PROJECT PROFILE
工程項目簡介

CLP Power Hong Kong Limited (CLP)
中華電力有限公司（中電）

Renewable Energy Supply on Town Island (also known as Dawn Island)
伙頭墳洲（又名晨曦島）可再生能源工程

June 2010
二零一零年六月

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GMS# 0103677

For and on behalf of
代表
ERM-Hong Kong, Limited
香港環境資源管理顧問有限公司

Approved by :
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Date
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1 BASIC INFORMATION

1.1 PROJECT TITLE

Renewable Energy Supply on Town Island (also known as Dawn Island) (hereafter called "the Project")

1.2 NAME OF PROJECT PROPONENT

CLP Power Hong Kong Limited (CLP)

1.3 NAME AND TELEPHONE NUMBER OF CONTACT PERSON

Name : Mr T K Chan

Title : Engineer 1, Planning & Design, CLP Power Hong Kong Limited

Phone No : 2678 9049

1.4 PURPOSE AND NATURE OF THE PROJECT

Town Island is located in the eastern waters of the Hong Kong Special Administrative Region (HKSAR) to the south of High Island. Dawn Island Treatment & Rehabilitation Centre (DITRC) is operated by Operation Dawn Limited (ODL) (a government-subvented non-profit making organisation) as a residential drug rehabilitation facility and is the only occupant on the island. DITRC is currently populated by 50 to 70 rehabilitants and a small number of staff.

Currently existing diesel generator and temporary Renewable Energy (RE) system which was recently put in place by CLP in a collaboration purpose provide electricity supply to the existing DITRC's use. The system comprises temporary photovoltaic (PV) arrays with a total generating capacity of about 20kWp within a small area east of the Mount Carmel Hostel and associated distribution facilities to provide short-term improvement in the reliability of electricity supply to DITRC.

It is understood that ODL has plans in place to redevelop the DITRC. A Master Layout Plan (MLP) has been submitted to District Lands Office (DLO) and the application is still being considered. The existing facilities to be redeveloped will include the Mark Hostel near the pier, Mount Carmel Hostel and Living Spring Hostel. These existing single-storey hostels will be redeveloped into 3-storey buildings for rehabilitants' accommodation and other uses. To provide sufficient electricity for the future DITRC redevelopment, the temporary RE system will be replaced by a permanent RE system which includes PV panels and small-scale wind turbine while the

existing diesel generator will be for stand-by purpose to support fire services equipment and back-up to the renewable energy supply.

Different options for supplying power to Town Island, including a submarine cable and an overhead line, have been considered but both are not preferred due to reasons including:

- potential impacts on the marine environment (for the submarine cable option);
- visual intrusion (for the overhead line option);
- marine navigation safety (for the overhead line option); and
- amenability to maintenance.

The self-sustained RE option (including PV panels and small-scale wind turbines) currently adopted for the Project serves to eliminate the above-mentioned issues associated with the submarine cable and overhead line options but still affords the same level of service to electricity users on Town Island.

This Project comprises permanent RE installations including PV arrays, two 6kW wind turbines, underground cabling system and associated equipment. The installations for the Project will be located in two separate areas (ie, Site 1 next to the existing Mount Carmel Hostel and Site 2 next to the existing Living Spring Hostel) on the island (see *Figure 1.4a*). Details of the arrangement of RE installations are presented in *Section 1.5* below.

1.5 LOCATION AND SCALE OF PROJECT AND HISTORY OF THE PROJECT SITE

DITRC has been operating on Town Island since 1976 and has since been the only occupant of the island. The island was reportedly used by a small fishing settlement and some of the original buildings of the fishing community were taken over by DITRC.

The Project comprises of RE installations at two sites, namely, Site 1 and Site 2. Site 1 is located in the central part of the island, about 230 m southeast of the pier, and about 15 m south of the Mount Carmel Hostel. Two existing freshwater tanks are located approximately 20m to the north of Site 1 (*Figure 1.4a*). Site 1 occupies a total area of about 0.27 ha and is generally flat with elevations between +26mPD and +28mPD.

Site 2 is located northeast of the Living Spring Hostel, about 280 m southeast of Site 1, and approximately 20m from the nearest southern coastline of Town Island. Site 2 occupies a total area of about 0.31 ha on the undulating terrain of a south-facing slope with elevations between +14 mPD and +20mPD.

