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

Renewable Energy by a Wind Turbine System on Lamma Island:

Final Environmental Monitoring and Audit

September 2004

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Ref.: C2701

For and on behalf of	
Environmental Resources Management	
Approved by:	Freeman Cheung
Signed:	
Position:	Executive Director
Date:	1st September 2004

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1 INTRODUCTION

1.1 PURPOSE OF THE MANUAL

This Environmental Monitoring and Audit (EM&A) Manual ("the Manual") has been prepared by ERM-Hong Kong, Limited (ERM) on behalf of The Hongkong Electric Co Ltd (HEC). The Manual is a supplementary document of the EIA Study of the project entitled Renewable Energy by a Wind Turbine System on Lamma Island (hereafter referred to as the Project).

The Manual has been prepared with reference to the *EIA Study Brief* (No. ESB-112/2004) and the *Technical Memorandum of the Environmental Impact Assessment Process (EIAO TM)*. The purpose of the Manual is to provide information, guidance and instruction to personnel charged with environmental duties and those responsible for undertaking EM&A work during construction and operation. It provides systematic procedures for monitoring and auditing of potential environmental impacts that may arise from the works.

1.2 PROJECT DESCRIPTION

1.2.1 Background to the Study

The Hongkong Electric Co Ltd (HEC) is committed to providing a high quality power supply to its customers with due care for the environment. Recognizing the importance of sustainable development, HEC is proposing to install a wind turbine of capacity ranging from 600 to 850kW as a demonstration project to utilize wind energy for renewable power generation on Lamma Island, Hong Kong.

Following the completion of a 12-month wind power monitoring exercise on Lamma Island in November 2002, a wind atlas was developed to assess the wind potential of the Island. A number of areas were identified as having wind power density over 150W/m^2, equivalent to the average wind speed of about 5.5m/s, and generally considered suitable for wind energy utilization. The existing power supply to Lamma Island is by means of 11kV power lines, high voltage distribution pillar and low voltage distribution cables from HEC's distribution network.

Following the completion of a site selection exercise the wind turbine has proposed to be located at Tai Ling Tsuen (*Figure 1.1*). The output will be connected to the existing power grid for supplying renewable energy to HEC customers. The operation of the wind turbine will be monitored and controlled through a central monitoring system located in a control room of the Lamma Power Station. The wind turbine site will be unmanned and will only require attendance of operational personnel during emergency or routine maintenance.

On 23 March 2004, HEC submitted an application (Project Profile No. PP-209/2004) for an *EIA Study Brief* under Section 5(1) of the *Environmental Impact Assessment Ordinance (Cap 499)* (*EIAO*). The *EIA Study Brief* (No. ESB-112/2004) was issued on 6 May 2004 under Section 5(7) of the *EIAO*.

Subsequently, HEC commissioned ERM as the Environmental Consultant to undertake an EIA for this Project. As part of the Study requirements, this Project specific EM&A Manual has been prepared to provide further details of the specific EM&A requirements that have been recommended during construction and operation of the Project. In particular, the requirements for ensuring compliance with mitigation measures specified for landscape and visual, noise, dust, water quality and ecological impacts are defined.

1.2.2 The Project

The Project constitutes a Designated Project by virtue of Item D.1 of Part I of Schedule 2 under the *EIAO*.

The works that are the subject of the EIA Study include the construction and operation phases of the Project. The key components of the Project includes the following:

i. Erection of a wind turbine (hub height approximately 45m and rotor blade diameter of approximately 52m, overall height of the wind turbine approximately 71m);

ii. Small-scaled excavation and construction of the wind turbine foundation (affected area approximately 15m by 15m);

iii. Construction of a site platform and retaining wall (affected area approximately 25 m by 60 m);

iv. Construction of one stainless steel hut as high voltage distribution pillar (HVDP) (size approximately 4.6 m length, 2.5 m width, 2.8 m height) for housing of switchgear and power conditioning devices. Transformer will be installed at the bottom of the wind turbine tower;

v. Underground distribution cables laying for connection to the nearby existing cable route (approximately 50m in length); and

vi. Operation and maintenance of the wind turbine system.

1.2.3 Construction Programme

Once the EIA Report has been formally approved by Government, HEC will obtain an Environmental Permit (EP) for construction of the Project. Once the EP has been obtained the construction of the Project is scheduled to commence in the first quarter of 2005 and will be completed within about 12 months, 8 months for civil works including site preparation, formation and foundation, and 4 months for electrical and mechanical works (such as installation & erection of the wind turbine).

1.3 OBJECTIVES OF THE EM&A PROGRAMME

The construction and operational impacts resulting from the implementation of the Project are specified in the EIA Report. The EIA Report also specifies 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 (*Annex A).* The EIA recommends that environmental monitoring will be necessary to assess the effectiveness of measures implemented to mitigate potential noise and ecological impacts during operation of the Project. Regular environmental auditing during construction is also recommended to ensure that potential impacts from other sources are adequately addressed through the implementation of the mitigation measures defined in this EIA Report.

This Manual provides the EM&A requirements that have been recommended in the EIA Report in order to ensure compliance with the specified mitigation measures. 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;
- provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- monitor the performance of the project and the effectiveness of mitigation measures;
- verify the environmental impacts predicted in the EIA Study;
- determine project compliance with regulatory requirements, standards and government policies;
- take remedial action if unexpected problems or unacceptable impacts arise; and
- provide data against which environmental audits may be undertaken.

1.4 THE SCOPE OF THE EM&A PROGRAMME

The scope of the EM&A programme is to:

- implement monitoring inspection and audit requirements for noise monitoring programme;
- implement monitoring inspection and audit requirements for ecology monitoring programme;
- implement inspection requirements for mitigation measures;

- liase with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the comprehension and consequences of the environmental audit;
- identify and resolve environmental issues and other functions as they may arise from the construction works;
- check and quantify the Contractor's overall environmental performance, 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;
- manage and liase 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 Contractor's general environmental awareness;
  - the Contractor's implementation of the recommendations in the EIA;
  - the Contractor's performance as measured by the EM&A;
  - the need for specific mitigation measures to be implemented or the continued usage of those previously agreed;
  - 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.

1.5 ORGANISATION AND STRUCTURE OF THE EM&A

1.5.1 General

The Proponent (HEC) shall appoint an Environmental Team (ET) to conduct the monitoring and auditing works and to provide specialist advice on the undertaking and implementation of environmental responsibilities.

The ET shall have previous relevant experience with managing similarly sized EM&A programmes, particularly concerning ecological impacts, and the Environmental Team Leader (ET Leader) shall be a recognised environmental professional, preferably with a minimum of seven years relevant experience in impact assessments and impact monitoring programmes.

With the consideration of the reasons listed below, as well as the small-scale nature of the Project and low magnitude of expected impacts, it is not considered necessary to appoint an independent environmental consultants to act as an " Independent Environmental Checker" (IC(E)) to verify and validate the environmental performance of the Contractor and the Environmental Team appointed by the Proponent:

- Low complexity, reliability and implementation experience of the proposed mitigation measures;
- Low significance, short duration and reversibility of the impacts due to the Project; and
- No complicated monitoring and auditing exercise and results to validate.

1.5.2 Project Organisation

The roles and responsibilities of the various parties involved in the EM&A process are further expanded in the following sections. The ET Leader shall be responsible for, and in charge of, the Environmental Team; and shall be the person responsible for executing the EM&A requirements.

HEC

HEC shall:

- employ an ET, as necessary, to undertake monitoring, laboratory analysis and reporting of the EM&A 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, as required, and undertake any necessary corrective actions;
- provide information/advice to the ET regarding works activities which may contribute, or be contributing to the generation of adverse environmental conditions;
- implement measures to reduce impact where any applicable 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.

Environmental Team

The duties of the Environmental Team (ET) and Environmental Team Leader (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;
- conduct site inspections to investigate and inspect the construction equipment and work methodologies with respect to pollution control and environmental mitigation, monitor compliance with environmental protection specifications, and to anticipate environmental issues that may require mitigation before the problem arises;
- 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;
- review working programme and methodology, and comment as necessary;
- investigate and evaluate complaints, and identify corrective measures;
- advice to the on environmental improvement, awareness, enhancement matters, etc, on site;
- report on the environmental monitoring and audit results and the wider environmental issues and conditions to HEC and the EPD; and
- adhere to the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

The ET shall be led and managed by the ET Leader. The ET Leader shall have relevant education, training, knowledge, experience and professional qualifications subject to the approval of the Director of Environmental Protection.

1.6 STRUCTURE OF THE EM&A MANUAL

The remainder of the Manual is set out as follows:

- *Section 2* sets out the EM&A general requirements;
- *Section 3* details the requirements for ecology impact monitoring, and lists relevant monitoring methodologies, submissions, compliance and Event and Action Plans (EAPs);

- *Section 4* details the requirements for dust suppression measures;
- *Section 5* details the requirements for noise monitoring;
- *Section 6* details the requirements for controlling water quality impacts;
- *Section 7* details the requirements for landscape and visual impacts mitigation measures;
- *Section 8* describes the scope and frequency of site auditing; and
- *Section 9* details the EM&A reporting requirements.

The EM&A Manual is an evolving document that should be updated to maintain its relevance as the Project progresses. The primary focus for these updates will be to ensure the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out.

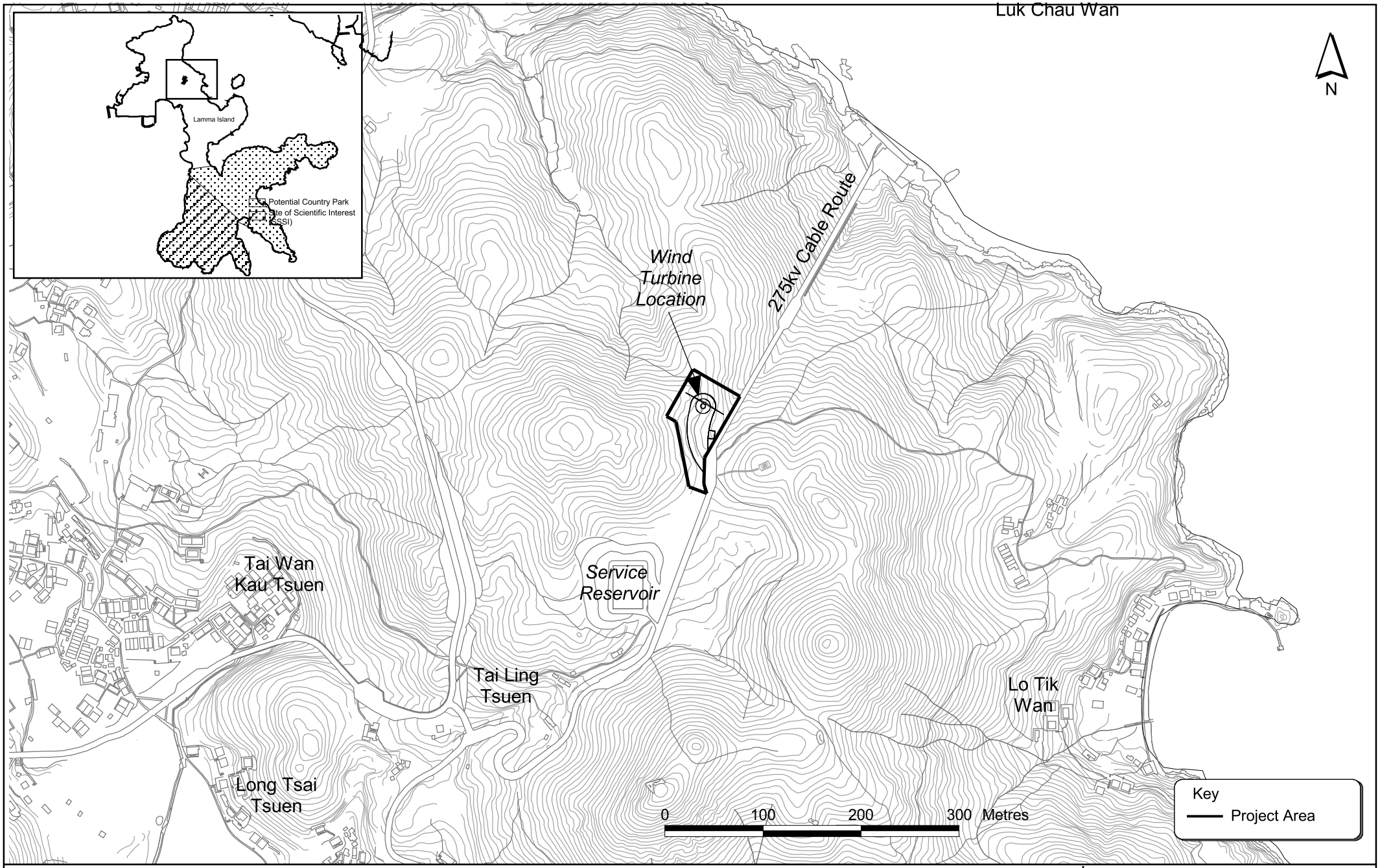

FIGURE 1.1

Location of The Proposed Wind Turbine

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2 EM&A GENERAL REQUIREMENT

2.1 INTRODUCTION

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

2.2 EM&A

Key environmental issues associated with the construction of the Project will be addressed through monitoring and controls specified in the EM&A Manual and construction contract. Ecology and noise will be subject to EM&A, the details of which are outlined in *Sections 3 and 5.*

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

2.2.1 *Environmental Monitoring*

Impact and operational monitoring will be carried out by the Environmental Team. Monitoring work is focussed on ecology, specifically construction phase impacts to the Romer's Tree Frog and operation phase impacts to birds and to a noise sensitive receiver. These are discussed in *Sections 3* and *5* of this Manual.

2.2.2 *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.

2.2.3 *Site Inspections*

In addition to monitoring ecology and noise as a means of assessing the ongoing performance of the construction works, the ET Leader shall undertake 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 construction

team(s) and the implementation of the environmental mitigation measures recommended in the EIA Report.

The findings of site inspections and audits shall be made known to the Contractor 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 8 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.

2.2.4 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. During construction of the Project, the majority of such correspondence is likely to be received directly by HEC.

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

1) The ET Leader shall notify HEC 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) HEC shall undertake the following steps, as necessary:

   - investigate and identify source of the problem;
   - if considered necessary by HEC, undertake additional monitoring to verify the existence and severity of the alleged complaint;
   - identify necessary remedial measures and implement as soon as possible;
   - repeat the monitoring to verify effectiveness of mitigation measures; and
   - repeat review procedures to identify further possible areas of improvement if the repeat monitoring results continue to substantiate the complaint.

4) The outcome of the investigation and the action taken shall be documented on a complaint proforma (*Annex B*). A formal response to each complaint received shall be prepared by HEC within a maximum of five working days, in order to notify the concerned person(s) that action has been taken.

5) All enquiries which trigger this process shall be reported in the monthly reports which shall include results of inspections undertaken by the contractor, and details of the measures taken, and additional monitoring results (if deemed necessary). It should be noted that the receipt of complaint or enquiry will not be, in itself, a 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.

2.2.5 Reporting

Monthly reports submitted to HEC, EPD and AFCD shall be prepared by the ET. The monthly reports shall be prepared and submitted within 10 working days of the end of each reporting month. Additional details on reporting protocols are presented in *Section 9*.

2.2.6 Cessation of EM&A

The ET shall continue to carry out environmental monitoring and site inspections until completion of the construction works and the specified operational phase monitoring period.

3 ECOLOGY

3.1 INTRODUCTION

Potential ecological impacts associated with the construction and operation of the wind turbine have been identified in the EIA Report. The following measures have been developed in accordance with this approach to mitigate the impacts.

3.2 MITIGATION MEASURES

3.2.1 Measures for Romer's Tree Frog

Undertake Romer's Tree Frog surveys within the Project Area just before the construction works commence. Due to the small size of the Project Area and given that there are no optimal habitats for Romer's Tree Frog, one day-time and one night-time survey is considered sufficient. The surveyor(s) should actively search within the Project Area paying special attention to the water bodies (ie abandoned containers). All recorded Romer's Tree Frog (adults and tadpoles) must be caught by hand and translocated to the stream pools of middle course of Stream S4 near Lo Tik Wan (*Figure 3.1*), the critical natural habitats for Romer's Tree Frog within the Study Area, immediately after the survey. The Romer's Tree Frog surveys and translocation works shall be undertaken by a qualified ecologist with at least five years of relevant experience in faunal translocation works.

3.2.2 Measures for Construction Runoff

Surface run-off from the construction site should be directed into existing stream channel via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities.

3.2.3 Good Construction Practice

- Erect fences along the boundary of the works area before the commencement of works to prevent tipping, vehicle movements, and encroachment of personnel onto adjacent areas.
- Avoid any damage and disturbance, particularly those caused by filling and illegal dumping, to the remaining and surrounding natural stream habitats.
- Regularly check the work site boundaries to ensure that they are not breached and that no damage occurs to surrounding areas.

- Prohibit and prevent open fires within the site boundary during construction and provide temporary fire fighting equipment in the Project Area.

- Treat any damage that may have occurred to individual major trees in the adjacent area and along the 275 kV Cable Route (used to transport the construction materials) with surgery.

- Reinstate temporary disturbed areas immediately after completion of the construction works, ie through on-site tree/shrub planting. Tree/shrub species used should make reference from those in the surrounding area and/or *Annex C* of the EIA Report.

3.3 ENVIRONMENTAL MONITORING AND AUDIT

3.3.1 Construction

The implementation of the ecological mitigation measures stated in *Section 3.3* above should be checked as part of the environmental monitoring and audit procedures during the construction period.

3.3.2 Operation

Monitoring for bird collision during operation is required. The purpose of the monitoring is to assess the impact (via collisions) of the wind farm on birds, with a particular focus on species of conservation interest (ie Black Kite). During the operation of the wind turbine, monitoring will be undertaken at monthly intervals for a period of 12 months. An area of 50 m radius will be searched around the base of the turbine. After this 12-month period, the monitoring results will be reviewed. Should any bird mortality or injury be confirmed as due to the wind turbine, relevant government departments (ie Environmental Protection Department (EPD) and Agriculture, Fisheries and Conservation Department (AFCD)) would be notified. If the bird collision event persists more than 3 times, HEC will discuss remedial action with government and implement any agreed actions to solve the event such as adjustment of wind turbine lighting and the colour of the wind turbine. The effectiveness of the proposed remedial action will be verified and evaluated with discussion with EPD/AFCD.

A simple Event and Action Plan during the first 12 months of operation of the wind turbine is recommended in *Table 3.1*.

Table 3.1 Event and Action Plan during Operation of Wind Turbine

Monitoring Criteria	Event	Action	
		Environmental Team Leader/ Environmental Manager (employed by HEC)	**HEC**
Bird Collision	Bird injury or mortality recorded in the vicinity of the wind turbine (50 m radius from the turbine) and confirmed due to the wind turbine.	1. Notify HEC and check the wind turbine site to find out the cause of the event(s).	1. Identify and report the cause(s) of the event if bird mortality or injury confirmed due to the wind turbine.
		2. Undertake weekly bird monitoring (observing the influence of the wind turbine on the behaviour of birds). The normal monitoring schedule will be resumed if the cause(s) of the event have been identified.	2. Submit proposals to relevant government departments (ie EPD and AFCD) for remedial action and implement the action to solve the event if the collision event persists more than 3 times.
		3. If the collision event persists more than 3 times, discuss and develop remedial actions with HEC such as adjustment of wind turbine lighting and the colour of the wind turbine.	3. Verify and evaluate the effectiveness of the remedial action with Environmental Team Leader/ Environmental Manager and EPD/AFCD.

If, after the 12-months monitoring period, insignificant number of bird collisions have been reported then monitoring will cease as it will have been demonstrated that the wind turbine is not having an adverse impact on bird species.

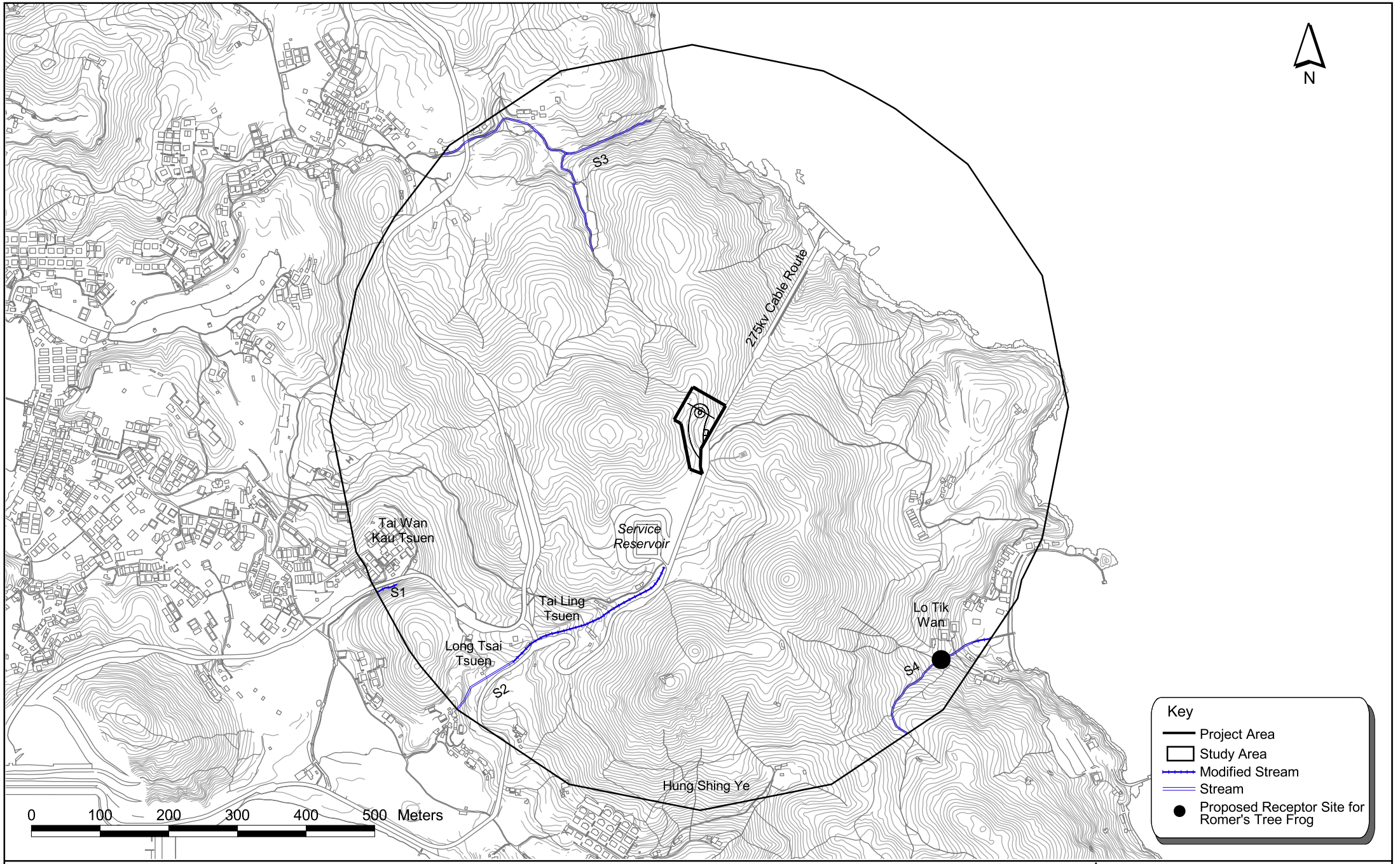

FIGURE 3.1

Proposed Receptor Site for the
Translocated Romer's Tree Frog

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4 DUST

4.1 INTRODUCTION

For land based construction works, dust suppression measures have been recommended in the EIA Report to reduce potential impacts to sensitive receivers. Implementation of these measures shall be reviewed during site inspections to ensure compliance with the requirements of the EIA and the effectiveness of these measures.

4.2 DUST GENERATING ACTIVITIES

Site formation by cutting the hill slope and filling to form the site platform, foundation construction, cable laying, wind turbine erection and landscaping works are the main construction activities. In them, wind erosion, materials handling and on-site stockpiling are the major dusty activities.

4.3 SENSITIVE RECEIVERS

ASRs have been identified within 500 m from the project site in accordance with the EIA Study Brief (ESB-112/2004) and the criteria set out in *Annex 12* of the *EIAO-TM* and through site inspections and review of land use plans. Type of Use, height of buildings, their horizontal distance from the worksite boundary and approximate base elevation (in mPD) are summarised in *Table 4.1*. The locations of ASRs are shown in *Figure 4.1*.

Table 4.1 Air Sensitive Receivers

ASR	Location	Type	No. of Storeys	Distance from Nearest Worksite Boundary (m)	Approximate Base Elevation in mPD
A1	No.1 Tai Ling Tsuen	R	2	185	79
A2	No.2 Tai Ling Tsuen	R	1	240	69
A3	No.3 Tai Ling Tsuen	R	1	245	69
A4	Tai Wan Kau Tsuen	R	3	420	12
A5	Po Lo Village	R	1	415	39
A6	Lung Tsai Tsuen	R	1 - 3	470	35
A7	Lo Tik Wan Village	R	2 - 3	430	10
A8	Tai Peng	R	2 - 3	470	42

Note:
(a) The base elevation of the wind turbine is 92 mPD.

4.4 DUST MITIGATION MEASURES

In order to reduce the dust emissions during construction phase, the following dust suppression measures stipulated in the *Air Pollution Control (Construction Dust) Regulation* will be incorporated into the Particular Specification and implemented by the Contractor.

- Covering entirely by impervious sheet or frequently watering of the on-site stockpile of excavated materials to keep wet always before backfilling;
- Frequent watering of exposed area or worksite of excavation to maintain surface wet;
- Provision of vehicle washing to remove any dusting materials from small village trucks' body and wheel at the exit of worksite;
- Well-maintained diesel-powered mechanical equipment to avoid black smoke emissions; and
- Shut-down of diesel-powered mechanical equipment or trucks inside the worksites when they are not in operation.

4.5 ENVIRONMENTAL MONITORING & AUDIT

Given the very limited dust emission anticipated due to the small worksites and limited generation of excavated spoils, dust monitoring is not required during the construction stage. Weekly site audit shall be conducted instead, to ensure the recommended dust suppression measures are properly implemented.

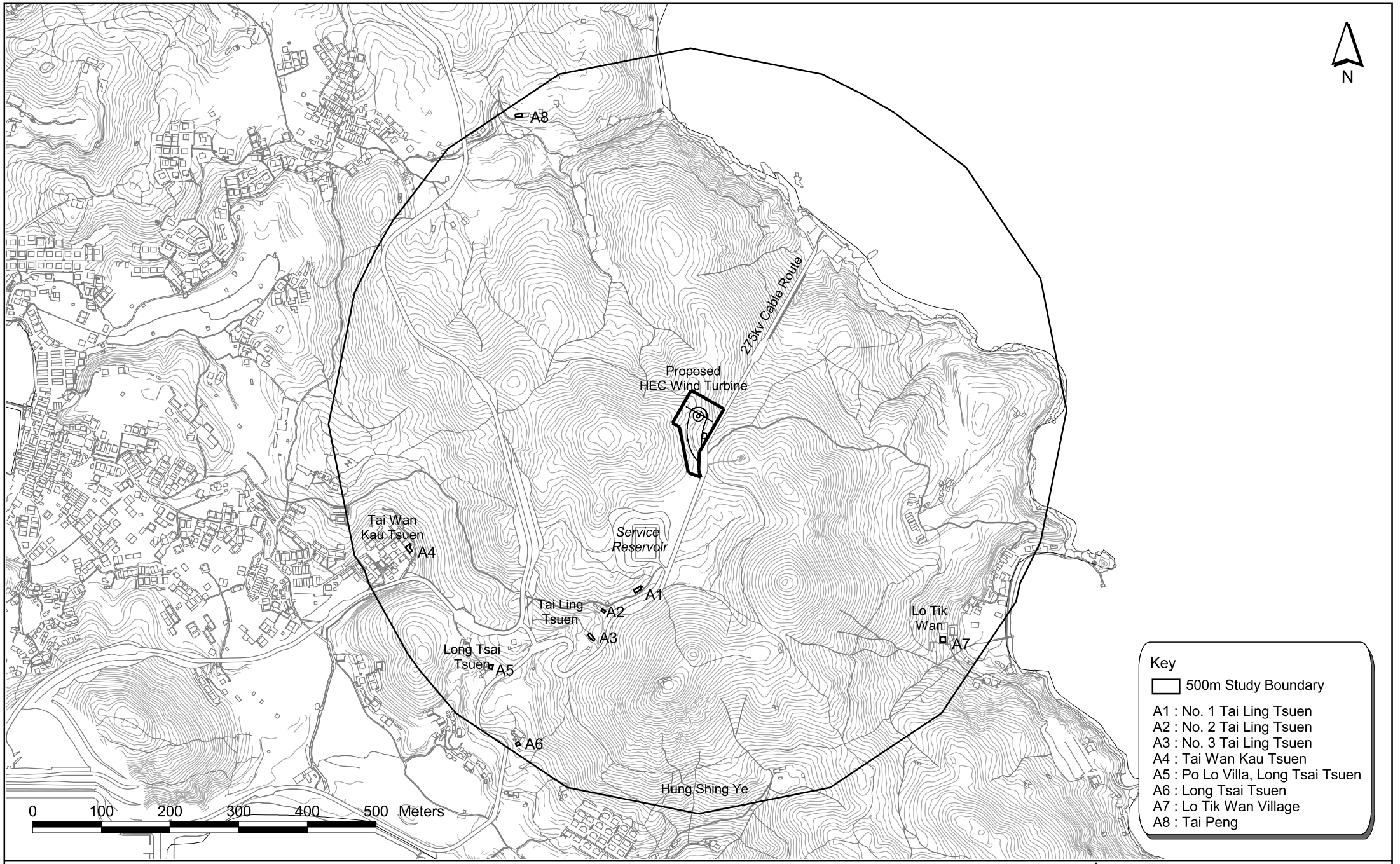

FIGURE 4.1

Location of Air Sensitive Receivers

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5 NOISE

5.1 INTRODUCTION

In this section, the general requirements, methodology, equipment, and mitigation measures for the monitoring and audit of noise impacts associated with the construction and operation of the Project are described below.

5.2 NOISE GENERATING ACTIVITIES

5.2.1 Construction Phase

The use of PME during the construction phase will be the main source of noise impact. The main construction activities are:

- excavation by cutting and filling to form a site platform;
- construction of retaining wall around site perimeter;
- construction of concrete footing for wind turbine foundation;
- erection of wind turbine and high voltage distribution pillar; and
- landscaping works including planting of trees and shrubs.

5.2.2 Operational Phase

The sources of noise emitted from the operating wind turbine include the rotation of mechanical and electrical equipment and aerodynamic noise originating from the flow of air around the blade.

5.3 NOISE SENSITIVE RECEIVERS

All NSRs, as defined by *EIAO-TM,* have been identified within an area of 300 m of the Study Area boundary. For NSRs outside the 300m Study Area boundary, such as Tai Wan Kau Tsuen and Lo Tik Wan are also identified. The locations of the NSRs have been shown in *Figure 5.1*. No planned NSRs are identified in the study boundary.

Table 5.1 Identified Noise Sensitive Receivers

NSR	Location	Type of Uses
N1	No. 1 Tai Ling Tsuen	Residential (2-Storey)
N2	No. 2 Tai Ling Tsuen	Residential (1-Storey)
N3	No. 3 Tai Ling Tsuen	Residential (1-Storey)
N4	Tai Wan Kau Tsuen	Residential (3-Storey)
N5	Lo Tik Wan	Residential (1-Storey)

5.4 ENVIRONMENTAL MONITORING & AUDIT

5.4.1 Methodology and Criteria

Construction Phase

As the predicted construction noise levels at the identified NSRs comply with the stipulated noise criterion, noise monitoring is not required during the construction stage. Methodology and criteria related to EM&A is therefore not applicable for the construction phase.

Operational Phase

The *EIAO-TM* and *Technical Memorandum on Noise From Places Other than Domestic Premises, Public Places or Construction Sites* (*IND-TM*) specifies the applicable Acceptable Noise Levels (ANLs) for operational noise of wind turbine system. The ANLs are dependent on the Area Sensitivity Rating (ASR) and the time of the day and are presented in *Table 5.2.*

Table 5.2 ANLs to be used as Operation Noise Criteria

Time Period	$L_{Aeq\ 30min}$ (dB(A))		
	ASR "A"	ASR "B"	ASR "C"
Daytime 0700-1900	60	65	70
Evening 1900-2300	60	65	70
Night-time 2300-0700	50	55	60

Fixed Plant Noise

Noise associated with the operation of wind turbine is controlled under *Section 13* of the *NCO* and the predictions will be undertaken in accordance with the *IND-TM*. The criteria noise limits are set out in the *EIAO-TM* as follows:

- the total fixed source noise level at the facade of the nearest NSR is at least 5 dB(A) lower than the appropriate ANL (as shown in *Table 5.4*) as specified in the *Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites* (*IND-TM*); or,

- where the prevailing noise level in the area is 5 dB(A) or more below the appropriate ANL, the total fixed source noise level must not exceed this noise level.

The criteria noise limits stipulated in the *IND-TM* are dependent on the Area Sensitivity Rating (ASR) of the NSRs as shown in *Table 5.2.*

As the site is located in a rural area and no influencing factors affect the NSRs, an ASR "A" has been assumed for the NSRs located within 300 m of study boundary. Background noise measurements have been conducted by HEC during 2004 to investigate the prevailing noise level in the study area. The 48-hour continuous measurements of prevailing free field noise levels in the vicinity of No. 1 Tai Ling Tsuen are in the range of 45 – 80 dB(A) $L_{Aeq,\ 30min}$.

With the inclusion of façade correction, the measured prevailing noise level will be higher than the (ANL-5) criterion, and therefore the (ANL – 5) criterion, i.e. 45 dB(A) $L_{Aeq, 30min}$ for night-time period will be considered as the stipulated noise limit for the assessment of operational noise impact.

In any event, the Area Sensitive Rating assumed in this Report is for indicative assessment only given that there are currently no influencing factors assumed in the vicinity of the NSRs. It should be noted that fixed noise sources are controlled under Section 13 of the *NCO*. At the time of investigation, the Noise Control Authority shall determine noise impact from concerned fixed noise sources on the basis of prevailing legislation and practices being in force, and taking account of contemporary conditions / situations of adjoining land uses. Nothing in this Report shall bind the Noise Control Authority in the context of law enforcement against all the fixed noise sources being assessment.

5.4.2 Monitoring Equipment

The ET Leader shall be responsible for providing and maintaining a sufficient number of sound level meters to conduct the necessary impact monitoring and *ad hoc* monitoring at the agreed monitoring location.

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* & *IND-TM*. The sound level meters shall be supplied and used with the manufacturers 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. The anemometers shall be used and calibrated in accordance with the manufactures recommendations.

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 ET Leader 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.

5.4.3 Monitoring Location

The ET Leader will be responsible for conducting noise monitoring at the following representative monitoring location, as defined in *Table 5.3* and shown in *Figure 5.2.*

Table 5.3 EM&A Representative Monitoring Location

NSR No.	Identity/Description
NM1	No. 1 Tai Ling Tsuen (N1)

The monitoring location 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. For reference, a correction of +3 dB(A) shall be made to the free field measurements.

5.4.4 Baseline Monitoring

To investigate the prevailing noise levels at the nearest NSR (NM1) , a continuous 48-hour noise measurement has been conducted from 1200 hours on 25 May 2004 to 1200 hours on 27 May 2004. As there were problems in gaining access to the nearest NSR (NM1), free-field noise measurement has been made at a close proximity to NM1. In addition, as the measurements are conducted off-site from the nearest NSR NM1, potential community noise associated with the residents will not be included in the measurement. Therefore, the measured levels are considered to represent the lowest ambient noise levels.

The chirps of the insect "cicadas" were identified as the dominant noise sources during the noise measurement. Although the chirps are seasonal in nature, the cicadas only chirps in early morning and day-time, such that the measured noise levels during night-time would not be affected by the chirps. Therefore the background noise measurement would represent the typical acoustic environment in the vicinity of the NSRs. The noise measurement results with facade correction are summarised in *Table 5.4*. A timeline chart showing the prevailing noise levels is presented in *Figure 5.3*.

Table 5.4 Measured Prevailing Noise Level (with facade correction)

Period	$L_{Aeq, 30min}$		
	Minimum	Average	Maximum
0700 – 2300 hours	49.8	65.8	81.9
2300 – 0700 hours	47.6	60.8	82.5

Without potential noise sources in the vicinity of the nearest NSR, it is anticipated that the measured prevailing noise levels can represent the results of baseline monitoring, and hence baseline monitoring is not necessary.

5.4.5 Impact Monitoring

Construction Phase

Given that compliance with the stipulated noise criterion is predicted, noise monitoring is not required during the construction stage. Weekly site audits will be conducted to ensure that the plant inventory used on site are consistent with the assumptions and mitigation measures used in the EIA report.

Operational Phase

During the operation of the wind turbine, noise monitoring shall be carried out during the night-time period at the agreed monitoring location once every fourteen days for a period of six consecutive months. A sample data sheet is shown in *Annex C*. Two types of measurement shall be carried out:

a) Broadband measurement of $L_{Aeq\ (t)}$. Note that the measurement period (t) shall normally be 30 minutes (six consecutive 5-minute measurement). However, if it can be demonstrated that the noise level is constant, then a shorter measurement period (no less than 5 minutes) may be used.

b) Frequency analysis between 31.5 and 16 kHz measured at 1/3 octave intervals. If the noise emanating from the wind turbine is found to be tonal (as defined in IND-TM) then an appropriate tonal correction should be applied to the measured noise level (MNL) to achieve the corrected noise level (CNL). This CNL shall be compared with the noise specifications.

5.4.6 Mitigation Measures

Construction Phase

Though the predicted construction noise levels comply with the stipulated noise criterion, good site practice and noise management is recommended for minimising the construction noise impact on nearby NSRs. The measures include:

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;
- Machines and plant that may be used intermittently, such as vibratory poker, should be shut down between work periods or should be throttled down to a minimum;
- Plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from nearby NSRs; and
- Mobile plant should be sited as far away from NSRs as possible.

In the event of exceedances or complaints, upon the advice of the ET Leader, the Contractor shall liaise with the ET Leader to agree further mitigation

measures, propose the recommended measures to HEC for approval, and then implement the mitigation measures.

Operational Phase

In the design stage, the allowable maximum sound power level of 100dB(A) with no pure tones shall be included in the tender specification of wind turbine.

The supplier shall guarantee this noise level by providing certificate of measurement and verify the overall noise level during commissioning and testing in accordance to international standard procedures such as IEC 61400-11. Whenever necessary, the supplier shall apply attenuation measures to achieve the guaranteed noise level during detailed design stage.

During the operational phase of the wind turbine, in the event of exceedances, HEC shall liaise with the ET Leader to investigate the cause of noise exceedances taking into account background noise levels. Whenever necessary, the supplier of the wind turbine will be requested to provide attenuation measures to achieve the guaranteed noise level.

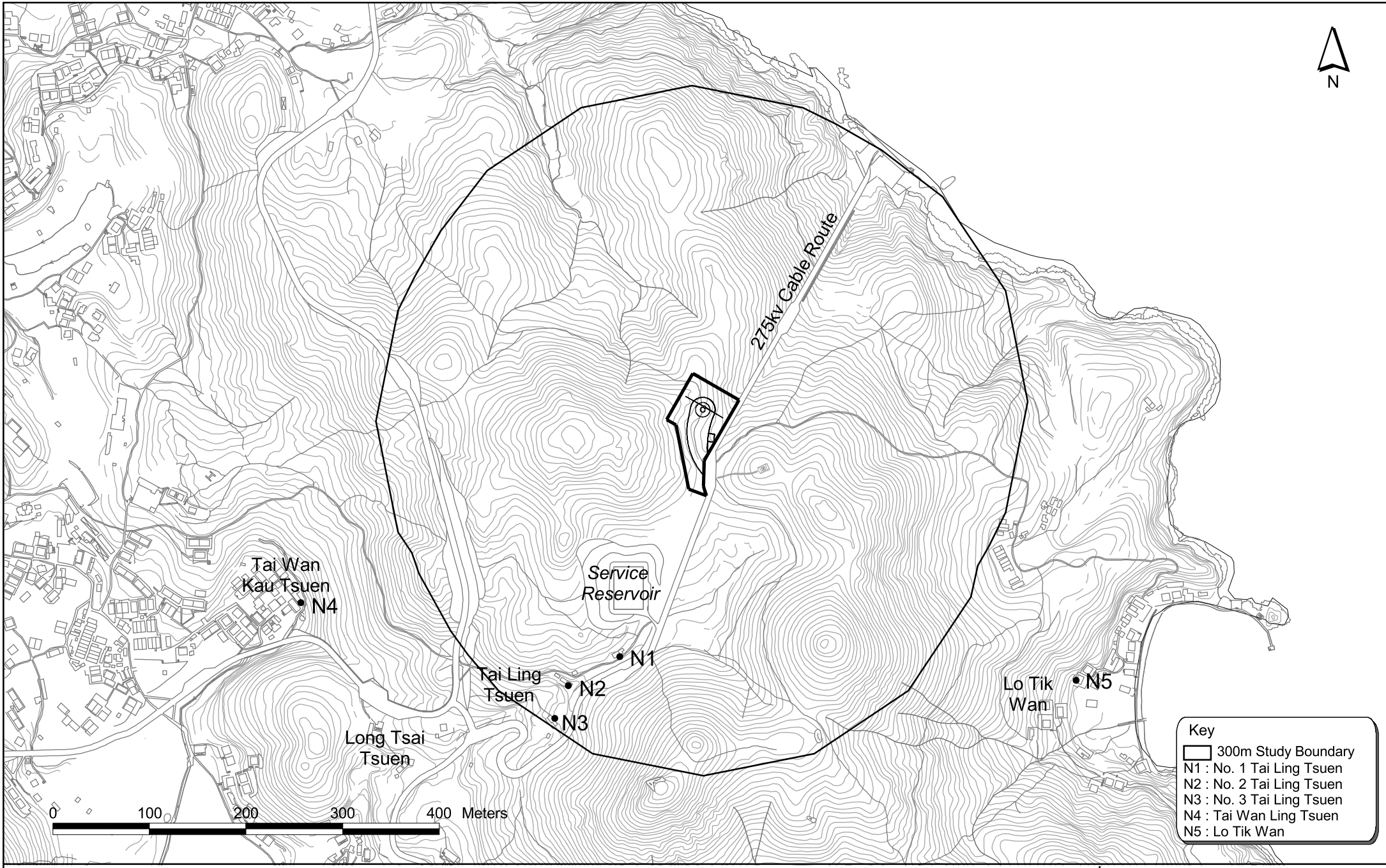

FIGURE 5.1

Location of Noise Sensitive Receivers (NSRs)

File: C2701g_3.apr
Date: 21/07/04

Environmental Resources Management

ERM

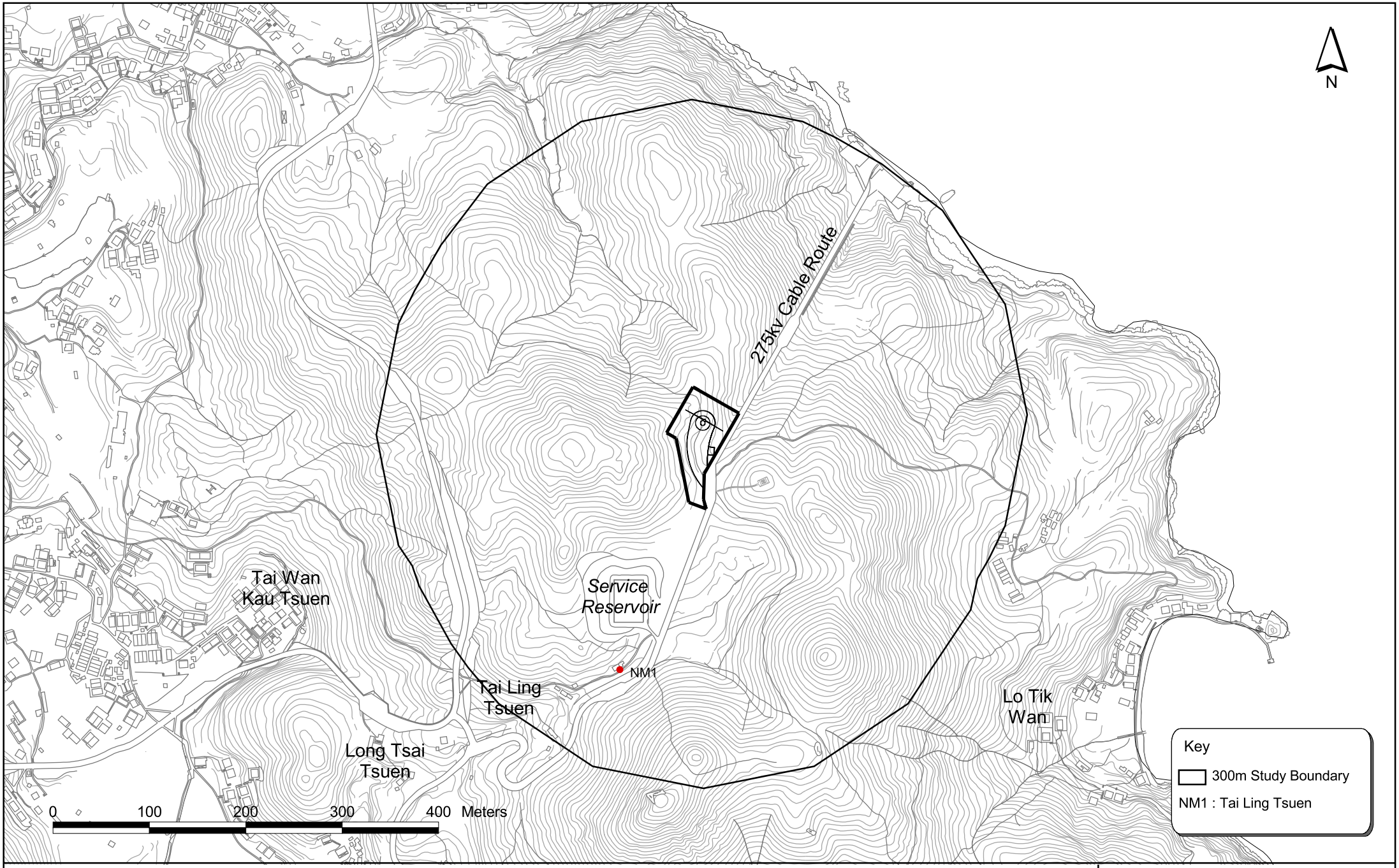

FIGURE 5.2

Proposed Noise Monitoring Location

File: C2701g_4.apr
Date: 21/07/04

Environmental Resources Management

ERM

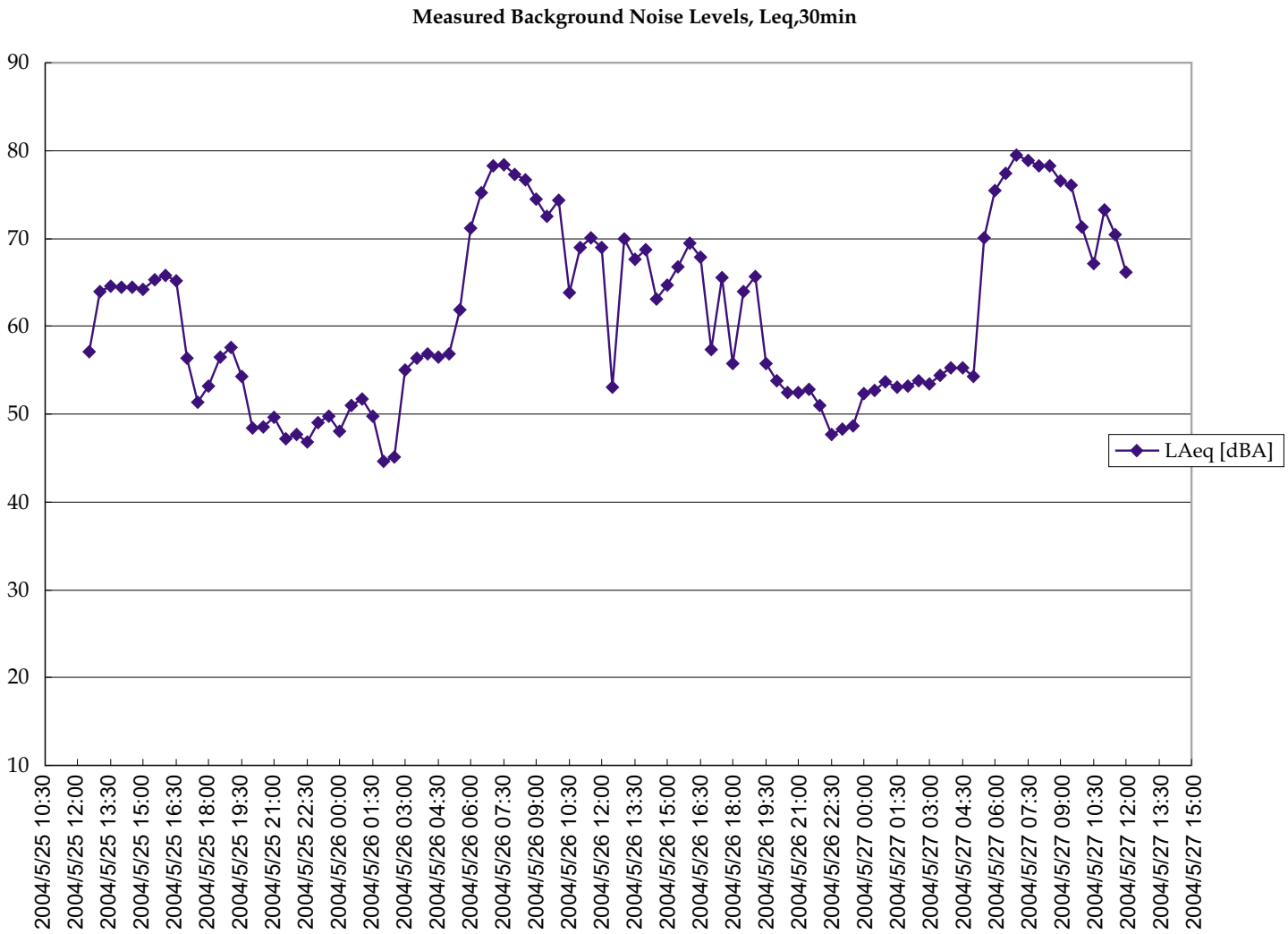

Figure 5.3

MEASURED BACKGROUND NOISE LEVELS

FILE: C2701f7
DATE: 05/07/04

Environmental Resources Management

ERM

6 WATER QUALITY

6.1 INTRODUCTION

This section presents the EM&A recommendations for auditing the water quality mitigation measures during the construction phase of the Project.

6.2 CONSTRUCTION PHASE

As stated in the EIA report, no water quality monitoring is required for the construction phase. However, as part of the regular audit procedures, it is recommended that the ET Leader confirms that the Contractor has implemented the mitigation measures, as described in *Section 8.6* of the EIA Report.

6.2.1 *Mitigation Measures*

The Contractor shall implement the following on-site measures to minimise potential water quality impacts associated with land based construction.

Surface Run-off

- Surface run-off from the construction site should be directed into stream channel via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities.

- Silt removal facilities should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.

- During excavation in the wet season, temporarily exposed soil surfaces should be covered, eg by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (eg along the crest/edge of the excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

- Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out as soon as practical after the final surface are formed to prevent erosion caused by rainstorms. Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.

- Open stockpiles of construction materials (eg aggregates and sand) on site should be covered with tarpaulin similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.

Wastewater from Site Facilities

- The use of chemical toilets will be necessary and these should be provided by a licensed contractor, who will be responsible for appropriate disposal and maintenance of these facilities.

In addition to implementing the specified mitigation measures, the Contractor will also be required to obtain a *WPCO* discharge licence should any wastewater discharges be released from the site. This may require the Contractor to undertake monitoring of the quality/quantity of the discharges to show compliance with the conditions of the licence; however, at this stage, this does not form part of the EM&A programme.

6.2.2 Operation Phase

No monitoring of water quality or mitigation measures are required during the operational phase of the Project.

The construction works will involve some site formation which will necessitate the removal of small quantities of spoil (approximately 1,300 m^3 of excavated materials). The quantity of waste materials arising from the construction phase is not expected to be high as most of the spoil (95% of the excavated materials) will be used as backfill, but practical measures will be taken to avoid, minimise and recycle wastes. Good construction practices, including limiting activities within the site boundary and avoiding of filling and illegal dumping by site management and audit, and provision of impermeable floor for the site are recommended to ensure that adverse environmental impacts are prevented.

During the construction phase, weekly site audit shall be conducted to ensure the good construction practice, waste management and disposal are properly implemented.

8 LANDSCAPE VISUAL

8.1 GENERAL

Details of all mitigation measures should be further developed at the detail design stage. The recommended mitigation measures should be included into the Contract Document where the Contractor is responsible for their implementation as recommended in the EIA Study. During the site environmental audit inspections, the Environmental Team (ET) Leader should be responsible for ensuring that landscape and visual mitigation measures are fully implemented by the Contractor, as per the approved construction programme. The following key mitigation measures are recommended.

8.2 DETAIL DESIGN STAGE

Mitigation measures recommended in the EIA Report for landscape and visual impacts during the detail design stage are summarised below:

Table 8.1 Mitigation measures recommended in the EIA Report

NSR No.	Identity/Description
MM1	New cut and fill slopes and other land affected by construction works would be reinstated to natural land form and topography of the natural slope as far as practical. Grading of these slopes to resemble a natural, rolling landform similar to that of adjacent topography would be carried out. Approximately 1,400 sq.m. of disturbed areas would be reinstated.
MM2	Appropriate landscape planting including trees, shrubs and grasses (approx. 1,400 sq.m.) will be provided to soften the ground level appearance of the proposed wind turbine site.
MM3	A light grey non-reflective colour scheme will be used to enable the proposed wind turbine to blend in well with natural surroundings and minimize the visual intrusion.
MM4	Existing soil resources on site from the cut slope will be re-used for backfilling at site as far as practicable to minimize the need to import or export soils.
MM5	Selection of low rotating speed machine to minimize the visual disturbance.

8.3 CONSTRUCTION STAGE

Mitigation measures recommended in the EIA Report for landscape and visual impacts during the construction stage are the same as those in the construction stage and these would be implemented by the contractor.

8.4 OPERATION STAGE

A landscape architect should make regular on-site visits within the establishment period to monitor the condition of newly planted vegetation.

9 SITE ENVIRONMENTAL AUDIT

9.1 SITE INSPECTION

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 weekly by the Environmental Team (ET) Leader to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Additionally, the ET Leader 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; the results of the inspections shall be made available to HEC.

The areas of inspection should include the general environmental conditions in the vicinity of the site and 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 ET Leader 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; and
- the relevant environmental protection and pollution control laws.

The ET Leader's inspection results and their associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to HEC 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. HEC and their contractors 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 Environmental Management system. 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 ET Leader 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.

9.2 COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS

There shall be contractual environmental protection and pollution control requirements as well as Hong Kong's environmental protection and pollution control laws which HEC shall comply with.

The ET Leader 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.

HEC shall also regularly copy relevant documents to the ET Leader so that the checking work 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 ET Leader during his site inspection.

After reviewing the documentation, the ET Leader shall advise HEC 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 ET Leader'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 potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise HEC accordingly.

Upon receipt of the advice, HEC shall undertake immediate action to remedy the situation.

10 REPORTING

10.1 GENERAL

Reports can be provided in an electronic medium upon agreeing the format with EPD. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach. All the monitoring data (baseline and impact) should also be submitted on diskettes.

10.2 BASELINE MONITORING REPORT

The ET Leader shall prepare and submit an Ecological Baseline Report within 10 working days of the completion of the Romer's Tree Frog baseline survey. Copies of the Ecological Baseline Report shall be submitted to AFCD and EPD. The exact number of copies required by AFCD and EPD will be established through liaison. The report will be supported by the results of the Romer's Tree Frog baseline survey in electronic format, along with the details of any necessary translocation works, including methodology and location of the receptor site.

10.3 MONTHLY EM&A REPORTS (CONSTRUCTION PHASE)

The results and findings of all EM&A work (mainly site audit) required in the Manual shall be recorded in the monthly EM&A Reports and be prepared by the ET Leader. The reports shall be submitted to EPD and copied to AFCD within two weeks of the end of each calendar month, with the first report due in the month after construction works commence. The ET Leader shall liase with the relevant parties to confirm the exact number and format of monthly reports in both hard copy and electronic format. The report shall include, but not be limited to, the following elements:

10.3.1 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);

- 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; and
- Works undertaken during the month.

(c) Environmental Status

- Works undertaken during the month with illustrations (such as location of works); and
- Drawing showing the project area, any environmental sensitive receivers.

(d) Summary of EM&A requirements including:

- 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, as recommended in the project EIA study report, summarised in the updated implementation schedule.

(f) Site Audit Report

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

- 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; 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.

10.3.2 Subsequent Monthly EM&A Reports

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

(a) Executive Summary (1-2 pages)

- 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.

(c) Implementation Status

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) Report on Complaints, Notifications of Summons and Successful Prosecutions

- 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.

(g) Appendix

- Outstanding issues and deficiencies.

10.4 OPERATION PHASE MONITORING

10.4.1 Monthly Report on Bird Monitoring

HEC shall prepare and submit a Monthly Report on Bird Monitoring, for a period of 12 months, during the operation of the wind turbine. Copies of the Monthly Report on Bird Monitoring shall be submitted to AFCD and EPD. The exact number of copies required by AFCD and EPD will be established through liaison.

10.4.2 Monthly Report on Noise Monitoring

HEC shall prepare and submit a Monthly Report on Noise Monitoring, for a period of 6 months, during the operation of the wind turbine. Copies of the Monthly Report on Noise Monitoring shall be submitted to EPD. The exact number of copies required by EPD will be established through liaison.

10.5 FINAL EM&A SUMMARY REPORT

The EM&A programme shall be terminated upon completion of those construction and operation activities that have the potential to result in a significant environmental impact and conclusion of the post-project monitoring.

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:

- 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;

(g) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;

(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;

(p) 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;

(q) 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

(r) a conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

10.6 DATA KEEPING

Documentation such as the monitoring field 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 ET Leader and HEC, 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. All the documents and data shall be kept for at least one year after completion of the construction contract.

10.7 INTERIM NOTIFICATION OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES

Interim notifications of bird collision event during the operation of the wind turbine will be issued to EPD and AFCD after the identification of an exceedance. The notification shall be followed up with advice to HEC, EPD and AFCD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. The Monthly Reports will contain all available details concerning measures exceedances and complaints, their causes and those steps taken to control impacts and prevent their recurrence.

10.8 INTERNET EM&A

To facilitate public inspection of the Baseline Monitoring Report and Monthly EM&A Reports via the EIAO Internet Website and at the EIAO Register Office, electronic copies of these Reports shall be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), will be submitted at the same time as the hard copies. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of these Reports will be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in these references are made. All provided in the main text from there the respective references area made. All graphics in these Reports will be interlaced GIF format. The content of the electronic of these Reports will be same as the hard copies.

HEC shall notify EPD in writing the internet address where the environmental monitoring data are to be placed. All environmental monitoring data shall be made available to the public via internet access in the shortest possible time and in no event later than 2 weeks after the relevant environmental monitoring data are collected or become available. The internet address and the relevant environmental monitoring data shall be made available to the public via the the EIAO Internet Website and at the EIAO Register Office.

The internet website shall enable user-friendly public access to the monitoring data with features capable of:

- Providing access to all environmental monitoring data collected since the commencement of works;
- Searching by date;
- Searching by types of monitoring data (noise and ecology); and
- Hyperlinks to relevant monitoring data after searching.

Annex A

Implementation Schedule

A1 IMPLEMENTATION SCHEDULE

This *Annex* provides a consolidation of the mitigation measures recommended for the Project. The consolidation is presented in the form of an Implementation Schedule in accordance with the format specified in *Section 3.4.7.3* of the *EIA Study Brief No. ESB-112/2004*.

The Implementation Schedule has the following column headings:

EIA Ref

This denotes the section number or reference from the EIA Report Main text.

EM&A Log Ref

This denotes the sequential number of each of the recommended mitigation measures specified in the Implementation Schedule.

Environmental Protection Measures

This denotes the recommended mitigation measures, courses of action or subsequent deliverables that are to be adopted, undertaken or delivered to avoid, minimise or ameliorate predicted environmental impacts.

Objectives

This denotes the objectives of the recommended mitigation measures and main concerns to address.

Location/Duration of Measures/Timing of Completion of Measures

This indicates the spatial area in which the recommended mitigation measures are to be implemented together with details of the programming or timing of their implementation.

Implementation Agent

This denotes where the responsibility lies for the implementation of the recommended mitigation measures.

Implementation Stage

This denotes the stage at which the recommended mitigation measures are to be implemented either during the Design, Construction, Operation or Decommissioning.

Relevant Legislation

This section defines the controlling legislation that is required to be complied with.

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Objectives	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
						Des	C	O	Dec	
		Noise - Construction Phase								
4.7.1	1	**Good Site Practices** • Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works; • Machines and plant that may be use intermittently, such as vibratory poker, should be shut down between work periods or should be throttled down to a minimum; • Plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from nearby NSRs; and • Mobile plant should be sited as far away from NSRs as possible.	To minimise potential noise nuisance arising from the works to nearby NSRs.	During Construction stage	Construction Contractor		✓			Noise Control Ordinance (NCO) and Annex 5 of the EIAO TM
		Noise - Operation Phase								
4.7.2	2	The allowable maximum sound power level of 100 dB(A) and pure tone free shall be included in the tender specification of wind turbine.	To minimise potential noise nuisance arising from operation of wind turbine	During detailed design stage	HEC	✓		✓		Noise Control Ordinance (NCO) and Annex 5 of the EIAO TM

		Ecology – Construction Phase								
5.11.2	3	**Measures for Romer's Tree Frog** • Undertake one day-time and one night-time survey for the Romer's Tree Frog within the Project Area just before the construction works commence. The surveyor(s) should actively search within the Project Area paying special attention to the water bodies (ie abandoned containers). All recorded Romer's Tree Frog (adults and tadpoles) must be caught by hand and translocated to the stream pools of middle course of Stream S4 near Lo Tik Wan, the critical natural habitat for the Romer's Tree Frog within the Study Area, immediately after the survey. The Romer's Tree Frog surveys and translocation works shall be undertaken by a qualified ecologist with at least five years of relevant experience in faunal translocation works.	To avoid impacts on the Romer's Tree Frog arising from the work	Prior to commence of construction	HEC/ Construction Contractor		✓			
5.11.2	4	**Measures for Construction Runoff** • Surface run-off from the construction site should be directed into existing stream channel via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities.	To minimise potential ecological impacts arising from the works	During construction	Construction Contractor		✓			

5.11.2	5	**Good Construction Practice** • Erect fences along the boundary of the works area before the commencement of works to prevent tipping, vehicle movements, and encroachment of personnel onto adjacent areas. • Avoid any damage and disturbance, particularly those caused by filling and illegal dumping, to the remaining and surrounding natural stream habitats. • Regularly check the work site boundaries to ensure that they are not breached and that no damage occurs to surrounding areas. • Prohibit and prevent open fires within the site boundary during construction and provide temporary fire fighting equipment in the Project Area. • Treat any damage that may have occurred to individual major trees in the adjacent area and along the 275 kV Cable Route (used to transport the construction materials) with surgery. • Reinstate temporary disturbed areas immediately after completion of the construction works, ie through on-site tree/shrub planting. Tree/shrub species used should make reference from those in the surrounding area and/or *Annex C* of EIA report.	To minimise potential ecological impacts arising from the works	During construction	Construction Contractor		✓			
		Ecology – Operation Phase								
5.11.3	6	No mitigation measures are required. See EM&A Manual for monitoring requirements.								

		Landscape and Visual – Construction Phase								
6.7	7	• Colour scheme and non-reflective paints will be made to enable the proposed wind turbine to blend in well with natural surroundings and minimise the visual intrusion. • Selection of low rotating speed machine to minimize the visual disturbance.	To minimum potential landscape and visual impacts arising from the works	Prior commence of construction	Construction Contractor	✓	✓			
6.7		• New cut and fill slopes and other land affected by construction works would be reinstated to natural land form and topography of the natural slope as far as practical. Grading of these slopes to resemble a natural, rolling landform similar to that of adjacent topography would be carried out. Approximately 1,400 sq.m. of disturbed areas would be reinstated. • Appropriate landscape planting including trees, shrubs and grasses (approx. 1,400 sq.m.) will be provided to soften the ground level appearance of the proposed wind turbine site. • Existing soil resources on site from the cut slope will be re-used for backfilling at site as far as practicable to minimize the need to import or export soils.	To minimum potential landscape and visual impacts arising from the works	During construction	HEC/ Construction Contractor	✓ ✓ ✓	✓ ✓ ✓	 ✓		
		Landscape and Visual - Operation Phase								
	8	No mitigation measures are required. See EM&A Manual for monitoring requirements.								

		Air Quality - Construction Phase								
7.5.1	9	• Covering entirely by impervious sheet or frequently watering of the on-site stockpile of excavated materials to keep wet always before backfilling; • Frequent watering of exposed area or worksite of excavation to maintain surface wet, if necessary and practical; • Provision of vehicle washing to remove any dusting materials from small village trucks' body and wheel at the exit of worksite; • Well-maintained diesel-powered mechanical equipment to avoid black smoke emissions; and • Shut-down of diesel-powered mechanical equipment or trucks inside the worksites when they are not in operation.	To minimise potential dust nuisance arising from the works	During construction	Construction Contractor		✓			Air Pollution Control (Construction Dust) Regulation
		Air Quality - Operation Phase								
7.5.2	10	N/A								
		WATER QUALITY - Construction Phase								
8.6.1	11	**Surface Run-off** • Surface run-off from the construction site should be directed into existing stream channel via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities.	To minimise potential water quality impacts arising from the works	During construction	Construction Contractor		✓			

		• Silt removal facilities should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times. • During excavation in the wet season, temporarily exposed soil surfaces should be covered, eg by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (eg along the crest/edge of the excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm. • Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out as soon as practical after the final surface are formed to prevent erosion caused by rainstorms. Appropriate intercepting channels should be provided where necessary. Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities. • Open stockpiles of construction materials (eg aggregates and sand) on site should be covered with tarpaulin similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.								

8.6.2	12	**Wastewater from Site Facilities** • The use of chemical toilets will be necessary and these should be provided by a licensed contractor, who will be responsible for appropriate disposal and maintenance of these facilities.	To minimise potential water quality impacts arising from the works	During construction	Construction Contractor		✓			
		WATER QUALITY - Operation Phase								
8.7.2	13	No mitigation measures are required.								
		WASTE- Construction Phase								
3.5	14	• Excavated materials should be used as backfill as far as practicable; • Excavated materials should be segregated from other wastes; • Works activities should be limited within the site boundary; and • Filling and illegal dumping should be inhibited through site management and audit.	To enhance reuse, recycling and, as appropriate, proper disposal of excavated materials To avoid contamination thereby ensuring acceptability at public filling areas and avoiding the need for landfill disposal To ensure that adverse environmental impacts are prevented	Project site/during construction	Construction Contractors		✓			ETWBTC No 34/2002; ETWBTC No 15/2003
		Waste - Operation Phase								
3.5	15	No mitigation measures are required.								

Annex B

Complaints Proforma

COMPLAINTS PROFORMA

REPORT FORM FOR COMPLAINTS `	SHEET ____ OF ____ UNIT REFERENCE _____

RECIPIENT

NAME: **LOCATION:** **TEL.:**

COMPLAINANT

NAME: **TEL.:** **FAX:**

ADDRESS:

COMPLAINT

TYPE: Noise/Dust/Other

DATE: **TIME:** **Location:**

DESCRIPTION:

COPY FAX TO: DATE:	ORIGINAL TO: DATE:

REVIEW RESULTS

SIGNED: **DATE:**

RECOMMENDATIONS

SIGNED: **DATE:**

ATTACHMENTS

COPY TO: **DATE/TIME:**

Annex C

Noise Monitoring Proforma

Field Record Data Sheet for Noise Monitoring

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 & Designation	Signature	Date
Recorded By	:	_____	_____	_____
Checked by	:	_____	_____	_____