shall be used

(Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.

Protocols

- 3.2.11 All *in situ* monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use. Responses of sensors and electrodes shall be checked with certified standard solutions before each use. For the on-site calibration of field equipment, the BS 1427: 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters shall be observed. Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.
- 3.2.12 Water samples for SS measurements shall be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection.

Laboratory Analysis

- 3.2.13 All laboratory work shall be carried out in a HOKLAS accredited laboratory. Water samples of sufficient quantity specified by the laboratory shall be collected at the monitoring and control stations for carrying out the laboratory determinations. The analysis shall start within the next working day after collection of the water samples.
- 3.2.14 The SS laboratory measurements shall be provided within 2 days of the sampling event (48 hours). The analyses shall follow the standard methods as described in *APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition*, unless otherwise specified (APHA 2540D for SS).
- 3.2.15 The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme.

Monitoring Strategy

- 3.2.16 Monitoring has been proposed to identify potential impacts to water and ecological sensitive receivers. The sensitive receivers within the vicinity of the cable laying works are as follows:
- Gazetted Bathing Beach at Tong Fuk; and
 - Small patches of corals communities within the area.
- 3.2.17 The above are considered sensitive (within the first 400m of the cable from the beach) during the cable installation works.

Diver Assisted and Marine Based (Cable Laying Vessel) Cable Installation

- 3.2.18 Monitoring will be undertaken during installation of each of the cable route segments S1 and S2. A total of four impact stations (for each segment) and two control stations will be sampled. The indicative sampling locations for the cable

installation are shown in **Figure 3-1**.

- 3.2.19 The sampling points would be set up in a radius of about 100m from the cable installation point (4 points in total in a radius around the cable working point). The stations will need to be of sufficient distance from the works to ensure divers are not affected and shall be located offshore from the diver for safety. Two control stations (C1 and C3) would be set up at 500m to the west and east of the cable installation point for Route S1, while the other two control stations (C2 and C3) would be also at about 500m to the east and west of the cable installation point for Route S2 respectively. These control stations have been selected in areas not to be affected by the cable laying works due to their remoteness to the construction works for both routes.
- 3.2.20 The exact co-ordinates of the sampling points shall be confirmed before commencement of baseline monitoring.
- 3.2.21 The water depth at the proposed monitoring stations appears to be less than 6m. As such, it is expected that monitoring will be undertaken only at mid depth of the water column (due to the shallow water depth). However, should the water depth be sufficient, monitoring will be undertaken at three depths (ie 1m below the sea surface, mid-depth and 1m above the seabed). It shall be undertaken at all designated monitoring stations and control stations during the most optimal tidal state to ascertain the extent of the sediment plume (e.g. during mid ebb to ebb tide for diver installation).
- 3.2.22 The monitoring stations mentioned above shall be sampled during baseline monitoring (prior to cable laying), impact monitoring (during any works related to cable installation) and post-construction monitoring (after completion of the cable installation).
- 3.2.23 A comparison in the field of turbidity levels at each station during cable installation will be undertaken to review significant changes to the water quality. The review will be undertaken in the field as follows:
- 1) The boat will position at the downstream from the cable installation area. Once cable installation works commence, the sampling will be undertaken.
 - 2) The data will be reviewed in the field. Should turbidity levels be more than 130% of the value of the baseline monitoring or upstream control station, then working practices shall be reviewed and amended to reduce turbidity levels.
 - 3) Monitoring works will continue and adjustments until suitable near shore cable installation working practices can be undertaken without exceeding the above criteria.
 - 4) For pre-installation right before and once the cable laying vessel has laid the cable and is sufficient distance from the safety zone, sampling shall be undertaken.
- 3.2.24 With regard to the laboratory data, including SS and other information collected during the survey, this information will be reviewed in relation to the cable installation practices and reported to EPD.

- 3.2.25 Should turbidity levels exceed the criteria set out in the Action and Limit Levels for Water Quality, the installation speed will be reduced and sampling will continue with amendments to the installation practice until the criteria are achieved (see Section 3.4).

Monitoring Frequency and Timing

Baseline Monitoring

- 3.2.26 Baseline conditions for water quality shall be established prior to the commencement of works. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact and control monitoring stations. The baseline conditions shall be established by measuring the water quality parameters specified in Sections 3.2.1 and 3.2.2.

- 3.2.27 Baseline monitoring of water quality will be undertaken three days per week for the duration of two weeks during mid-ebb and mid-flood tide. The interval between two sets of monitoring shall not be less than 36 hours. The monitoring will be undertaken at all 11 monitoring stations as shown in Figure 3-1 for Routes S1 and S2.

Impact Monitoring

- 3.2.28 When the works commence, water quality monitoring shall be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling/ measurement at the designated monitoring stations (applicable to the cable being installed, a total of 4 stations) and control stations (applicable to the cable being installed, two control stations) for the duration of the works within Hong Kong waters. Works are anticipated to take place over an approximate two week period in August (2008) and an approximate two week period in September (2008) dependent on seabed conditions.

Post-construction Monitoring

- 3.2.29 Post-construction monitoring after completion of works for water quality shall be carried out on two consecutive days after completion of the cable installation works, in the same manner as the impact monitoring.

3.3 Action and Limit Levels

3.3.1 Water quality monitoring results for selected parameters will be evaluated against the water quality criteria namely the Action and Limit levels as shown in **Table 3-1** below. Where there are exceedances of Action and/or Limit levels, the monitoring frequency shall be increased.

Table 3.1 Action and Limit Levels for Water Quality

Parameters	Action Level	Limit Level
Suspended Solids (SS) in mg/L (depth-averaged) ¹	95%-ile of baseline data, or 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data 30% exceedance of value at any impact station compared with corresponding data from control station
Turbidity in NTU (depth-averaged)	95%-ile of baseline data 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data 30% exceedance of value at any impact station compared with corresponding data from control station

1 "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths. Non-compliance of the water quality criteria occurs when monitoring results are higher than the limits.

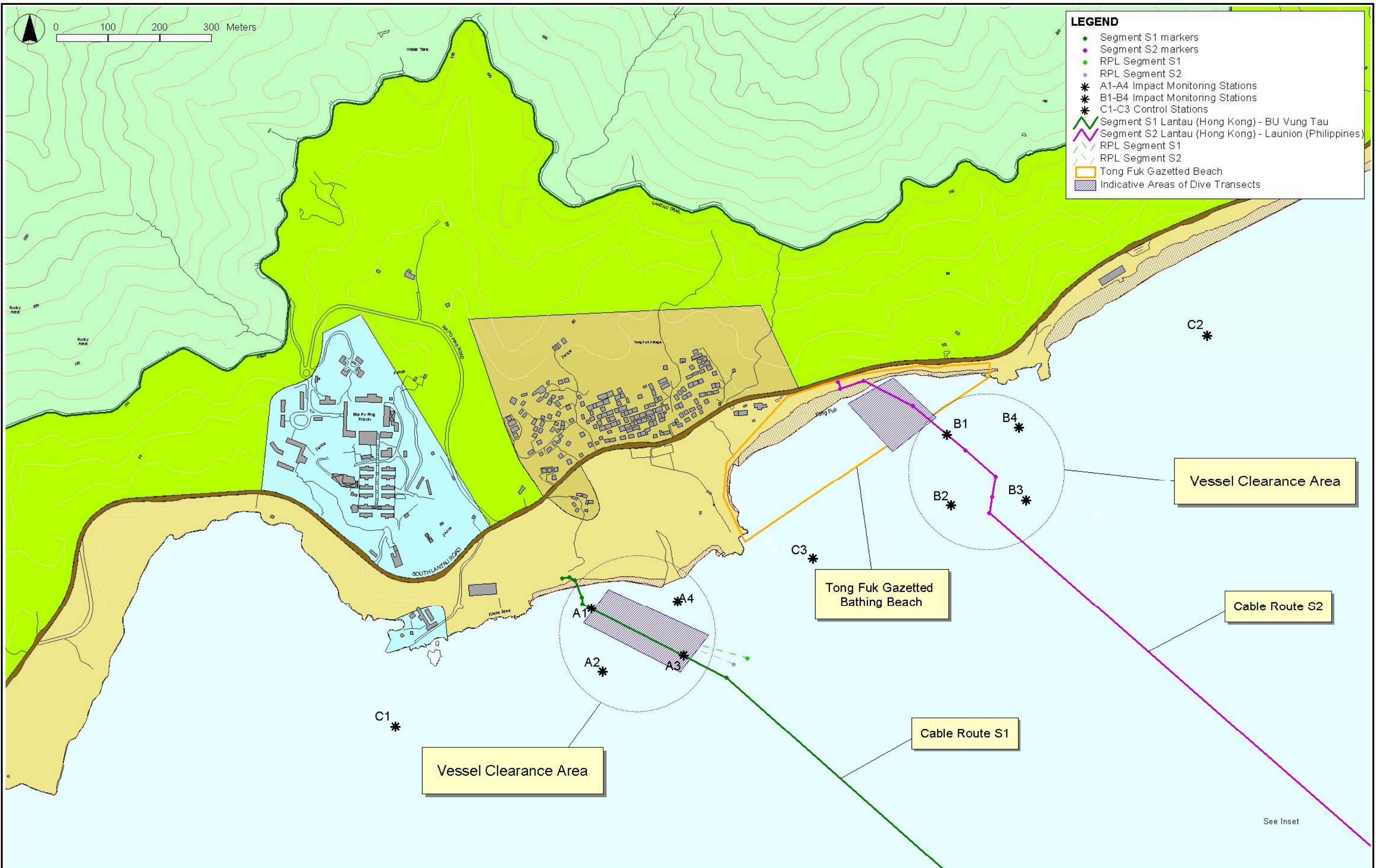
2 Only turbidity measurements will be used for the Action and Limit Levels during injection jetting by cable laying vessel. SS will be used as reference after the laboratory results are received to further confirm performance.

3.4 Event and Action Plan

- 3.4.1 Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria are exceeded, the actions in accordance with the Action Plan in **Table 3-2** shall be carried out.

Table 3.2 Event Action Plan for Water Quality

Event	Contractor
Action Level Exceedance	<p>Step 1 – repeat sampling event.</p> <p>Step 2 – Inform EPD and LCSD and confirm notification of the noncompliance in writing;</p> <p>Step 3 – discuss with cable installation contractor the most appropriate method of reducing suspended solids during cable installation (e.g. reduce cable laying speed/volume of water used during installation.</p> <p>Step 4 – repeat measurements after implementation of mitigation for confirmation of compliance.</p> <p>Step 5 – if non compliance continues, increase measures in Step 3 and repeat measurements. If non compliance occurs a third time, consider the suspension of cable laying operations.</p>
Limit Level Exceedance	<p>Undertake Steps 1-4 immediately, if further non compliance continues at the Limit Level, discuss with the Contractor and EPD and consider suspending cable laying operations until an effective solution is identified.</p>



LEGEND

- Segment S1 markers
- Segment S2 markers
- RPL Segment S1
- RPL Segment S2
- * A1-A4 Impact Monitoring Stations
- * B1-B4 Impact Monitoring Stations
- * C1-C3 Control Stations
- Segment S1 Lantau (Hong Kong) - BU Vung Tau
- Segment S2 Lantau (Hong Kong) - Launion (Philippines)
- RPL Segment S1
- RPL Segment S2
- Tong Fuk Gazetted Beach
- ▨ Indicative Areas of Dive Transects

Vessel Clearance Area

Tong Fuk Gazetted Bathing Beach

Cable Route S2

Cable Route S1

Vessel Clearance Area

See Inset



Asia-America Gateway (AAG) Cable Network,
South Lantau

Title:	Indicative Location of Water Quality Monitoring Stations for Cable Installation Works		
Date:	July 2008	Figure:	3-1

4. CORAL SURVEY

4.1 Background and Objective

- 4.1.1 Based on the results of the baseline subtidal (dive) surveys conducted in September 2007 at Tong Fok, Lantau Island, Site S1 was characterized by large (>50cm) and small (<50cm) boulders. The boulder surface was mainly dominated by tube worms and mussels and only one common hard coral species (*Oulastrea crispate*) was recorded within the survey area (see **Figure 4-1** below) at some locations. The abundance of this species was found to be low (5%) with only a few small colonies (1-25cm²) recorded. This hard coral species mainly inhabits subtidal turbid water and abundance is generally not high within its distribution range (Veron, 2000).



Figure 4-1 Photo Showing the Locations of Site S1 at Tong Fuk. Positions of Transects (T1 – T5, n = 5) for baseline subtidal (dive) survey, conducted in September 2007, are indicated by blue lines. Proposed cable route S1 is indicated by a red line.

- 4.1.2 The main objective is to determine if direct and indirect impacts may occur to corals which maybe present in the vicinity of the cable route S1 during cable installation, and to ensure appropriate action is undertaken to effectively minimise such impacts.

4.2 Monitoring Requirement

- 4.2.1 As part of the baseline documentation of the Project and subtidal engineering review, the cable alignment would be surveyed by divers before installation of cable. In accordance with Conditions 2.4 and 2.5 specified in Environmental Permit (EP-298/2007), near-shore baseline coral surveys by divers shall be carried out along

the first 500m of the cable alignment of the Route S1 prior to the near-shore cable installation.

- 4.2.2 A marine ecologist shall also be included in the survey team to provide input on any refinements of the route alignment in the field to avoid or minimise potential impacts to corals.

4.3 Methodology

- 4.3.1 A coral survey was undertaken in September 2007 which covered the first 100m of the proposed cable route, and the length of line transects was 50m (25m at each side of the route). For the baseline surveys, the area of direct disturbance (the cable route alignment from shore to the first 500m) will be surveyed as this is the area that would be directly affected along the cable route alignment. This baseline survey would cover the cable alignment. Further surveys, in the form of transect surveys, will also be undertaken to identify coral communities within 25m either side of the cable route.

- 4.3.2 During the baseline survey, possible receiving/ control sites will be reviewed with regard to their potential as coral translocation sites.

Baseline Coral Survey

- 4.3.3 The baseline coral survey shall cover the first 500m section of the proposed cable route. The purpose is as follows:

- 1) to identify the presence or absence of coral colonies that may be directly affected;
- 2) to verify the status of coral community in the survey area in terms of species composition, abundance, translocation feasibility (if appropriate), size, percentage cover and healthiness before the commencement of the cable installation; and
- 3) to assess the suitability of the existing coral colonies for potential avoidance or mitigation measures including translocation and tagging for during (if appropriate) and post installation monitoring.

- 4.3.4 A direct swim-over of the first 150m shall be carried out initially to cover depths which are suitable for coral growth. After this distance, it is anticipated that the substrate will consist of soft sediment which is not likely to support corals. After the 150m mark, spot dives will be conducted at 50m intervals to confirm the absence or presence of corals by covering a 4m wide x 10m distance (either side of the cable alignment) at these intervals (eg. 7 spot dives to the 500m mark).

- 4.3.5 In addition, belt transect surveys will be undertaken to identify corals within 25m (either side) of the alignment. Belt transects will be laid at 25m intervals along the first 150m and shall cover an area of 200m² (4m wide x 50m) parallel to the coastline (a sub-total of 6 transects). Should the spot dives, after 150m, record the presence of any corals, then transects of a similar length shall be laid at 50m intervals (a sub-total of 7 transects). Locations of the starting and ending points of each transect will be recorded by global positioning system (GPS, Garmin GPSmap 60CS).

- 4.3.6 General physical parameters will be recorded for each transect, including substrate

characteristics, visibility, weather, tidal conditions and water current. Common benthic flora and fauna will also be described.

- 4.3.7 Quantitative data on coral community will be collected where each transect will be surveyed for the distribution of coral colony. Each coral colony will be identified to species level and colony size, and the percentage area of sedimentation on colony surface, the percentage area of bleaching and recent mortality will be recorded. Where corals are located, the associated substrate type will be recorded. Photographs will be taken for each substantial colony.
- 4.3.8 The specific location of identified coral colonies along substratum will be recorded for further consideration to be included in a coral translocation, tagging and monitoring assessment. The abundance of coral (number of colonies), number of species (S), and coral percentage cover will be summarized for each transect.
- 4.3.9 Data collected in the baseline survey will be assessed against the proposed cable alignment work. Possible impact of the construction on the standing corals will be estimated. Mitigation measures, if necessary, will be suggested to minimize adverse effect on the coral community and may include, but not be limited to, minor re-alignment of proposed cable route, coral translocation, tagging and monitoring.
- 4.3.10 Baseline data collected in this survey serve as reference material for determining the need of any mitigation measures such as coral translocation and post-construction survey to evaluate the possible impact of the cable installation on the coral community.

Assessment for Potential Coral Translocation, Tagging and Monitoring

- 4.3.11 The necessity of coral translocation will be determined by the baseline coral survey and is dependant on the coral colonies identified and their proximity to the proposed cable route. Coral translocation would induce stress to corals and as such, will be fully investigated before deemed necessary. As mentioned previously, other mitigation measures are to be taken into account, if necessary, and may include, but not be limited to, minor re-alignment of proposed cable route. In general, should translocation be required:
- If the associated substratum is movable, the coral colonies will be translocated to a receiving site, which will be selected before commencement of the cable installation. Monitoring of the translocated corals would be performed twice over a two week period after the translocation.
 - However, if the coral colonies are attached to bedrock or boulder which is too large to be readily moved ***without damaging the attached colony***, it will be considered unsuitable for translocation. These colonies will be tagged on site and regularly monitored during (if appropriate) and after the cable installation.

Coral Translocation Process if Required

Site Selection Survey for a Receiving/ Control Site (Site R) for Potential Coral Translocation and Routine Monitoring

- 4.3.12 Should translocation of corals be required, a survey will be conducted to identify a receiving site for the translocated colonies and will be close to the source area of the translocated corals, but not affected by the construction work or other anthropogenic disturbance. The receiving site will be similar to the source site in

terms of physical characters (depth, turbidity, wave action, tidal currents and degree of exposure to freshwater run-off) and ecological characters (substratum type, composition of coral and other benthic community).

- 4.3.13 The proposed receiving/ control site (Site R) will serve the following purposes:
- a) to identify location for placement of translocated coral colonies from the impact site;
 - b) to evaluate the condition of the translocated coral colonies after the moving exercise, using original coral colonies in Site R as reference; and
 - c) to evaluate the condition of the coral colonies in the impact site (S1) after cable installation, using original coral colonies in Site R as reference.
- 4.3.14 At the proposed receiving Site R, physical and ecological characters will be quantified using the similar transect methods as the baseline coral survey at Site S1.
- 4.3.15 Quantitative data collected in the site selection survey at Site R will be used as baseline data for monitoring of natural mortality, bleaching and sedimentation, so that any adverse impact due to cable installation on the tagged colonies at Site S1 and translocated colonies at Site R after the moving exercise can be identified.

Coral Translocation Protocol

- 4.3.16 Should coral translocation be required, the location of the survey area will be identified using handheld GPS and buoyed for relocation.
- 4.3.17 Coral colonies identified for translocation in the baseline survey will be relocated, and their condition, including damage, sedimentation, bleaching and partial mortality will be recorded. Photographs will be taken of each colony before translocation.
- 4.3.18 Coral colonies attached to bedrock or boulders too large to be readily moved with strops and lifting bag **without damaging the attached colony** will be considered unsuitable for translocation. Data and photographs will be recorded for these colonies to confirm the correct translocation decision has been made.
- 4.3.19 Translocation will be carried out by manual lifting of the identified coral colonies, using SCUBA divers, under the supervision of a marine ecologist. Colonies will be kept in seawater and not exposed to air during the whole translocation process. Identified coral colonies will be moved with the associated substrate, i.e. boulder substrate, to the receiving site (to be confirmed during baseline survey). Efforts will be made to minimize the amount of contact by the diver and the length of time the coral colonies are handled.
- 4.3.20 Small moveable colonies will be relocated by divers wearing gloves. Larger coral colonies and associated substrate will be lifted with a webbed sling and 50 kg lift bags. With both manual methods, divers will avoid direct contact with the coral tissue at all times, thus minimising possible physical impact and damage to the coral polyps. The orientation of each coral (i.e. upright position) will be maintained during the moving process and each coral will be inspected after final positioning to ensure that the correct orientation was maintained.
- 4.3.21 After translocation to the receiving site (Site R), each colony will be marked with a plastic tag for identification with photographs taken for each colony. Post-

translocation monitoring will be conducted after the moving exercise to evaluate any adverse impact on the translocated colonies. The condition of each colony, including damage, sedimentation, bleaching and partial mortality, will be recorded and compared with the condition before translocation and also with the original, tagged but not translocated colonies in the receiving site.

Coral Tagging and Monitoring if required

Purpose of Monitoring

- 4.3.22 The aims of coral monitoring survey are as follows:
- a) to evaluate possible impact of cable installation on the corals at impact site (S1), and
 - b) to evaluate possible adverse effect of moving exercise on the translocated coral colonies at Site R, using natural coral colonies at Site R as control.

Coral Tagging Protocol/ Moving Exercise

- 4.3.23 At the impact site (S1), two sets of coral colonies will be tagged for routine monitoring during (if appropriate) and after cable installation as follows:
- a) coral colonies which cannot be translocated (i.e. attached to bedrock or large boulder) but located within 10m on either side of the proposed cable route; and
 - b) coral colonies which are beyond 10m but within 20m on either side of the proposed cable route.
- 4.3.24 Priority shall be given to tag the largest and undamaged coral colonies as these types of corals are more sensitive to sediment damage. It shall be noted that both tagging exercises will be conducted before commencement of cable installation.
- 4.3.25 At the receiving/ control site (Site R), in addition to the colonies translocated from the impact site (S1), at least 10 original coral colonies will be tagged and used to identify background environmental perturbations during monitoring.
- 4.3.26 The identified colonies will be tagged using two-level marking as follows:
- a) A numbered stone, painted in bright yellow, will be placed next to each tagged colony; and
 - b) A numbered plastic tag will be nailed into an adjacent piece of hard substrate.
- 4.3.27 For each tagged coral, specific detailed information will be collected including species identification, size, growth form, depth and general condition for immediate surroundings. The health status of each tagged coral colony will be carefully recorded, including information on existing surface area with sedimentation, partial mortality and bleached area. Photographs of each tagged coral colony will be taken.

Monitoring Surveys at Impact and Receiving/ Control Sites

- 4.3.28 For each monitoring survey, both impact (Site S1) and control (Site R) sites will be surveyed. A control site shall be included in order to identify background environmental perturbations that are not associated with the construction/translocation.

Survey Methods

- 4.3.29 At impact and receiving/ control sites, the tagged hard coral colonies will be surveyed to record the health status of the tagged corals, including percentage cover of sedimentation, bleaching and partial mortality. The condition of each tagged coral colony will be recorded by taking photographs that best represents the entire colony. General physical parameters will be recorded for each survey site, including visibility, weather, tidal conditions and water current.
- 4.3.30 The results of the impact monitoring survey will be reviewed with reference to findings of the baseline coral survey and the data from the receiving/ control site collected. Should translocation be required, the status of tagged and translocated colonies will be compared with the condition before translocation, and also the original colonies at the receiving/ control site.

Coral Monitoring Frequency

- 4.3.31 Based on the results of the baseline subtidal (dive) surveys conducted in September 2007, only one common hard coral species (*Oulastrea crispate*) was recorded in low abundance, away from the impact area, with a few small colonies noted. This hard coral species is resistant to sedimentation, mainly inhabits subtidal turbid water; and abundance is generally not high within its distribution range (Veron, 2000). Suspended solids generated during the diver assisted cable installation are expected to be localised and short term in duration, particularly as good visibility is required to carry out such works. As such, no impact to the corals is expected and no impact monitoring is proposed.
- 4.3.32 To further ensure that suspended solids are minimised near the coral locations, a briefing will be provided to the divers in advance of their work to inform them of the locations of the corals so they can minimize the generation of suspended solids and disturbance as much as possible during installation in this area. In addition, water quality results will be reviewed during the installation and should turbidity levels be exceeded, diver assisted installation practices will be reviewed with the contractor to reduce suspended solids generated from installation (e.g. reduce rate of installation etc.).
- 4.3.33 Post construction review of the tagged corals for degree of sedimentation, bleaching and mortality will be conducted within 2 weeks after the completion of cable installation.

5. MARINE MAMMALS INSPECTION

5.1 Monitoring Requirement

5.1.1 The Project Profile found that due to relatively low numbers of marine mammals observed from recent monitoring surveys (from waters to the south of Lantau when compared to western and northern waters of Lantau), that the waters through which the cable routes pass are of limited importance to cetaceans in Hong Kong. As such, impacts are not found to be significant. However, due to the potential presence of marine mammals, visual inspections of the Chinese White Dolphin (*Sousa chinensis*) and Finless Porpoise (*Neophocaena phocaenoides*) are required during cable laying installation works as specified in Condition 2.5 of the Environmental Permit (EP-298/2007). As diver assisted cable installation is not likely to impact marine mammals, and due to the close distance to the shore (up to 400m), inspections shall only be carried out during cable installation by injection jetting (cable laying vessel) works.

5.2 Methodology and Event and Action Plan

5.2.1 A dolphin/ porpoise exclusion zone within a radius of 250m around the cable installation works shall be implemented. The area shall be visually inspected for dolphins/ porpoises prior to commencement of works with works beginning once the area is clear of dolphins and porpoises.

5.2.2 Monitoring of the dolphin/ porpoise exclusion zone shall be undertaken by independent dolphin observers (marine ecologist) with an elevated and clear view of the area. Works shall not commence until the observer confirms that the area is continuously clear of dolphins and porpoises for a 30 minute period, thus allowing for the approximate maximum dolphin dive time of 4 minutes.

5.2.3 Works may commence following the 30 minute monitoring period when the area is found to be clear of dolphins/ porpoises. Should dolphins or porpoises move into the area during works, cessation of works is required until the area is found to be clear of dolphins/ porpoises for another 30 minute period.

5.3 Precautionary Measures

5.3.1 According to the Project Profile, no significant impacts are likely to occur to the marine ecological resources. Nonetheless, during the cable installation, should dolphins/ porpoises enter the 250m dolphin and porpoise exclusion zone, works shall cease and recommence once the area is found to be clear for a 30 minute period.

6. COMPLIANCE AUDIT PROCEDURES

6.1 Site Surveillance

- 6.1.1 Site surveillance will be undertaken by the ET to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented by the Contractor and that the legal requirements are complied.
- 6.1.2 Site inspection work shall be undertaken by the ET three times a week during shore based works and a visual inspection of marine mammals shall be undertaken daily during cable installation by injection jetting (cable laying vessel) works. An example of a proforma for site inspection, deficiency and action reporting system in the form of a flowchart has been prepared for reference, and is presented in **Figure 6-1**.
- 6.1.3 The areas of inspection shall include, but shall not be limited to, the environmental situation, and pollution control and mitigation measures within the site. It shall also review the environmental situation outside the site area that is likely to be affected, directly or indirectly, by the site activities. The ET Leader shall make reference to the following information in conducting the inspection:
- The recommendations on environmental protection and pollution control mitigation measures in the Project Profile;
 - On-going results of the EM&A programme;
 - Works progress and programme;
 - Individual works methodology proposals (which shall include proposals on associated pollution control measures);
 - The contract specifications on environmental protection and pollution prevention;
 - The relevant environmental protection and pollution control laws and guidelines; and
 - Previous site inspection results.
- 6.1.4 The ET shall notify the Contractor within 24 hours of any environmental non-compliance for taking immediate action.
- 6.1.5 The Contractor shall follow the procedures and time frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET to report on any remedial measures subsequent to the site inspections.
- 6.1.6 The ET shall conduct ad-hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of any environmental complaints, or as part of the investigation work, as specified in the Event/ Action Plan for environmental monitoring and audit.

6.2 Environmental Complaints

- 6.2.1 Should complaints received, the ET shall undertake the tasks outlined in **Figure 6-2**. During the complaint Investigation work, the Contractor and ER shall co-operate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified to be required in the investigation in consultation with the Contractor shall promptly carry out the measures. The ER shall ensure that the Contractor has implemented the mitigation measures.

6.3 Documentation

- 6.3.1 All documentation is required to be filed in a traceable and systematically manner and ready for inspection upon request. All EM&A results and findings shall be documented in the EM&A report prepared by the ET prior to circulation to the Contractor, ER and EPD.

Figure 6-1 Flow Chart of Site Inspection, Deficiency and Action Reporting System

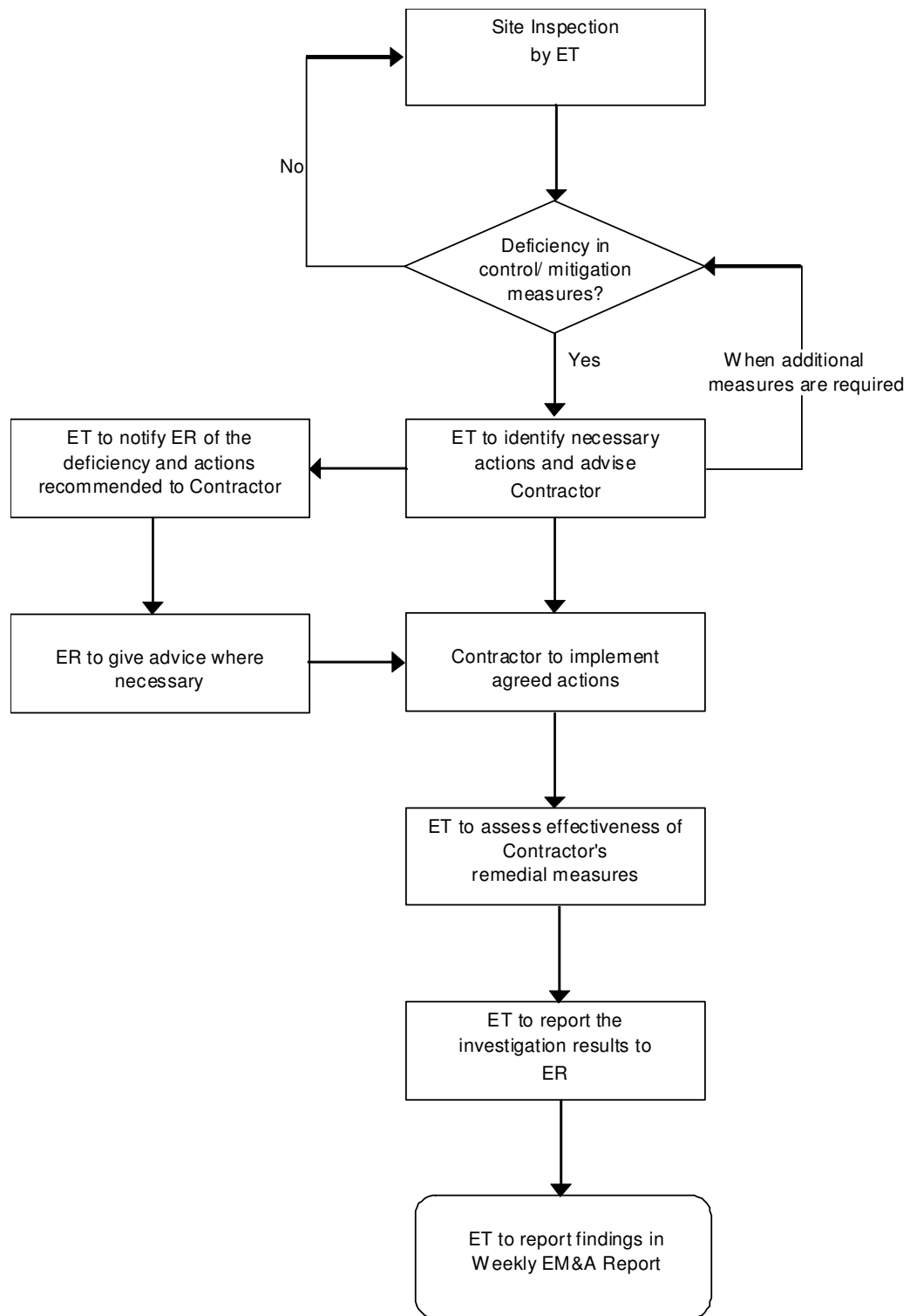
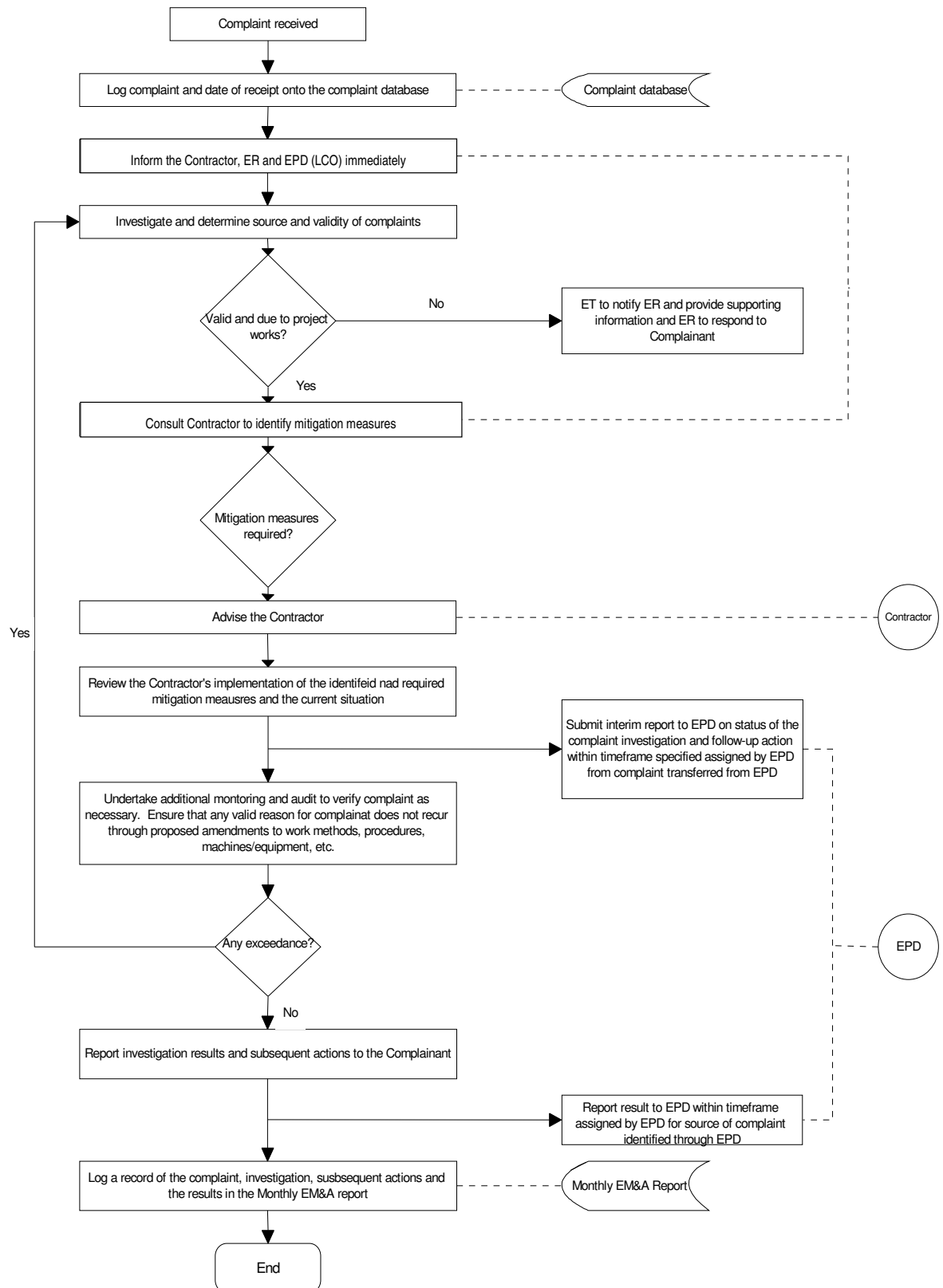


Figure 6-2 Flow Chart of Complaint Investigation Procedures



7. REPORTING

7.1 General

- 7.1.1 The following reporting requirements are based upon a paper-documented approach. However, the same information shall be provided in an electronic medium upon agreeing the format with the ER and EPD. All the monitoring data (baseline and impact) shall also be submitted in an agreed electronic format. This would enable a transition from a paper/ historic and reactive approach to an electronic/ real time proactive approach.
- 7.1.2 Types of reports that the ET Leader shall prepare and submit include Baseline Monitoring Report, regular Weekly Impact Monitoring Report, Post Project Monitoring Report and Summary EM&A Report.
- 7.1.3 A report shall be provided to EPD that shall include the monitoring results in addition to operating practices of the cable burial machine during sampling (including position, speed, cable burial depth) and an interpretation of monitoring results. The monitoring data shall be provided graphically to show the relationship between the Control and the Impact monitoring stations and compliance or non-compliance with respect to the Action/ Limit Levels.

7.2 Baseline Monitoring Report

- 7.2.1 The report shall include at least the following:
- (i) drawings showing locations of the baseline monitoring stations;
 - (ii) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth); and
 - monitoring date, time, frequency and duration;
 - (iii) details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results;
 - (iv) determination of the action and limit levels for each monitoring parameter and statistical analysis of the baseline data; and
 - (v) any revisions for inclusion in the EM&A Manual.

7.3 Regular Weekly Impact Monitoring Report

- 7.3.1 The results and findings of each audit shall be documented in regular Weekly

Impact Monitoring Report prepared by the ET and submitted to EPD within three days after the relevant monitoring data are collected or become available.

7.3.2 The Weekly Impact Monitoring Report shall include at least the following:

- (i) 1-2 pages executive summary;
- (ii) advice on the implementation status of environmental protection, mitigation and pollution control measures, as recommended in the Project Profile, summarised in the updated implementation schedule;
- (iii) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration;
- (iv) graphical plots of trends of monitored parameters over the past four reporting periods for representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (v) a summary of non-compliance (exceedances) of the environmental quality performance limits;
- (vi) a review of the reasons for and the implications of noncompliance including review of pollution sources and working procedures;
- (vii) a description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier noncompliance;
- (viii) a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints;
- (ix) a summary record of notification of summons, successful prosecutions for breaches of environmental protection/ pollution control legislation, and actions taken to rectify such breaches;
- (x) works programme; and
- (xi) comments, recommendations and conclusions for the monitoring period.

7.4 Post Project Monitoring Report

7.4.1 A Post Project Monitoring Report shall be prepared by the ET to report the EM&A results and findings for the cable installation works assisted by diver. It shall be submitted to EPD within one month after completion of the cable installation work at segment S1 and S2 respectively. The Post Project Monitoring Report shall include at the items described in S7.3.2 above.

7.5 Summary EM&A Report

- 7.5.1 A Summary EM&A report shall also be prepared by the ET and submitted to EPD within 10 working days upon completion of all cable installation works. The Summary EM&A Report shall include at least the items described in S7.3.2 above.

7.6 Electronic Reporting of EM&A Information

- 7.6.1 To facilitate public inspection of all the environmental monitoring and audit results and reports and all submissions required by the Environmental Permit (EP-298/2007), a dedicated web site will be set up by the Permit Holder in the shortest practicable time and in no event later than one week after the relevant environmental monitoring data are collected or become available, unless otherwise agreed with the DEP.
- 7.6.2 The Permit Holder will set up the dedicated website and notify the DEP in writing the internet address where the environmental monitoring and project data is to be placed within two weeks after the commencement of construction of the Project. The Permit Holder will maintain the dedicated website throughout the entire construction stage and during the first three operating months of the Project to facilitate public access to environmental monitoring data.

7.7 Typical Forms to be Adopted

- 7.7.1 To facilitate the management of the EM&A programme for the construction of the project, the record forms presented in **Appendix 1** (including those presented in the preceding sections) shall be adopted where applicable during the construction phase of the project. These forms are listed as follows:
5. Implementation Status Performa;
 6. Site Inspection Corrective Action Proforma;
 7. Proactive Environmental Protection Proforma;
 8. Regulatory Compliance Proforma;
 9. Complaint Log; and
 10. Sample Template for Interim Notifications of Environmental Quality Limits Exceedances.

7.8 Interim Notifications of Environmental Quality Limit Exceedances

- 7.8.1 With reference to the Event and Action Plan described in previous sections, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the EPD, as appropriate. The notification shall be followed up with the advice to EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Appendix 1**.

Appendix 1

Proforma for EM&A

IMPLEMENTATION STATUS PROFORMA

Ref: _____

Ref**	Environmental Protection Measures*	Implementation Status

* All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and /or accepted public comment to the proposed project
** EIA Ref/EM&A Log Ref/Design Document Ref

Signed by Environmental Team Leader: _____

Date: _____

SITE INSPECTION PROFORMA

Ref: _____

Date	Location	Req't Ref.*	Observation/Deficiency	Mitigation Action** (Responsible Agency)	Date*** of Confirmation

* EIA Ref/EM&A Log Ref/Design Document Ref/Environmental Protection Contract Clause
 ** Specific Environmental Mitigation Measures should be stated, such as, equipment, processes, systems, practices or technologies.
 *** The required completion date to confirm the specified Environmental Protection Action

This Proforma is an Environmental Protection Instruction for: _____ on _____

Signed by Environmental Team Leader: _____ Date: _____

PROACTIVE ENVIRONMENTAL PROTECTION PROFORMA

Ref: _____

Ref*	Proposed Construction Method**	Location/ Working Period	Anticipated Impacts	Recommended Mitigation Measures

* EIA Ref/EM&A Log Ref/Design Document Ref
 ** Details of equipment, vehicles, plants, processes, technologies for the option of construction method

Reviewed by Environmental Team Leader: _____

Date: _____

REGULATORY COMPLIANCE PROFORMA

Ref: _____

Ref**	Environmental License/Permit*	Control Area/Facility/Location	Effective Date

* Name of Applicant, Business Corporation, relevant regulation and remark of license/permit conditions
** File reference of the licensee/permittee

Recorded by Environmental Team Leader: _____

Date: _____

COMPLAINT LOG

Ref: _____

Log Ref	Date/Location	Complainant/ Date of Contact	Details of Complaint	Investigation/Mitigation Action	File Closed

Filed by Environmental Team Leader: _____

Date: _____

Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

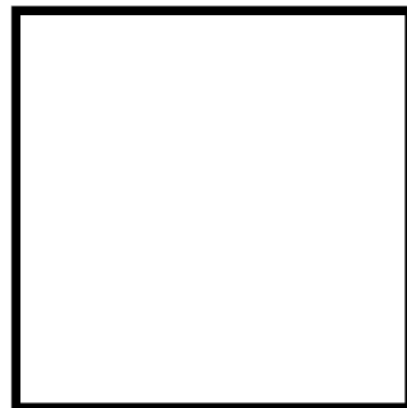
Location Plan

Prepared by : _____

Designation : _____

Signature : _____

Date : _____



**阿特金斯顧問有限公司
Atkins China Ltd**

5th Floor, Wharf T&T Centre
Harbour City
Tsim Sha Tsui
Kowloon
Hong Kong
Tel : +852 2972 1000
Fax : +852 2890 6343
Email : acl@atkins.com.hk

**阿特金斯深圳
Atkins Shenzhen**

Unit 8-16
53/F Shun Hing Square
Di Wang Commercial Center
5002 Shen Nan Dong Road
Shenzhen 518008
People's Republic of China
Tel : +86 755 8246 2109
Fax : +86 755 2588 2563
Email : info@atkins.com.cn

**阿特金斯上海
Atkins Shanghai**

46/F Raffles City
268 Xi Zang Zhong Lu
Shanghai 200001
People's Republic of China
Tel : +86 21 6122 5100
Fax : +86 21 6122 5101
Email : info@atkins.com.cn

**阿特金斯北京
Atkins Beijing**

Unit 1105 The Exchange Beijing
of China Merchants Centre
No. 118 Jian Guo Lu Yi
Chao Yang District
Beijing 100022
People's Republic of China
Tel : +86 10 6567 7933
Fax : +86 10 6567 7930
Email : info@atkins.com.cn

**阿特金斯成都
Atkins Chengdu**

Unit 20, Building B
City Tower, No. 86 Section One
South People Road
Chengdu Sichuan 610016
People's Republic of China
Tel : +86 28 8620 2130
Fax : +86 28 8620 2132
Email : info@atkins.com.cn

**阿特金斯武漢
Atkins Wuhan**

Room 904B
Ruitong Plaza Building B
No. 847 Jianshe Road
Wuhan 430015
People's Republic of China
Tel : +86 27 8580 4620
+86 27 8548 7935
Fax : +86 27 8548 7696
Email : info@atkins.com.cn

www.atkinglobal.com
www.atkins.com.hk
www.atkins.com.cn