The Project will include the following elements:

Site 1

- a permanent chain-link fence;
- arrays of non-reflective solar photovoltaic (PV) panels [1], with a total power generating capacity of about 120 kWp, which will be mounted on steel frames standing about 1.3m above ground on concrete footing and set at an inclined angle of about 22.5°;
- a 6kW small scale wind turbine [2] to use wind energy to supplement the solar energy and enhance the supply reliability to the use on Town Island;
- existing plant room and cut-out box inherited from the temporary RE system;
- one new plant room and one new cut-out box to be installed;
- An existing lightning pole inherited from the temporary RE system;
- a new lightning pole on the northern site boundary;
- an aviation warning light pole [3] located close the wind turbine; and
- underground LV cables connecting to the existing distribution circuit.

Site 2

- a permanent chain-link fence;
- arrays of non-reflective solar PV panels, with a total power generating capacity of about 60 kWp, which will be mounted on steel frames standing about 1.3m above ground on concrete footing and set at an inclined angle of about 22.5°;
- a 6kW small scale wind turbine to use wind energy to supplement the solar energy and enhance the supply reliability to the use on Town Island;
- a plant room and cut-out box;
- a lightning pole on the northwest site boundary;
- an aviation warning light pole [3] located close the wind turbine; and
- underground LV cables connecting to the existing distribution circuit.

When the temporary RE system is decommissioned, the PV panels, steel frames, lightning pole, plant room/cut-out box and chain-link fence will be reused at Site 1 of the Project and other projects to minimise waste generation.

The preliminary layouts of Site 1 and Site 2 are shown in *Figures 1.5a* and *1.5b,* respectively.

Minor site levelling will be required for the installation of the PV panels and the fence. Minor excavation for footing construction will be required but the

(1) A total of about 600 PV panels are proposed to be installed in Site 1 and about 300 PV panels in Site 2. The specification of the PV panels is available from one of the datasheets published by Suntech Power at: *http://www.suntech-power.com/images/August24/EN/STP210_18Ud_EN.pdf*.

(2) The specification of the 6kW wind turbine can be referenced at http://www.turbineservices.co.uk/wind-turbines/proven/proven-6-kw/

(3) Since the small-scale wind turbine with aviation warning light cannot be sourced from the market, a separate aviation light pole is proposed close to the wind turbine. The aviation light will be omni-directional, red and non-flashing with a minimum intensity of 10 candelas.

volume of excavated materials to be generated will be limited, which will be reused onsite for backfilling.

The PV panels to be installed will be dark-coloured non-reflective panels. A section showing the typical arrangement of the PV panels is provided in *Figure 1.5c*. The plant room and cut-out boxes will be constructed onsite and will contain a battery bank, switches and power conditioning system (PCS). Only minor civil works such as concreting and assembling of equipment will be required for the installation of the plant room and cut-out boxes.

A Proven WT6000 6kW self-regulating wind turbine (or similar latest model) will be installed at Site 1 and a similar one will be installed at Site 2. With reference to the specification of Proven WT 6000 kW wind turbine, the rotor diameter is 5.5m and mast heights of 9m or 15m are available. The mast height for the wind turbine could not be confirmed until the detailed design stage, and therefore both mast heights will be considered in this PP. With the above in mind, the total height of the wind turbine (from the concrete plinth to the tip of rotor blade) will be about 13.5m or 19.5m [(1)]. The wind turbines will have rotor blades made of glass thermoplastic composite in a subdued colour. Minor excavation will be required for the construction of the footing for the wind turbines. However, the volume of excavated materials to be generated will be limited, which will be reused onsite for backfilling.

The lightning pole installed for the temporary RE system on the northern boundary of Site 1 will be re-used in the Project. Two additional lightning poles are proposed for Site 1 on its northeastern boundary and for Site 2 on its northwestern boundary, respectively. Aviation warning light poles are also proposed next to wind turbines for Site 1 and Site 2. Structural support for the new lightning poles and aviation warning light poles will be integrated with the permanent fencing to reduce concreting works.

New underground LV cables will be installed along the existing concrete footpath to connect the existing LV distribution circuit constructed for the temporary RE system. The preliminary routing of underground cables is shown in *Figure 1.4a*. Minor excavation will be required for the construction of wind turbine footings and the quantity of excavated materials generated is expected to be very small. The excavated materials will be reused for backfilling onsite for the reinstatement of the footpath.

The RE generation systems and power distribution facilities will be unmanned during their operation. Maintenance of the RE facilities will only be required on an *ad hoc* basis at an extremely low frequency. The maintenance will mostly be light-duty work using hand tools.

(1) Total height of wind turbine = 9m (mast) + 2.75m (radius of rotor) + height of base slab = 13.5m OR 15m (mast) + 2.75m (radius of rotor) + height of base slab = 19.5m

1.6 NUMBER AND TYPES OF DESIGNATED PROJECTS TO BE COVERED BY THE PROJECT PROFILE

The Project qualifies as a Designated Project under *Schedule 2*, Part I, Category D – Energy Supply, Item D.1 – Public Utility Electricity Power Plant of the *Environmental Impact Assessment Ordinance* (EIAO).

The Project involves the construction and operation of a permanent RE system described in *Section 1*. The construction of the Project is tentatively scheduled to start in mid 2010 and the operation is expected to commence in 2011.

An indicative programme showing the key milestones for the Project as currently envisaged is provided in *Table 2.1*. The installation of RE Systems at Sites 1 and 2 will be carried out at the same time.

Table 2.1 Indicative Project Programme

Key Stage of Project	Programme
Installation at Site 1 (Tentatively commencing in Q3/Q4 2010)	
Site levelling and installation of PV arrays and steel frames	3.5 months
Installation of wind turbine	1 month
Cable wiring and connection for PV panels, battery and inverter	1 month
Plumbing and drainage work	1.5 months
E&M Work, Testing and commissioning	2.5 month
Installation at Site 2 (Tentatively commencing simultaneously with Site 1 in Q3/Q4 2010)	
Site levelling and installation of PV arrays and steel frames	3.5 months
Installation of wind turbine	1 month
Cable wiring and connection for PV panels, battery and inverter	1 month
Plumbing and drainage work	1.5 months
E&M Work, Testing and commissioning	2.5 month
Underground cable installation (Tentatively commencing in Q4 of 2010 or early 2011)	
Excavation	1 month
Cable laying	2 weeks
Reinstatement of existing paving	1 month

The only other project that may be undertaken on Town Island is the redevelopment of DITRC but no committed construction programme has been formulated yet. Judging from the progress of the DITRC redevelopment project, its construction works may be undertaken concurrently with this Project. However, the RE project will only require minor excavation and only a very small number of construction equipment will be deployed onsite. Based on the above, the cumulative impacts from the two projects undertaken concurrently are expected to be very minor.

Town Island is located within Sai Kung Volcanic Rock Region of Hong Kong Geopark but it is not identified as Geo-Area within the Region [1].

Indicative layout plans for Site 1 and Site 2 are presented in *Figures 1.5a* and *1.5b*, respectively. Site 1 and its immediate surrounding area are currently covered mainly by grass and shrubs. A number of existing DITRC facilities, including two freshwater tanks and a single-storey boarding facility (the Mount Carmel Hostel), are located immediately north and northwest of the Site, respectively.

Similar to Site 1, Site 2 and its surrounding area are characterised by their scarce vegetation cover, which comprises mainly of grass and shrubs, with isolated patches of exposed ground. The Site is located on the southeastern coast of the island, immediately southeast of the Living Spring Hostel and near a cliff.

Two streams are found between Sites 1 and 2 and near the pier.

The underground cables will be installed directly along the existing concrete footpath.

The existing environment surrounding the Site is presented in *Figure 3.1a*.

[1] Hong Kong Geopark Map : http://www.geopark.gov.hk/publications/district_map.pdf

4.1 INTRODUCTION

4.1.1 Construction Phase

The construction of the Project is expected to involve casting of concrete plinths for the plant room and cut-out boxes, assembly of PV arrays and steel frames, erection of fencing, construction of wind turbine footings, cable trenching and erection of wind turbines.

During the construction phase, a workforce of about 20 to 25 persons is expected to be deployed at the two sites and along the underground cable route.

Mini-sized excavators, generators, winches, small concrete mixers, hand-held drill and air compressors will be deployed onsite. Construction materials and equipment will be delivered to Town Island by helicopter or boat. Minor excavation will be required for slight adjustments to the site levels, construction of wind turbine footings and forming the underground cable trench but the spoil will be backfilled onsite immediately. A small quantity of broken concrete generated from cable trenching works will be disposed of at public fill reception facilities.

4.1.2 Operational Phase

During the operational phase, the PV panels, wind turbines, control equipment and associated power distribution system will be unmanned. Infrequent inspections or maintenance may be required.

4.1.3 Summary of Potential Environmental Impacts arising from the Project

A summary of potential environmental impacts arising from the Project during the construction and operational phases is presented in *Table 4.1a*. The key potential impacts are related to air quality, noise, ecology and site runoff during the construction phase. Potential operational phase impacts are expected to include noise, ecology and landscape and visual impacts associated with the PV panels, plant room and wind turbines but these are considered minor. Further details on the consideration of the potential environmental impacts are provided in subsequent sections.

Table 4.1a ***Potential Environmental Impacts arising from the Project during Construction and Operational Phases***

Potential Impact	Construction	Operation
• Gaseous Emission	– (a)	–
• Dust	✓ (a)	–
• Odour	–	–
• Noise	✓	✓
• Night-Time Operations	–	✓
• Traffic	–	–
• Liquid Effluents, Discharge or Contaminated Runoff	✓	–
• Generation of Waste or By-products	✓	–
• Manufacturing, Storage, Use, Handling, Transport, or Disposal of Dangerous Goods	–	–
• Hazard to life	–	–
• Disposal of Spoil Material	✓	–
• Terrestrial Ecology	✓	✓
• Landscape and Visual	✓	✓
• Cultural and Heritage	–	–
• Cumulative Impacts	✓	✓

Note:
(a) '✓' = Possible; '–' = Not Expected

4.2 AIR QUALITY

4.2.1 Construction Phase

Small scale construction works will be required for the installation of the RE equipment and the power distribution system. The construction of footings for the wind turbine and PV panels and cable trenching will involve minor site level adjustments and minor excavation. Few number of diesel power-mechanical equipment (such as generator) will be deployed onsite at any one time (please refer to *Annex A1*), therefore, limited air emission is anticipated from the operation of PMEs. The amount of excavated materials expected to be generated will be minimal in view of the size of the site area. All the excavated materials, which comprise mainly soil, will be backfilled immediately, and therefore no temporary stockpiling of excavated materials will be required. Throughout the construction period, dust suppression measures stipulated under the *Air Pollution Control (Construction Dust) Regulation* and good site practice will be implemented. As a result, the air quality impact on the surrounding environment is expected to be extremely minor and no adverse air quality impact is anticipated to arise from the construction of the Project.

4.2.2 Operational Phase

No atmospheric emission is anticipated during the operation of the Project, and therefore no air quality impact will arise.

4.3 NOISE

4.3.1 Baseline Conditions

The Sites on Town Island are rural in nature and characterised by the low-rise structures of the DITRC. The background noise levels are those typical of a general rural environment and the major noise sources are identified as arising from activities at the DITRC facilities and from passing marine vessels.

To investigate the prevailing noise levels at the Sites, noise measurements were taken from 17 to 18 August 2009 at the Mount Carmel Hostel. The noise measurements were conducted using a SVAN 949 Sound Level Meter (Type 1), which had been calibrated using a SVAN Sound Level Calibrator Type 4231 with a calibration signal of 94.0 dB(A) at 1kHz. The microphone was set at 1m from the building façade of the Mount Carmel Hostel, and therefore the measurements included façade reflection. The measurements were conducted in accordance with the calibration and measurement procedures stated in the *IND-TM*. The measured prevailing background noise levels were summarised in *Table 4.3a*.

Table 4.3a Measured Prevailing Background Noise Levels

Measurement Location	Time Periods		Measured Noise Levels, dB(A)
Mount Carmel Hostel	Daytime:	18:00 to 23:00 hrs	46 – 58
		07:00 to 10:00 hrs	46 – 47
	Night-time:	23:00 to 05:00 hrs	44 – 56

4.3.2 Noise Sensitive Receivers

Existing and planned representative Noise Sensitive Receivers (NSRs) were identified in accordance with the criteria stipulated in *Annex 13* of the *Technical Memorandum on Environmental Impact Assessment Process* (*EIAO-TM*) and listed in *Table 4.3b*. The locations of the existing and planned NSRs are presented in *Figures 4.3a* and *4.3b*, respectively.

Table 4.3b Representative Noise Sensitive Receivers

NSR No.	Description	Type of Use	Building Height
N1	Mount Carmel Hostel	Residential	1-storey (G/F)
N2	Living Spring Hostel	Residential	1-storey (G/F)
N3	Redeveloped Mount Carmel Hostel (Planned) (a)	Residential	3-storey (G/F to 2/F)
N4	Redeveloped Living Spring Hostel (Planned) (a)	Residential	3-storey (G/F to 2/F)

Note:

(a) The location and layout of these planned NSRs shown in *Figure 4.3b* are based on the best available information provided by Operation Dawn Ltd and are still subject to planning approval.

4.3.3 Construction Phase

Construction Noise Criteria

Under the *EIAO*, potential noise impacts arising from general construction works during normal working hours (ie 07:00 to 19:00 hrs on any day not being a Sunday or public holiday) at the openable windows of buildings are to be assessed in accordance with the noise criteria specified in the *EIAO-TM*. The *EIAO-TM* noise standards are presented in *Table 4.3c*.

Table 4.3c EIAO-TM Daytime Construction Noise Standards ($L_{eq, 30\ min}$ dB(A))

Use	Noise Standard (dB(A))
Domestic Premises	75
Educational Institutions (normal periods)	70
Educational Institutions (during examination periods)	65

Should night-time (ie 23:00 to 07:00 hrs) works be required, the Contractor must hold a valid Construction Noise Permit (CNP) and ensure full compliance with the requirements of the *Noise Control Ordinance* (*NCO*)(Cap 400). The *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (*GW -TM*) and *Technical Memorandum on Noise from Construction Work in Designated Areas Piling* (*DA-TM*) detail the procedures adopted by the Environmental Protection Department (EPD) for assessing such an application.

Construction Activities and Programme

The use of powered mechanical equipment (PME) during the construction phase of the Project may affect the nearby NSRs. The major construction activities will include erection of fencing, construction of footings and supporting frame of PV panel arrays, construction of wind turbine footings, construction of plant rooms and plumbing and drainage works. The construction works for the Project will be carried out during daytime hours only.

The areas with PV panels will be provided with a chain-link fence. No major excavation or site formation will be required for the installation of the PV panels and the fence. Similarly, no major excavation or site formation will be required for the installation of the plant room and cut-out boxes.

For the purpose of the construction noise assessment presented below, the proposed construction plant inventory and works programme presented in *Annex A1* were assumed. The Project Proponent has reviewed the programme and plant inventory, and has confirmed that they are reasonable and practicable for completing the Project within the scheduled timeframe.

Assessment Methodology

The construction noise impact assessment was undertaken in accordance with the procedures outlined in the *GW-TM*, which was issued under the *NCO*, and the *EIAO-TM*. The assessment methodology is summarised as follows:

- Locate representative NSRs that may be affected by the Project;
- Determine the plant teams for corresponding activities, based on the agreed plant inventory;
- Assign sound power levels (SWLs) to the Powered Mechanical Equipment (PME) proposed based on the *GW-TM* and list of SWLs of other commonly used PME (1);
- Calculate the correction factors based on the distance between the NSRs and the notional noise source position of the work sites;
- Apply corrections in the calculations, such as potential screening effects and acoustic reflection, if any; and
- Predict the construction noise levels at NSRs in the absence of any mitigation measures.

The potential noise impacts on the identified NSRs were subsequently evaluated by comparing the predicted noise levels with the *EIAO-TM* day-time construction noise limits ($L_{eq, 30min}$ dB(A)). Only existing NSRs were considered in the construction noise assessment as the construction works is likely conducted with the construction works of DITRC redevelopment.

Impact Assessment

The predicted façade noise levels due to the construction activities were calculated in accordance with the methodology described in *GW-TM*. The results indicated that the predicted façade noise levels were in the range of 63 to 75dB(A), ie, in compliance with the noise criteria described in *Table 4.3c*. The results are summarised in *Table 4.3d* with details of the calculations provided in *Annex A2*.

Table 4.3d Predicted Construction Noise Levels

NSR No.	Description	Predicted Noise Level, dB(A)	Noise Criterion, $L_{eq, 30min}$, dB(A)
N1	Mount Carmel Hostel	62 – 75	75
N2	Living Spring Hostel	65 – 70	75

As the predicted noise levels comply with the noise criteria, noise mitigation measures are not required.

The works for the DITRC redevelopment and those for this Project may be undertaken concurrently. With the planning application for the DITRC redevelopment still under review by the Authority, the detailed construction programme or the type of construction equipment to be deployed for the DITRC redevelopment are not yet available. Notwithstanding this, the possibility for any noise exceedance due to the concurrent implementation of

(1) "Sound power levels of other commonly used PME" published by the Noise Control Authority , ie EPD, at http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

construction the DITRC redevelopment and this Project is extremely low taking into account the small scale of construction works and the limited number of construction equipment to deployed onsite for this Project.

4.3.4 Operational Phase

Fixed Plant Noise Criteria

The *EIAO-TM* and *Technical Memorandum on Noise From Places Other than Domestic Premises, Public Places or Construction Sites* (*IND-TM*) specify the applicable Acceptable Noise Levels (ANLs) for the operation of the Project. The ANLs are dependent on the Area Sensitivity Rating (ASR) and the time of day. The ANLs are presented in *Table 4.3e*.

Table 4.3e ANLs to be used as Operational Noise Criteria

Time Period	$L_{Aeq, 30min}$ (dB(A))		
	ASR "A"	ASR "B"	ASR "C"
Day-time (ie 07:00-19:00 hrs)	60	65	70
Evening (ie 19:00-23:00 hrs)	60	65	70
Night-time (ie 23:00-07:00 hrs)	50	55	60

Fixed plant noise is controlled under *Section 13* of the *NCO* and the predictions were made in accordance with the *IND-TM*. The noise criteria for planning and design of Designated Projects are set out in the *EIAO-TM* as follows:

- The noise level at the facade of the nearest NSR is at least 5 dB(A) lower than the appropriate ANL (as shown in *Table 4.3e*) as specified in the *IND-TM*; or,

- The prevailing background noise level (for quiet areas with a noise level 5 dB(A) below the appropriate ANL).

The noise criteria stipulated in the *IND-TM* are also dependent on the ASR of the NSR, as shown in *Table 4.3e*.

As the NSRs are located on an isolated island and are not affected by any influencing factor (IF), an ASR of "A" was assigned. Background noise measurements were conducted to investigate the prevailing noise level in the Project Sites. With the inclusion of façade reflection, the measured prevailing noise levels were in the range of $L_{eq, 30min}$ 44 to 58 dB(A). Based on the above, the lowest prevailing background noise level of $L_{eq, 30min}$ 44 dB(A), which is lower than any of the noise criterion stipulated in the *IND-TM*, was assigned as the noise criterion for the assessment of operational noise impact from the Project during day-time and night-time periods.

Fixed Plant Noise Sources

The operational fixed noise sources include a 6kW wind turbine at each of the Sites. There will be plant rooms containing battery banks and switches at both Sites. Ventilators will be installed at the plant rooms to provide ventilation when necessary. It is expected that the ventilators will not be required to operate during night-time period and the noise emitted from the

ventilators will be less than 50dB(A) at 1m. Based on the above, no adverse noise impact is anticipated to arise from the operation of the plant rooms.

Sources of Wind Turbine Noise

The sources of noise emitted from the operation of the wind turbines include the rotation of mechanical and electrical parts and the aerodynamic noise originating from the flow of air around the blades. The mechanical and electrical parts that may typically generate noise include gearbox, generator and transformer. The aerodynamic noise generally increases with an increase in rotor speed.

For the proposed wind turbines, the rotors are specifically designed to operate at low speed to keep aerodynamic noise to a minimum. With the direct drive permanent magnet generator, the rotor is coupled directly to the generator without the need for a gearbox. This eliminates the gearbox hum, which is one of the major noise sources in wind turbines with gearboxes. The blade tips are specially shaped to reduce the vortices present at the end of any aerofoil and keep wind noise to a minimum.

Wind Turbine Noise Source Term

The proposed wind turbine has a capacity of 6kW, with a design maximum rotating speed of about 200 rpm. This design limits the noise generation, and therefore the noise impacts on the identified NSRs.

Information provided by the wind turbine supplier indicates that the sound pressure levels of a wind turbine with a capacity of 6kW would be 45dB(A) and 65dB(A) at the base of a 9m or 15m mast at wind speeds of 5ms^{-1} and 20ms^{-1} respectively (*Annex A3*).

Description of Wind Turbine Operation

For the wind turbine proposed to be installed for the Project, the rotor will cut in at a wind speed of 2.5ms^{-1}. The blade pitch will be automatically adjusted to maintain the rotor speed at 200rpm for the capped full output when the wind speed exceeds 12ms^{-1}.

The hourly wind speed data obtained from the Hong Kong Observatory at the Sai Kung and Tap Mun Automatic Weather Stations from October 2008 to September 2009 were summarised in *Table 4.3f* with the full data set presented in *Annex A4*.

Table 4.3f ***Wind Speed Data at Sai Kung and Tap Mun Automatic Weather Stations from October 2008 to September 2009***

Weather Station	Wind Speed (ms^{-1})		
	Average	Minimum	Maximum
Sai Kung	3.1	0.7	10.9
Tap Mun	3.0	0.1	7.6

As observed from the above-mentioned wind data set, about 88% and 85% of the data at the Sai Kung and Tap Mun Automatic Weather Stations,

respectively, were below 5 ms^{-1}. It is considered reasonable to base the assessment of wind turbine operational noise impacts on an average wind speed of 10 ms^{-1}, taking also into account the common observation that wind noise would gradually exceed and mask the noise from the operation of the wind turbine at wind speeds exceeding 10 ms^{-1}. As a result of the above observations, an overall sound pressure level of 52 dB(A) at the base of the mast at a wind speed of 10ms^{-1} has been assumed in the noise impact assessment. This sound pressure level was estimated on the basis of the sound pressure levels measured by the wind turbine manufacturer at wind speeds of 5ms^{-1} and 20ms^{-1} (*Annex A3*).

It is technically feasible and practicable to limit the operational noise level for the type of wind turbine being considered for the Project to 52 dB(A), with no acoustic characteristics relating to tonality, impulsiveness and intermittency, at the base of the mast at a wind speed of 10ms^{-1} by applying suitable engineering design features (*Annex A3*). The tender specification of the Project for the wind turbine will specify an operational sound pressure level of 52 dB(A), with no characteristics relating to tonality, impulsiveness and intermittency, at the base of the mast at a wind speed of 10ms^{-1}.

Based on the above, the overall sound pressure level at a wind speed of 10ms^{-1} is assumed to be 52dB(A) irrespective of the mast height to be adopted. In view of the similar ground levels of wind turbine and NSR at both of the Sites, the slant distance between the NSR and the wind turbine will be smaller with a lower mast height (ie, 9m) and the predicted operational noise level from the operation of the wind turbines will be higher. As a result, the prediction of wind turbine noise has been based on wind turbines with a 9m mast for a more conservative assessment.

Assessment Methodology

The operational noise impact assessment was undertaken in accordance with the procedures outlined in *ISO 9613 Acoustics - Attenuation of Sound during Propagation Outdoors* (*ISO 9613*), the *IND-TM* issued under the *NCO* and the *EIAO-TM*. The assessment took into account the distance between the NSRs and the noise sources and corrections for tonality, impulsiveness and intermittency, if any, in accordance with the *IND-TM*.

Impact Assessment

The façade noise levels at the identified NSRs were predicted and summarised in *Table 4.3g*. The predicted noise levels comply with the designated daytime and night-time noise criteria of 44 dB(A). Details of the noise calculations are presented in *Annex A5*.

Table 4.3g Predicted Operational Noise Levels

NSR No.	Description	Predicted Noise Level, dB(A)	Noise Criterion during Daytime and Night-time Periods, $L_{eq, 30min}$, dB(A)
N1	Mount Carmel Hostel (G/F)	37	44
N2	Living Spring Hostel (G/F)	39	44
N3	Redeveloped Mount Carmel Hostel (Planned) (2/F)	38	44
N4	Redeveloped Living Spring Hostel (Planned) (2/F)	39	44

With a wind turbine generating a sound pressure level of 52 dB(A) at the base of the mast at a wind speed of 10ms^{-1} and with the absence of characteristics relating to tonality, impulsiveness and intermittency, the predicted façade noise levels at all the identified existing and planned NSRs will comply with the daytime and night-time noise criteria.

4.4 WATER QUALITY

4.4.1 Construction Phase

Only minor excavation will be required for the construction of the Project and all the excavated spoils will be backfilled immediately. In the event of temporarily storage of excavated spoils required onsite, the stockpile will be located away as far as practicable from the stream or coastline to avoid the release of spoils and appropriate measures will be in place to control site surface runoff. With the implementation of proper site runoff control measures and considering the small scale and short duration of works activities, no adverse water quality impact is expected.

4.4.2 Operational Phase

Considering the infrequent cleaning and very limited amount of wastewater generated, no water quality impact is anticipated. Pre-cast concrete block with hydroseeding will be applied within the fenced area and this will avoid soil erosion and blockage of catch water at the area especially under the PV panels.

4.5 WASTE MANAGEMENT

4.5.1 Construction Phase

The construction activities associated with the Project may generate the following broad categories of waste:

- a limited quantity of construction and demolition (C&D) materials, mainly inert materials from the construction of wind turbine footings and installation of underground cables;

- very small quantities of chemical wastes, such as batteries and lubricating oils from the maintenance of construction equipment; and

- small quantities of general refuse, including food waste from the on-site work force and the packaging from the construction materials.

All the excavated spoil will be backfilled whereas the broken concrete will be transported offsite by boat for proper disposal at public fill reception facilities. General refuse will be taken away from the Sites by the workers for proper disposal on a daily basis

The construction activities will involve only a very small number of construction equipment. The quantities of chemical waste to be generated from regular maintenance of equipment would be negligible and no impact is expected in this respect. With proper housekeeping measures and refuse collection in place, minimal or no impact is expected to result from refuse generated during the construction phase of the Project.

4.5.2 Operational Phase

During the operational phase, the operation of the Project will be unmanned and it will not involve any process that generates wastes. No waste management issue is anticipated

4.6 ECOLOGY

4.6.1 Introduction

This section presents the ecological baseline information for terrestrial ecological resources (particularly avifauna) gathered from the literature review and focused field surveys, which were conducted between June and August 2009 within the Study Area (the area within 500 m from the Site boundary on Town Island).

4.6.2 Environmental Legislation and Guidelines

The following legislation and guidelines provide the framework for the protection of species and habitats of ecological importance for ecological impact assessment in Hong Kong:

- *Forests and Countryside Ordinance* (Cap 96);

- *Town Planning Ordinance* (Cap 131);

- *Wild Animals Protection Ordinance* (Cap 170);

- *Protection of Endangered Species of Animals and Plants Ordinance* (Cap 586); and,

- *Hong Kong Planning Standards and Guidelines Chapter 10* (HKPSG).

Reference was also made to the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) issued under the EIAO in the evaluation of potential ecological impacts.

4.6.3 Literature Review of Ecological Characteristics of the Study Area

According to the results of literature review discussed in *Annex B*, some information is available on the avifauna in the close vicinity of the Project Site covering dry and wet seasons although limited ecological information available on habitats and other wildlife within the Study Area. To supplement and update the available baseline information, terrestrial ecological baseline surveys were therefore conducted on 15 and 22 June 2009, 22, 23 and 24 July 2009, and 17, 18 and 28 August 2009, which included habitat/vegetation, terrestrial mammal and bird. The details of survey methodology and findings are presented in *Annex B.*

4.6.4 Summary of Ecological Baseline Conditions

Habitat and Vegetation

Terrestrial habitats found within the Study Area consisted of young woodland, shrubby grassland and modified areas (*Figures B5 & B6*). Shrubby grassland is the dominant habitat within the Study Area and is considered to be of low ecological value. