

Agreement No CE 60/96

Northshore Lantau Development Feasibility Study

Environmental Impact Assessment

Environmental Monitoring & Audit Manual

February 2000

Civil Engineering Department

Agreement No. CE60/96

Northshore Lantau Development Feasibility Study

Environmental Impact Assessment

Final Report

- Environmental Monitoring & Audit Manual -

February 2000

Scott Wilson (Hong Kong) Ltd in association with **ERM Hong Kong Ltd**
Brooke International - City Planning Consultants - Shankland Cox - Wilbur Smith Associates

Executive Summary

Volume 1	Chapter 1	Introduction
	Chapter 2	Project Description
	Chapter 3	Air Quality
	Chapter 4	Noise
	Chapter 5	Water Quality
Volume 2	Chapter 6	Solid Waste Management
	Chapter 7	Terrestrial Ecology
	Chapter 8	Marine Ecology
	Chapter 9	Fisheries Impact Assessment
	Chapter 10	Hazard to Life Assessment for Dangerous Goods
	Chapter 11	Historical, Archaeological and Cultural Heritage Assessment
	Chapter 12	Land Contamination
	Chapter 13	Landscape and Visual Impact Assessment
	Chapter 14	Environmental Monitoring & Audit
	Chapter 15	Implementation Schedules
	Chapter 16	Conclusions and Summary of EIA Findings
Volume 3	Annex A	Construction Programme and Phasing of the Reclamations
	Annex B	Air Quality Impact Assessment
	Annex C	Noise Impact Assessment (excluding Annex C3)
	Annex D	Water Quality Impact Assessment
	Annex E	Terrestrial Ecology Impact Assessment
Volume 4	Annex F	Supporting Information for the Marine Ecology Impact Assessment
	Annex G	Supporting Information for the Fisheries Impact Assessment
	Annex H	Cultural Heritage Impact Assessment
	Annex I	Land Contamination Assessment
	Annex J	Landscape and Visual Impact Assessment for NLDFS and CKWLR
	Annex K	EIA Study Brief (SB-044/BC)
Volume 5	Annex C3 (only)	Construction Noise Impact Assessment – Predicted Noise Levels

Annex L

Environmental Monitoring & Audit Manual

CONTENTS

1	INTRODUCTION	1-1
1.1	PURPOSE OF THE MANUAL	1-1
1.2	BACKGROUND AND HISTORY TO THE PROJECT	1-1
1.3	RELEVANT STUDIES	1-3
1.4	OBJECTIVES OF THE ENVIRONMENTAL MONITORING AND AUDIT	1-6
1.5	THE SCOPE OF THE ENVIRONMENTAL MONITORING AND AUDIT PROGRAMME	1-7
1.6	STRUCTURE OF THE EM&A MANUAL	1-8
2	ENVIRONMENTAL MANAGEMENT SYSTEMS FOR THE DESIGN, CONSTRUCTION AND OPERATIONAL PHASES	2-1
2.1	INTRODUCTION	2-1
2.2	GENERAL	2-1
2.3	DESIGN PHASE	2-2
2.4	CONSTRUCTION PHASE	2-3
2.5	OPERATIONAL PHASE	2-7
2.6	SUMMARY	2-7
3	ORGANISATION AND STRUCTURE OF THE EM&A	3-1
3.1	APPROACH TO THE EM&A PROGRAMME	3-1
3.2	INFRASTRUCTURE WORKS	3-2
3.3	ROLE AND OBJECTIVES OF THE ENPO	3-2
3.4	PROJECT ORGANISATION	3-3
4	EM&A GENERAL REQUIREMENT	4-1
4.1	INTRODUCTION	4-1
4.2	SUMMARY OF THE SCHEDULE 2 DESIGNATED PROJECT ENVIRONMENTAL IMPACT ASSESSMENT	4-1
4.3	CONSTRUCTION PHASE EM&A	4-13
4.4	OPERATIONAL PHASE EM&A	4-16
5	AIR QUALITY MONITORING	5-1
5.1	INTRODUCTION	5-1
5.2	CONSTRUCTION DUST MONITORING	5-1
5.3	OPERATIONAL AIR QUALITY MONITORING	5-10
5.4	MITIGATION MEASURES	5-10
6	NOISE MONITORING	6-1
6.1	INTRODUCTION	6-1
6.2	CONSTRUCTION PHASE EM&A	6-1
6.3	OPERATIONAL NOISE MONITORING	6-8
6.4	MITIGATION MEASURES	6-8
7	WATER QUALITY MONITORING	7-1
7.1	INTRODUCTION	7-1
7.2	METHODOLOGY AND CRITERIA	7-1

7.3	MONITORING EQUIPMENT	7-2
7.4	MONITORING LOCATIONS	7-4
7.5	BASELINE MONITORING	7-6
7.6	IMPACT MONITORING	7-7
7.7	COMPLIANCE ASSESSMENT	7-8
7.8	EVENT AND ACTION PLAN	7-9
7.9	MITIGATION MEASURES	7-12
7.10	AUDITING REQUIREMENTS	7-12
8	WASTE MANAGEMENT	8-1
8.1	INTRODUCTION	8-1
8.2	WASTE MANAGEMENT PRACTICES	8-1
8.3	REQUIREMENTS OF A WASTE MANAGEMENT PLAN	8-1
8.4	EM&A RECOMMENDATIONS	8-2
8.5	MITIGATION MEASURES	8-4
9	TERRESTRIAL ECOLOGY	9-1
9.1	ECOLOGICAL MONITORING REQUIREMENTS	9-1
9.2	MITIGATION MEASURES	9-2
9.3	AUDITING REQUIREMENTS	9-2
10	MARINE ECOLOGY	10-1
10.2	MITIGATION MEASURES	10-2
11	FISHERIES	11-1
11.1	THE EM&A RECOMMENDATIONS	11-1
11.2	ENVIRONMENTAL MONITORING AND AUDIT	11-1
11.3	MITIGATION MEASURES	11-1
12	CULTURAL HERITAGE IMPACT	12-1
12.1	INTRODUCTION	12-1
12.2	MITIGATION MEASURES	12-1
12.3	AUDITING REQUIREMENTS	12-1
13	HAZARD ASSESSMENT	13-1
14	LANDSCAPE AND VISUAL	14-1
14.1	INTRODUCTION	14-1
14.2	GENERAL	14-1
14.3	MITIGATION MEASURES	14-1
14.4	AUDITING REQUIREMENTS	14-1
15	LAND CONTAMINATION	15-1
15.1	INTRODUCTION	15-1
16	ENVIRONMENTAL AUDITING	16-1
16.1	SITE INSPECTIONS	16-1
16.2	COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS	16-2

16.3	ENVIRONMENTAL COMPLAINT	16-2
17	REPORTING	17-1
17.1	GENERAL	17-1
17.2	BASELINE MONITORING REPORT	17-1
17.3	EM&A REPORTS	17-2
17.4	QUARTERLY EM&A SUMMARY REPORTS	17-7
17.5	FINAL EM&A SUMMARY REPORT	17-8
17.6	DATA KEEPING	17-10
17.7	INTERIM NOTIFICATION OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES	17-10
18	EM&A REQUIREMENTS FOR ADDITIONAL INFRASTRUCTURE PROJECTS ASSOCIATED WITH THE NLDFS	18-1
18.1	INTRODUCTION	18-1
18.2	IDENTIFICATION OF AIR AND NOISE SENSITIVE RECEIVERS	18-1
18.3	EM&A REQUIREMENTS	18-4
18.4	ORGANISATION AND STRUCTURE OF THE EM&A PROGRAMME	18-11
18.5	EM&A PROGRAMME REQUIREMENTS	18-13

ANNEX A REPORTING DOCUMENTATION

ANNEX B IMPLEMENTATION SCHEDULE

1 INTRODUCTION

1.1 PURPOSE OF THE MANUAL

In June 1998, Civil Engineering Department (CED) of the Hong Kong Special Administrative Region Government commissioned Scott Wilson (Hong Kong) Limited to be the lead consultant for the Northshore Lantau Development Feasibility Study (Agreement No. CE 60/96), hereafter referred to as the Project.

Environmental Resources Management - Hong Kong (ERM) has been commissioned as the sub-consultant to undertake the Environmental Impact Assessment. Shankland Cox Asia Limited has been commissioned to undertake Landscape and Visual Impact Assessment (LVIA), while City Planning Consultants Limited and Shankland Cox Asia Limited are the Planning Consultants, Wilbur Smith Associates Limited and Brooke International Limited are respectively the Project's traffic consultant and the lands consultant. The Study Brief was issued by EPD on 13 February 1998 which was before promulgation of the Environmental Impact Assessment Ordinance (EIAO) on 1 April 1998. The document has been placed on the EIAO Register under Section 15(1)(b) of the Ordinance, with the reference number SB-044/BC.

The Northshore Lantau Development Feasibility Study (NLDFS) is an integrated planning and engineering feasibility study. It consists of two development packages, the planning study of Northshore Lantau Development and the preliminary design of Chok Ko Wan Link Road (CKWLR), previously named as Lantau Port Expressway in the Study Brief, which have been studied with different sets of objectives and requirements. The proposed NLDFS developments are within the reclamation boundaries shown in the Draft North-East Lantau Outline Zoning Plan (S/I-NEL/5) gazetted in August 1999, and the Siu Ho Wan Layout Plan (L/I-SHW/D).

NLDFS itself is a Designated Project under Schedule 3 of the Environmental Impact Assessment Ordinance (Cap. 499) as an engineering feasibility study of urban development with a study area covering more than 20 ha. A Schedule 3 Designated Project requires an EIA report and EM&A Manual to be approved under the EIAO.

1.2 BACKGROUND AND HISTORY TO THE PROJECT

A Preliminary Outline Development Plan based on the overall planning objective of tourism/recreation was endorsed by the Committee on Planning and Land Development (CPLD) in March 1999 as the basis for formulating the Draft Recommended Outline Development Plan (RODP). The land use plan was endorsed by CPLD in December 1999 as basis for EIA and finalising the draft RODP. The Draft RODP was prepared in January 2000 and has been used as the basis of this EIA.

CKWLR is an expressway hence is classified as a Designated Project under Schedule 2 of the EIAO. Under the Ordinance, Designated Projects under Schedule 2 require Environmental Permits for their construction and operations.

In 1989, the Port and Airport Development Strategy Study (PADS) recommended that the majority of Hong Kong future port facilities be developed at the northeast of Lantau Island. This was reaffirmed by the Lantau Port and Western Harbour Development (LAPH) Studies conducted in 1993.

Penny's Bay Reclamation was originally earmarked for container terminals (CT10 and CT11) under the LAPH Studies. A number of EIA Studies have confirmed the feasibility of the reclamation and devised mitigation measures. The EIA reports that have been previously endorsed by Environmental Pollution Advisory Committee (EPCOM) and Advisory Council on the Environment (ACE) are as follows:

- Lantau Port and Western Harbour Development (LAPH) Studies (1993) Final Report, Volume III, EIA Report, CED, (EIA-021/BC) endorsed by the EPCOM on 7 June 1993;
- Lantau Port Development Stage 1 - Container Terminals 10 and 11 Ancillary Works (Design) EIA Final Report, CED, 1994 (EIA-049BC) endorsed by the ACE with conditions on 20 February 1995;
- Lantau Port Development Stage 1 - Container Terminals 10 and 11 Preliminary Design, Final Report, Volume 2, Container Terminal EIA, CED 1995 (EIA-057BC) endorsed by ACE with conditions on 20 February 1995; and
- Lantau Port Development Stage 1 - Design of Reclamation and Edge Structures for Container Terminals 10 and 11 and Back-up Areas, EIA Final Report, CED, 1995 (EIA-073/BC) endorsed by ACE with conditions on 18 December 1995.

The subsequent LAPH studies confirmed the feasibility of North-East Lantau for port development as recommended in PADS. The proposed port facilities including container terminals, container back-up areas, boatyard and marine services support area have been incorporated into the North-East Lantau Port Outline Zoning Plan gazetted under the Town Planning Ordinance in March 1995 with subsequent minor amendments carried out in 1996 and 1998 (North-East Lantau Port OZP). Facilities proposed to be located on Northshore Lantau were river trade cargo terminal and floating docks onshore facilities.

The 1997/98 Port Cargo Forecast indicated that there is a general slowdown of the growth rate of cargo throughput in Hong Kong. On the basis of such findings, the planned development programme for port facilities has been subsequently reviewed.

The 1995 Visitor and Tourism Study commissioned by the Hong Kong Tourist Association in conjunction with the Planning Department identified the potential for a tourism corridor along the northshore of Lantau Island. The

1998 Territorial Development Strategy Review (TDSR) also identified the area as having potential for a range of other land uses, such as tourism/recreation, housing, business estate and major transport interchange.

As a follow up to the TDSR, the NLDFS was commissioned by the CED in June 1998 to review the land use potential of the area. Based on assessment of alternative development options, the NLDFS has recommended that the land use proposals for North-East Lantau should be based on a tourism and recreation development theme with scope for international standard tourism facilities, while the sites for container terminals near Kau Yi Chau in the far south are retained for long term port development, pending further studies on the alternative location for port development.

In March 1999, the Committee on Planning and Land Development (CPLD), after considering initial findings of the NLDFS, agreed that the land use proposals for North-East Lantau should be drawn up on the basis of the tourism/ recreation development theme, with an intention to translate North-East Lantau into a "Tourist Paradise" comprising a world-class theme park and a range of other compatible tourist attractions. The meeting also decided that Container Terminals 10 and 11 were no longer required to be located at Penny's Bay, making way for an international Theme Park in Penny's Bay.

The preliminary findings of NLDFS and a preliminary outline development plan (PODP) were presented to the Town Planning Board and it was agreed at the meeting in July 1999 that the development thrust of North-East Lantau should in the future be for tourism and recreation purposes and the PODP was a suitable basis for the revision of the previous North-East Lantau Port OZP. The draft North-East Lantau OZP (S/I-NEL/5) was gazetted under the Town Planning Ordinance in August 1999.

1.3 RELEVANT STUDIES

The EIA reports that are relevant to this Project and have been endorsed by Environmental Pollution Advisory Committee (EPCOM) and the Advisory Council on the Environment (ACE) are as follows:

- East Lamma Channel Borrow Area - Scoped Environmental Assessment, Final Report, CED (1993);
- Backfilling of South Tsing Yi and North of Lantau Marine Borrow Areas: Final Environmental Impact Assessment Report, CED (1995);
- Environmental Impact Assessment of Backfilling Marine Borrow Areas at East Tung Lung Chau - Final Report, CED (1998);
- Lantau and Airport Railway : Environmental Impact Study, MTRC (1994);
- Route 10 - North Lantau to Yuen Long Highway, Investigation and Preliminary Design, EIA Final Assessment Report, HyD (1999);

Subsequently, CED commissioned Scott Wilson, with ERM-Hong Kong Ltd as the Lead Environmental Consultants, to undertake the EIA for this Project. As part of the EIA Study requirements, this Project specific EM&A Manual has

been prepared to provide further details of the EM&A requirements that have been recommended in the EIA for the Projects construction and operational phases. In particular, the requirements for ensuring compliance with the mitigation measures specified for noise, dust, water quality, waste management, terrestrial and marine ecology, fisheries, archaeology, culture and heritage and landscape and visual impacts are defined.

1.3.1 *Proposed Works*

The NLDFS Project Area covers the north-eastern part of Lantau Island which comprises generally three portions :

- Northshore Lantau which stretches along the northern shoreline of Lantau Island between Tai Ho and Kwai Shek;
- Tsing Chau Tsai which is an upland area at North Lantau; and
- Penny's Bay Reclamation which includes the broader Penny's Bay area stretching between Sz Pak Tsui and Pa Tau Kwu, Northeast Lantau between Pa Tau Kwu and Tso Wan, and the section of Chok Ko Wan Link Road stretching between Yam O Interchange and the Route 10 - North Lantau to Yuen Long Highway toll plaza at Fa Peng.

The draft RODP developments are largely to be built on reclaimed lands to be formed between 2000 to 2028.

Penny's Bay Reclamation comprises a total area of 280 ha. The reclamation will be formed in two stages, namely Stage I from 2nd quarter (Q2) 2000 to Q1 2002, and Stage II from Q2 2000 to Q1 2006, using approximately 13 Mm³ of public fill and 73 Mm³ of marine sand. The reclamation will provide land for road and rail infrastructures, two phases of an International Theme Park (ITP) and its associated hotels, two ferry piers (about 0.8 ha), 19 ha of Government, Institution or Community (G/IC) Facilities, and a 32 ha Water Recreation Centre (WRC).

A series of low-rise hotels (maximum building height of 40 m) has been planned to the south of the ITP with a total of 7,000 rooms upon full completion. G/IC facilities related to security, rescue, car and coach parking, and public transport facilities have been planned to the north of the ITP to support its operation.

The WRC will include an artificial lake of about 12 ha to provide fresh water mainly of collected runoff from surrounding natural slopes for irrigation of landscape areas within the ITP. Other planned uses for the WRC may include a boating facility, changing rooms, restaurant/dining, refreshment kiosk, canteen, and place of recreation.

Road infrastructures proposed within the Penny's Bay Reclamation include primary distributor Road P2 running from Yam O through the Penny's Bay roundabout to the ITP, approximately 1.5 km section of CKWLR, and a 3.5 km long Resort Road of district distributor standard within the ITP. Penny's Bay Rail Link will form a new 3.6 km long rail line from Yam O through a 850 m

tunnel at Tsing Chau Tsai headland to Penny's Bay with new stations at Yam O and the ITP (Penny's Bay Rail Station).

Phase I of the ITP and its associated hotels and supporting G/IC facilities, as well as the WRC, are expected to be opened in Q2 of 2005 with an estimated annual attendance of 7.5 million upon opening. Full completion of Phase II is planned for about 2024, which is expected to attract about 17.1 million visitors annually, according to the current development schedule.

A 10 ha reclamation has been planned at Yam O for completion in Q3 of 2003 using 1Mm³ of public fill and 1.2 Mm³ of marine sand fill to provide land for construction of a temporary public transport interchange and Road P2. A further 65 ha of reclamation will be constructed at northshore Lantau from Yam O to To Kau Wan from Q1 of 2012 for completion in 6 years using 5.6 Mm³ of public fill and 1.4 Mm³ of marine sand fill.

Developments proposed at the northshore reclamation in the draft RODP include a 20-ha Theme Park Gateway (completed in 2014), a Crossed-Boundary Ferry Terminal (first one to be completed in 2018 and the second one in 2031), a 20-ha Tourist and Convention Village (completed in 2020), a 20-ha Technodrome (completed in 2022), a 2-km waterfront promenade, a 1.8-ha service area, and a 5.4-ha bus and coach parking.

The Theme Park Gateway comprises mainly the PBRL Yam O Station and a Public Transport Interchange. The proposed Tourist and Convention Village will accommodate a large convention centre accompanied by a low-density type resort hotel (maximum building height of 40 m). The Technodrome is aimed at providing hi tech indoor entertainment and educational facilities using state-of-the-art equipment set in a futuristic environment.

The Siu Ho Wan reclamation will commence in Q3 of 2014 for completion in Q1 of 2016 using 3.7 Mm³ of public fill and 1.2 Mm³ of marine sand fill. The reclamation comprises a total of 39 ha from Ta Pang Po to Siu Ho Wan to provide land for the Road P1 section (8 ha), the Special Duties Unit (SDU) and the Small Boat Division (SBDIV) Marine Base (1 ha), and the R2 residential development and schools (30 ha).

Road P1 is intended as a primary distributor road serving all the developments alongside the North Lantau Highway (NLH). Road P1 commences west of MTRC Siu Ho Wan Depot, passes around the Depot on its northern seaboard, runs parallel to the NLH for about 2.7 km before entering the western portal of the 760 m Yam Tsai tunnel, and then connects with the NLH. Construction of Road P1 is currently envisaged to commence in Q1 of 2015 for completion in Q4 of 2016.

The R2 housing development at Siu Ho Wan (building height of about 84 m) extends from the Tai Ho New Town will provide about 5,500 residential units with a planning population of 13,676. The Siu Ho Wan housing development, including one primary and one secondary school, will be built after the completion of the CDA development on the existing MTRC Siu Ho Wan Depot. Its construction has been assumed to be commenced in Q1 of 2017 for a period of 36 months for this EIA.

A site of about 1 ha at Sham Shui Kok has been planned for a new Special Duties Unit (SDU) Marine Base and the Small Boat Division (SBDIV) of the Marine Police.

Reclamation at Tsing Chau Tsai East from Sam Chuen to Pa Tau Kwu comprises a total area of 74 ha using about 13 Mm³ of public fill and 2.2 Mm³ of marine sand fill. The reclamation will be formed in three periods, namely CKWLR Phase I reclamation for CKWLR and R10-NLYLH sections including the R10 toll plaza, CKWLR Phase II reclamation for the CKWLR section connected to the R10-HKLL and the Pa Tau Kwu Interchange, and the Fa Peng reclamation for proposed recreational uses.

The CKWLR Phases I and II Reclamation are scheduled to be commenced in Q1 of 2002 and Q2 of 2006, respectively. Both reclamations will take 24 months to complete. The Fa Peng Reclamation is scheduled to be commenced in Q2 of 2022 for completion in 48 months.

Construction of the recreational development at Tsing Chau Tsai East is currently assumed to be commenced in Q1 of 2024 for a period of 60 months. A Village Expansion Area (VEA) to accommodate 62 small houses has been planned at Tso Wan which is a small-medium sized inhabited unrecognized village.

Reclamation of about 80 ha has been proposed between Pa Tau Kwu south and Phase II of the International Theme Park for the possible Phase III Theme Park extension or other recreational uses. Construction of the reclamation will be commenced in Q2 2026 for completion in 24 months using about 16.5 Mm³ of public fill and 2.4 Mm³ of marine sand fill. The reclamation will also provide land for the construction of Road P2 and PBRL extensions.

Construction of the proposed theme park extension is currently assumed to be commenced in Q2 of 2028 for a period of 36 months. A 10-ha freshwater lagoon zoned as Conservation Area has been designated around the Pa Tau Kwu headland.

The Project is shown in *Figure 1.2a*.

1.4

OBJECTIVES OF THE ENVIRONMENTAL MONITORING AND AUDIT

The construction and operational impacts resulting from the implementation of the Project are specified in the EIA Report. The Report also specifies the mitigation measures that need to be implemented to ensure compliance with the required environmental criteria; these mitigation measures and their implementation requirements, are presented in the Implementation Schedule contained in *Annex B* of this EM&A Manual. In order to ensure that these mitigation measures are fully and effectively implemented, the EIA Report recommends that EM&A should be undertaken for noise, air, water, waste, land contamination, terrestrial and marine ecology, fisheries, cultural heritage, archaeology and landscape and visual issues.

This Manual provides specific details of the EM&A requirements that have been recommended to ensure compliance with the mitigation measures specified in the EIA Report.

The main objectives of the EM&A programme are:

- to provide a database against which any short or long term environmental impacts of the project can be determined;
- to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- to monitor the performance of the project and the effectiveness of mitigation measures;
- to verify the environmental impacts predicted in the EIA Study;
- to determine project compliance with regulatory requirements, standards and government policies;
- to take remedial action if unexpected problems or unacceptable impacts arise; and
- to provide data against which environmental audits may be undertaken.

1.5

THE SCOPE OF THE ENVIRONMENTAL MONITORING AND AUDIT PROGRAMME

It has been agreed that the main focus and scope of this EM&A Manual is for the CKWLR. Consequently, this manual defines the necessary environmental monitoring and auditing requirements for this scheme. Nevertheless, *Section 17* of this Manual provides generic information regarding the envisaged EM&A requirements that will need to be adopted during the future implemented of the non-CKWLR components of the NLDFS.

The scope of the CKWLR EM&A programme is as follows:

- establish baseline noise, air and water quality levels at specified locations and review these baseline levels every six months;
- implement monitoring and inspection requirements for noise, air and water quality and terrestrial ecology impacts;
- implement inspection and audit requirements for waste management, landscape and visual, terrestrial and marine ecology and fisheries issues;
- liaise with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the comprehension and consequences of the environmental monitoring data;
- identify and resolve environmental issues and other functions as they may arise from the works;
- check and quantify the Contractor's overall environmental performance, the implementation of Event and Action Plans (EAPs), and remedial actions taken to mitigate adverse environmental effects as they may arise from the works;

- conduct monthly reviews of monitored impact data as the basis for assessing compliance with the defined criteria and to ensure that necessary mitigation measures are identified and implemented, and to undertake additional *ad hoc* monitoring and auditing as required by special circumstances;
- evaluate and interpret all environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards, and to verify the environmental impacts predicted in the EIA Report;
- manage and liaise with other individuals or parties concerning other environmental issues deemed to be relevant to the construction process;
- conduct regular site inspections of a formal or informal nature to assess:
 - the level of the Contractors' general environmental awareness,
 - the Contractors' implementation of the recommendations in the EIA Report;
 - the Contractors' performance as measured by the EM&A;
 - the need for specific mitigation measures to be implemented or the continued usage of those previously agreed; and
 - to advise the site staff of any identified potential environmental issues; and
- submit monthly EM&A reports which summarise project monitoring and auditing data, with full interpretation illustrating the acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

1.6 STRUCTURE OF THE EM&A MANUAL

Following this introductory Section, the remainder of the Manual is set out as follows:

- *Section 2* outlines the wider aspects of Environmental Management which should be employed during the design, construction and operational phases to minimise environmental impacts;
- *Section 3* outlines the various parties involved in the EM&A process, and presents the proposed organisational structure of the organisations responsible implementing the EM&A programme and their key responsibilities;
- *Section 4* sets out the EM&A general requirements;
- *Section 5* details the requirements for baseline and impact monitoring for air quality, and lists relevant monitoring equipment, locations, compliance and EAPs;

- *Section 6* details the requirements for baseline and impact monitoring for noise, and lists relevant monitoring equipment, locations, compliance and Event and Action Plans (EAPs);
- *Section 7* details the requirements for baseline and impact monitoring for water quality, and lists relevant monitoring equipment, locations, compliance and EAPs;
- *Section 8* details the audit procedures with regard to waste management issues;
- *Section 9* details sampling and audit procedures and key locations with regard to terrestrial ecological issues;
- *Section 10* discusses EM&A requirements with regard to marine ecology;
- *Section 11* discusses EM&A requirements with regard to fisheries issues;
- *Section 12* discusses EM&A requirements with regard to culture and heritage issues;
- *Section 13* discusses EM&A requirements with regard to hazard assessment issues;
- *Section 14* discusses EM&A requirements with regard to landscape and visual issues;
- *Section 15* details sampling and audit procedures and key locations with regard to land contamination issues;
- *Section 16* describes the scope and frequency of site auditing;
- *Section 17* details the EM&A reporting requirements;
- *Section 18* provides generic information regarding the envisaged EM&A requirements that will need to be adopted during the future implemented of the non-CKWLR components of the NLDFS.
- *Annex A* contains the recommended Reporting Documentation; and
- *Annex B* contains the Implementation Schedule.

The EM&A Manual is an evolving document that should be updated to maintain its relevance as the Project progresses. It is suggested that the first revision to the EM&A Manual takes place when the construction monitoring locations have been agreed with the Engineer, the ENPO and the EPD, and when the proposed work processes and activities have been determined following any supplementary environmental reviews which may be required.

The primary focus for these reviews of the EM&A Manual will be to ensure that the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out.

2 ENVIRONMENTAL MANAGEMENT SYSTEMS FOR THE DESIGN, CONSTRUCTION AND OPERATIONAL PHASES

2.1 INTRODUCTION

This section sets out the proposed environmental management system approaches that will be implemented to ensure that the recommendations of the EIA are fully and effectively implemented during the Project's design, construction and operational phases.

2.2 GENERAL

2.2.1 Schedule 3 Designated Project EIA Report

The Schedule 3 Designated Project EIA Report for the NLDFS provides an assessment of the predicted scope and extent of likely impacts resulting from the Project's construction and operation. Mitigation recommendations have been specified to ensure that the environmental quality objectives are met. The recommended mitigation measures from the Schedule 3 Designated Project EIA Report are summarised in the form of an Implementation Schedule (IS) (*Annex B* of this EM&A Manual). The IS provides the primary means by which the EIA Report recommendations are transferred from the planning phase to the design, construction and operational phases of the Project.

An integral part of these recommendations is the requirement to undertake an EM&A process to verify the level of environmental performance achieved and the effectiveness of the recommended mitigation measures.

2.2.2 The EM&A Manual

The EM&A programme provides the means by which feed-back on the project's compliance with the recommended mitigation measures and the environmental monitoring programme are provided to the Contractors, the Client (comprising CED) and the Environmental Protection Department (EPD).

A draft EM&A Manual is submitted at the time of the EIA and provides an outline of the likely monitoring and auditing protocols and requirements which will be necessary to achieve the objectives of the EM&A programme. For the construction and operational phases, this Manual provides a description of the organisational arrangements required for the EM&A programme, stipulation of the scope of monitoring (e.g. noise, air, water etc), the parameters to be measured (e.g. $L_{Aeq,30min}$, Total Suspended Particulates, Suspended Solids, etc.), the frequency of monitoring and the actions to be taken in the event of exceedances of the environmental criteria being recorded. This EM&A programme also outlines guidelines for construction

phase site inspections as a means of identifying and resolving problems, and the associated reporting requirements.

In addition to the construction and operational phase EM&A requirements, this EM&A Manual also makes recommendations on mechanisms for ensuring that the mitigation measures which have been recommended for the design stage are fully and effectively implemented.

This draft EM&A Manual should be reviewed (as necessary) during the detailed design stage of the Project if it is determined, or anticipated, that substantial changes to the extent or scope of the Project may occur which could have an influence on the Project's environmental performance. In this instance, it is customary that a revised assessment and EM&A Manual are produced to maintain the relevance of the EM&A process to the Works. The same process should also be followed on award of the Project.

2.2.3 *Contractual Documentation*

In order to ensure that the design and construction Contractors implement the recommended mitigation measures during the Project's design and construction phases, it is recommended that their contractual documentation should include clauses related to compliance with the appropriately recommended mitigation measures/environmental monitoring requirements. In addition, the contractual documentation should define appropriate contractual mechanisms to ensure compliance with these environmental requirements. The range of mechanisms available to the Engineer should reflect the priority that the Client gives to environmental issues although they may include provisions for suspending works pending the remediation of persistent environmental problems. Similarly, the inclusion of environmental performance milestone payments should be considered by the Client as a means of enhancing the environmental performance and encouraging the design and construction Contractors to meet these contractual obligations.

A key element to be included in the contractual documentation will be the requirement to prepare, implement and maintain an Environmental Management Plan (EMP) (see *Section 2.4.1* for details).

2.3 *DESIGN PHASE*

The development and implementation of a number of the recommended mitigation measures will have to be undertaken at the design stage. To ensure that these measures are adequately implemented it is recommended that the Environmental Management System be extended to include this phase of the Project.

As stated in *Section 2.2.3* above the environmental requirements for the design phase should be included in the design contractors contractual documentation. To ensure compliance with these requirements it is

recommended that the design contractors are also required to report progress against these requirements. It is envisaged that progress will be reported in bi-monthly reports prepared by the design contractors and submitted to the Project Proponent (CED) and the EPD.

The Project Proponent's Environmental Manager (or other representative with responsibilities over environmental issues) will be responsible for ensuring that the recommended mitigation measures are complied with within the stated time periods. It is recommended that the Environmental Manager, or other organisation as appropriate, undertakes audits to ensure that the environmental requirements are being addressed during the design development phase, and to ensure that all proposed solutions achieve the required objective.

2.4 CONSTRUCTION PHASE

The management of the Project's construction phase will be undertaken in line with an EM&A procedure which has been agreed with Government. The EM&A process will seek to ensure that the works are carried out in a manner which meets all legal, contractual and environmental commitments.

Past experience with projects of this nature has revealed that the implementation of EM&A procedures tends to result in an over-reliance on the process, and on mitigating impacts after they are identified. To complement the EM&A process, a level of proactivity is required which seeks to minimise the incidence of environmental problems. This can be referred to as an Environmental Management System (EMS) approach and is based upon the specification of a number of management mechanisms, processes and organisational arrangements including the EM&A programme. A wider environmental management system approach, if adopted, should draw upon all available documentation and particularly the following:

- previous environmental reports, assessments and reviews of the Project area;
- the Contracting Organisations ISO 9000 and 14000 (where appropriate) Standards;
- the project-specific Environmental Management Plan;
- the results of Environmental Performance Reviews and Site Inspections;
- the Construction Method Statements to be submitted to the Engineer for review prior to carrying out of works processes; and
- Contractual Documentation relating to the civil works packages.

A number of these elements have been discussed above. Those outstanding elements, and the role they play within the environmental management system are described below.

2.4.1 *Construction Phase EM&A Manual*

As stated in *Section 2.2.2*, this draft EM&A Manual is a dynamic document that will be reviewed and updated (as necessary) during later stage of the Project.

To ensure that this EM&A Manual remains current, it is recommended it is initially up-dated at the commencement of the construction phase to include contact details of the Contractors' and management's staff together with details of the monitoring locations that are agreed with the Engineer, the ENPO and the EPD. It will also update and clarify as necessary any information which may alter during the Project's development.

Assuming the ENPO system is adopted for the construction of the CKWLR, it is recommended that the update of the construction phase EM&A Manual is undertaken by the ENPO. As the ENPO system may not be required for the construction of the remaining components of the NLDFS (since the current indicative programme envisages that the implementation of these other aspects of the Project will not result in multiple construction contracts being undertaken in close proximity to one another), it is envisaged that the EM&A Manual will be updated by the Contractors or their Environmental Teams.

2.4.2 *Environmental Management Plans*

In order to ensure the effective contract specific implementation and reporting on compliance with the stated mitigation measures, as well as the monitoring and auditing requirements and remedial actions defined in the EIA Report, an appropriate contractual and supervisory framework needs to be established. During the construction phase, the basis of the framework within which implementation should be managed overall is through the preparation of Environmental Management Plans (EMPs) by the Contractor(s).

An EMP is similar in nature to a quality plan and provides details of the means by which the Contractors (and all subcontractors working to the Contractors) will implement the recommended mitigation measures and achieve the environmental performance standards defined in Hong Kong environmental legislation, the Contract and in the EIA documentation. The primary reason for adopting the EMP approach is to make the Contractors aware of his environmental responsibilities and to be pro-active about the commitment to achieve the standards specified, rather than relying on the EM&A programme.

The EMP also provides opportunities for the Contractors to draw upon the strength of other institutional processes such as ISO 9000/14000 to ensure that the achievement of the required standards and fulfilment of commitments are documented.

It is envisaged that the provision of EMPs will be contractual requirement, and that they will be approved by the Engineer following review/comment from the EATL/Independent Checker (IC/E).

The contractual requirement for an EMP would generally comprise appropriate extracts from (and references to) the Project EIA Report and EM&A Manual, and include such typical elements as the relevant statutory environmental standards, general environmental control clauses and specific environmental management clauses, as well as an outline of the scope and content of the EMP. In drafting the documentation, due consideration should be given to the predictive nature of the EIA process and the consequent need to manage and accommodate the actual impacts arising from the construction process. In particular, the Contractors must be placed under a clear obligation to identify and control any impacts arising from changes to the working methods assumed in the EIA Report, or to the progress rates and other estimates made during the preliminary design phase.

2.4.3 Environmental Performance Reviews

The environmental performance review programme comprises the regular assessment of the effectiveness of the EMPs, site practices and procedures to ensure that the required mitigation measures are routinely implemented and that they are being effective in achieving the required environmental standards.

The criteria against which the review should be undertaken should be derived from the following:

- the approaches, procedures and commitments given by the Contractors in their EMPs;
- the clauses contained within the Contractors' Contractual Documentation; and
- those parts of the Contractors' method statements which relate to the minimisation of environmental impacts or other specified environmental protection measures.

The reviews should focus on the effectiveness of the implemented measures to achieve the purpose, not simply the fact that a measure has been implemented.

Review protocols should be developed prior to the commencement of works and it is suggested that the protocols should include inspection and auditing of the following:

- the allocation of responsibility for fulfilling environmental requirements, and agreed mitigation measures, and the effectiveness of lines of communication with regard to environmental issues;

- compliance with procedures established to enable an effective response to environmental incidents, exceedances or non-compliances;
- the extent and accuracy of record-keeping related to environmental performance indicators;
- the effectiveness of staff training in ensuring high levels of awareness with regard to environmental requirements; and
- the effectiveness of environmental management activities.

The protocols should comprise checklists of environmental requirements and should be amended, throughout the construction phase as necessary, to focus on areas of frequent non-compliance and to reflect the potential impacts associated with specific activities within the construction programme.

2.4.4 Construction Method Statement

It is common practice for the Contractors to submit details of forthcoming works to the Engineer to seek approval for the commencement of the works as well as the methodology and equipment proposed to be used.

It is recommended that this process be expanded, in line with the adoption of the Contractors' EMP, to require the signature of the Contractors' Environmental Manager who shall comment on deviations of the specific works from that assumed in the Project EIA and advise on the implications of the changes in construction methods for achieving the environmental performance criteria set out in the EIA documentation and the EMP.

This ongoing requirement for the Contractors to review proposed working methods, in terms of their potential to impact upon the environment, will reduce the time taken to implement the necessary environmental control measures and reduce the number of iterations a measure may have to go through before becoming effective.

Any changes in construction methods will need to be reflected in a revised EMP or the Contractors will be required to demonstrate the manner in which the existing EMP shall accommodate the proposed changes.

2.4.5 Electronic Quality Performance Monitoring System

The use of an electronic communication and data recording system for the construction phase would facilitate the rapid and effective communication of the site environmental status, as well as serving as a management tool for the Contractors. The system has the potential to interface with EPD's *Specialised Electronic Environmental Monitoring and Audit (SEEMA)* system (or another equivalent system) and so function as a database for the entry of all recorded monitoring and audit information. In addition, the system could:

- automatically issues Notifications of Exceedances and track their completion;

- action Event and Action Plans and track their completion;
- store details of complaints;
- store details of licenses/permits and notify of forthcoming expiry dates;
- store construction activity details and other relevant site information and link these to the EM&A Implementation Schedule; and
- allow retrieval of electronic versions of the EM&A Manual and other documents.

In the future, the SEEMA system (or another equivalent system) may be further developed to interface with the world wide web, improving the accessibility and availability of environmental monitoring information as 'real time' (within two weeks) as possible to the general public.

2.5 *OPERATIONAL PHASE*

2.5.1 *EM&A Manual*

It is envisaged that no EM&A Manual will be required for the operational phase.

2.6 *SUMMARY*

The environmental management concepts described above have evolved from previous experiences in implementing large scale EM&A programmes in Hong Kong. These experiences have shown that in order to harness the full potential of the EM&A process, a number of complementary procedures and tools should be adopted to fulfil the wider objectives of the process which include the preservation of the environment.

The uptake and specification of these procedures within the appropriate documents would facilitate a greater level of environmental management and responsibility to be achieved, however, the adoption of some or all of these practises must ultimately be directed by the Client before they can form part of the proposed EM&A programme.

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3 ORGANISATION AND STRUCTURE OF THE EM&A

3.1 APPROACH TO THE EM&A PROGRAMME

The construction of each of the component schemes included within the NLDFS Project will comprise the implementation of several large scale construction Contracts. The exact details and sequencing of the construction works are still being developed.

This EM&A Manual is focussed upon the implementation of the CKWLR. It is currently planned that this aspect of the Project will be undertaken concurrently with a number of major civil engineering construction contracts that will be implemented for the proposed international Theme Park in Penny's Bay of North Lantau and its essential associated infrastructure . A EIA Report has been undertaken for the Project related to the construction and operation of the proposed international Theme Park. The EM&A Manual for this international Theme Park Project recommended that an Environmental Project Office (ENPO) be set-up to implement the proposed EM&A programme. The justification for this recommendation was that the concurrent undertaking of a number of construction contracts within close proximity to one another could result in cumulative environmental impacts. The most effective way to monitor, investigate and rectify potential cumulative impacts was resolved to be through the ENPO system. As the CKWLR will be undertaken in close proximity to, and within the same time-frame as the construction contracts associated with the international Theme Park, it is recommended that the ENPO system be expanded to cover the construction of the CKWLR.

The currently available information indicates the CKWLR Phases I and II Reclamation are scheduled to be commenced in Q1 of 2002 and Q2 of 2006, respectively, with both reclamations programmed to take 24 months to complete.

Construction work associated with the construction of the International Theme Park and its associated developments that is programmed to be undertaken concurrently with the CKWLR works includes the following reclamation works:

- the Penny's Bay Stage 2 Reclamation, which is programmed to start in Q2 2000 and to be completed by Q1 2006, and
- the Yam O reclamation, which is programmed to start in Q4 2001 and be completed Q3 2003.

3.2 *INFRASTRUCTURE WORKS*

Additionally, infrastructure works associated with the International Theme Park and its associated developments will commence from Q2 2002. The exact number and timing of these construction contracts is currently uncertain, however, it is envisaged that the infrastructure works will be divided into 3 or 4 construction contracts and that they may, at times, be undertaken concurrently.

As the CKWL will be constructed in conjunction with the Theme Park and related infrastructure projects, the reasoning behind extending the ENPO is one of practicality, and most efficient use of resources. It is considered that the ENPO can provide a more 'global' perspective when conducting and assessing the monitoring results, thereby ensuring greater co-ordination and responses to any exceedances or complaints, and being able to co-ordinate actions /mitigation measures to resolve cumulative impacts.

3.3 *ROLE AND OBJECTIVES OF THE ENPO*

The Environmental Project Office (ENPO) will only be operational during the construction phase. The ENPO shall be established, managed and funded by CED. The ENPO shall undertake all the environmental monitoring and audit requirements defined in this EM&A Manual. The ENPO shall interpret the environmental monitoring data and determine whether there are any breaches of the agreed environmental criteria. In such cases, the ENPO shall investigate these exceedances and, if appropriate, assist in the specification of remediation action. The ENPO shall have particular regard to the potential for cumulative impacts.

To be effective, the ENPO must be suitably empowered, and must have influence over each of the Contractors working on site. It is envisaged that this will require the establishment of contractual obligations for each of the Contractors to implement the recommendations of the ENPO.

The objectives of the ENPO are as follows:

- to control pollution and reduce adverse environmental impacts and nuisances arising from the works;
- to identify sources of pollution, impacts or nuisance particularly of a cumulative nature (from multiple sources), which arise as a result of the works;
- to propose timely, cost effective, and practical solutions to problems through liaison with the site engineers, contractors and government works agencies;
- to ensure the implementation of appropriate mitigation measures;
- to collect and maintain an up-to-date database of monitoring information from the project area;

- to audit the results by determining baseline pollution levels for the area and to set Action and Limit levels;
- to provide regular notification of existing or predicted problems via regular public consultation and liaison, and
- to assist the Government in investigating complaints arising as a result of construction activities.

3.4 *PROJECT ORGANISATION*

The roles and responsibilities of the various parties involved in the EM&A process outlined above are further expanded upon in the following sections. The organisation and lines of communication with respect to environmental works are shown in *Figure 3.5a*.

The term “Contractor” shall be taken to mean all Construction Contractors, and sub-contractors, working on site. The “Engineer” shall refer to the role undertaken by the “Engineer” and/or the “Engineer’s Representative” (ER) to ‘monitor’ the works undertaken by the various Contractors.

The ENPO shall undertake all of the environmental monitoring, and the subsequent auditing and interpretation of the results. The Environmental Monitoring Team Leader, shall be responsible for and in charge of the Environmental Monitoring Team (EMT).

3.4.1 *Environmental Project Office (ENPO)*

Environmental Monitoring Team

Within the ENPO, an Environmental Monitoring Team (EMT) shall be appointed to undertake all the environmental monitoring requirements for each of the proposed construction contracts. An Environmental Monitoring Team Leader EMTL shall be appointed to plan and organise the implementation of the environmental monitoring programme, and to ensure that the environmental monitoring is undertaken to the required standards. The main objectives of the EMT will be to:

- to monitor the various environmental parameters as required by this or subsequent revisions to the EM&A Manual; and
- to adhere to the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

Environmental Auditing Team Leader

Within the ENPO, an Environmental Auditing Team Leader (EATL) shall be appointed to independently audit and interpret the monitoring data obtained by the EMT. The EATL shall also be responsible for undertaking site audits/inspections to verify the overall environmental performance of the

works, and for assessing the effectiveness of the EMT in their duties. The main objectives of the EATL will be to:

- assess the EM&A data and review the success of the EM&A programme determining the adequacy of the mitigation measures implemented and the validity of the EIA predictions as well as identify any adverse environmental impacts before they arise;
- to review and audit the environmental monitoring data obtained by the EMT;
- arrange and conduct regular site inspections and to investigate and inspect the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;
- to report to the Engineer, the EPD and the Client regarding the environmental monitoring and audit results and, in particular, on compliance with the agreed environmental criteria, and on the general site environmental conditions and the implementation of mitigation measures resulting from site inspections; and
- provide specialist advice to the Engineer and/or the Client on environmental matters.

Whilst the members of the ENPO Team must be suitably empowered in order to be effective in their role, it is not envisaged that they will have the power to give instructions directly to the Contractors. Any instructions to effect change or to stop the construction Works must be made through the Engineer.

3.4.2 *Contractors*

Reporting to the Engineer, the Contractors shall:

- work within the scope of the construction contract and other tender conditions;
- participate in the site inspections undertaken by the EATL, as required, and undertake any corrective actions instructed by the Engineer;
- provide information/advice to the EATL regarding works activities which may contribute, or be contributing to the generation of adverse environmental conditions;
- implement measures to reduce impact where Action and Limit levels are exceeded; and
- take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their project staff.

3.4.3 *Engineer or Engineer's Representative*

The Engineer or Engineers Representative (ER) shall:

- monitor the Contractors' compliance with contract specifications, including the effective implementation and operation of environmental mitigation measures and other aspects of the EM&A programme;
- comply with the agreed Event and Action Plan in the event of any exceedance;
- liaise with the ENPO and assist as necessary in the implementation of the environmental monitoring and auditing programme; and
- instruct the Contractors to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

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4 EM&A GENERAL REQUIREMENT

4.1 INTRODUCTION

In this Section, the general requirements of the EM&A programme are presented with reference to the relevant findings from the EIA Report that have formed the basis of the scope and content of the programme.

4.2 SUMMARY OF THE SCHEDULE 2 DESIGNATED PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

A summary of the key findings of the EIA Report that have a bearing on the objectives, scope and content of the EM&A programme are presented below. The recommended mitigation measures and schedule for their implementation are detailed in *Annex B* of this EM&A Manual.

4.2.1 Air Quality

The Project Area is predominantly rural in nature and the major existing sources of air emission identified include the NLH and the Penny's Bay Gas Turbine Plant (GTP). Other potential odour sources within the Project Area including the Siu Ho Wan Sewage Treatment Works (STW) and the North Lantau Transfer Station (NLTS).

Construction Air Quality

Air quality impacts arising from the construction of the Project primarily relate to dust nuisance and gaseous pollutant emissions from the construction plant and vehicles. Cumulative dust impacts at air sensitive receivers (ASRs) identified within the Project Area from all concurrent construction activities have been quantitatively assessed using computer dispersion modelling. With the incorporation of the recommended dust suppression measures, the maximum hourly and daily total suspended particulates levels are predicted to be within the relevant standards at the identified ASRs.

Operational Air Quality

Vehicular emission and industrial emissions from the GTP and the Theme Park are expected to be the major sources of air pollutant in the Penny's Bay area during the operational phase. Cumulative impacts due to all prominent sources have been assessed using computer dispersion modelling, taking into consideration the background pollutant concentrations. Results of the assessment indicate that the predicted criteria pollutant levels at all ASRs will comply with relevant Hong Kong Air Quality Objectives (AQOs). Electric passenger trains will be used for the proposed PBRL hence no air pollutant emissions of significant levels is envisaged.

Height restrictions have been incorporated into the Theme Park plans to avoid any potential air quality impact from the GTP and it has been assessed that the dispersion of the chimney emissions will not be affected by the Theme Park (Phases I and II) and its associated developments.

The impacts of fireworks display emissions from the Theme Park on air quality has been assessed in the Theme Park EIA and it is predicted that they should not contribute any adverse increase in the air pollutant levels in the atmosphere.

To ensure that the air sensitive receivers will not be affected by the major roads, buffer distances recommended by Hong Kong Planning Standards and Guidelines should be followed in detailed planning of the Project developments. Results of the computer modelling of unmitigated emission from the Yam Tsai tunnel at Road P1 have indicate exceedance of HKAQO at ASRs in the vicinity of the portal. Ventilation building and jet fans have been recommended at the tunnel to ensure effective dispersion of the pollutant emission. With the incorporation of these recommended mitigation measures, air quality at Luk Keng Tsuen and proposed Eco Park should achieve full compliance of the AQOs.

Odour control facilities have been designed at the NLTS and the Siu Ho Wan STW to control odour level at the site boundaries to acceptable levels. Hence it is envisaged that there will be no residual odour impact for the developments proposed in the vicinity. Potential odour impacts from the proposed sewage pumping station would not affect the adjacent ASRs with the adoption of recommended odour control measures in the detailed design such as enclosure of odour sources and provision of odour scrubbing systems.

4.2.2

Noise

Construction Noise

Noise impacts due to the use of powered mechanical equipment (PME) during construction phase of the Project have been quantitatively and cumulatively evaluated based on the worst case construction programme. Results of the assessment indicate that unmitigated construction activities associated with the Project would cause exceedances at certain Noise Sensitive Receivers (NSRs) of both daytime and evening construction noise standards stipulated in the EIAO Technical Memorandum. Mitigation measures such as the use of quiet plant, erection of temporary noise barriers, reduction on the number of PME usage and restriction on evening works for some of the construction activities have been recommended to ameliorate the impacts. Night-time construction works will be limited to the dredging activity of the first stage of Penny's Bay Reclamation. Results of the assessment indicate that compliance of the night-time 45 dB(A) criterion at NSRs identified at Peng Chau and Discovery Bay can be achieved during this worst case period.

Operational Noise

Operational noise impacts from the Theme Park (Phases I and II) have been assessed in detail in the Theme Park EIA. The report indicates that noise impacts from the operations and the fireworks shows are predicted to be within relevant acceptable standards at NSRs.

Unmitigated road traffic noise predictions suggested that there will be approximately 1,130 residential dwellings at the proposed residential development at Siu Ho Wan and Luk Keng Tsuen, and 67 classrooms at Siu Ho Wan which exceed the relevant EIAO TM criteria. At source noise mitigation measures have been proposed to ameliorate traffic noise impacts at the residential dwellings to achieve the EIAO-TM criterion of 70 dB(A). Exceedance of the traffic noise criterion was predicted at approximately 13 classrooms at the schools in Siu Ho Wan after all possible direct mitigation measures have been exhausted. Indirect noise mitigation measures by the provision of window insulation and air-conditioning have been recommended to achieve the EIAO TM criterion.

No NSRs have been planned within the Noise Exposure Forecast (NEF) 25 zone hence no adverse aircraft noise impacts are anticipated. The Government Flying Services' Penny's Bay helicopter flight path is an emergency path to be used only in adverse weather conditions. Noise levels predicted at the proposed residential development at Siu Ho Wan reveals only minor exceedance of 1 dB(A) which the impact is envisaged to be minimal.

The predicted cumulative (Airport Express, Tung Chung Line, and the proposed Penny's Bay Rail Link) railway noise levels at Luk Keng Tsuen and the proposed residential and school developments at Siu Ho Wan will comply with the statutory requirements of the Noise Control Ordinance and the EIAO TM. Adverse noise impacts from train operation are not envisaged.

4.2.3 *Water Quality*

A review of EPD routine water quality monitoring data determined that the water quality in the vicinity of the NLDFS development was generally good. There were, however, exceedences of the Water Quality Objectives for total inorganic nitrogen to the south of Penny's Bay and of dissolved oxygen to the south and east of Penny's Bay and to the north of Yam O. The exceedence of the total inorganic nitrogen had been recorded for the last 10 years and was thought to be strongly influenced by the outflows from the Pearl River Estuary. The exceedence of the dissolved oxygen WQO had not been recorded in earlier years and would be expected to recover in the future. *E. coli* levels were compliant with the WQOs for Secondary Contact Recreation Sub-zones to the south of Penny's Bay.

The construction phase impacts were assessed by considering the potential impacts due to the construction of the reclamation's associated with the

NLDFS developments and land based construction activities, including those for the Chok Ko Wan Link Road. The assessment determined that, while there was the potential for adverse impacts to water quality, these predicted impacts could be readily controlled through the implementation of suitable mitigation measures. The mitigation measures were specified in terms of operational constraints and 'best practice' construction methods. The potential impacts to water quality from land based construction activities could be readily controlled through a series of 'best practice' methods to control wastewater discharges from the construction sites. Environmental Monitoring and Audit (EM&A) was recommended to ensure that no adverse impacts would occur during reclamation formation, while audit of the mitigation measures for the land based construction activities would be carried out.

The assessment of the impacts of the operation of the NLDFS developments on water quality considered the potential impacts to hydrodynamic characteristics and marine water quality, as a result of sewage effluent generated by the developments and stormwater discharges, including those from the Chok Ko Wan Link Road. The assessment of the impacts of the operation of the NLDFS development on hydrodynamics and water quality was undertaken for the development alone and cumulatively with a proposed container terminal development to the south east. The assessment determined that the Northshore Lantau Development could cause changes in tidal current patterns but that these changes in combination with the discharge of sewage effluent and stormwater would not result in adverse impacts to water quality. It was assessed that there was the potential for poor water quality in the small embayed area at Yam O but that this potential could be mitigated and that the need for and extent of such mitigation would be determined during further, more detailed studies. The cumulative impacts from the container terminal development was not predicted to cause adverse impacts to water quality, except within the container terminal itself. Mitigation measures were devised to minimise the risk of such an impact. It was determined that the potential impacts from the operation of the Chok Ko Wan Link Road could be controlled through design measures for the drainage system and would not therefore pose the risk of adverse impacts.

4.2.4 Waste Management

The following quantities of waste are expected to arise during the construction of the NLDFS developments and CKWLR: Dredged materials (approximately 55 Mm³ and 4.2 Mm³ respectively, maximum dredging rate is 90,600 m³ day⁻¹ and 6,000 m³ day⁻¹, respectively), construction and demolition waste (peak generation rate of about 50 m³ day⁻¹ for NLDFS developments and minimal generation rate for CKWLR); chemical waste (a few cubic metres per month); and general refuse (2.405 tpd and 227.5 kg d⁻¹ respectively during peak construction period). No surplus of excavated materials is envisaged.

Reclamation's for the NLDFS development and CKWLR require large amount of fill materials and therefore offers a very good opportunity to utilise the

public fill generated in the HKSAR. The use of public fill will not only alleviate the demand for virgin fill material but also reduce the pressure of disposing inert Construction and Demolition Material (C&DM) at the strategic landfills. The intention to maximise the use of good quality public filling material reclamations has been incorporated into the engineering design of the Project whilst ensuring that the programme is not adversely affected. Apart from Penny's Bay Reclamation Stage I, over 80% of the fill requirements for other reclamations will make use of public fill. These initiatives will have indirect environmental benefit.

Without any waste recovery/recycling programme, waste arising during the full operational is estimated to be 335.13 tpd. With proper planning and management as well as waste avoidance and recycling measures, it is considered that the handling and disposal of waste arising from the Project will not cause insurmountable impacts.

A waste avoidance and recycling programme, which forms a major part of the Theme Park (Phases I and II) Waste Management Plan for the operation of the Theme Park and associated development, will be implemented and closely monitored. Similar plans are recommended for the operation of other tourism and recreational developments such as Theme Park (Phase III) Extension, Tourist and Convention Village, Eco Park, Water Recreation Centre, Technodrome, and the recreational development at Tsing Chau Tsai East.

The assessment indicates that the North Lantau Transfer Station will be able to handle the waste arising from the NLDFS developments.

Good waste management practices have been recommended to ensure that adverse environmental impacts from NLDFS developments and CKWLR construction and operational wastes are prevented. This EIA concludes that no unacceptable environmental impacts will result from the storage, handling, collection, transport, and disposal of wastes arising from the construction and operation of the NLDFS developments and CKWLR.

4.2.5 Biogas Assessment

As it is not possible to measure possible methane emission from the organic sediment within the proposed reclamation areas, the gas generation rate has been estimated based on total organic carbon and sediment oxygen demand levels of the marine sediment using certain conservative assumptions. No biogas emission is envisaged at the Theme Park (Phase I) and the Water Recreation Centre due to the adoption of fully dredged reclamation option.

The estimated average methane gas generation rate is slightly over the maximum safe rate of methane emission from landfill sites specified by the UK Department of Environment in WMP26A as indicating that such sites can be regarded as no longer posing a threat due to gas and are safe to be re-developed. However, it is well within the suggested maximum rate of methane emission per unit area of 10 litres m² day⁻¹ and the limit of 84.7 litres

m² day⁻¹ recommended by the London Scientific Services. The former criterion provides a reasonable general guide for determining whether the rates of methane emission pose an unacceptable risk to unrestricted development on a potentially gassing site. The latter criterion represents the absolute "cut-off" level of methane flux which developments should be allowed to build on the potentially gassing site.

Although the exact details of the individual buildings to be constructed on the NLDFS developments are not available, it is considered that, even if there is a route by which biogas could enter any below ground or ground level rooms or confined spaces, it is likely that, at times, the rates of gas ingress into any such rooms would be significantly greater than the average rate of gas generation. Overall, it may be stated that, on the basis of the results of the sediment analysis and comparison with published guidance on safe levels of gas emissions, the predicted rate of gas generation is within the range which may be considered as 'likely be safe'. As the potential source of biogas exists at the reclamation area, there is still a possibility that potentially dangerous levels of methane may accumulate within the development but this will depend on the exact form which the development takes and the specific details of any confined spaces.

4.2.6 *Terrestrial Ecology*

The major habitat types within the Project Area comprises secondary woodland, tall shrubland, grassland/shrubland mosaic, brackish/freshwater wetland, village/orchard, wasteland, plantation, freshwater streams, as well as backshore vegetation. The field surveys which have been undertaken indicate that the grassland/shrubland mosaic, which are typical of similar habitats elsewhere in Hong Kong, are the main habitat type. The identified secondary woodland, backshore vegetation and freshwater stream habitats are considered to have moderate to high ecological value, and all the others habitats a low value.

A number of plant species with ecological interest are present within the Study Area which may be affected by the proposed NLDFS developments and CKWLR including *Thespesia populnea* at Fa Peng and Pa Tau Kwu Pak Wan, *Lilium brownii* at Fa Peng Teng, *Amorphophallus variabilis* at Tso Wan and *Schoenus falcatus* at Chok Ko Wan Tsui.

Two locally rare faunal species have been recorded in the Study Area: the Rice Fish (*Oryzias latipes*) in the lower Mong Tung Hang Stream and the White-bellied Sea Eagle (*Haliaeetus leucogaster*) in the Pa Tau Kwu woodland, respectively.

The proposed developments associated with the NSLD and CKWLR will generally lead to a loss of low ecological value terrestrial habitats with low ecological impact. Mitigation measures for the development are recommended to avoid or reduce the potential impacts on the secondary

woodlands, backshore vegetation natural streams, rare/restricted/protected plant species, Rice Fish and the White-bellied Sea Eagle.

Stream habitat creation is also recommended to compensate for the loss of the permanent freshwater stream at Fa Peng and behind the GTP.

Construction disturbance effects (e.g. noise), particularly those from the Theme Park (Phase III) Extension works and CKWLR, could potentially be controlled such that disturbance to the White-bellied Sea Eagles would be minimised, and the Theme Park (Phases I and II) fireworks displays would be located 0.8 km remote from the nesting site to minimise potential disturbance; although worst case abandonment of the nest site as result of construction or operational disturbances could not be ruled out. However the White-bellied Sea Eagles should be able to find suitable alternative nesting sites, such as the remote Tang Lung Chau (with previous record of White-bellied Sea Eagles breeding but the nest site has been abandoned), Southeast Lantau, or Sunshine Island with woodland areas, should they abandon the nesting site at the Pa Tau Kwu.

4.2.7

Marine Ecology

Literature reviews of existing information supplemented with the results of recently undertaken field surveys on marine ecological resources indicate that the intertidal rocky shores within the Study Area are of medium ecological value whereas for the sandy habitats, low ecological value was assigned. Soft bottom habitats identified in the review were regarded as of low ecological value. A small area containing high ecological value assemblages of hard corals will be lost as a result of the reclamation activities. Information on baseline conditions suggests that no species of conservation importance have been recorded from the marine areas close to the reclamation site, with the exception of the Indo-Pacific Humpbacked Dolphin. However, the waters near the proposed NLDFS reclamation sites do not appear to be highly utilised by the dolphins, it is unlikely that this area contains critical *Sousa chinensis* habitat.

Potential impacts to marine ecological resources from the proposed construction works may arise either indirectly, eg through perturbations of the surrounding water quality, or directly as a result of habitat loss. The natural intertidal and subtidal assemblages with the various reclamation footprints will be lost permanently. However, it is anticipated that given adequate seawall design, assemblages typical of those lost will recolonise after reclamation. Indirect impacts during the reclamation process, such as an increase in SS levels and decrease in DO in the water column may impact intertidal and subtidal filter feeders and other marine organisms. However, the effects are not expected to be severe and no unacceptable impacts are predicted to occur from NLDFS developments or CKWLR Project construction.

Operational impacts to marine ecological resources may occur through disturbances to water quality due to changes in the hydrodynamic regime of the area or due to polluted discharges into the marine environment. It is expected that all NLDFS developments discharges will comply with the WPCO discharge standards and consequently marine ecological resources will be protected from impacts. Minor changes in the local hydrodynamic regime are predicted although these are not expected to alter water quality to an extent that marine ecological resources are affected. An increase in the number of vessels travelling to and from the Pearl River Delta and the NLDFS is predicted to occur. Many of these vessels on the northshore of Lantau are expected to be high speed ferries to and from the CBFT which could potentially impact dolphin populations. Mitigation measures have been recommended which should minimise disturbances to dolphins.

Mitigation measures specific to marine ecology include the provision of rubble mound/armour rock seawalls on the edges of the reclamations to facilitate colonisation by intertidal organisms and corals which will be lost as a result of the construction of the reclamation. Mitigation measures designed to minimise impacts to the seasonal population of marine mammals that use the area include restrictions on vessel speed and the use of bubble curtains during percussive piling work for construction of the cross boundary ferry terminal and Road P1. Other mitigation measures designed to mitigate impacts to water quality to acceptable levels (compliance with WQOs) are also expected to mitigate impacts to marine ecological resources.

The impacts occurring as a result of construction and operation of the NLDFS are the direct loss of 258 ha of the low ecological value soft benthic assemblages, 4.6 km of medium and low ecological value intertidal shores and 0.16 ha of high ecological value coral habitat. The loss of the habitat within the areas to be reclaimed can be mitigated through the provision of 11.3 km of rubble mound sloping seawalls which are suitable for the colonisation and growth of intertidal organisms. These seawalls will provide 3.1 ha which are suitable for the colonisation and growth of corals. This mitigation measure reduces the magnitude of the residual impact to acceptable levels.

The cumulative losses of habitats as a result of NLDFS developments, Theme Park and its associated developments and Route 10 are the direct loss of 554 ha of soft bottom benthic habitat, the severity of which is anticipated to be acceptable as the areas to be reclaimed are of low ecological value. The residual impact is considered to be acceptable as the habitat is of low ecological value and the rubble mound seawalls and Artificial Reefs to be deployed will assist in enhancing the marine ecology of the area surrounding the completed reclamations. The direct loss of 0.458 ha of subtidal hard surface habitats of high ecological value is unlikely to be unacceptable without mitigation. The provision of rubble mound sloping seawalls is expected to provide greater than 7.4 ha of habitat suitable for colonisation by corals. With these mitigation measures in place the residual cumulative loss of subtidal habitat is considered to be acceptable. The direct loss of 4.68 km of

natural and 4.27 km of artificial intertidal habitats, the severity of which is anticipated to be acceptable in the light of the provisioning of greater than 15.2 km of sloping artificial seawalls that are ecologically enhancing.

An ecological monitoring and audit programme involving the use of dive surveys will be conducted to report on the progress of colonisation of the rubble mound seawalls once construction works have ceased. As an additional habitat enhancement measure the project proponent of the Theme Park EIA has undertaken to deploy Artificial Reefs in Hong Kong waters at a site (or sites) to be decided upon consultation with AFCD and others. Construction phase dolphin monitoring should be conducted to evaluate whether there have been any effects on the animals. Further monitoring and audit activities specifically designed to assess the effects of the reclamation activities on marine ecological resources are not deemed necessary as those conducted to detect and mitigate any unacceptable impacts to water quality will serve to protect against unacceptable impacts to marine ecological resources. Operation phase dolphin monitoring should be conducted for a period of two years on commencement of operations of the CBFT by a qualified research team, to evaluate whether there have been any effects on the animals.

4.2.8 *Fisheries*

A review of existing information on capture fisheries indicates that the adult fisheries resources in the marine areas close to the proposed reclamation sites are in general low. Adult capture fisheries resources are unlikely to be adversely impacted by the NLDFS and CKWLR Projects as they will likely avoid the works areas. Although impacts to fish fry may occur through the permanent loss of habitat and/or elevated suspended sediment levels as a result of the proposed reclamation works, these impacts have been deemed acceptable as these waters are not an important nursery area for commercial fisheries species. Any impacts which are predicted can be mitigated through Project design. Any measures which are required to reduce impacts to water quality will also serve to protect against unacceptable impacts to capture fisheries resources.

In terms of residual impacts to capture fisheries, the combination of the small loss of fishing grounds and the low value to the Hong Kong fishery are expected to be compensated for by the potential environmental benefits of the proposed rubble mound seawalls. Artificial Reefs have been recommended for deployment as an additional marine ecology and fisheries habitat enhancement measure. As a result, the residual impacts to capture fisheries through the construction and operation of the NLDFS and CKWLR Projects has been deemed acceptable.

In terms of impacts to the culture fisheries, the Ma Wan Fish Culture Zone (FCZ) is not predicted to be impacted by either suspended solids elevations, dissolved oxygen depletions or nutrient elevations as a result of either the construction or operation. Discharges comply with WPCO standards and any

potential impacts to water quality and, therefore, culture fisheries resources at the FCZ, will be avoided. Project changes to the hydrodynamic regime are not expected to impact the water quality of the FCZ as current speeds are expected to be only minimally affected.

4.2.9 *Historical, Archaeological and Cultural Heritage*

The NLDFS developments and the CKWLR have been designed with due consideration to avoid and minimise the potential impacts to the known archaeological sites as far as practicable. Mitigation measures to heritage resources such as temporary coverage of the archaeological site before construction have been recommended to ameliorate the potential impacts. In order to ensure the preservation of the heritage sites within the Project Area, a number of archaeological sites, heritage building structure, and grave sites located in the vicinity to construction sites have been recommended to be shown on construction plans as “temporary protection area”. The sites will be fenced off during the construction period.

Preservation by record prior to the reclamation of Chok Ko Wan archaeological site has been recommended to mitigate the impact through implementation of a full rescue programme. Field evaluations conducted at the proposed Tso Wan Village Expansion Area site have identified three grave sites and two boundary stones. No significant archaeological remain had been identified during the field evaluations.

The preferred alignments of CKWLR and Road P2 may have impact onto potential archaeological deposit at the original coastal area currently covered by Cheoy Lee Shipyard. Field evaluation at the Cheoy Lee Shipyard site has been recommended to provide data for the design of the structural support locations of the roads. Rescue excavation may be considered if avoidance of impacts is considered impractical.

Detailed design of certain developments and infrastructures including the Road P1, drainage channel at Fa Peng, looking out area at Fa Peng Teng and services reservoirs at Yam O Tuk should avoid direct impact to the archaeological sites in the vicinity as far as practicable

4.2.10 *Risk Assessment*

A number of potential sources of hazard have been identified within the Project Area. These include the Siu Ho Wan Water Treatment Works, which is classified as a Potentially Hazardous Installation, the proposed Tang Lung Dangerous Goods Anchorage, Dangerous Goods marine traffic through the Kap Shui Mun fairway, the Towngas high pressure gas pipeline which has a landfall at the Luk Keng headland and runs along the North Lantau coast to Tai Ho, and the handling and storage of fireworks and sodium hypochlorite at the Theme Park (Phases I and II).

Based on the identification of hazard sources within the NLDFS Study Area, the proximity of the proposed NLDFS developments to these hazard sources and the additional population due to the proposed NLDFS developments, it is found that the proposed developments considered in the Draft RODP do not contribute to any significant increase in overall risks from the hazard sources.

It is concluded that the Draft RODP is compatible with Hong Kong Risk Guidelines and are feasible from hazard to life considerations.

4.2.11 *Landscape and Visual*

The Northshore Lantau area is rural in nature with significant intrusions along the north coast in the form of the NLH. Elements consist of natural and man-made coastlines, bay and coastal waters, undulating hills and upland areas, associated with Fa Peng Teng, Tai Yam Teng and Tai Shan, and some small streams and associated valleys. Upland areas are dominated by grassland, and denser shrubland and woodland exist in scattered groups along sheltered stream courses and the lower slopes. Many of the streamcourses in the north of the study areas have already been altered due to construction of the NLH corridor. Much of the coastline has already been disturbed or reclaimed.

Development is proposed predominantly on reclamation and the local natural landscape will remain relatively undisturbed. Impacts will be concentrated on the south and east Fa Peng Teng hillsides due to cut slopes for the construction of the CKWLR and the service reservoir. Additional smaller impacts will occur on the Yam O headland due to construction of the Road P1, tunnel portals and at Ngong Shuen Au due to loss of woodland for CKWLR.

Landscape character on Fa Peng Teng will change from primarily natural hillsides to a zone containing a road and the reservoir with associated slope cuttings, although much of the hillsides will retain their overall character. The change of Penny's Bay from a bay to a reclaimed area will represent a major change in character. The proposed development will cause a change of the overall character of this eastern end of Lantau, from being distinctly rural to a more sub-urban landscape, with a mix of developed and natural areas.

Visual impacts will arise from the extension of the coastline along the northern side. However, much of its coastal areas are already reclaimed and is dominated by the NLH and Lantau and Airport Railway. The development will provide the opportunity to create a new character to the coastal zone to screen and buffer the transport corridor. The recent policy decision for enhancing the existing NLH corridor will have a beneficial impact visually on the Northshore area.

On the southern side the impacts are likely to be greater overall as the change in character will be from the current bay with limited disturbance to a large reclamation. The change of character will be great, but will also provide opportunity to create positive visual features of the area.

The main landscape impacts after mitigation are the same of good quality woodland, shrubland and natural coastline, and the disturbance of topography. A range of mitigation measures have been proposed in the form of compensatory planting and provision of naturalistic contours. Rough blasting for cut slopes will reduce impacts to the greatest extent. Visually impacts will be substantially alleviated by mitigation measures. Impacts that persist are associated chiefly with the slope cutting for CKWLR at Pa Tau Kwu.

The primary residual impact that have been identified are the loss of bay at Penny's Bay and coastal water on the Northshore and the adverse impact of the CKWLR on local landscape and visual quality of the area. In accordance with the EIAO TM, the landscape and visual impact is considered acceptable with mitigation

4.2.12 Land Contamination

Contaminated land issues have not been identified as a major concern for the Study Area, with the exception of the CLS site. However, the NLDFS EIA comprises Schedule 3 level coverage of the environmental impacts arising from shipyard decommissioning, although access to the shipyard site was not available as part of the Schedule 3 NLDFS EIA, due to its present operation and private ownership. To allow the Theme Park and associated developments EIA to 'stand alone' the relevant land contamination section of the NLDFS EIA was included within this EIA, although it is not strictly a requirement of the Study Brief. Additionally, the decommissioning of a shipyard comprises a Designated Project under Schedule 2 of the EIAO. Thus, a separate and subsequent EIA Study will be commissioned by CED before the decommissioning of the CLS shipyard occurs. This subsequent decommissioning EIA, which, due to access requirements can only commence after the shipyard property has become available, will include detailed site investigation and formulation of appropriate remedial methods and procedures, if required, to decontaminate the shipyard site. CED presently expect this decommissioning EIA to be completed and submitted under the EIAO to DEP for approval in 2002. More importantly, this decommissioning EIA will need to be approved under the EIAO, and an Environmental Permit issued by the DEP before any construction work can commence in the shipyard area.

As a result of the CLS site Schedule 2 EIA described above, appropriate remediation will be performed in accordance with EPD guidelines for the decommissioning of the shipyard site, future potential negative impacts are not expected. The concerns for potential impacts of land contamination are reduced further as there have been no documented spillages or leakages from this shipyard site, or any other facilities within the Study Area according to Government sources. Where shipyard facility operations are noted to be a concern for causing potential contamination, it is noted that standard mitigation measures will be employed, thereby reducing the need for contact

with any potentially contaminated soils during construction works. In addition, it is considered unlikely that there has been any extensive migration of potential contaminants from the shipyard site due to its environmental setting. Therefore, assuming that remedial measures prescribed by the CLS site Schedule 2 EIA are conducted in accordance with appropriate protocols and the *Guidance Notes* (this will be verified in the CLS site Schedule 2 EIA), there will be no potential residual negative impacts, and no insurmountable conditions for the future use of the former CLS site for road and railway access to the Theme Park (Phases I and II) and associated developments

4.3 CONSTRUCTION PHASE EM&A

4.3.1 General

The environmental issues, which were identified during the EIA process and are associated with the construction phase of the CKWLR, will be addressed through the monitoring and controls specified in this EM&A Manual and in the construction contracts.

During the construction phase air quality, noise, water, terrestrial and marine ecology, archaeology, and landscape and visual issues will be subject to EM&A, with the environmental monitoring of the effectiveness being taken for dust, noise, water and terrestrial and marine ecology.

Monitoring of the effectiveness of the mitigation measures will be achieved through this process as well as through site inspections. The inspections will include within their scope, mechanisms to review and assess the Contractors' environmental performance, ensuring that the recommended mitigation measures have been properly implemented, and that the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations of the EIA Report.

4.3.2 Environmental Monitoring

The monitoring of environmental impacts during the construction phase shall be carried out by the ENPO; the monitoring work will comprise the quantitative assessment of noise, air and water quality impacts at representative sensitive receivers in the vicinity of the works, together with the assessment of terrestrial and marine ecology.

4.3.3 Action and Limit Levels

Action and Limit (A/L) Levels are defined levels of impact recorded by the environmental monitoring activities which represent levels at which a prescribed response is required. These levels are quantitatively defined later in the relevant sections of this manual and described in principle below:

- *Action Limits:* beyond which there is a clear indication of a deteriorating ambient environment for which appropriate remedial actions are likely to

be necessary to prevent environmental quality from falling outside the *Limit Levels*, which would be unacceptable; and

- *Limit Levels*: statutory and/or agreed contract limits stipulated in the relevant pollution control ordinances, HKPSG or *Environmental Quality Objectives* established by the EPD. If these are exceeded, works should not proceed without appropriate remedial action, including a critical review of plant and working methods.

4.3.4 *Event and Action Plans*

The purpose of the Event and Action Plans (EAPs) is to provide, in association with the monitoring and audit activities, procedures for ensuring that if any significant environmental incident (either accidental or through inadequate implementation of mitigation measures on the part of the Contractor) does occur, the cause will be quickly identified and remediated, and the risk of a similar event recurring is reduced. This also applies to the exceedances of A/L criteria identified in the EM&A programme.

4.3.5 *Site Inspections*

In addition, to monitoring noise, air and water quality levels as a means of assessing the ongoing performance of the Contractors, the EATL shall undertake regular site inspections and audits of on-site practices and procedures. The primary objective of the inspection and audit programme will be to assess the effectiveness of the environmental controls established by the Contractors and the implementation of the environmental mitigation measures recommended in the EIA Report.

Whilst the audit and inspection programme will undoubtedly complement the monitoring activity with regard to the effectiveness of dust suppression, noise attenuation measures and water quality control, the criteria against which the audits shall be undertaken shall be derived from the clauses within the Contract Documents which seek to enforce the recommendations of the EIA Report and the established management systems.

The findings of site inspections and audits shall be made known to the Contractors at the time of the inspection to enable the rapid resolution of identified non-compliances. Non-compliances, and the corrective actions undertaken, shall also be reported in the monthly EM&A Reports. *Section 16* of this Manual presents details of the scope and frequency of on-site inspections and defines the range of issues that the audit protocols should be designed to address.

4.3.6 *Enquiries, Complaints and Requests for Information*

Enquiries, complaints and requests for information can be expected from a wide range of individuals and organisations including members of the public,

Government departments, the press and television media and community groups.

All enquiries concerning the environmental effects of the construction works, irrespective of how they are received, shall be reported to the Engineer and directed to the ENPO which shall set up procedures for the handling, investigation and storage of such information. The following steps shall then be followed:

- 1) The EATL shall ensure that the Engineer is notified of the nature of the enquiry.
- 2) An investigation shall be initiated to determine the validity of the complaint and to identify the source of the problem.
- 3) The following steps, as necessary:
 - the EATL shall investigate and identify the source of the problem;
 - if considered necessary by the EATL following consultation with the Engineer, the EMTL shall undertake additional monitoring to verify the existence and severity of the alleged complaint;
 - the EATL shall liaise with the Contractor to identify remedial measures;
 - the Contractor implement the agreed mitigation measures;
 - the EMTL shall repeat the monitoring to verify the effectiveness of the mitigation measures; and
 - if the repeat monitoring results continue to substantiate the complaint, the EATL, the Engineer and the Contractor shall repeat their review of the procedures to identify further possible areas of improvement.
- 4) The outcome of the investigation and the action taken shall be documented by the EATL on a complaint proforma. A formal response to each complaint received shall be prepared, by the EATL, within a maximum of five working days and submitted to the Engineer in order to notify the concerned person(s) that action has been taken, see *Annex A(1.1)*.
- 5) All enquiries which trigger this process shall be reported in the monthly reports which shall include results of inspections undertaken by the EATL, and details of the measures taken, and additional monitoring results (if deemed necessary). It should be noted that the receipt of complaints or enquiries will not, in itself, be sufficient reason to introduce additional mitigation measures.

In all cases the complainant shall be notified of the findings, and audit procedures shall be put in place to ensure that the problem does not recur.

4.3.7 *Reporting*

Monthly, annual and bi-annual reports shall be prepared by the EMTL and approved by the EATL. These reports shall be submitted to the Engineer and EPD. The monthly reports shall be prepared and submitted within 7 working days of the end of each calendar month. Additional details on reporting protocols are presented in *Section 17*.

4.3.8 *Cessation of EM&A*

The EMTL and the EATL shall continue to carry out environmental monitoring and site inspections until the completion of the Construction works.

4.4 *OPERATIONAL PHASE EM&A*

Environmental monitoring during the operational phase is anticipated for terrestrial ecology impacts only. The suggested monitoring parameters and locations are outlined in *Sections 9.1* of this report.

5 AIR QUALITY MONITORING

5.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impacts during the construction and operation of the CKWLR are presented.

5.2 CONSTRUCTION DUST MONITORING

5.2.1 Introduction

The objectives of the air quality monitoring for Total Suspended Particulates (TSP) shall be:

- to identify the extent of construction dust impacts on sensitive receivers;
- to determine the effectiveness of mitigation measures to control dust from construction activities;
- auditing the compliance of the Contractor with regard to dust control, contract conditions and the relevant dust impact criteria;
- to recommend further mitigation measures if found to be necessary; and
- to comply with Action and Limit (AL) Levels for air quality as defined in this Manual.

5.2.2 Methodology and Criteria

Monitoring and audit of the TSP levels shall be carried out by the EMTL to ensure that any deterioration in air quality can be readily detected and timely actions taken to rectify the situation.

The criteria against which air quality (measured as TSP) monitoring shall be assessed are:

- The Hong Kong *Air Quality Objectives* (AQOs) for TSP, 24-hour TSP levels of 260 mg m^{-3} ; and
- The statutory 1-hour TSP limit of 500 mg m^{-3} .

These levels are not to be exceeded at Air Sensitive Receivers (ASRs).

The 1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust. The TSP levels shall be measured by following the standard high volume sampling method as set out in *High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA*.

24-hour average TSP concentrations should be measured by drawing air through a high volume sampler (HVS) fitted with a conditioned, pre-weighed

filter paper, at a controlled rate. After sampling for 24-hours, the filter paper with retained particles is collected and returned to the laboratory for drying in a desiccator followed by accurate weighing. 24-hour average TSP levels are calculated from the ratio of the mass of particulates retained on the filter paper to the total volume of air sampled. The analysis process normally takes about two days to complete.

1-hour average TSP concentrations shall be measured using the same monitoring method as 24-hour average TSP (i.e. the HVS).

An alternative means of monitoring 1-hour average TSP concentrations is by undertaking real-time airborne particulate measurements undertaken using a direct reading meter such as the MIE Data-Ram Portable Real Time Aerosol Monitor (MIE). 1-hour average TSP concentrations measured by a hand held real-time aerosol monitor require no laboratory analysis and will give an instant reading of the dust levels. Air samples are drawn through the optically-sensitive area of the monitor for a continuous period of 1-hour and the monitor will calculate the time-average dust levels. Despite the advantages of using a real time monitor to measure particulate concentrations such as in response to dust complaints, results are not comparable with 24-hour HVS data. It is suggested that the real time monitoring technique be used to supplement the HVS sampling.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc shall be recorded down in detail. A sample data sheet is shown in *Annex A (1.2)*.

5.2.3 *Monitoring Equipment*

A high volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:

- 0.6 - 1.7 m³ min⁻¹ (20-60 SCFM) adjustable flow range;
- equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm² (63 in²);
- flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- incorporated with a manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;

- easy to change the filter; and
- capable of operating continuously for 24-hr period.

The EMTL shall be responsible for the provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit are available for carrying out the baseline, regular impacts monitoring and *ad hoc* monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals, in accordance with requirements stated in the manufacturers operating manual and as described below. All the equipment, calibration kit, filter papers, etc shall be clearly labelled.

The flow rate of each HVS with mass flow controller shall be calibrated using an orifice calibrator. Initial calibration of the dust monitoring equipment shall be conducted upon installation and prior to commissioning. One point flow rate calibration shall be carried out every two months. Five point calibration shall be carried out every six months.

The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down on the data sheet as mentioned in a *Annex A(1.2)*.

If the EMTL proposes to use a direct reading dust meter to supplement the monitoring of 1-hour TSP, then this shall be capable of sampling in the range of 0.1-100 mg m⁻³. The EMTL shall submit sufficient information to the Engineer and the EATL to prove that the instrument is acceptable for its intended use. The instrument shall also be calibrated regularly.

Wind monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The location of the equipment shall be determined by the EMTL and agreed with the Engineer and the EATL. For installation and operation of the wind data monitoring equipment, the following points shall be observed:

- the wind sensors should be installed on masts at an elevated level 10 m above the ground, so that they are clear of obstructions or turbulence caused by building(s);
- the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
- the wind data monitoring equipment should be re-calibrated at least once every six months; and
- wind direction should be divided into 16 sectors of 22.5 degrees.

In exceptional situations, the EMTL may propose alternative methods to obtain representative wind data upon approval from the EATL and Engineer, and agreed with EPD.

Table 5.2a presents the recommended types and quantities of TSP monitoring equipment required, although the exact requirements will depend upon the final organisation of the EM&A programme, and the ENPO's manpower resources.

Table 5.2a TSP Recommended Monitoring Equipment

Description	Quantity
High Volume sampler	1 unit
Hand-held direct reading dust meter	1 unit

5.2.4 Laboratory Measurement/Analysis

A clean laboratory with constant temperature and humidity control, and equipped with the necessary measuring and conditioning instruments to handle the dust samples, shall be available for sample analysis and equipment calibration and maintenance. The laboratory shall be either HOKLAS accredited or another internationally accredited laboratory.

If a site laboratory or a non-HOKLAS accredited laboratory is used, the laboratory equipment and measurements shall meet with the satisfaction of the Engineer in consultation with the EATL. The EATL shall conduct regular audits to determine the accuracy of the measurement results. The EMTL shall provide the Engineer and the EATL with one copy of the *Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Annex B* for reference.

5.2.5 Monitoring Locations

One air quality monitoring station has been identified in the locality of the CKWLR. The location of the monitoring station is presented in Table 5.2b and depicted in Figure 5.2a

Table 5.2a Representative Air Quality Monitoring Station for CKWLR During Construction Phase

ASRs No.	Identity/Description	Remarks
AM1	Penny's Bay Gas Turbine Plant	For the construction of the section from Yam O Interchange to East of TCT up to R10 Toll Plaza
AM2	Luk Keng Tsuen	For the construction of the section from Yam O Interchange to East of TCT up to R10 Toll Plaza
AM3	Tso Wan	For the construction of the section from Yam O Interchange to East of TCT up to R10 Toll Plaza
AM4	Theme Park Phase II	For the construction of the section from south of TCT to R10-HKLL

Prior to the commencement of the EM&A programme, the proposed air quality monitoring stations shall be discussed and agreed with the Engineer,

the EATL and EPD. When positioning the samplers, the following points shall be noted:

- a horizontal platform with appropriate support to secure the samples against gusty wind shall be provided;
- no two sampler shall be placed less than 2 m apart;
- the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- a minimum of 2 m separation from walls, parapets and penthouses is required for rooftops samplers;
- a minimum of 2 m separation from any supporting structure, measures horizontally is required;
- no furnace or incinerator flue is nearby;
- airflow around the sampler is unrestricted;
- the sampler is more than 20 m from the dripline;
- any wire fence and gate to protect the sampler, shall not cause any obstruction during monitoring;
- permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- a secured supply of electricity is needed to operate the samplers.

5.2.6 *Baseline Monitoring*

Baseline monitoring shall be carried out to determine the ambient 24-hour TSP and 1-hour levels at the monitoring locations prior to the commencement of the construction works. During the baseline monitoring, there shall not be any construction or dust generating activities in the vicinity of the monitoring stations.

Baseline monitoring shall be carried out for a continuous period of at least two weeks under typical weather conditions with the 24-hour and three 1-hour ambient measurements taken daily at each monitoring location. As noted above, monitoring results of HVS and direct reading methods are not directly comparable and the same instrument must therefore be used for both baseline and impact monitoring in the case of 1-hour TSP. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources shall also be recorded throughout the baseline monitoring period.

The baseline monitoring will provide data for the determination of the appropriate Action levels with the Limit levels set against statutory or otherwise agreed limits.

Baseline checking of ambient dust levels shall be carried out every six months at each monitoring location, when no dusty works activities are in operation. If the EMTL considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the

baseline levels and air quality criteria, after consultation and agreement with the Engineer, the EATL and the EPD.

5.2.7 *Impact Monitoring*

The monthly schedule of the compliance and impact monitoring programme shall be drawn up by the EMTL one month prior to the commencement of the scheduled construction period. For regular impact monitoring, a sampling frequency of at least once in every six-days shall be strictly observed at all of the monitoring stations for 24-hour TSP monitoring. In case of complaints, 1-hour TSP monitoring shall be conducted at least three times in every six-days when the highest dust impacts are likely to occur. Before commencing the baseline monitoring, the EMTL shall inform the EATL of the impact monitoring programme such that the EATL can conduct an on-site audit to ensure the accuracy of the impact monitoring results.

The specific time to start and stop the 24-hour TSP monitoring shall be clearly defined for each location and shall be strictly followed by the operator.

5.2.8 *Compliance Assessment*

Action and Limit (A/L) levels provide an appropriate framework for the interpretation of monitoring results. The air quality monitoring data shall be checked against the agreed A/L levels as listed in *Tables 5.2c and 5.2d*.

Table 5.2c *Derivation of Action and Limit Levels for 24-Hour TSP Monitoring*

Level	Total Suspended Particulates ($\mu\text{g m}^{-3}$)
Baseline	Numerical average of physical measurements prior to construction commencement
Action	For baseline $< 108 \text{ mg m}^{-3}$, average of 130% of baseline and the Limit level For $108 \text{ mg m}^{-3} < \text{baseline} < 154 \text{ mg m}^{-3}$, 200 mg m^{-3} For baseline $> 154 \text{ mg m}^{-3}$, 130% of baseline level
Limit	AQO for 24-hour TSP: 260 mg m^{-3}

Table 5.2d *Derivation of Action and Limit Levels for 1-Hour TSP Monitoring*

Level	Total Suspended Particulates ($\mu\text{g m}^{-3}$)
Baseline	Numerical average of physical measurements prior to construction commencement
Action	For baseline $< 154 \text{ mg m}^{-3}$, average of 130% of baseline and the Limit level For $154 \text{ mg m}^{-3} < \text{baseline} < 269 \text{ mg m}^{-3}$, 350 mg m^{-3} For baseline $> 269 \text{ mg m}^{-3}$, 130% of baseline level
Limit	EIAO Statutory Limit: 500 mg m^{-3}

5.2.9 *Event and Action Plan (EAP)*

The principle upon which the EAP is based is the prescription of procedures and actions associated with the measurement of certain defined levels of air pollution recorded by the environmental monitoring process and defined in the tables above. The EMTL shall compare the impact monitoring results with the air quality criteria (*Tables 5.2c and 5.2d*) set up for 24-hour TSP and 1-hour TSP. In cases where exceedance of these criteria occurs, the EMTL, the EATL, the Engineer and the Contractor shall strictly observe the relevant actions of the EAP shown in *Table 5.2e* below.

Table 5.2e Event and Action Plan for Construction Phase Air Quality

EVENT	ENPO		Engineer	Contractor
	EMTL	EATL		
Action Level				
1. Exceedance for one sample	2. Repeat measurement to confirm findings.	1. Identify the source(s) of impact.	1. Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1. In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3. Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.		2. Amend proposals if required by the Engineer or the EATL.
		5. Check monitoring data trends and Contractors' working methods.		3. Implement the remedial actions immediately upon instruction from the Engineer.
2. Exceedance for two or more consecutive samples	2. Repeat measurement to confirm findings.	1. Identify the source(s) of impact.	1. Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1. In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3. Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.	2. Discuss remedial actions required with the EATL and the Contractor.	2. Amend proposals if required by the Engineer or the EATL.
	10. If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5. Check monitoring data trends and Contractors' working methods.	3. Ensure agreed mitigation measures are fully implemented.	3. Implement the remedial actions immediately upon instruction from the Engineer.
		6. Discuss remedial actions required with the Engineer and the Contractor.		4. Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		7. Ensure agreed mitigation measures are fully implemented.		
		8. Assess the efficacy of remedial actions and keep the Contractor informed.		
		9. If exceedance continues, arrange meeting with Engineer to review implementation and identify further appropriate mitigation measures		

EVENT	ENPO		Engineer	Contractor
	EMTL	EATL		
Limit Level				
2. Exceedance for two or more consecutive samples	3.Repeat measurement to confirm findings.	1. Identify the source(s) of impact.	1. Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1. Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2. Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2. Discuss remedial actions required with the EATL and the Contractor.	2. In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
		5. Check monitoring data trends and Contractors' working methods.	3. Ensure agreed mitigation measures are fully implemented.	3. Amend proposals if required by the Engineer or the EATL.
		6. Discuss remedial actions required with EPD, the Engineer and the Contractor.		4. Implement remedial actions immediately upon instruction from the Engineer.
		7. Ensure agreed mitigation measures are fully implemented.		5. Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		8. Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.		
	3. Repeat measurement to confirm findings.	1. Identify the source(s) of impact.	1. Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1. Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2. Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2. Discuss remedial actions required with the EATL and the Contractor.	2. In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	10. If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5. Check monitoring data trends and Contractors' working methods.	3. Ensure agreed mitigation measures are fully implemented.	3. Amend proposals if required by the Engineer or the EATL.
		6. Discuss remedial actions required with EPD, the Engineer and the Contractor.		4. Implement remedial actions immediately upon instruction from the Engineer.
		7. Ensure agreed mitigation measures are fully implemented.		5. Resubmit proposal to EATL and Engineer if the problem is still not under control.
		8. Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.		6. Stop the relevant portion of works as determined by the EATL and Engineer, until the exceedance is abated.
		9. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.		

5.2.10 Construction Phase Mitigation Measures

The EIA Report has recommended air quality control and mitigation measures during the construction phases of the Project. These are outlined in the Implementation Schedule (in *Annex B* of this EM&A Manual). In the event of exceedances or complaints, the Contractor shall be responsible for reviewing the effectiveness of these measures and for proposing, designing and implementing alternative measures as appropriate.

5.3 OPERATIONAL AIR QUALITY MONITORING

5.3.1 Introduction

The EIA has concluded that the CKWLR will not result in any operational air quality impacts. As such, no operational phase air quality monitoring is required for the CKWLR.

5.4 MITIGATION MEASURES

The EIA Report has recommended air quality mitigation measures. Details of these recommendations are outlined in the Implementation Schedule (in *Annex B* of this EM&A Manual).

6 NOISE MONITORING

6.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations and mitigation measures for the monitoring and audit of noise impacts associated with the construction and operational of the CKWLR are described.

6.2 CONSTRUCTION PHASE EM&A

6.2.1 Methodology and Criteria

Noise level measurements shall be carried out using the methodology set out in *Sub-section 3 of the Annex - General Calibration and Measurement Procedures*, as stated in the *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (GW-TM).

The appropriate parameter for measuring construction noise impacts shall be the A-weighted equivalent continuous sound pressure level (L_{Aeq}) measured in decibels (dB). The two statistical sound levels L_{10} and L_{90} , the levels exceeded for 10 and 90 percent of the time respectively, shall also be recorded during the monitoring for reference. A sample data record sheet is shown in *Annex A (1.3)* for reference.

Whilst the *Noise Control Ordinance* (NCO) does not provide for the statutory control of construction activities occurring on weekdays during normal working hours (that is, Monday to Saturday inclusive 0700-1900), a daytime limit of $L_{Aeq (30 \text{ minute})}$ 75dB, recommended in the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) was adopted in the EIA Report and agreed with EPD as the appropriate criterion for all residential dwellings; while a daytime limit of $L_{Aeq (30 \text{ minute})}$ 70dB was adopted in the EIA Report as the appropriate criterion for all educational institutions during normal school days and $L_{Aeq (30 \text{ minute})}$ 65dB during examination periods.

The NCO provides statutory controls on general construction works during restricted hours (ie 1900-0700 hours Monday to Saturday and at any time on Sundays and public holidays). The ANLs for evenings and holidays and for night-time are dependent on the Area Sensitivity Rating at the NSR. The relevant ANLs are provided in *Table 6.2a*.

Table 6.2a Acceptable Noise Levels (ANLs)

Time Period	Area Sensitivity Rating		
	A	B	C
All days during the evening (1900-2300 hours) and general holidays (including Sundays) during the day and evening (0700-2300 hours)	60	65	70
All days during the night-time (2300-0700)	45	50	55

6.2.2 Monitoring Equipment

The EMTL shall be responsible for providing and maintaining a sufficient number of sound level meters to conduct the necessary baseline monitoring, regular impact monitoring and *ad hoc* monitoring at the agreed monitoring locations.

Sound level meters and calibrators shall comply with the *International Electrotechnical Commission (IEC) Publication 651 : 1979 (Type 1) and 804 : 1985 (Type 1)* specification as referred to in the GW-TM. The sound level meters shall be supplied and used with the manufacturer's recommended wind shield and with a tripod.

The calibration of the sound level meters shall be carried out in accordance with the manufacturer's requirements. The sound level meters, including the calibrators, shall be verified by the manufacturers once every two years to ensure that they perform to the same level of accuracy as stated in the manufacturers specifications. Calibrated hand-held anemometers capable of measuring the wind speed in ms^{-1} shall also be supplied for the measurement of wind speeds during noise monitoring periods.

Sound level meters shall be calibrated using a portable calibrator before and after each measurement. The calibration levels shall be noted with the measurement results and where the difference between the calibration levels is greater than 1 dB(A) the measurement shall be repeated.

The EMTL shall ensure the equipment shall be kept in a good state of repair in accordance with the manufacturer's recommendations and maintained in proper working order with sufficient spare equipment available in the event of breakdown to maintain the planned monitoring programme.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5 ms^{-1} or wind with gusts exceeding 10 ms^{-1} . The wind speed shall be checked with the hand-held anemometers. Table 6.2b lists the suggested quantities of noise monitoring equipment required for the Works, although the exact requirements will depend upon the final organisation of the EM&A programme, and the ENPO's manpower resources.

Table 6.2b Noise Monitoring Equipment

Description	Quantity
Noise meter	1 unit
Calibrator	1 unit
Hand-held anemometer	1 unit

6.2.3 Monitoring Locations

Based on the noise sensitive receivers identified and stated within the EIA Report, representative noise monitoring locations have been determined in the vicinity of the works associated with the construction of the CKWLR. Their locations are listed below in *Table 6.2b* and depicted in *Figure 6.2a*. Prior to the commencement of the EM&A Programme, the proposed noise monitoring locations will be discussed and agreed with the Engineer, EATL and the EPD.

Table 6.2b EM&A Representative Monitoring Locations

NSR No	Identity/Description
NM1	Sea Crest Villa (Peng Chau)
NM2	Crestmont Villa (Discovery Bay)
NM3	Luk Keng Tsuen
NM4	Tso Wan

If, due for example, there are difficulties obtaining access to the proposed noise monitoring locations, alternative monitoring locations may be proposed. The selection of these alternative monitoring locations shall be based on the following criteria:

- at locations close to the major site activities which are likely to have noise impacts;
- close to the NSRs (any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing arts centre shall be considered as a NSR); and
- for monitoring locations located in the vicinity of the NSRs, care shall be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring locations shall normally be at a point 1 m from the exterior of the sensitive receiver building façade and at a height approximately 1.2 m above the ground or at the height that has the least obstructed view of the construction activity in relation to the receiver. If there is a problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. The EMTL shall agree with the EATL and EPD on the monitoring positions and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and impact monitoring shall be carried out at the same positions.

6.2.4 *Baseline Monitoring*

The EMTL shall carry out the baseline noise monitoring prior to the commencement of the construction works. To obtain fully satisfactory baseline results, a waterproof sound level meter and noise logger shall be used. Baseline noise levels shall be measured over one consecutive 7-day calendar week at a minimum logging interval of 15 minutes. The L_{Aeq} , L_{10} and L_{90} shall be recorded at the specified interval. The survey period shall be selected prior to the commencement of construction activities and so as to avoid other atypical noise sources. The proper functioning of the logger shall be ensured during this period and shall be visited for a period of not less than one hour every two days to ensure its continued operation and to detail specifics of audible noise sources at the monitoring locations. The calibration of the logger kit shall be as recommended by the manufacturer. Measurements shall be recorded to the nearest 0.1 dB.

Checking for changes in the baseline noise levels throughout the construction of Project shall be carried out by taking "sample" noise measurements every six months, when no noisy construction activities are in progress. If significant changes that can be validated are observed to have arisen, the baseline may be adjusted accordingly after consultation and agreement with the Engineer, the EATL and the EPD.

6.2.5 *Impact Monitoring*

During normal construction working hours (0700-1900 Monday to Saturday), monitoring of $L_{Aeq, 30min}$ noise levels (as six consecutive $L_{Aeq, 5min}$ readings) shall be carried out at the agreed monitoring locations once every six days in accordance with the methodology in the GW-TM. The six consecutive $L_{Aeq, 5min}$ readings shall be used to calculate the $L_{Aeq, 30min}$ noise level and this shall be compared to the $L_{Aeq, 30min}$ noise criteria and reported against.

If restricted hours works are undertaken, monitoring of $L_{Aeq, 5min}$ noise levels shall be carried out at the agreed monitoring stations at the same frequency as specified for normal working hours. Three consecutive $L_{Aeq, 5min}$ readings shall be taken to ensure the validity of the results. Each of the $L_{Aeq, 5min}$ noise readings shall be compared to the $L_{Aeq, 5min}$ noise criteria and reported against.

In relation to the monitored noise levels, other noise sources such as road traffic or aircraft may make a significant contribution to the overall noise environment. Therefore, the results of the noise monitoring activities will take into account any such influencing factors which were not present during the baseline monitoring period. All measurements shall be recorded to the nearest 0.1 dB.

6.2.6 Compliance Assessment

Action and Limit (A/L) Levels provide an appropriate framework for the interpretation of monitoring results. As an Area Sensitivity Rating has been assigned to individual affected NSRs, it is proposed that the interpretation of monitoring results is undertaken through checking them against the Action and Limit (A/L) Levels defined in *Table 6.2c*.

Table 6.2c Action and Limit Levels for Construction Noise dB(A)

Time Period	Action	Limit
0700-1900 on any day not being a Sunday or public holiday.	When one documented complaint is received	75 dB(A) ⁽¹⁾
1900-2300 on all days and 0700-2300 on general holidays (including Sundays) .	When one documented complaint is received	60/65/70 dB(A) ^{(2) (3)}
2300-0700 on all days.	When one documented complaint is received	45/50/55 dB(A) ^{(2) (3)}

(1) For educational establishments the limit level shall be 70 dB(A), reduced to 65 dB(A) during examination periods.

(2) Acceptable Noise Levels for Area Sensitivity Rating of A/B/C.

(3) NM1 , NM2 and NM4 have been assigned an ASR of 'A' and NM3 has been assigned an ASR of B

To account for cases where ambient noise levels, as identified by baseline monitoring, approach or exceed the stipulated Limit Level prior to commencement of construction, a Maximum Acceptable Impact Level, which incorporates the baseline noise level and the identified construction noise Limit Level, may be defined upon agreement with the EPD. This amended level will, therefore, be greater than 75 dB(A) and will represent the maximum acceptable noise level at a specific monitoring station. Correction factors for the effects of acoustic screening and / or architectural features of NSRs may also be applied for, from the EPD, as specified in the GW-TM.

For the purposes of compliance checking, after taking into account any adjustments agreed with the EPD, comparison with either the Limit or the Maximum Acceptable Impact Level shall represent the governing criteria for noise impact assessment during the Project EM&A.

6.2.7 Event and Action Plan (EAP)

The principle on which the EAP is based is the prescription of procedures and actions associated with the measurement of defined levels of noise impact recorded by the environmental monitoring process and defined in the table above. In cases where exceedance of these criteria occurs, the EMTL, the EATL, the Engineer and the Contractor shall strictly observe the relevant actions of the EAP shown in *Table 6.2d*.

Table 6.2d Event and Action Plan for Construction Noise

EVENT Action Level	ENPO		Engineer	Contractor
	EMTL	EATL		
1. Exceedance for one sample	2. Repeat measurement to confirm findings.	1. Identify the source(s) of impact.	1. Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1. In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3. Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.		2. Amend proposals if required by the Engineer or the EATL.
		5. Check monitoring data trends and Contractors' working methods.		3. Implement the remedial actions immediately upon instruction from the Engineer.
2. Exceedance for two or more consecutive samples	2. Repeat measurement to confirm findings.	1. Identify the source(s) of impact.	1. Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1. In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3. Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.	2. Discuss remedial actions required with the EATL and the Contractor.	2. Amend proposals if required by the Engineer or the EATL.
	10. If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5. Check monitoring data trends and Contractors' working methods.	3. Ensure agreed mitigation measures are fully implemented.	3. Implement the remedial actions immediately upon instruction from the Engineer.
		6. Discuss remedial actions required with the Engineer and the Contractor.		4. Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		7. Ensure agreed mitigation measures are fully implemented.		
		8. Assess the efficacy of remedial actions and keep the Contractor informed.		
		9. If exceedance continues, arrange meeting with Engineer to review implementation and identify further appropriate mitigation measures		

Limit Level			
2. Exceedance for two or more consecutive samples	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.Discuss remedial actions required with the EATL and the Contractor.
		5.Check monitoring data trends and Contractors' working methods.	3.Ensure agreed mitigation measures are fully implemented.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.	
		7.Ensure agreed mitigation measures are fully implemented.	
		8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.	
	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	10.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5.Check monitoring data trends and Contractors' working methods.	3.Amend proposals if required by the Engineer or the EATL.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.	4.Implement remedial actions immediately upon instruction from the Engineer.
		7.Ensure agreed mitigation measures are fully implemented.	5.Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.	
	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	10.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5.Check monitoring data trends and Contractors' working methods.	3.Amend proposals if required by the Engineer or the EATL.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.	4.Implement remedial actions immediately upon instruction from the Engineer.
		7.Ensure agreed mitigation measures are fully implemented.	5.Resubmit proposal to EATL and Engineer if the problem is still not under control.
		8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.	6.Stop the relevant portion of works as determined by the EATL and Engineer, until the exceedance is abated.
	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	10.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5.Check monitoring data trends and Contractors' working methods.	3.Amend proposals if required by the Engineer or the EATL.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.	4.Implement remedial actions immediately upon instruction from the Engineer.
		7.Ensure agreed mitigation measures are fully implemented.	5.Resubmit proposal to EATL and Engineer if the problem is still not under control.
		8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.	6.Stop the relevant portion of works as determined by the EATL and Engineer, until the exceedance is abated.

6.3 OPERATIONAL NOISE MONITORING

Normal practice, following the construction of a new road, is to undertake operational phase noise monitoring at potentially affected NSRs along the road in order to verify the efficacy of the recommended direct technical remedies. This is to ensure that the proposed mitigation measure, as implemented, are effective, and that the impact to the identified NSRs is within acceptable noise limits. However, as all the NSRs considered for the CKWLR are located a considerable distances from CKWLR, no adverse noise impact was predicted in the EIA to NSRs from the CKWLR's operational phase. As such, no mitigation measures have been specified for the CKWLR's operational phase and no noise monitoring is required.

6.4 MITIGATION MEASURES

The Project EIA has recommended noise control and mitigation measures during the construction phase of the CKWLR. Details of these recommendations are outlined in the Implementation Schedule (in *Annex B* of this EM&A Manual).

7 WATER QUALITY MONITORING

7.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations and mitigation measures for the monitoring and audit of water quality impacts from the construction of the CKWLR are presented.

7.2 METHODOLOGY AND CRITERIA

Water quality monitoring shall be carried out by the EMTL to ensure that any deteriorating water quality is readily detected and that timely action is taken to rectify the situation. The appropriate water quality mitigation measures are outlined in the Implementation Schedule (in *Annex B* of this EM&A Manual).

7.2.1 Water Quality Monitoring

The objectives of the water quality monitoring programme are as follows:

- to determine the effectiveness of the operational controls and mitigation measures employed, and the need for supplementary mitigation measures; and
- to check compliance with relevant WQOs;

Parameters to be measured *in situ* are:

- Dissolved oxygen (DO) (in mg L⁻¹ and % saturation);
- Temperature (°C);
- Turbidity (NTU);
- Salinity (mg L⁻¹); and
- Water depth (m).

Parameters to be measured in the laboratory are:

- suspended solids (mg L⁻¹);
- total inorganic nitrogen (mg L⁻¹); and
- un-ionised ammonia (mg L⁻¹).

In addition to the water quality parameters, other relevant data shall also be measured and recorded, including monitoring location / position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), special phenomena and work activities at the construction site.

A full listing of the water quality monitoring parameters to be monitored at each location is given in *Table 7.3a*, and a sample monitoring record sheet shown in *Annex A(1.4)*.

7.3 *MONITORING EQUIPMENT*

For water quality monitoring, the following equipment shall be supplied by the EMTL and approved by the EATL and the Engineer.

7.3.1 *Dissolved Oxygen and Temperature Measuring Equipment*

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⁻¹ and 0 - 200% saturation; and
- a temperature of 0 - 45 degrees Celsius.

It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 25 m in length. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary. (For example, YSI model 59 metre, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

7.3.2 *Turbidity Measurement Equipment*

Turbidity within the water shall be measured in-situ by the nephelometric method. The instrument shall be a portable, weatherproof turbidity-measuring unit complete with cable, sensor and comprehensive operation manuals. The equipment shall be operated from a DC power source, it shall have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU and shall be complete with a cable with at least 25 m in length (Hach 2100P or an approved similar instrument).

The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg L⁻¹). After calibration, turbidity measurements shall be taken as a true representation of levels of suspended solids only before laboratory test results for suspended solids are known.

7.3.3 *Water Depth Gauge*

A portable, battery-operated echo sounder (Seafarer 700 or a similar approved instrument) shall be used for the determination of water depth at each designated monitoring station. This unit shall either be hand-held or affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme.

7.3.4 *Salinity Measurement Instrument*

A portable salinometer capable of measuring salinity in the range of 0 - 40 mg L⁻¹ shall be provided for measuring salinity of the water at each monitoring location.

7.3.5 *Water Sampling Equipment*

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.

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.

7.3.6 *Positioning Device*

A boat-fixed type digital Differential Global Positioning System (DGPS) shall be used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

7.3.7 *Testing Protocols*

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, and subsequently re-calibrated at 3-monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes shall be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location. The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg l⁻¹) where possible.

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.

7.3.8 *Laboratory Analysis*

All laboratory work shall be carried out in a HOKLAS accredited laboratory. Water samples of about 1,000 ml shall be collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work shall start within 24 hours after collection of the water samples. The analyses shall follow the standard methods according to *Table 7.3a* and as described in *APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition*, unless otherwise specified.

Table 7.3a *Analytical Methods to be Applied to Marine Water Quality Samples*

Determinant	Standard Method
Suspended solids	APHA 2540D
Total inorganic nitrogen	APHA 4500-N _{org} / NO ₃ ; or equivalent methods subject to approval of DEP.
Ammonia	APHA 4500-NH ₃ G

For each of the testing methods details shall be submitted to the DEP for approval prior to the commencement of the monitoring programme. The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme. The QA/QC results shall be reported. EPD may request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter-laboratory calibration. Remaining samples after analysis shall be kept by the laboratory for 3 months in case repeat analysis is required. If *in-house* or non-standard methods are proposed, details of the method verification should, if required, be submitted to the EPD. In any circumstances, the sample testing shall have comprehensive quality assurance and quality control programmes. The laboratory shall be prepared to demonstrate the quality control programmes to the EPD or their representative if and when required.

7.4 *MONITORING LOCATIONS*

The water quality monitoring stations are shown in *Figure 7.4a*. Six Sensitive Receiver (SR) Stations have been chosen on the basis of their proximity to the dredging and filling operations and thus the greatest potential for water

quality impacts, as detailed in *Table 7.4a*. The nine SR monitoring locations are:

- SR1: Kau Yi Chau;
- SR2: Discovery Bay;
- SR3: Sze Pak Wan;
- SR4: Ma Wan Fish Culture Zone South;
- SR5: Ma Wan Fish Culture Zone North;
- SR6: Tung Wan Beach;

Table 7.4a *Locations of Marine Water Quality Monitoring Stations*

Station	Easting	Northing
SR1	825 607	816 216
SR2	820 268	817 870
SR3	821 033	819 153
SR4	823 827	823 208
SR5	823 827	823 705
SR6	824 511	823 518

As detailed in *Table 7.4b*, four Control Stations have been chosen for the CKWLR works to facilitate comparison of the water quality of the SR stations with ambient water quality conditions.

As no future activities have been planned, as yet, during the period of construction which may have potential water quality impacts in the study area, all control stations are located in areas not expected to be affected by other projects and which lie within the path of water body movements affecting the SR's but are outside the predicted influence of the CKWLR. Monitoring data from these control stations can be used as upstream and downstream controls for the SR stations. Locations of control stations shall be subject to change depending on the location and timing of dredging and other marine works projects in the Study Area. Any proposal for change to the locations of control/impact stations shall be subject to the EPD's approval.

Table 7.4b *Locations of Marine Water Quality Control Stations*

Station	Easting	Northing
C1	816 646	823 766
C2	816 688	820 581
C3	826 456	821 181
C4	825 871	824 880

Water quality monitoring shall be undertaken by suitably qualified members of the EMT. Water quality monitoring results from both the control and SR stations shall be compared to EPD's Water Quality Objectives (WQO), for the

Southern (SWCZ), North West(NWWCZ), and Western Water Control Zones (W WCZ), as follows:

- *Suspended Solids (SS)*: SS should not be raised above ambient levels by an excess of 30% nor cause the accumulation of SS which may adversely affect aquatic communities.
- *Dissolved Oxygen (DO)*: DO within 2m of the bottom should not be less than 2 mg l⁻¹ for 90% of the samples; depth averaged DO should not be less than 4 mg l⁻¹ for 90% of the samples during the whole year.
- *Ammonia (NH₃N)*: The unionised ammoniacal nitrogen level should not be more than 0.0021 mg L⁻¹, calculated as the annual average (arithmetic mean).
- *Nutrients (TIN)*: TIN should not exceed 0.5 mg L⁻¹ for the North Western WCZ and 0.4 for the Western Buffer WCZ, expressed as annual water column average.

Prior to the commencement of the EM&A programme, the EMTL shall seek approval of the proposed water monitoring stations from the EATL, the Engineer and the EPD.

When alternative monitoring locations are proposed, they should be chosen taking into regard the following criteria:

- at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA Report, which are likely to have water quality impacts;
- close to sensitive receptors which are directly or likely to be affected;
- for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance during monitoring;
- at two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations should be outside the area of influence of the works and, as far as practicable, not affected by any other works.

7.5

BASELINE MONITORING

The purpose of the baseline monitoring is 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 measurements shall be taken at all designated Control and SR stations, 3-days per week, at mid-flood and mid-ebb tides, for at least 4 consecutive weeks prior to the

commencement of the reclamation works. The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency will be increased.

Table 7.5a summarises the baseline monitoring programme for each water quality parameter.

Table 7.5a Summary of Baseline Monitoring Programme for Water Quality

Parameter	Monitoring Stations	Frequency	Total Number of Sampling Days
Dissolved Oxygen	All	Three days per week at each monitoring station	12
Temperature	All	Three days per week at each monitoring station	12
Turbidity	All	Three days per week at each monitoring station	12
Suspended Solids	All	Three days per week at each monitoring station	12
Salinity	All	Three days per week at each monitoring station	12
Ammoniacal Nitrogen	All	Three days per week at each monitoring station	12
Total inorganic nitrogen	All	Three days per week at each monitoring station	12

All measurements shall be carried out at three water depths, namely, 1 m below water surface, mid-water depth, and 1 m above sea bed as appropriate to the derivation of Action and Limit levels. If the water depth is less than 6 m, the mid-depth measurement may be omitted subject to the approval of the EATL and the Engineer. If the depth is less than 3 m, only the mid-depth measurement needs to be taken subject to the approval of the EATL and the Engineer. There shall not be any marine construction activities in the vicinity of the stations during the baseline monitoring. All parameters should be measured at the control stations on each monitoring day.

The Baseline monitoring results will be approved by the EATL.

7.6 IMPACT MONITORING

7.6.1 Construction Phase

During the course of the marine works associated with the CKWLR, impact monitoring shall be undertaken on three working days per week. Monitoring at each station shall be undertaken at both mid-ebb and mid-flood tides on the same day. The interval between two sets of monitoring shall not be less than 36 hours. Two consecutive measurements of DO concentration (mg l^{-1}), DO

saturation (%) and turbidity (NTU) will be taken *in situ* at 1 metre below the surface, mid-depth and 1 metre above the seabed at each station. The monitoring probes shall be retrieved out of water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings shall be taken. Water samples for SS(mg l⁻¹), NH₃-N(mg l⁻¹) and TIN (mg l⁻¹) measurements shall be collected at the same three depths. As for the *in situ* measurements, duplicates will be taken at both Control and SR Stations.

In addition to the above in-situ measurements temperature, salinity and pH will be determined at all Control and SR stations at the same three depths, as specified above.

For the purpose of evaluating water quality, the values obtained from individual water depths (i.e. surface, middle, bottom) will be assessed individually against specified WQOs criteria. Note that in addition to the monitoring location/position, time, water depth, water temperature, salinity, weather conditions, sea conditions, tidal stage, and any special phenomena and work underway at the dredging site shall be recorded.

Upon completion of all marine activities, a post project monitoring exercise water quality shall be carried out for four weeks, in the same manner as the monitoring during construction.

7.7 COMPLIANCE ASSESSMENT

Water quality monitoring results will be evaluated against Action and Limit levels as shown in *Table 7.7a*. For all other parameters, Action and Limit Levels shall be proposed by the EMTL for agreement with the EATL and the EPD following the completion of the baseline monitoring. Exceedances of the Action and Limit level may, as necessary, result in changes to the monitoring and dredging operations, potentially involving increased monitoring and implementation of appropriate mitigation measures.

Table 7.7a Action and Limit for Water Quality

Parameters	Action	Limit
DO in mg L ⁻¹ (Surface, Middle and Bottom).	<u>Surface and Middle</u> 5 th percentile of baseline data for surface and middle layer	<u>Surface and Middle</u> For non-FCZ stations the limit level shall be 4 mg L ⁻¹ or 1% of baseline data for surface and middle layer, whereas for FCZ stations the limit level shall be 5 mg L ⁻¹
	<u>Bottom</u> 5 th percentile of baseline data for bottom layer	<u>Bottom</u> 2 mg L ⁻¹ or 1% of baseline data for bottom layer
SS in mg L ⁻¹ (depth-averaged)	95 th percentile of baseline data and 120% upstream control station's SS at the same tide of the same day	99 th percentile of baseline, or 130% of upstream control station's SS at the same tide of the same day
Turbidity (Tby) in NTU (depth-averaged)	95 th percentile of baseline data or 120% of upstream control station's Tby at the same tide on the same day	99 th percentile of baseline data or 130% of upstream control station's Tby at the same tide on the same day
NH ₃ -N in mg L ⁻¹ (depth averaged)	95 th percentile of baseline data	99 th percentile of baseline data or 0.021 mg L ⁻¹ for unionised ammoniacal nitrogen, whichever is greater.
TIN in mg L ⁻¹ (depth averaged)	95 th percentile of baseline data	99 th percentile of baseline data or 0.5 mg L ⁻¹ for the North Western WCZ, 0.4 for the Western Buffer WCZ, and 0.1 Southern WCZ whichever is greater.

Notes:

- "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths;
- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- For SS and Tby, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered necessary.
- Whichever of the two criteria is greater shall be used as the Action and Limit levels, subject to approval from EPD.
- Unionised ammoniacal nitrogen shall be calculated from the monitored ammoniacal nitrogen based on temperature, pH and salinity which are routinely monitored.

7.8**EVENT AND ACTION PLAN**

Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria have been exceeded, the actions in accordance with the Event and Action Plan in *Table 7.8a* shall be carried out.

Table 7.8a Event and Action Plan for Construction Phase Water Quality

EVENT Action Level	ENPO		Engineer	Contractor
	EMTL	EATL		
1. Exceedance for one sample	2.Repeat in-situ measurement to confirm findings;	1. Identify the source(s) of impact.	1.Discuss proposed mitigation measures with EATL and Contractor;	1.Rectify unacceptable practice; Check all plant and equipment.
	6.Repeat measurement on next day of exceedance.	3.Inform Engineer and EPD and confirm notification of the non-compliance in writing; 4.Check monitoring data, all plant, equipment and Contractors' working methods; 5.Discuss mitigation measures with Engineer and Contractor; 7.Assess the effectiveness of the implemented mitigation measures.	2.Make agreement on the mitigation measures to be implemented; 3.Ensure mitigation measures are implemented.	2.Consider changes of working methods; 3.Propose and discuss mitigation measures with Engineer and EATL; 4.Implement the agreed mitigation measures.
Action level exceeded on more than two consecutive sampling days	1.Repeat in-situ measurements to confirm findings;	1. Identify source(s) of impact;	1.Discuss proposed mitigation measures with EATL and Contractor;	1.Rectify unacceptable practice; Check all plant and equipment;
	7.Following the implementation of the mitigation measures increase the monitoring frequency to daily; 9.Repeat measurement on next day of exceedance.	2. Inform Engineer and EPD and confirm notification of the non-compliance in writing; 3. Check monitoring data, all plant, equipment and Contractors' working methods; 4. Discuss mitigation measure with Engineer and Contractor; 5. Ensure mitigation measures are implemented; 6. Assess the effectiveness of the implemented mitigation measures.	2.Make agreement on the mitigation measures to be implemented; 3.Ensure mitigation measures are implemented.	2.Consider changes of working methods; 3.In consultation with the EATL and the Engineer, propose and agree mitigation measures within 3 working days; 4.Implement the agreed mitigation measures.

Table 7.5a Event and Action Plan for Construction Phase Water Quality (Continued)

EVENT	ENPO		Engineer	Contractor
	EMTL	EATL		
Limit Level				
Limit level exceeded on one sampling day	1.Repeat in-situ measurement to confirm findings;	2.Identify source(s) of impact;	1.Discuss proposed mitigation measures with EATL and Contractor;	1.Rectify unacceptable practice;
	7.Increase the monitoring frequency to daily until no exceedance of Limit level.	3.Inform Engineer and EPD and confirm notification of the non-compliance in writing;	2.Request Contractor to critically review the working methods;	2.In consultation with the EATL and the Engineer, propose and agree mitigation measures within 3 working days;
		4.Check monitoring data, all plant, equipment and Contractors' working methods;	3.Make agreement on the mitigation measures to be implemented;	3.Implement the agreed mitigation measures.
		5.Discuss mitigation measure with Engineer and Contractor;	4.Ensure mitigation measures are implemented.	
		6.Ensure mitigation measures are implemented;		
		8.Assess the effectiveness of the implemented mitigation measures.		
	1.Repeat in-situ measurement to confirm findings;	2.Identify source(s) of impact;	1.Discuss proposed mitigation measures with EATL and Contractor;	1.Rectify unacceptable practice;
	7.Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	3.Inform Engineer and EPD and confirm notification of the non-compliance in writing;	2.Request Contractor to critically review the working methods;	2.In consultation with the EATL and the Engineer, propose and agree mitigation measures within 3 working days;
		4.Check monitoring data, all plant, equipment and Contractors' working methods;	3.Make agreement on the mitigation measures to be implemented;	3.Implement the agreed mitigation measures.
		5.Discuss mitigation measure with Engineer and Contractor;	4.Ensure mitigation measures are implemented.	4. As directed by the Engineer, to slow down or to stop all or part of the marine work or construction activities.
		6.Ensure mitigation measures are implemented;	5.Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of limit level.	
		8. Assess the effectiveness of the implemented mitigation measures.		

7.9 *MITIGATION MEASURES*

Details of all the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

7.10 *AUDITING REQUIREMENTS*

In order to ensure that water resources are adequately protected it will be necessary to undertake audits to ensure the effective implementation of the recommended mitigation measures. In particular, it will be necessary to ensure that dredging rates are regularly audited in order to ensure compliance with the EIA report's assumptions and recommendations.

Details of the recommended mitigation measures are outlined in the Implementation Schedule (in *Annex B* of this EM&A Manual).

8 WASTE MANAGEMENT

8.1 INTRODUCTION

This section sets out the handling, recycling, storage, transportation and disposal measures which are recommended to avoid or minimise potential adverse impacts associated with waste arising from the construction of the Penny's Bay Reclamation and the associated Theme Park developments.

8.2 WASTE MANAGEMENT PRACTICES

Construction Phase

The construction Contractors should incorporate these recommendations into a Waste Management Plan for the construction works. Such a management plan should incorporate site specific factors, such as the designation of areas for the segregation and temporary storage of reusable and recyclable materials.

Possible waste arising during the construction phase will include dredged/excavated sediment, construction and demolition waste, chemical waste and general refuse. Excavated material will also be generated but it is expected that all of this can be re-used on-site and no off-site disposal is required.

The Implementation Schedule (*Annex B* of this EM&A Manual) provides details on the appropriate mitigation measures for avoiding and preventing adverse environmental impacts associated with dredged/excavated sediment, construction and demolition waste, chemical waste and general refuse. The Waste Management Plan should be refined and updated as more detailed information is available such as the volume of dredged/excavated sediment and C&D waste arisings. Similarly, it should be regularly reviewed, and updated as appropriate, throughout the course of the construction works to ensure that it remains current with the latest detailed information and works practices.

The Waste Management Plan should also outline the requirements for a waste audit programme to ensure the measures outlined in the plan are effectively implemented and adhered to.

8.3 REQUIREMENTS OF A WASTE MANAGEMENT PLAN

The Contractor's Waste Management Plan should include, but not limited to, the following issues:

- Waste Avoidance Measures;

- Material Recovery and Recycling Programme; and
- Waste Management Audit Framework.

The Waste Management Plan should also include a refined list of potential waste types arising from the CKWLR construction works. For each waste type, detailed information on practical avoidance measures, recovery and recycling targets, collection, transportation and disposal options should be included.

The Contractor will be responsible for ensuring that only approved licensed waste collectors are used to collect and transport waste, and that appropriate measures are implemented to minimise adverse impacts, including windblown litter and dust during the transportation of these wastes. In addition, the Contractors must ensure that all necessary waste disposal permits are obtained.

The Waste Management Plan should be prepared and updated by the Contractor, as required, to ensure that it remains current with the latest working practices and best practice. The WMP should be submitted to the Engineer for approval.

8.4 *EM&A RECOMMENDATIONS*

In order to ensure that the construction Contractors have implemented the recommendations of the EIA Report, the EAT shall conduct regular site audits of each of the waste streams, to determine if wastes are being managed in accordance with the approved procedures and the site Waste Management Plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, transport and disposal. An appropriate audit programme should be undertaken with the first audit conducted at the commencement of the construction works and then quarterly audit, thereafter. The scope of the waste management audits is presented below.

8.4.1 *Objectives of the Waste Audit*

The aims of the waste management audit will include, but are not limited to, the following:

- ensuring that the wastes arising from works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner and comply with the relevant requirements under the *Waste Disposal Ordinance (WDO)* and its regulations;
- ensuring that the Contractors properly implement the appropriate environmental protection and waste pollution control mitigation measures, as outlined in *Section 8.3* and the Implementation Schedule (in

Annex B of this EM&A Manual) to minimise and control the potential for waste impacts;

- ensuring the effective implementation of the Contractors' Environmental Management System (EMS) and waste management plan; and
- to encourage the reuse and recycling of materials.

8.4.2 *Methodology and Criteria*

The construction Contractors should ensure that the necessary waste disposal permits or licences are obtained from appropriate authorities in accordance with the various Ordinances. In addition to the EAT audits, each construction Contractor should designate a member of staff as being responsible for inspecting and auditing the on-site waste management practices on a bi-weekly basis, with reference to the relevant legislation and guidelines as well as the recommendations given in the Implementation Schedule contained in *Annex B* of this EM&A Manual, and defined below:

General Legislation for Waste Management

- *Waste Disposal Ordinance* (Cap 354);
- *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354);
- *Land (Miscellaneous Provisions) Ordinance* (Cap 28);
- *Public Health and Municipal Services Ordinance* (Cap 132) - *Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws*;
- *Dumping at Sea Ordinance* (1995).
- the storage, handling and disposal of chemical waste should be audited with reference to the requirements of the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* published by the EPD.

Other Relevant Guidelines

- *Waste Disposal Plan for Hong Kong* (December 1989), Planning, Environment and Lands Branch Government Secretariat;
- *Environmental Guidelines for Planning In Hong Kong* (1990), Hong Kong Planning and Standards Guidelines, Hong Kong Government;
- *New Disposal Arrangements for Construction Waste* (1992), Environmental Protection Department & Civil Engineering Department;
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* (1992), Environmental Protection Department.
- *Works Branch Technical Circular No. 6/92, Fill Management*; Works Branch, Hong Kong Government;
- *Works Branch Technical Circular 22/92, Marine Disposal of Dredged Mud*;

- *Works Branch Technical Circular, 32/92, The Use of Tropical Hard Wood on Construction Site*; Works Branch, Hong Kong Government;
- *Technical Circular No 1-1-92 Classification of Dredged Sediments for Marine Disposal*, Environmental Protection Department;
- *Works Branch Technical Circular No. 2/93, Public Dumps*, Works Branch, Hong Kong Government;
- *Works Branch Technical Circular No. 16/96, Wet Soil in Public Dumps*; Works Branch, Hong Kong Government;
- *Works Bureau Technical Circular No. 4/98, Use of Public Fill in Reclamation and Earth Filling Projects*; Works Bureau, Hong Kong SAR Government;
- *Works Bureau Technical Circular No 5/98, On-site Sorting of Construction Waste on Demolition Site*; Works Bureau, Hong Kong SAR Government;
- *Waste Reduction Framework Plan, 1998 to 2007*, Planning, Environment and Lands Bureau, Government Secretariat, 5 November 1998;
- *Works Bureau Technical Circular No 5/99, Trip-ticket System for Disposal of Construction and Demolition Material*; Works Bureau, Hong Kong SAR Government; and
- *Work Bureau Technical Circular No. 25/99, Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers*; Works Bureau, Hong Kong SAR Government.

8.5

MITIGATION MEASURES

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

TERRESTRIAL ECOLOGY

This Section defines the EM&A requirements that have been recommended for the CKWLR to ensure that the proposed terrestrial ecological mitigation measures are effective.

9.1

ECOLOGICAL MONITORING REQUIREMENTS

Specific monitoring programmes are recommended for the White-bellied Sea Eagles at Pa Tau Kwu and the restricted plant, *Thespesia populnea*. The monitoring field work should be undertaken by suitably qualified avian specialists / botanists, respectively, with at least three years of local experience in ecological monitoring.

9.1.1

White-bellied Sea Eagles

Baseline

Monitoring should be undertaken for 3 months (February-April 2000) prior to commencement of works, and should have as its primary focus, the establishment of baseline data on the White-bellied Sea Eagles on Pa Tau Kwu. The monitoring should aim to establish whether or not the White-bellied Sea Eagles are still present, and if so, what are their routine activities on Pa Tau Kwu prior to the start of the reclamation works.

Field surveys of one days duration should be undertaken twice per month in order not to disrupt the birds' breeding activity. Information should be collected on behaviour, breeding activity, and responses to any disturbances.

Monitoring During Construction

During construction, field surveys should be at a frequency of twice per month during periods of breeding activity (October to April), and once per month at other times of the year. The field surveys should be evenly spread over the duration of the monitoring programme. Information should be collected on behaviour, breeding activity, and any responses to disturbances. Any disturbance of the breeding pair should be examined in conjunction with the construction noise monitoring and other events related to the works.

A simple Event and Action Plan is recommended in *Table 9.1a*. This plan assumes that the White-bellied Sea Eagles are seldom absent from their territory on Pa Tau Kwu and this will be verified during the baseline monitoring.

Table 9.1a *Event and Action Plan for Construction Phase*

Event	Action		
	ENPO Environmental Monitoring Team	ENPO Environmental Auditing Team	Contractor
White-bellied Sea Eagle absence for a whole day during the monitoring period	1. Increase monitoring to daily frequency	1. Notify Site Engineer 2. If absence persists, review construction activities, within 1 km from nest site, and noise monitoring results from the previous week 3. Submit recommendations for remedial action, such as adjustment of construction method. 4. Discuss remedial actions with Site Engineer and Contractors 5. Liaise with Environmental Monitoring Team regarding the effectiveness of the remedial actions	1. Implement agreed remedial action

Operational Phase

No operational phase monitoring is required for the White-bellied Sea Eagles, as no adverse impact would be expected due to the CKWLR.

9.1.2 *Rare/Restricted/Protected Plant*

Before the works commence, the affected restricted plant species, *Thespesia populnea*, will be transplanted to a suitably selected site (see Section 7.7.1 of the EIA Report). After transplantation of the restricted plants is complete, monitoring shall be undertaken to check the performance, health and condition of the plants and to ensure that they are experiencing no adverse effects. The monitoring shall be undertaken at monthly intervals for a period of three years. The field monitoring should be evenly spread over the duration of the monitoring programme.

9.2 *MITIGATION MEASURES*

Details of the recommended mitigation measures are included within the Implementation Schedule (in Annex B of this EM&A Manual).

9.3 *AUDITING REQUIREMENTS*

The implementation of the mitigation measures recommended in the Implementation Schedule should be assessed as part of the EM&A programme. The assessment should evaluate the effectiveness and suitability of the mitigation measures rather than simply verifying their implementation.

10 MARINE ECOLOGY

10.1.1 Construction EM&A Requirements

General

The constraints on dredging and filling operations defined within the water quality section of the EIA Report will act as appropriate mitigation measures to control the environmental impacts to marine ecological resources to within acceptable levels. Actual impacts of construction activities associated with the CKWLR will be monitored through impacts to water quality (see *Section 7 of this EM&A Manual*). EM&A activities designed to detect and mitigate any unacceptable impacts to water quality will serve to proactively protect against unacceptable impacts to marine ecological resources. Should any impacts be detected, the procedures outlined in the water quality Event and Action Plan for implementing appropriate mitigation will serve to protect against unacceptable impacts to marine ecological resources, thereby ensuring the environmental acceptability of the project.

According to the *EIAO TM Section 8.3 (c)* an EM&A programme would be required in a situation where:

- "the project involves mitigation measures of which the effectiveness may require a long period to establish"

This *Section 8.3 (c)* of the *EIAO TM* is applicable in this situation as the effectiveness of providing rubble mound seawalls for the recolonisation of corals will take time to evaluate. In response to this it is recommended that an ecological monitoring and audit programme be conducted to monitor the process of recolonisation of the area once the construction works have been completed. Before monitoring can begin, details of the monitoring programme should be agreed with AFCD and EPD.

The objective of the ecological monitoring programme is to determine the rate and effectiveness of colonisation of the rubble mound seawall by coral assemblages. Ecological monitoring and audit will consist of subtidal dive surveys after reclamation works have ceased. Once the seawalls are constructed the frequency of monitoring should be at six monthly intervals for a period of three years. This monitoring and audit will be used to assess the extent of recolonisation of rubble mound seawalls by corals. Results of these surveys are to be reported to EPD and AFCD and will form the basis for deciding whether any further mitigation measures are necessary.

10.1.2 *Operation EM&A Requirements*

General

As no impacts to marine ecological resources are predicted to occur as a result of the operation of the CKWLR, the development and implementation of a monitoring and audit programme specifically designed to assess the effects of operational activities on marine ecological resources is not deemed necessary.

10.2 *MITIGATION MEASURES*

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

11 FISHERIES

11.1 THE EM&A RECOMMENDATIONS

The impacts of the reclamation activities on fisheries resources will be monitored indirectly through the water quality EM&A programme. The mitigation measures recommended to protect fisheries resources are identified in the Implementation Schedule (in *Annex B* of this EM&A Manual).

11.2 ENVIRONMENTAL MONITORING AND AUDIT

11.2.1 Construction Phase

The constraints on dredging and filling operations defined within the water quality section of the EIA Report will act as appropriate mitigation measures to control the environmental impacts to fisheries resources to within acceptable levels. Actual impacts of construction activities associated with the CKWLR will be monitored through impacts to water quality (see *Section 7 of this EM&A Manual*). EM&A activities designed to detect and mitigate any unacceptable impacts to water quality will serve to proactively protect against unacceptable impacts to fisheries resources. Should any impacts be detected, the procedures outlined in the water quality Event and Action Plan for implementing appropriate mitigation will serve to protect against unacceptable impacts to fisheries resources, thereby ensuring the environmental acceptability of the project. Consequently, the development and implementation of a monitoring and audit programme specifically designed to assess the effects of construction activities on fisheries resources is not deemed necessary.

11.2.2 Operational Phase

As no unacceptable impacts to fisheries resources are predicted to occur from the operation of the CKWLR, the development and implementation of a monitoring and audit programme specifically designed to assess the effects of operational activities on fisheries resources is not deemed necessary.

11.3 MITIGATION MEASURES

No fisheries-specific mitigation measures are required during construction or operational phases.

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12 CULTURAL HERITAGE IMPACT

12.1 INTRODUCTION

The EIA Report assessed the potential impacts to cultural and heritage resources from the Project's implementation. Whilst no specific environmental monitoring and auditing activities have been recommended, the EIA Report did specify a number of mitigation measures that should be implemented to minimise the potential impacts to cultural and heritage resources.

In order to ensure that these mitigation measures are fully and effectively implemented during the construction phase, it is recommended that the Contractors' compliance with these requirements is assessed as part of the regular auditing programme defined in *Section 16* of this Manual.

No operational phase mitigation measures have been recommended, and there is therefore no requirement to include cultural and heritage considerations within the operational phase EM&A Programme.

12.2 MITIGATION MEASURES

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

12.3 AUDITING REQUIREMENTS

The implementation of the mitigation measures recommended in the Implementation Schedule should be assessed as part of the EM&A programme. The assessment should evaluate the effectiveness and suitability of the mitigation measures rather than simply verifying their implementation.

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Based on the identification of hazard sources within the CKWLR Study area, no significant increase in overall risks from the hazard sources has been found for the construction or operation of CKWLR. It has been concluded that the Draft RODP is compatible with Hong Kong Risk Guidelines and are feasible from hazard to life considerations.

No mitigation measures or audit requirements have been identified for this section.

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14 LANDSCAPE AND VISUAL

14.1 INTRODUCTION

This section identifies a range of measures to mitigate against landscape and visual impacts associated with the construction phase of the Project. The main recommended mitigation measures are as follows.

14.2 GENERAL

The Northshore Lantau area is rural in nature with significant intrusions along the north coast in the form of the NLH. Elements consist of natural and man-made coastlines, bay and coastal waters, undulating hills and upland areas, associated with Fa Peng Teng, Tai Yam Teng and Tai Shan, and some small streams and associated valleys. Much of the coastline has already been disturbed or reclaimed.

Landscape and Visual Impacts will be concentrated on the south and east Fa Peng Teng hillsides due to cut slopes for the construction of the CKWLR and the service reservoir, although much of the hillsides will retain their overall character. Additional smaller impacts will occur on the Yam O headland due to the loss of woodland for CKWLR.

A range of mitigation measures have been proposed to reduce landscape impacts in the form of compensatory planting and provision of naturalistic contours. Rough blasting for cut slopes will reduce impacts to the greatest extent. Visually impacts will be substantially alleviated by mitigation measures. Adverse landscape and visual quality impacts that persist are associated chiefly with the slope cutting for CKWLR at Pa Tau Kwu. In accordance with the EIAO TM, the landscape and visual impact is considered acceptable with mitigation

14.3 MITIGATION MEASURES

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

14.4 AUDITING REQUIREMENTS

The implementation of the mitigation measures recommended in the Implementation Schedule should be assessed as part of the EM&A programme. The assessment should evaluate the effectiveness and suitability of the mitigation measures rather than simply verifying their implementation.

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15 LAND CONTAMINATION

15.1 INTRODUCTION

Within the scope of the original Study Brief issued by the EPD for the Theme Park, a review has been undertaken to determine whether there are likely to be any potential land contamination impacts as a result of the Project's implementation. As no contamination concerns have been identified for the Schedule 2 Designated Projects that have been considered within this EIA Report, no specific environmental monitoring and auditing activities have been recommended.

However, the Cheoy Lee Shipyard will need to be appropriately remediated prior to the implementation of the Road P2, the Chok Ko Wan Link Road and the Penny's Bay Rail Link. The detailed requirements for the remediation of this site will be assessed later as part of the Schedule 2 EIA for the Decommissioning of the Cheoy Lee Shipyard, and an Environmental Permit will need to be obtained before the decommissioning works are commenced.

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16 ENVIRONMENTAL AUDITING

16.1 SITE INSPECTIONS

Site inspections provide a direct means to track and ensure the enforcement of specified environmental protection and pollution control measures. The inspections should be undertaken routinely by the EATL to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Additionally, the EATL shall be responsible for defining the scope of the inspections, detailing any deficiencies that are identified, and reporting any necessary action or mitigation measures that were implemented as a result of the inspection.

Site inspections shall be carried out at least once per week. The areas of inspection should include the general environmental conditions in the vicinity of the site and the pollution control and mitigation measures within the site; it should also review the environmental conditions outside the site area which are likely to be affected, directly or indirectly, by site activities. The EATL shall make reference to the following information in conducting the inspections:

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- works progress and programme;
- individual works method statements which shall include proposals on associated pollution control measures;
- the contract specifications on environmental protection;
- the relevant environmental protection and pollution control laws; and
- previous site inspection results undertaken by the EATL.

The inspection results and their associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the Engineer and the Contractor, as appropriate, within 24 hours, for reference and for taking immediate action. They shall also be presented, along with the remedial actions taken, in the monthly EM&A report. The Contractor shall follow the procedures and time-frames stipulated in the environmental site inspection for the implementation of mitigation proposals and the resolution of deficiencies in the Contractors' EMS. An action reporting system shall be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

Ad hoc site inspections shall also be carried out by the EATL if significant environmental problems are identified. Inspections may also be required

subsequent to receipt of an environmental complaint, or as part of the associated investigation work.

16.2 COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS

There shall be contractual environmental protection and pollution control requirements, which the Contractor shall comply with, in addition to Hong Kong's environmental protection and pollution control laws.

The EATL shall review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.

The Contractors shall also regularly copy relevant to the EATL so that the checking and auditing process can be carried out. The relevant documents are expected to include the updated Work Progress Reports, the updated Works Programme, the application letters for different licences/permits under the environmental protection laws, and all the valid licences/permit. The site diary shall also be available, upon request, to the EATL during his site inspection.

After reviewing the documentation, the EATL shall advise the Engineer and the Contractors of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the EATL's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works is incompatible with the works programme or may result in a potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractors and the Engineer accordingly.

Upon receipt of the advice, the Contractors shall undertake immediate action to remedy the situation. The Engineer shall follow up to ensure that appropriate action has been taken by the Contractors in order that the environmental protection and pollution control requirements are fulfilled.

16.3 ENVIRONMENTAL COMPLAINT

Complaints shall be referred to, and investigations co-ordinated by the ENPO. The EATL shall implement the complaint investigation procedures; which shall comprise the following upon receipt of a complaint:

- log complaint and date of receipt onto the complaint database;

- investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- if considered necessary following consultation the Engineer, liaise with the EMTL so that the EMT undertake monitoring to verify the existence and severity of the alleged complaint;
- if a complaint is valid and due to works, identify mitigation measures;
- if mitigation measures are required, advise the Engineer and Contractor accordingly;
- review the Contractors' response on the identified mitigation measures, and the updated situation;
- if the complaint is transferred from the EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
- undertake additional audits and/or inspections, and if necessary co-ordinate with the EMTL so that the EMT undertake additional monitoring to verify the effectiveness of the mitigation measures;
- report the investigation results and the subsequent actions to the complainant for responding to the complainant (if the source of complaint is EPD, the results should be reported within the time frame assigned by EPD); and
- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports and filing system.

During the complaint investigation work, the Contractor and Engineer shall cooperate with the EATL in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation works. The Engineer shall ensure that the measures have been carried out by the Contractor.

A flow chart of the complaint response procedures is shown in *Figure 16.3a*, with a suggested format for a complaint proforma shown in *Annex A(1.1)*.

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17 REPORTING

17.1 GENERAL

The primary reporting function, undertaken within the EM&A programme, will be the issuance of formal exceedance notifications, corrective actions and ongoing feedback between the EATL, the Contractor and the Engineer. Reporting will be driven by the results of the monitoring and audit programme and will be recorded through written correspondence, site inspections and minutes and notes of meetings.

In addition, periodic reviews of the EM&A process and subsequent revisions to the EM&A Manual, as appropriate, will be prepared and circulated to relevant personnel within the Contractors' Project Team as a means of gauging site staff and contractor performance. The periodic reviews will comprise Monthly, Biannual and Annual EM&A Reports; these reports will be copied to the EPD for comment. The exact details of the frequency, distribution and time frame for submission shall be agreed with the EPD prior to the commencement of the works.

The following reporting requirements are based upon a paper documented approach. However, the same information can be provided in an electronic medium (such as the EPD's *Specialised Electronic Environmental Monitoring and Audit* (SEEMA) software (or a similar alternative)) upon agreeing the format with the Engineer, the EATL and the EPD. All the monitoring data (baseline and impact) shall also be submitted to diskettes in an agreed format.

17.2 BASELINE MONITORING REPORT

The EATL shall prepare and submit a draft Baseline Environmental Monitoring Report within 10 working days of the completion of the baseline monitoring. Copies of the Baseline Report shall be submitted to the Engineer and the EPD for their agreement. Copies shall also be provided to the Contractors for their information. The exact number of copies required by each party will be established through liaison. The draft report will be supported by the baseline monitoring data in electronic format, along with information covering the monitoring locations and conditions, equipment and protocols. The agreed baseline report will then be reissued as a stand alone report.

The form and content of the report and the representation of baseline monitoring data shall be in a format to the satisfaction of EPD and include, but not limited to the following:

- (a) up to half a page executive summary;

- (b) brief project background information;
- (c) drawings showing locations of the baseline monitoring stations;
- (d) an updated construction programme with milestones of environmental protection/mitigation activities annotated;
- (e) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration;
 - QA/QC results and detection limits.
- (f) details on influencing factors, including:
 - major activities, if any, being carried out on the Site during the period;
 - weather conditions during the period;
 - other factors which might affect the results;
- (g) determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data; the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- (h) revisions for inclusion in the EM&A Manual; and
- (i) comments and conclusions.

17.3

EM&A REPORTS

The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the EMTL and EATL. The reports shall be submitted to the EPD within 10 working days of the end of each calendar month, with the first report due in the month after construction works commence. Copies shall also be submitted to the Contractor and Engineer for information. The EATL shall liaise with the relevant parties to confirm the exact number and format of monthly reports in both hard copy and electronic format. However, it is envisaged that each party will receive no more than a maximum 4 copies of each monthly EM&A report. The EATL shall review the number and location of monitoring stations and parameters to monitor every 6 months or on an as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

The report shall include, but not be limited to, the following elements:

17.3.1 First Monthly EM&A Report

The first monthly EM&A report shall include at least but not be limited to the following :

(a) Executive Summary (1-2 pages);

- Breaches of AL levels;
- Complaint Log;
- Notifications of any summons and successful prosecutions;
- Reporting Changes;
- Future key issues.

(b) Basic Project Information

- Project organisation including key personnel contact names and telephone numbers;
- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
- Management structure; and
- Works undertaken during the month;

(c) Environmental Status

- Works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage fines in the fill material used); and
- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

(d) Summary of EM&A requirements including:

- All monitoring parameters;
- Environmental quality performance limits (Action and Limit levels);
- Event-Action Plans;
- Environmental mitigation measures, as recommended in the project EIA study final report;
- Environmental requirements in contract documents;

(e) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated implementation schedule.

(f) Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth);
- Monitoring date, time, frequency, and duration;
- Weather conditions during the period;
- Graphical plots of trends of monitored parameters in the month annotated against;
- The major activities being carried out on site during the period;
- Weather conditions that may affect the results; and
- Any other factors which might affect the monitoring results;
- QA/QC results and detection limits.

(g) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

(h) Others

- An account of the future key issues as reviewed from the works programme and work method statements;
- Advice on the solid and liquid waste management status; and

- Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarising the EM&A of the period.

17.3.2 *Subsequent Monthly EM&A Reports*

The subsequent monthly EM&A reports shall include the following:

(a) Executive Summary (1-2 pages)

- Breaches of AL levels
- Complaint Log
- Notifications of any summons and successful prosecutions;
- Reporting Changes
- Future key issues

(b) Environmental Status

- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
- Works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

(c) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated implementation schedule.

(d) Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth);
- Monitoring date, time, frequency, and duration;
- Weather conditions during the period;
- Graphical plots of trends of monitored parameters in the month annotated against;
- The major activities being carried out on site during the period;

- Weather conditions that may affect the results; and
 - Any other factors which might affect the monitoring results;
 - QA/QC results and detection limits.
- (e) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
- Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - Record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
 - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
 - Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (f) Others
- An account of the future key issues as reviewed from the works programme and work method statements; and
 - Advice on the solid and liquid waste management status.
- (g) Appendix
- AL levels
 - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - i) major activities being carried out on site during the period;
 - ii) weather conditions during the period; and
 - iii) any other factors which might affect the monitoring results
 - Monitoring schedule for the present and next reporting period
 - Cumulative statistics on complaints, notifications of summons and successful prosecutions
 - Outstanding issues and deficiencies

17.4 QUARTERLY EM&A SUMMARY REPORTS

The quarterly EM&A summary report, which shall be produced by the EMTL/EATL, should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

- (a) up to half a page executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- (c) a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the project EIA study final report;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the 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;
- (g) advice on the solid and liquid waste management status;
- (h) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (i) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (j) for project where measurement of suspended solids is required, an quarterly assessment of construction impacts on suspended solids at the

project site, including, but not limited to, a comparison of the difference between the quarterly mean and 1.3 times of the ambient mean, which is defined as 30% increase of the baseline data or EPD data, of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 on water quality times of the ambient mean ($p < 0.05$).

- (k) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (l) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (m) a summary record of notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (n) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- (o) proponents' contacts and any hotline telephone number for the public to make enquiries.

17.5

FINAL EM&A SUMMARY REPORT

The EM&A programme shall be terminated upon completion of those construction activities that have the potential to result in a significant environmental impact.

Prior to the proposed termination, it may be advisable to consult relevant local communities (such as village representatives/committees and/or District Boards). The proposed termination should only be implemented after the proposal has been endorsed by the EATL, the Engineer and the project proponent, and following final approval from the Director of Environmental Protection.

The final EM&A summary report shall include, inter alia, the following:

- (a) an executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contracts of key management, and a synopsis of work undertaken during the entire construction period;

- (c) a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the project EIA study final report;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the 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; and
 - the return of ambient environmental conditions in comparison with baseline data;
- (g) compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;
- (h) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- (i) advice on the solid and liquid waste management status;
- (j) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (k) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (l) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (m) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (n) review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);

- (o) a summary record of notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (p) review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures) recommend any improvement in the EM&A programme; and
- (q) a conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

17.6

DATA KEEPING

Documentation such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, such documents shall be well kept by the EMTL/EATL, as appropriate, and shall be available for inspection upon request. All relevant information shall be clearly and systematically recorded in the documents. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. The water quality data software format shall be agreed with EPD. All the documents and data shall be kept for at least one year after completion of the construction contract.

17.7

INTERIM NOTIFICATION OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES

Interim notifications of exceedances of Limit levels will be issued to the EPD within 24 hours of the identification of an exceedance. The Monthly Reports will contain all available details concerning measures, exceedances and complaints, their causes and those steps taken to control and prevent their recurrence. A suggested format for a complaints proforma is in *Annex A (1.1)*.

18 *EM&A REQUIREMENTS FOR ADDITIONAL INFRASTRUCTURE PROJECTS ASSOCIATED WITH THE NLDFS*

18.1 *INTRODUCTION*

The previous 'technical sections' have all been focussed upon the EM&A requirements for the CKWLR as this is the component of the NLDFS that is most developed and that will be implemented first; hence it has been necessary to define the EM&A requirements that will need to be implemented for the CKWLR so that these can form part of any future Environmental Permit that will need to be gained before construction can commence.

The following chapter provides generic information regarding the envisaged EM&A requirements that will need to be adopted during the future implementation of the non-CKWLR components of the NLDFS. These requirements will need to be further refined and developed during any future environmental studies that may be undertaken prior to the application for an Environmental Permit.

Details of the EM&A requirements for those projects included within the EIA Report for the Theme Park and Associated Infrastructure Developments are defined within that Project's EM&A Manual.

18.2 *IDENTIFICATION OF AIR AND NOISE SENSITIVE RECEIVERS*

In order to provide an outline of the EM&A requirements that may be necessary during the implementation of the non CKWLR components of the NLDFS it is first necessary to identify which generic sensitive receivers may be affected by the proposed developments. Due to the phased nature of the Project, the potential sensitive receivers will change over time as new, potentially sensitive, landuses are constructed and brought into occupation /operation. Consequently, it is necessary to have a clear understanding of the phasing of the Project so that potential air, noise and water sensitive receivers can be identified.

The following sections outline the phasing of the various components included within the NLDFS and relate this to potential generic sensitive receivers. The exact details of these receivers, and the actual determination of whether environmental monitoring will be undertaken at these locations, will be determined during future environmental studies that may be undertaken prior to the application for an Environmental Permit.

18.2.1 *Components of the NLDFS*

The proposed developments within the NLDFS Project Area are largely to be built on reclaimed lands that will be formed between 2000 to 2008. Key components of the NLDFS developments are shown on the Draft

Recommended Outline Development Plan (RODP). The NLDFS developments can be broadly divided into five phases in accordance with the proposed reclamations, namely Penny's Bay (Stages I and II), Northshore, Siu Ho Wan, Tsing Chau Tsai East, and Theme Park Extension.

18.2.2 *Penny's Bay Reclamation (Stage I and II)*

The Penny's Bay Reclamation Stage I comprises an area of 200 ha. The construction of this reclamation will commence in Q2 2000 with completion programmed for Q3 2002. The provision of this reclaimed land will enable the construction of the International Theme Park (Phase I) and its hotels, as well as the Water Recreation Centre. This construction work will commence in Q2 2002, with the construction programmed to be completed within 36 months. In addition to the Theme Park, the Penny's Bay Reclamation Stage I will also permit the planned construction of the CKWLR section from Yam O Interchange to Penny's Bay roundabout. This is programmed to commence in Q3 2002 with completion scheduled for Q1 of 2005. During the above construction works, Penny's Bay GTP and Cheoy Lee Shipyard are expected to be the ASRs, whilst residential developments at Peng Chau north and Discovery Bay will be the NSRs.

The Theme Park (Phase I) is scheduled to be opened in Q2 2005. The Government, Institutional and Community facilities to the north of the Theme Park, fresh air intakes of the Theme Park hotels, as well as the Penny's Bay GTP will be the representative ASRs during its operational phase. Residential developments at Peng Chau and Discovery Bay will be the representative NSRs.

Construction of CKWLR (Penny's Bay Interchange to Route 10 toll plaza) section and Stage II of the Penny's Bay Reclamation are scheduled to be completed in Q3 2005 and Q1 2006, respectively. There will be a period of overlapping between the above construction works and the operation of Theme Park (Phase I) and its associated developments. Theme Park (Phase I) and its associated developments will therefore be considered as ASRs.

A 10 ha reclamation has been proposed at Yam O for the construction of a temporary public transport interchange and for part of the Road P2. The reclamation will commence in Q1 2002 for completion in Q3 of 2003. The development's construction will tie in with the operation of the Penny's Bay Rail Link (PBRL) in 2005. The existing residents at Luk Keng Tsuen will be the A&NSRs during the reclamation and construction periods.

18.2.3 *Northshore Lantau Reclamation*

An additional 65 ha reclamation has been proposed along the northshore of the Project Area from Yam O to To Kau Wan. Dredging of the seawall will commence in Q1 2012 and the entire reclamation works are expected to be completed in Q1 2018.

The Northshore Reclamation will mainly provide land for the 20 ha Theme Park Gateway (programmed to be constructed from Q1 2014 to Q2 2017), a 20 ha Tourist and Convention Village (programmed to be constructed from Q1 2018 to Q2 2020), and a 20 ha Technodrome (programmed to be constructed from Q1 2020 to Q2 2022). The existing Luk Keng Tsuen will be the ASR and NSR while the PBRL Yam O Rail Station and the proposed Eco Park at Luk Keng headland will be the ASR in the vicinity. In addition, the completed developments on the Northshore Reclamation will also become ASRs to the reclamation (until Q1 2018) and construction of the remaining developments.

Road P1 is a primary distributor will be serving all development alongside the North Lantau Highway. Its alignment commences west of MTRC Siu Ho Wan Depot, runs parallel to the NLH for about 2.7 km before entering the western portal of Yam Tsai tunnel, and then connects with the NLH. Construction of Road P1 is envisaged to commence in Q1 2015 for completion in Q4 2016. The existing Luk Keng Tsuen will be the A&NSR and the PBRL Yam O Station will be the ASR during construction and operation of Road P1.

18.2.4 *Siu Ho Wan Reclamation*

The Siu Ho Wan Reclamation comprises a total of 39 ha from Ta Pang Po to Siu Ho Wan for the Road P1 section (8 ha), the Special Duties Unit and the Small Boat Division Marine Base (1 ha), and the residential developments and schools (30 ha). Dredging of the seawall will commence in Q3 2014 and the entire reclamation works is expected to be completed in Q1 2016. Construction of the residential development and schools is assumed to commence in Q1 2017 for completion in 39 months.

The Siu Ho Wan Reclamation and the proposed developments are likely to be commenced after the residential and schools developments proposed at Siu Ho Wan under the Remaining Development in Tung Chung and Tai Ho Comprehensive Feasibility Study, which will be the ASRs and NSRs during the reclamation and construction periods.

18.2.5 *Tsing Chau Tsai East Reclamation*

The Tsing Chau Tsai Reclamation from Sam Chuen to Pa Tau Kwu comprises a total area of 74 ha. The reclamation will be built in three periods, namely the 17 ha CKWLR Phase I Reclamation (programmed to be constructed from Q1 2002 to Q1 2004) for the CKWLR and R10-NLYLH sections including the R10 toll plaza, the 25 ha CKWLR Phase II Reclamation (programmed to be constructed from Q2 2006 to Q2 2008) for the CKWLR section connected to the long term R10-HKLL and the Pa Tau Kwu Interchange, and the 32 ha Fa Peng Reclamation (programmed to be constructed from Q2 2022 to Q2 2024) for the proposed tourism and recreation development.

The existing Tso Wan village (also a proposed village expansion area under the Draft RODP) will be the ASRs and NSRs during the Tsing Chau Tsai East Reclamation, and the construction and operation of the CKWLR (Yam O

Interchange to R10 toll plaza section which is scheduled for completion in 2005) and R10-NLYLH (which is scheduled for completion in 2007). Construction of the proposed tourism and recreation development at Fa Peng is assumed to be commenced in Q1 2024 for completion in 63 months. The CKWLR section (R10 toll plaza to the long term R10-HKLL) will be constructed from Q2 2028 to Q2 2030. Hence the proposed tourism and recreation development at Fa Peng will be an ASR during construction of this CKWLR section.

18.2.6 *Theme Park Extension Reclamation*

The Theme Park Extension Reclamation comprises about 80 ha between Pa Tau Kwu south and the Theme Park (Phase II) will be constructed from Q2 2026 for completion in 24 months. Construction of the Theme Park Extension and its associated developments and infrastructures are assumed to be commenced in Q2 2026 for a period of 27 months. Theme Park (Phase II) development (which is assumed to be built out in 2024) will be the ASR during the Theme Park Extension Reclamation and the constructions.

18.3 *EM&A REQUIREMENTS*

Having outlined the predicted air and noise sensitive receivers above, the following sections provide generic information on the envisaged monitoring requirements.

18.3.1 *Air Quality - Construction Phase*

Monitoring Locations

At this stage in the development process it is envisaged that, during the construction phase, air quality (dust) monitoring will be undertaken at each of the following generic locations outlined in *Table 18.3a* and shown in *Figure 18.3a*. These locations have been selected in order to verify the effectiveness of mitigation measures proposed to minimise the impact to these ASRs.

Table 18.3a *Representative Air Quality Monitoring Stations for NLDFS Construction Phase*

ASRs	Identity/Description	Purpose
AM1	Luk Keng Tsuen	To monitor impacts associated with: <ul style="list-style-type: none"> Construction of Road P1 Northshore Reclamation
AM2	Tso Wan	To monitor impacts associated with: <ul style="list-style-type: none"> Fa Peng Reclamation
AM3	Water Treatment Works	To monitor impacts associated with: <ul style="list-style-type: none"> Construction of Road P1 Siu Ho Wan Reclamation
AM4	Theme Park Phase I	To monitor impacts associated with: <ul style="list-style-type: none"> Northshore reclamation
AM5	Theme Park Phase II	To monitor impacts associated with: <ul style="list-style-type: none"> Fa Peng Reclamation

The above table presents only the generic locations of the envisaged air quality monitoring stations. The locations will be further refined in any future environmental studies that are undertaken prior to the application for an Environmental Permit. Additionally, prior to the commencement of the EM&A programme, the proposed air quality monitoring stations will be discussed and agreed with the EPD.

Methodology, Criteria and Equipment

The proposed methodology, criteria and monitoring equipment shall be as specified in *Sections 5.2.2 and 5.2.3* of this EM&A Manual.

Baseline and Impacts Monitoring

The proposed baseline and impacts monitoring requirements shall be as specified in *Sections 5.2.6 and 5.2.7* of this EM&A Manual.

Compliance Assessment

The criteria for assessing compliance shall be as specified in *Section 5.2.8* of this EM&A Manual.

18.3.2 *Air Quality - Operational Phase*

It is envisaged that operational air quality monitoring will be required for the section of Road P1 that passes in tunnel underneath the proposed Eco Park. Outline details of the envisaged monitoring programme are provided below. The exact requirements will be developed as part of any future environmental studies that are undertaken prior to the application for an Environmental Permit.

Monitoring Locations

The monitoring locations will be within the tunnel. Due to the envisaged length of the tunnel, it is assumed that there will be no more than two monitoring locations.

Methodology and Criteria

Monitoring and auditing of carbon monoxide, nitrogen dioxide, and sulphur dioxide shall be carried out by the tunnel operator, or Highways Department (as appropriate) to ensure that any deterioration in the air quality can be readily detected, and hence, timely actions implemented to rectify the situation.

The generic air quality guidelines outlined in *Table 18.3b* (measured in $\mu\text{g}/\text{m}^3$) shall provide an appropriate framework for the interpretation of monitoring results. The air quality monitoring data shall be checked against the maximum concentrations for each pollutant. Where concentrations of

pollutants exceed the Tunnel Air Quality Guidelines, EPD shall be contacted immediately so that remedial actions can be discussed, agreed and implemented.

Table 18.3b Tunnel Air Quality Guidelines

Air Pollution	Averaging Time	Maximum Concentration	
		Micrograms Per Cubic Metre ($\mu\text{g}/\text{m}^3$)	Parts Per Million (ppm)
Carbon Monoxide	5 minutes	115,000	100
Nitrogen Dioxide	5 minutes	1,800	1
Sulphur Dioxide	5 minutes	1,000	0.4

As these are only generic guidelines action and limit levels shall be determined at a later date upon agreement with EPD.

Monitoring Equipment

The HyD or the tunnel operator shall install (within the tunnel enclosure) and operate analysing equipment capable of monitoring for each of the aforementioned pollutants. All instrumentation shall be checked for zero and span once a month, and shall be calibrated and certified by an independent environmental laboratory in accordance with the criteria.

Impact Monitoring

It is envisaged that the analysing equipment will undertake continuous measurements of carbon monoxide and nitrogen dioxide. The analysers are likely to be connected to an audible alarm at the main tunnel control room. The alarm will sound whenever the measured carbon monoxide or nitrogen dioxide concentrations exceed $60,000 \mu\text{g}/\text{m}^3$ or $1,000 \mu\text{g}/\text{m}^3$ respectively. In such cases, the HyD or the tunnel operator (as appropriate) will implement prompt action, including increasing the fan operation or restricting traffic flow, in order to resolve the problem. In line with the EPD's Practice Note on Control of Air Pollution in Vehicle Tunnels, the continuous monitoring of sulphur dioxide concentrations is not likely to be required.

18.3.3 Noise - Construction Phase

At this stage in the development process it is envisaged that, during the construction phase, noise monitoring will be undertaken at each of the following generic locations outlined in *Table 18.3b* and shown in *Figure 18.3b*. These locations have been selected in order to verify the effectiveness of mitigation measures proposed to minimise the impact to the NSR identified in *Sections 18.2.2 to 18.2.6*.

Table 18.3b *Representative Noise Monitoring Stations for NLDFS Construction Phase*

NSR No	Identity/Description	ASR ⁽¹⁾⁽²⁾	Remarks / Purpose
NM1	Luk Keng Tsuen	B	Located besides CKWLR, for monitoring construction of Northshore development
NM2	Tso Wan	A	Located besides CKWLR, for monitoring construction of the Eastern development
NM3	Planning Area 38 in Tai Ho	C	Construction phase monitoring of the Siu Ho Wan development
NM4	Planning Area 10 at Siu Ho Wan MTRC Depot	C	Construction phase monitoring of the Siu Ho Wan development
NM5	Planning Area 56 in Tai Ho	C	Construction phase monitoring of the Siu Ho Wan development

(1) ASR stands for Area Sensitivity Ratings
(2) The ASR is assigned for evaluating construction noise impact

Methodology, Criteria and Equipment

The proposed methodology, criteria and monitoring equipment shall be as specified in *Sections 6.2.1 and 6.2.2* of this EM&A Manual.

Baseline and Impacts Monitoring

The proposed baseline and impacts monitoring requirements shall be as specified in *Sections 6.2.4 and 6.2.5* of this EM&A Manual.

Compliance Assessment

The criteria for assessing compliance shall be as specified in *Section 6.2.6* of this EM&A Manual.

18.3.4 *Noise - Operational Phase*

It is envisaged that any operational phase noise monitoring is likely be focused on traffic noise, and in particular, the performance verification of any direct technical remedies that may be recommended (in this and later environmental studies undertaken prior to the application of an Environmental Permit) due to noise associated with the operation of Road P1 and Route 10.

Monitoring Locations

Exact details of the proposed monitoring locations will be specified at a later date. However, it is envisaged that operational phase noise monitoring will be undertaken at generic locations outlined in *Table 18.3c* and shown in *Figure 18.3b*. The choice of final monitoring locations will depend upon the future developments that are implemented as part of the development of Northshore Lantau.

Table 18.3c *Representative Noise Monitoring Stations for NLDFS Operational Phase*

NSR No	Identity/Description	ASR ⁽¹⁾⁽²⁾	Remarks / Purpose
NM6	Tso Wan Village Expansion Area	-	Operation monitoring for Route 10
NM7	Planning Area 4A to 4C in Siu Ho Wan	-	Operation monitoring for Road P1

Methodology, Criteria and Equipment

If such monitoring is required, the noise levels shall be measured in terms of $L_{10(1 \text{ hour})}$ for the am and pm peak traffic flow on normal weekdays once the road is fully operational. In order to capture the actual peak hour traffic noise, noise monitoring is recommended to be conducted for a period of one and a half hours.

Monitoring Equipment.

The proposed monitoring equipment shall be as detailed in *Section 6.2.2* of this EM&A Manual. That is, sound level meters shall complying with the *International Electrotechnical Commission (IEC) Publications 651:1979 (Type 1)* and *804:1985 (Type 1)* specifications (as referred to in the GW-TM) shall be used for carrying out the traffic noise monitoring. Calibration procedures and other measurement conditions shall also be as stated in *Section 6.2.2*.

18.3.5 *Water - Construction Phase*

The reclamations associated with the non-CKWLR components of the NLDFS have the potential to result in water quality impacts. In order to assess the effectiveness of mitigation measures recommended in this, and later environmental studies undertaken prior to the application of an Environmental Permit, it is envisaged that marine water quality monitoring will need to be undertaken as part of any future EM&A programme. Details of the envisaged requirements are provided below.

Monitoring Locations

The envisaged water quality monitoring stations are shown in *Figure 18.3c*. At this stage of the Project's development, it has been assumed that a total of nine Sensitive Receiver (SR) Stations will be required in order to monitor the impact of each of the proposed reclamations. The envisaged SR Stations have been selected basis of their proximity to the proposed dredging and filling operations, they thus represent the water sensitive receivers that have the greatest potential to experience water quality impacts. The nine SR monitoring locations and their purpose are defined in *Table 18.3d* below.

Table 18.3d Proposed SR Monitoring Locations

Ref	Location	Purpose
SR1	Kau Yi Chau	Required for monitoring impacts from Tsing Chau Tsai East and Theme Park Extension reclamations
SR2	Discovery Bay	Required for monitoring impacts from Tsing Chau Tsai East and Theme Park Extension reclamations
SR3	Sze Pak Wan	Required for monitoring impacts from Tsing Chau Tsai East and Theme Park Extension reclamations
SR4	Ma Wan Fish Culture Zone South	Required for monitoring impacts from Tsing Chau Tsai East, Theme Park Extension, Northshore and Siu Ho Wan reclamations
SR5	Ma Wan Fish Culture Zone North;	Required for monitoring impacts from Tsing Chau Tsai East, Theme Park Extension, Northshore and Siu Ho Wan reclamations
SR6	Tung Wan Beach;	Required for monitoring impacts from Tsing Chau Tsai East, Theme Park Extension, Northshore and Siu Ho Wan reclamations
SR7	Brothers	Required for monitoring impacts from Northshore and Siu Ho Wan reclamations
SR8	Chek Lap Kok	Required for monitoring impacts from Northshore and Siu Ho Wan reclamations
SR9	Tung Chung Bay	Required for monitoring impacts from Northshore and Siu Ho Wan reclamations

Table 18.3e provides details regarding the locations of the SR Stations.

Table 18.3e Locations of Marine Water Quality Monitoring Stations

Station	Easting	Northing
SR1	825 607	816 216
SR2	820 268	817 870
SR3	821 033	819 153
SR4	823 827	823 208
SR5	823 827	823 705
SR6	824 511	823 518
SR7	815 910	821 439
SR8	811 556	820 493
SR9	810 529	816503

As detailed in Table 18.3f, it is envisaged that six Control Stations will also be required. These have been selected to facilitate comparison of the water quality of the SR stations with ambient water quality conditions.

As no future activities have been planned, as yet, during the period of construction which may have potential water quality impacts in the study

area, all control stations are located in areas not expected to be affected by other projects and which lie within the path of water body movements affecting the SR's but are outside the predicted influence of the NLDFS component projects. Monitoring data from these control stations can be used as upstream and downstream controls for the SR stations. Locations of control stations shall be subject to change depending on the location and timing of dredging and other marine works projects in the Study Area. Any proposal for change to the locations of control/impact stations shall be subject to the EPD's approval.

Table 18.3f *Locations of Marine Water Quality Control Stations*

Station	Easting	Northing
C1	816 646	823 766
C2	816 688	820 581
C3	826 456	821 181
C4	825 871	824 880
C5	809 188	824 143
C6	806 764	817 028

Water Quality Parameters, Equipment and Testing Protocols

The water quality parameters, equipment, and testing protocols shall be as defined in Sections 7.2.2, 7.2.3 and 7.2.4 respectively.

Baseline, Impact and Compliance Monitoring

The baseline and impact monitoring requirements, and the compliance assessment criteria shall be as defined in Sections 7.3.1, 7.3.2 and 7.4 respectively.

18.3.6 *Marine Ecology*

With regard to the reclamations associated with the Penny's Bay (Stages I and II), Tsing Chau Tsai East, and Theme Park Extension, it is envisaged that a programme of marine ecological monitoring may need to be implemented in order to determine the rate and effectiveness of colonisation of rubble mound seawalls by coral assemblages. The requirements of this monitoring would be as outlined in Section 10.1.1 of this EM&A Manual.

In addition to the above, operation-phase dolphin/porpoise monitoring is likely to be required for a period of two years following the commencement of operations of the cross boundary ferry terminal. This monitoring should be undertaken by a qualified research team in order to evaluate whether there have been any effects on the animals.

18.4 ORGANISATION AND STRUCTURE OF THE EM&A PROGRAMME

The timescale for the construction of the non-CKWLR components of the NLDFS is less well defined than that which is proposed for the CKWLR, however, the latest information regarding phasing is presented in Sections 18.2.2 to 18.2.6. As detailed in these sections, it is envisaged that the included within the NLDFS will be implemented over a large time period with completion of the final element not being programmed to be achieved until 2030. In addition to this, the elements of the non-CKWLR components of the NLDFS are spaced over a wide area. It is not therefore envisaged that there will be a high potential for cumulative impacts since the works will be separated in both spatially and in time. It is therefore recommended that the EM&A requirements for each of the component projects is undertaken by reverting to the 'traditional' organisation structure whereby Environmental Monitoring Teams employed by the Contractors undertake the required environmental monitoring, and an Independent Environmental Checker (IEC) (rather than an ENPO) verifies that validity and accuracy of the monitoring procedures and results.

18.4.1 Roles and Responsibilities

The roles and responsibilities of the various parties involved in the EM&A approach proposed for the non-CKWLR components of the NLDFS are discussed below the following sections. The organisation and lines of communication with respect to environmental works are shown in Figure 18.4a.

18.4.2 Engineer or Engineer's Representative

For the purpose of this discussion, the term "Engineer" shall refer to the role undertaken by the "Engineer" and/or the "Engineer's Representative" (ER) to 'monitor' the works undertaken by the various Contractors. The Engineer (ER) shall:

- monitor the Contractor's compliance with contract specifications, including the effective implementation and operation of environmental mitigation measures and other aspects of the EM&A programme;
- comply with the agreed Event Contingency Plan in the event of any exceedance;
- employ an Independent Environmental Checker (IEC) to audit the results of the EM&A works carried out by the ET; and
- instruct the Contractor to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

18.4.3 Contractors

Reporting to the Engineer, the Contractor shall:

- work within the scope of the construction contract and other tender conditions;

- employ an ET (as necessary) to undertake the monitoring, laboratory analysis and reporting of the environmental monitoring and audit requirements outlined in this Manual;
- provide assistance to the ET in conducting the required environmental monitoring;
- participate in the site inspections undertaken by the ET and the IEC, as required, and undertake any corrective actions instructed by the Engineer;
- provide information/advice to the ET or IEC regarding works activities which may contribute, or be contributing to the generation of adverse environmental conditions;
- implement measures to reduce impact where Action and Limit levels are exceeded; and
- take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their project staff.

18.4.4 Environmental Team

It is normal practice for an Environmental Team to be appointed, either by the Contractor or the Client, to undertake the environmental monitoring requirements required in the EM&A programme. The ET Leader, (ET Leader), shall be responsible for and in charge of the Environmental Team (ET), and shall be the person responsible for executing the environmental monitoring and audit requirements. The duties of the ET and ET Leader are:

- to monitor the various environmental parameters as required by this or subsequent revisions to the EM&A Manual;
- assess the EM&A data and review the success of the EM&A programme determining the adequacy of the mitigation measures implemented and the validity of the EIA predictions as well as identify any adverse environmental impacts before they arise;
- to conduct site inspections and to investigate and inspect the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;
- to audit the environmental monitoring data and report the status of the general site environmental conditions and the implementation of mitigation measures resulting from site inspections;
- to report on the environmental monitoring and audit results and the wider environmental issues and conditions to the (IEC), Contractor, Engineer and the EPD; and
- adhere to the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

18.4.5 Independent Environmental Checker

An Independent Environmental Checker (IEC) shall be appointed to independently audit and verify the overall environmental performance of the works and to assess the effectiveness of the ET in their duties. The main objectives will be to:

- monitor the implementation of the EM&A programme and the overall level of environmental performance being achieved;
- arrange and conduct regular 'independent' site inspections / audits of the works;
- provide specialist advice to the Engineer and / or the Client on environmental matters;
- check that the necessary mitigation measures recommended in the EIA and Contract documents, or as subsequently required, are effectively implemented, and
- report the findings of site inspections / audits and other environmental performance reviews to the Engineer and the EPD.

18.5 *EM&A PROGRAMME REQUIREMENTS*

With the exception of the reversion of the 'traditional' organisation structure outlined above, it is envisaged that the other components of the EM&A Programme for the non-CKWLR components of the NLDFS (ie the implementation of an environmental management systems approach, the reporting requirements etc), would remain as outlined in this EM&A Manual.

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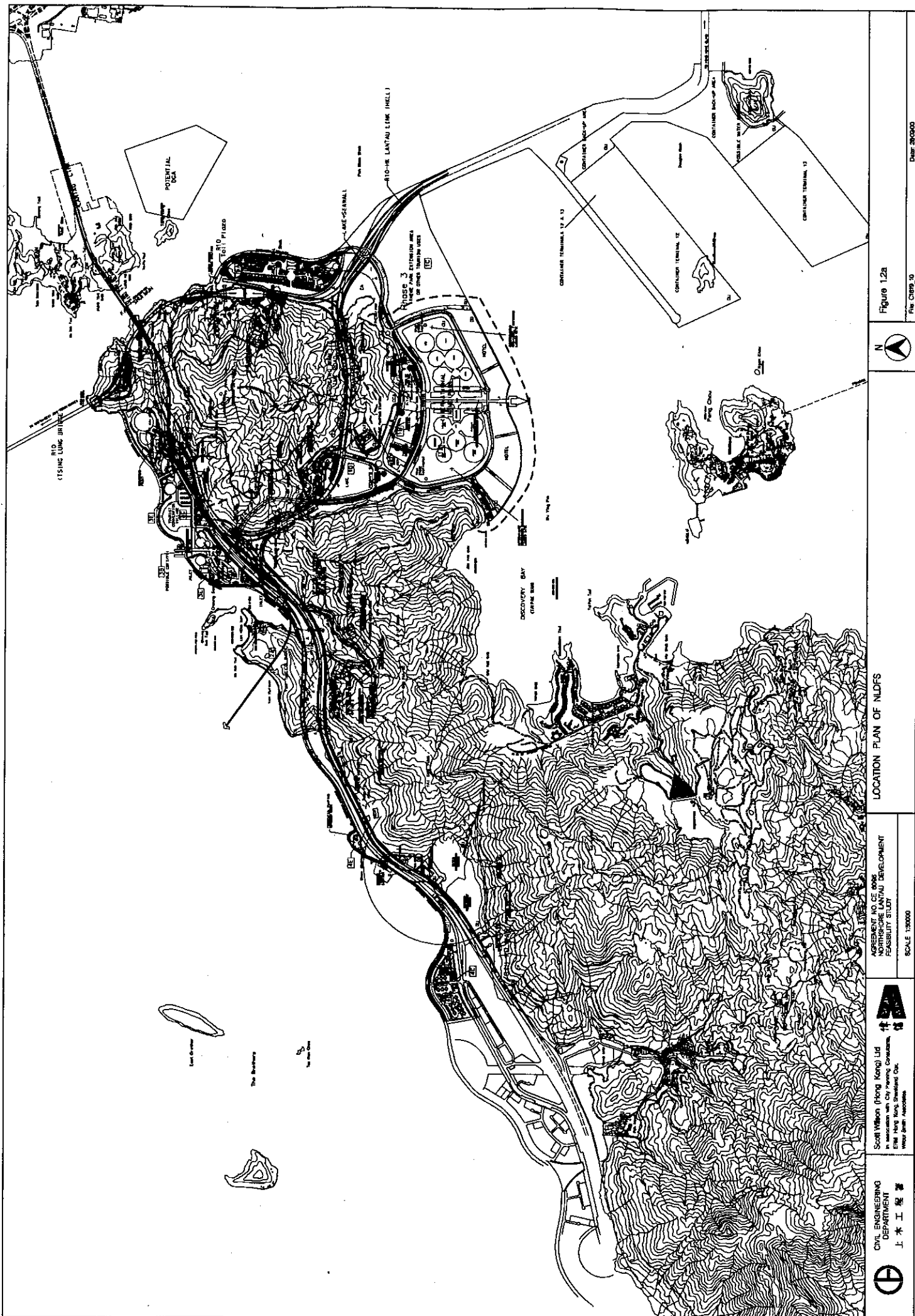


Figure 1.2a



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LOCATION PLAN OF NLDTS

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NORTHSHORE LANTAU DEVELOPMENT
FEASIBILITY STUDY

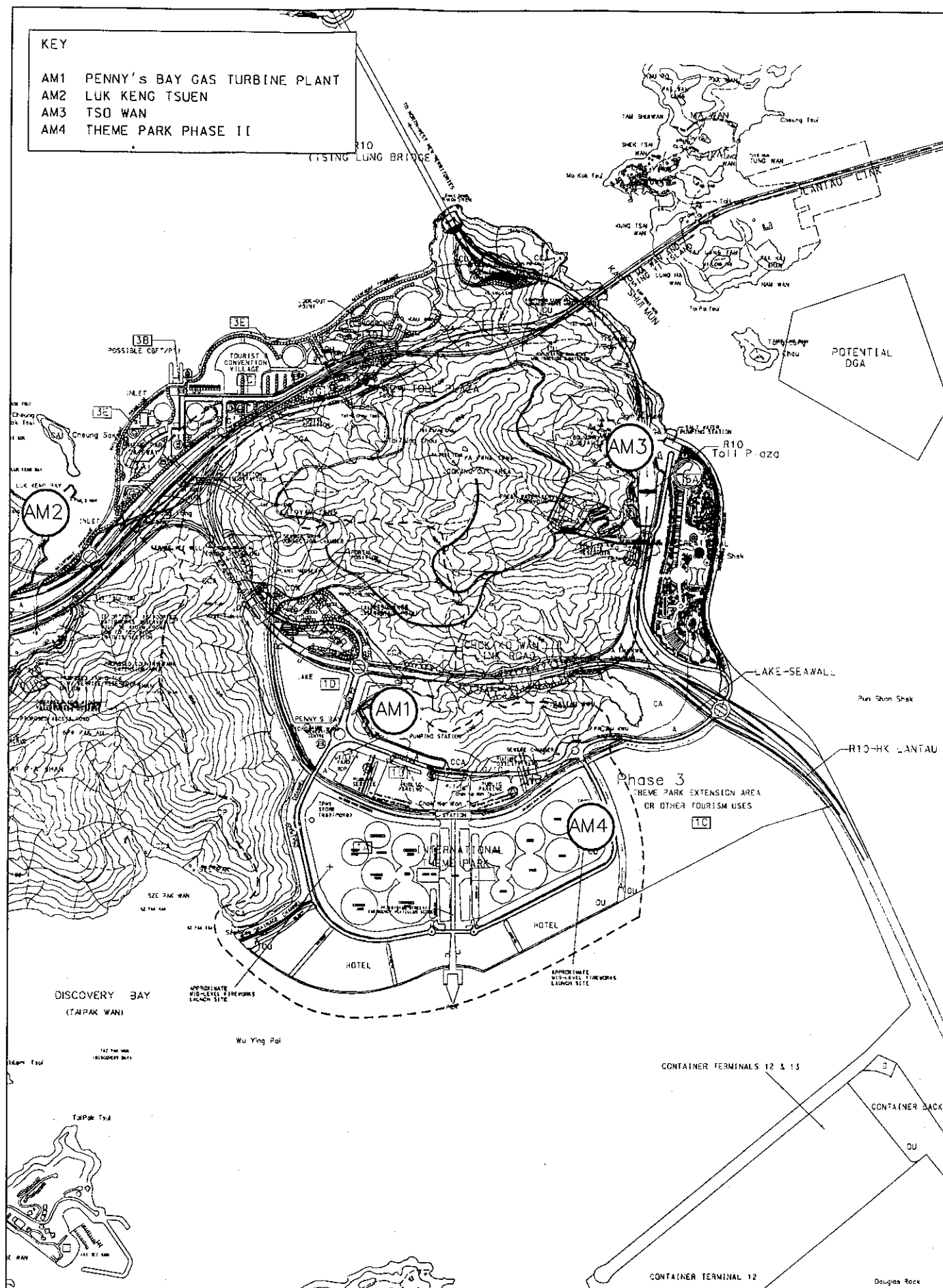
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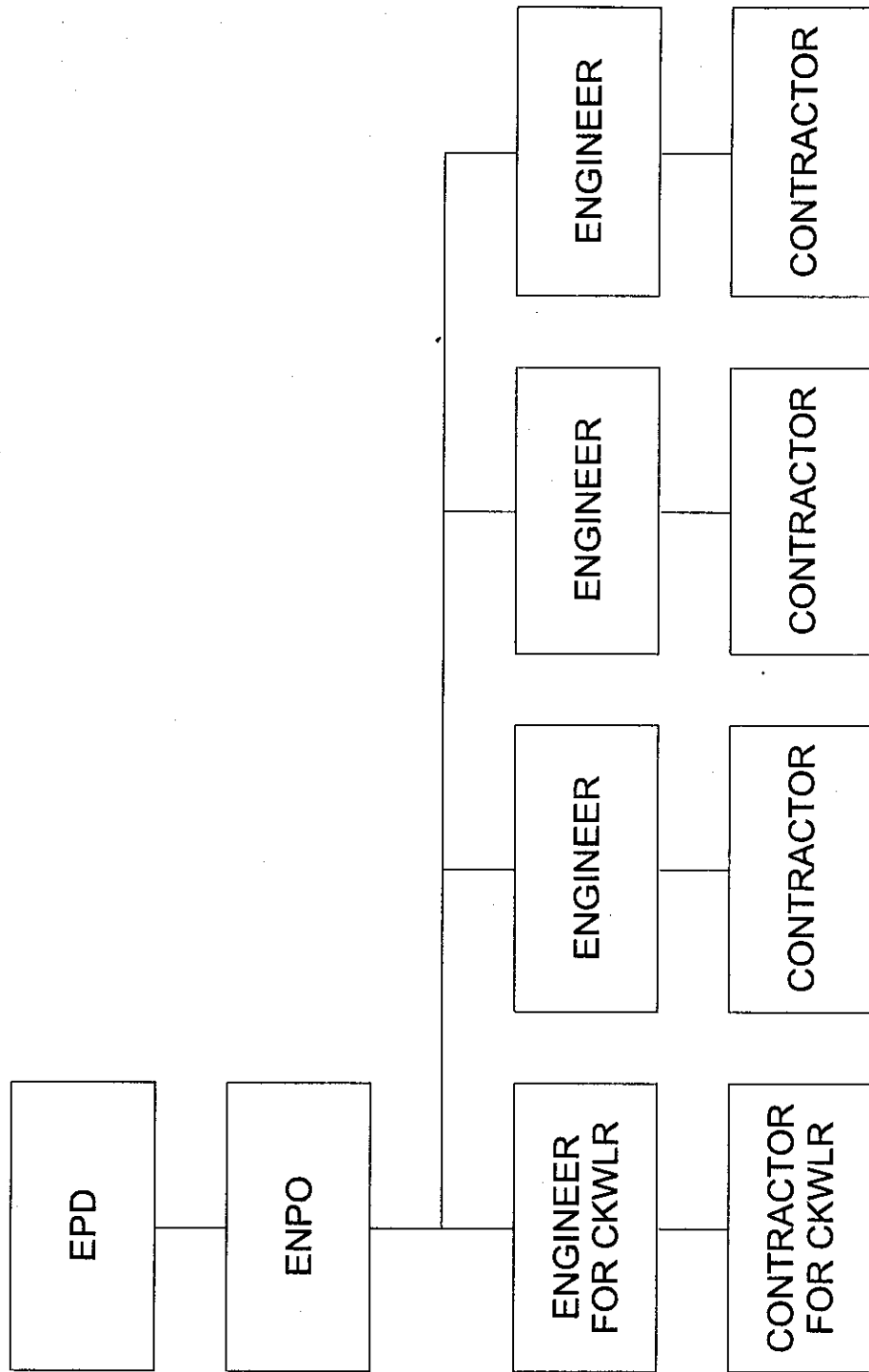
NORTHSHORE LANTAU DEVELOPMENT FEASIBILITY STUDY
LOCATION OF AIR MONITORING STATIONS FOR CKWL

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FIG. 5.2a



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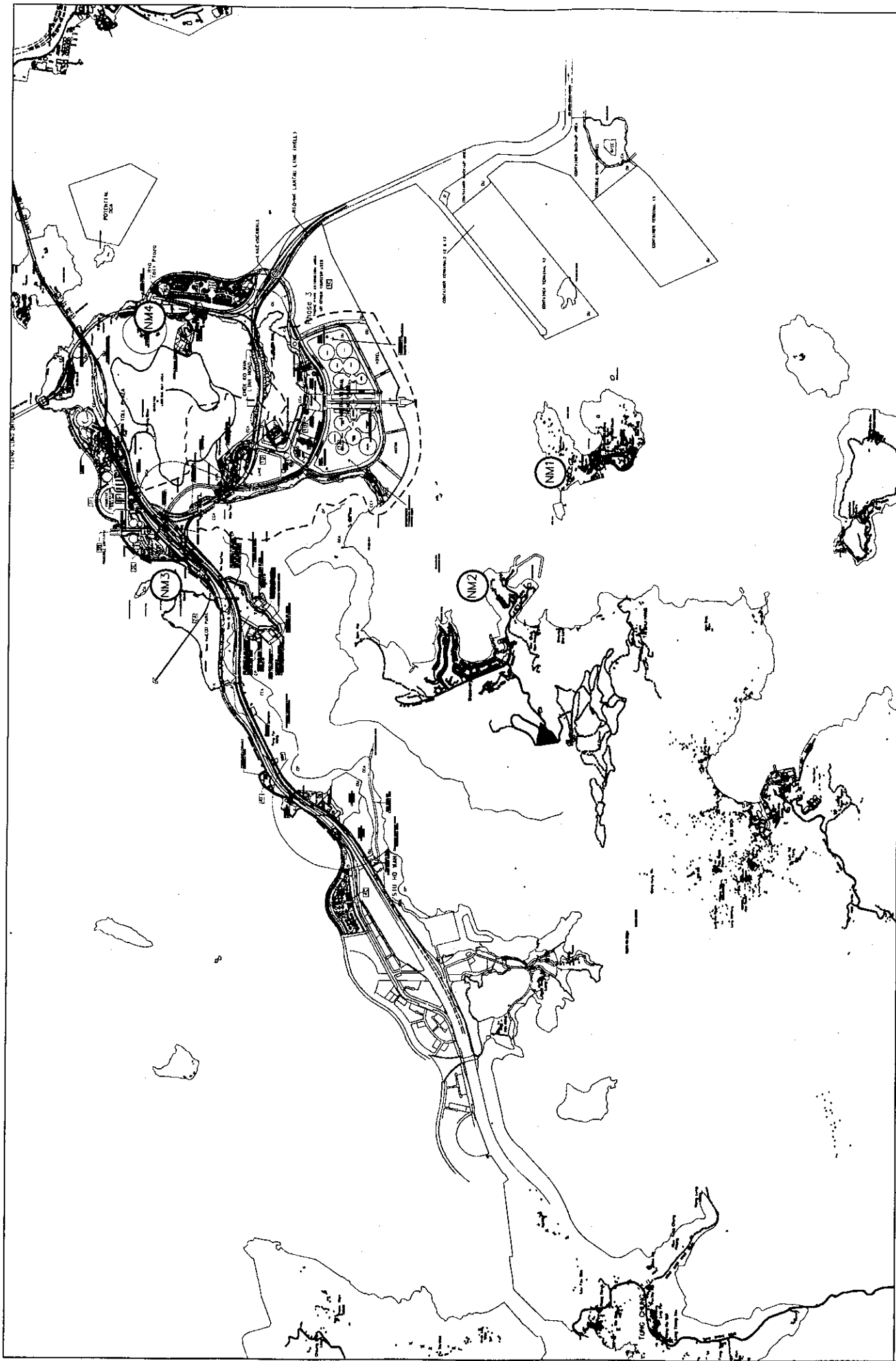


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NORTHSIDE LANTAU DEVELOPMENT
FEASIBILITY STUDY

ORGANISATIONAL STRUCTURE & LINES OF COMMUNICATION



Figure 3.5a



NOISE MONITORING LOCATIONS FOR CKWL

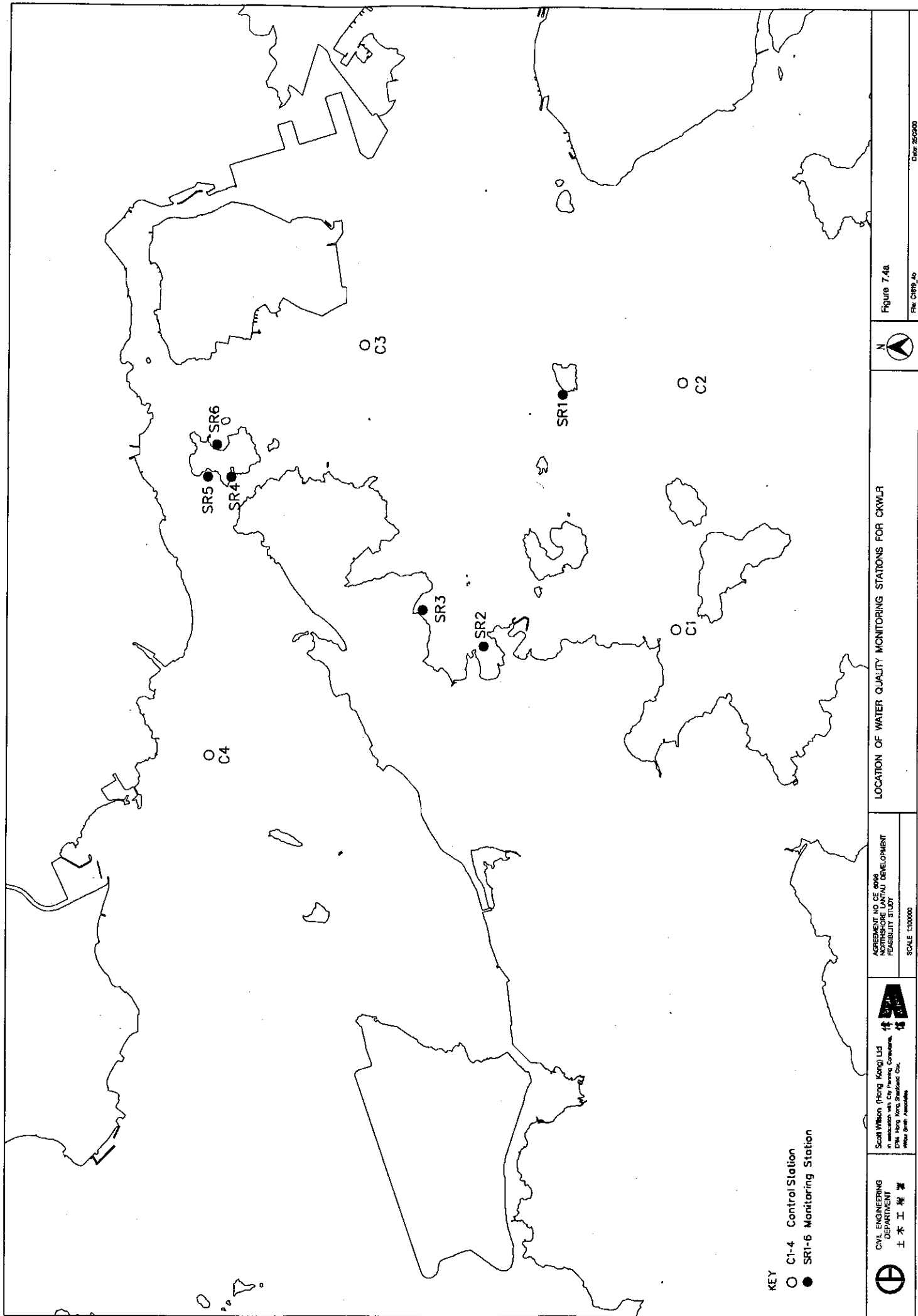
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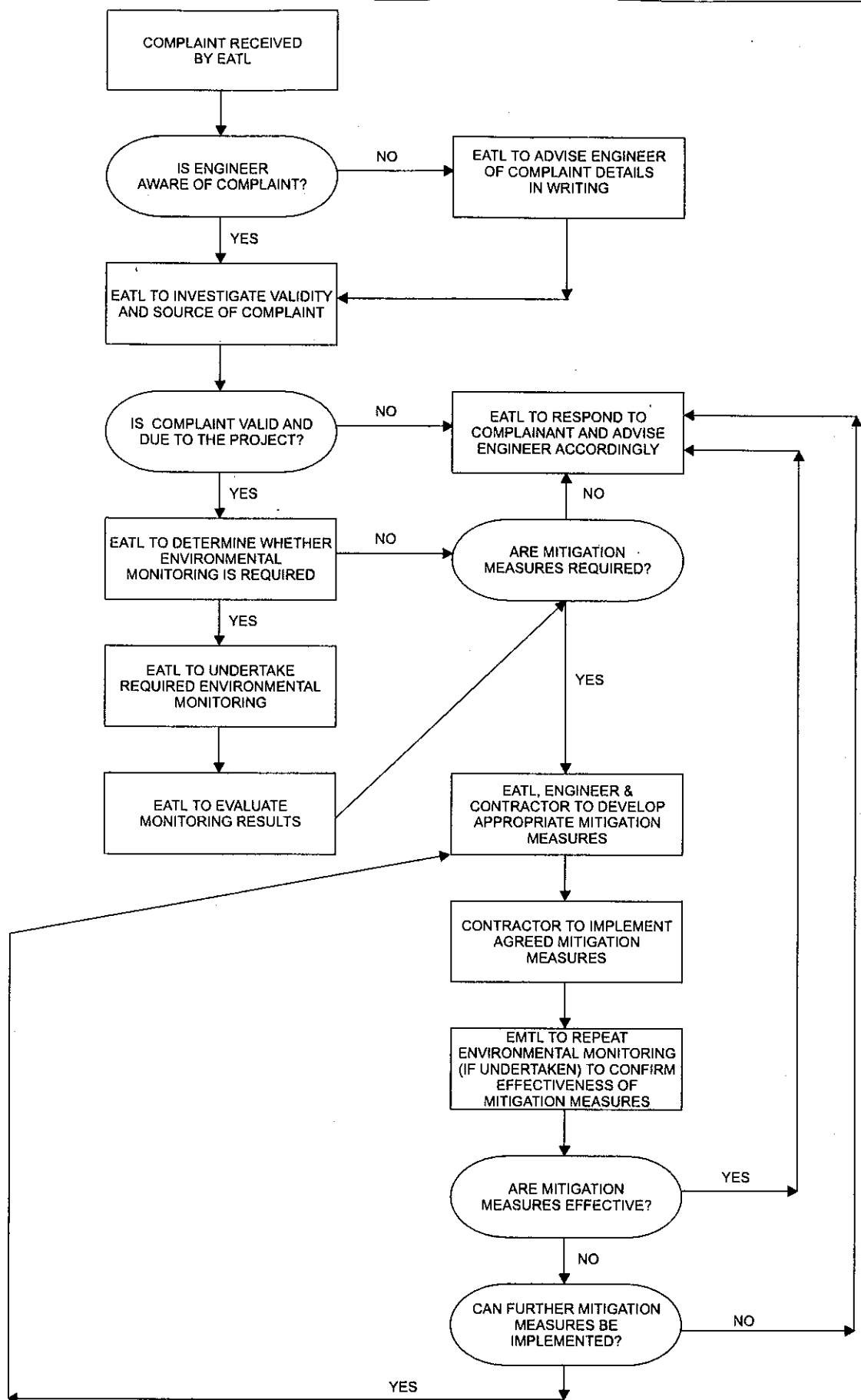
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NORTHSHORE LANTAU DEVELOPMENT FEASIBILITY STUDY COMPLAINTS RESPONSE PROCEDURES

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FIG. 16.3a



KEY

- AM1 LUK KENG TSUEN
- AM2 TSO WAN
- AM3 WATER TREATMENT WORK
- AM4 THEME PARK PHASE I
- AM5 THEME PARK PHASE II

LOCATION OF AIR MONITORING STATIONS FOR NLDS

AGREEMENT NO. CE 8008
 FOR THE DEVELOPMENT OF THE
 DISCOVERY BAY
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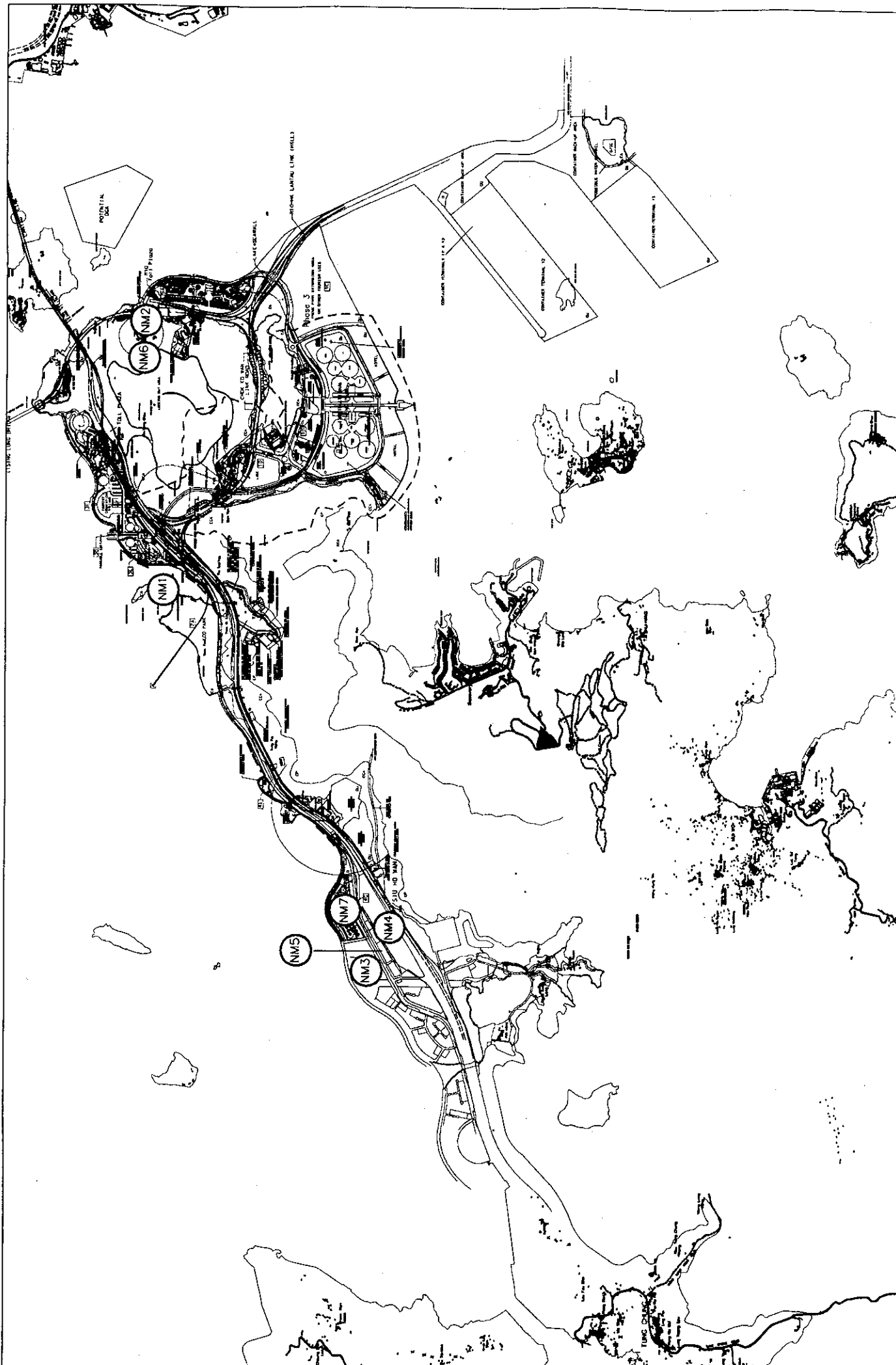
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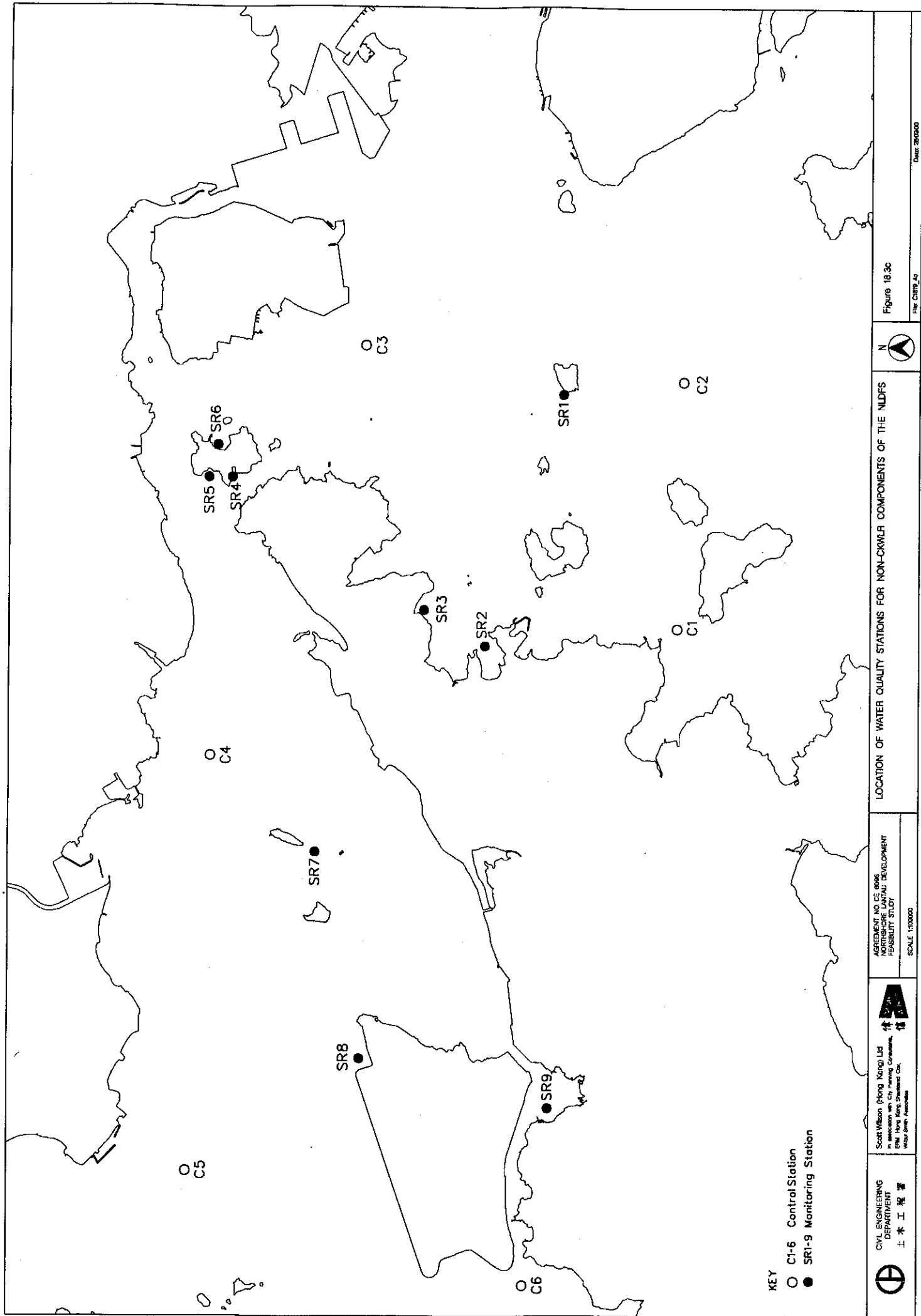
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Figure 18.3a

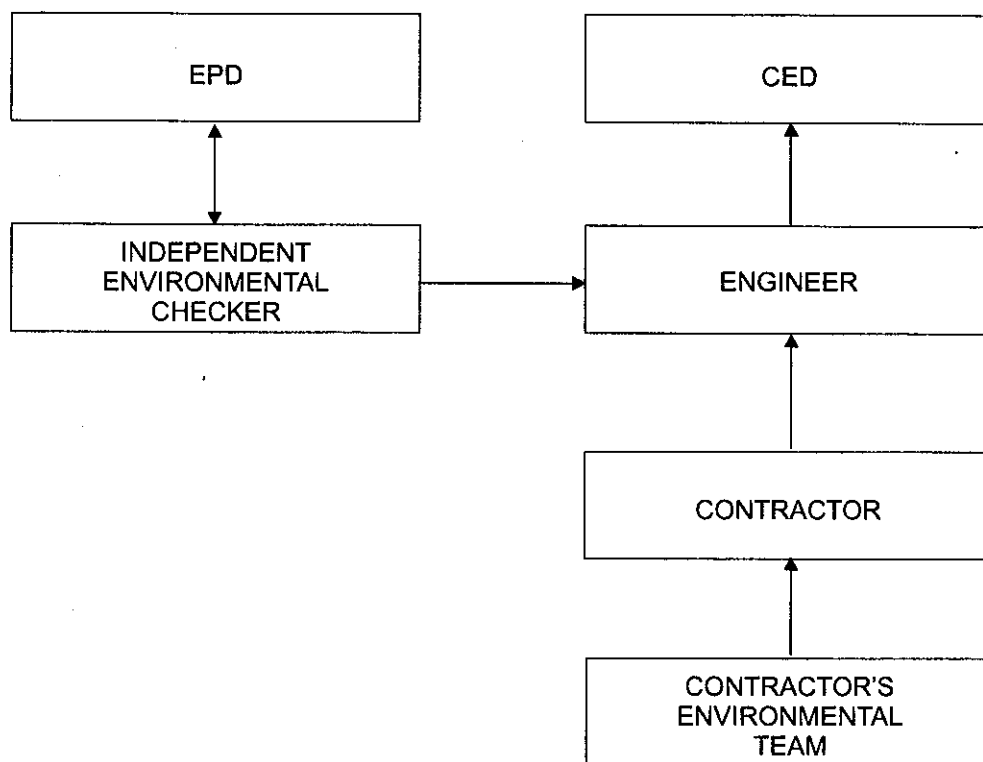
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8008/00/01/02/03/04/05/06/07/08/09/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47/48/49/50/51/52/53/54/55/56/57/58/59/60/61/62/63/64/65/66/67/68/69/70/71/72/73/74/75/76/77/78/79/80/81/82/83/84/85/86/87/88/89/90/91/92/93/94/95/96/97/98/99/100/101/102/103/104/105/106/107/108/109/110/111/112/113/114/115/116/117/118/119/120/121/122/123/124/125/126/127/128/129/130/131/132/133/134/135/136/137/138/139/140/141/142/143/144/145/146/147/148/149/150/151/152/153/154/155/156/157/158/159/160/161/162/163/164/165/166/167/168/169/170/171/172/173/174/175/176/177/178/179/180/181/182/183/184/185/186/187/188/189/190/191/192/193/194/195/196/197/198/199/200/201/202/203/204/205/206/207/208/209/210/211/212/213/214/215/216/217/218/219/220/221/222/223/224/225/226/227/228/229/230/231/232/233/234/235/236/237/238/239/240/241/242/243/244/245/246/247/248/249/250/251/252/253/254/255/256/257/258/259/260/261/262/263/264/265/266/267/268/269/270/271/272/273/274/275/276/277/278/279/280/281/282/283/284/285/286/287/288/289/290/291/292/293/294/295/296/297/298/299/300/301/302/303/304/305/306/307/308/309/310/311/312/313/314/315/316/317/318/319/320/321/322/323/324/325/326/327/328/329/330/331/332/333/334/335/336/337/338/339/340/341/342/343/344/345/346/347/348/349/350/351/352/353/354/355/356/357/358/359/360/361/362/363/364/365/366/367/368/369/370/371/372/373/374/375/376/377/378/379/380/381/382/383/384/385/386/387/388/389/390/391/392/393/394/395/396/397/398/399/400/401/402/403/404/405/406/407/408/409/410/411/412/413/414/415/416/417/418/419/420/421/422/423/424/425/426/427/428/429/430/431/432/433/434/435/436/437/438/439/440/441/442/443/444/445/446/447/448/449/450/451/452/453/454/455/456/457/458/459/460/461/462/463/464/465/466/467/468/469/470/471/472/473/474/475/476/477/478/479/480/481/482/483/484/485/486/487/488/489/490/491/492/493/494/495/496/497/498/499/500/501/502/503/504/505/506/507/508/509/510/511/512/513/514/515/516/517/518/519/520/521/522/523/524/525/526/527/528/529/530/531/532/533/534/535/536/537/538/539/540/541/542/543/544/545/546/547/548/549/550/551/552/553/554/555/556/557/558/559/560/561/562/563/564/565/566/567/568/569/570/571/572/573/574/575/576/577/578/579/580/581/582/583/584/585/586/587/588/589/590/591/592/593/594/595/596/597/598/599/600/601/602/603/604/605/606/607/608/609/610/611/612/613/614/615/616/617/618/619/620/621/622/623/624/625/626/627/628/629/630/631/632/633/634/635/636/637/638/639/640/641/642/643/644/645/646/647/648/649/650/651/652/653/654/655/656/657/658/659/660/661/662/663/664/665/666/667/668/669/670/671/672/673/674/675/676/677/678/679/680/681/682/683/684/685/686/687/688/689/690/691/692/693/694/695/696/697/698/699/700/701/702/703/704/705/706/707/708/709/710/711/712/713/714/715/716/717/718/719/720/721/722/723/724/725/726/727/728/729/730/731/732/733/734/735/736/737/738/739/740/741/742/743/744/745/746/747/748/749/750/751/752/753/754/755/756/757/758/759/760/761/762/763/764/765/766/767/768/769/770/771/772/773/774/775/776/777/778/779/780/781/782/783/784/785/786/787/788/789/790/791/792/793/794/795/796/797/798/799/800/801/802/803/804/805/806/807/808/809/810/811/812/813/814/815/816/817/818/819/820/821/822/823/824/825/826/827/828/829/830/831/832/833/834/835/836/837/838/839/840/841/842/843/844/845/846/847/848/849/850/851/852/853/854/855/856/857/858/859/860/861/862/863/864/865/866/867/868/869/870/871/872/873/874/875/876/877/878/879/880/881/882/883/884/885/886/887/888/889/890/891/892/893/894/895/896/897/898/899/900/901/902/903/904/905/906/907/908/909/910/911/912/913/914/915/916/917/918/919/920/921/922/923/924/925/926/927/928/929/930/931/932/933/934/935/936/937/938/939/940/941/942/943/944/945/946/947/948/949/950/951/952/953/954/955/956/957/958/959/960/961/962/963/964/965/966/967/968/969/970/971/972/973/974/975/976/977/978/979/980/981/982/983/984/985/986/987/988/989/990/991/992/993/994/995/996/997/998/999/1000/1001/1002/1003/1004/1005/1006/1007/1008/1009/1010/1011/1012/1013/1014/1015/1016/1017/1018/1019/1020/1021/1022/1023/1024/1025/1026/1027/1028/1029/1030/1031/1032/1033/1034/1035/1036/1037/1038/1039/1040/1041/1042/1043/1044/1045/1046/1047/1048/1049/1050/1051/1052/1053/1054/1055/1056/1057/1058/1059/1060/1061/1062/1063/1064/1065/1066/1067/1068/1069/1070/1071/1072/1073/1074/1075/1076/1077/1078/1079/1080/1081/1082/1083/1084/1085/1086/1087/1088/1089/1090/1091/1092/1093/1094/1095/1096/1097/1098/1099/1100/1101/1102/1103/1104/1105/1106/1107/1108/1109/1110/1111/1112/1113/1114/1115/1116/1117/1118/1119/1120/1121/1122/1123/1124/1125/1126/1127/1128/1129/1130/1131/1132/1133/1134/1135/1136/1137/1138/1139/1140/1141/1142/1143/1144/1145/1146/1147/1148/1149/1150/1151/1152/1153/1154/1155/1156/1157/1158/1159/1160/1161/1162/1163/1164/1165/1166/1167/1168/1169/1170/1171/1172/1173/1174/1175/1176/1177/1178/1179/1180/1181/1182/1183/1184/1185/1186/1187/1188/1189/1190/1191/1192/1193/1194/1195/1196/1197/1198/1199/1200/1201/1202/1203/1204/1205/1206/1207/1208/1209/1210/1211/1212/1213/1214/1215/1216/1217/1218/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KEY
 ○ C1-6 Control Station
 ● SR1-9 Monitoring Station

 <p>CIVIL ENGINEERING DEPARTMENT 土木工程署</p>	 <p>Scott Wilson (Hong Kong) Ltd In association with City Planning Commission, EPA, Hong Kong Shatterdust Co., Water & Sewerage Authority</p>	<p>AGREEMENT NO. CE 606 ANALYSIS OF LOCAL DEVELOPMENT FEASIBILITY STUDY SCALE 1:10000</p>	<p>LOCATION OF WATER QUALITY STATIONS FOR NON-CKWL COMPONENTS OF THE NLDS</p> <p>N </p> <p>Figure 18.3c</p> <p>The City of Hong Kong</p> <p>Date: 20/06/00</p>
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**CIVIL ENGINEERING
DEPARTMENT**
土木工程署

Scott Wilson (Hong Kong) Ltd
in association with City Planning Consultants,
ERM, Shankland Cox, Wilbur Smith Associates

NORTHSHORE LANTAU DEVELOPMENT FEASIBILITY STUDY
LINES OF REPORTING FOR THE NON-CKWLR COMPONENTS
OF THE NLDFS

File: C1819x2
Date: 26/02/00



FIG. 18.4a

Annex A

Reporting Documentation

1.1 *Complaints Proforma*

Report Form for Complaints	Sheet _____ of _____ Unit Reference _____
<u>RECIPIENT</u>	
Name:	Location: Tel:
<u>COMPLAINANT</u>	
Name:	Tel:
Address:	Fax:
<u>COMPLAINT</u>	
Type: Noise/Dust/Water/ Other	
Date:	Time: Location:
Description:	
Copy fax to: _____ Date: _____	Original to: _____ Date: _____
<u>REVIEW RESULTS</u>	
Signed: Date:	
<u>RECOMMENDATIONS</u>	
Signed: Date:	
<u>ATTACHMENTS</u>	
Copy to: PR Manager:	Date/Time: _____ Date: _____ Time: _____
Engineer	Date: _____ Time: _____
EATL	Date: _____ Time: _____

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial FlowRate, Qsi	Pi (mmHg)	
	Ti (°C)	
	Hi (in.)	
	Qsi (Std.m³)	
Final Flow Rate, Qsf	Pf (mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std.m³)	
Average Flow Rate (Std.m³)		
Total Volume (Std.m³)		
Filter Identification No.		
Initial Wt.. of Filter (g)		
Final Wt.. of Filter (g)		
Measured TSP Level (g/ m³)		

	<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator :	_____	_____	_____
Laboratory Technician :	_____	_____	_____
Checked by :	_____	_____	_____

Monitoring Location		
Details of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L ₉₀ (dB(A))	
	L ₁₀ (dB(A))	
	L _{eq} (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

Name & DesignationSignatureDate

Recorded By : _____

Checked by : _____

Monitoring Location				
Date of Monitoring				
Start Time (hh.mm)				
Weather				
Sea Conditions				
Tidal Mode				
Monitoring Depth		Surface	Middle	Bottom
Salinity				
Temperature (°C)				
DO Saturation (%)				
DO (mg/l)				
Turbidity (NTU)				
SS Sample Identification				
SS (mg/l)				
Observed Construction Activities	<100m from location			
	>100m from location			
Other Observations				

Name & DesignationSignatureDate

Recorded By : _____

Laboratory Technician : _____

Checked by : _____

Note: The SS results are to be completed once they are available from the laboratory

Annex B

Implementation Schedule
for the Chok Ko Wan Link
Road

This Annex should comprise the Implementation Schedule for the Project (*Section 15* of the EIA Report) for operational purposes.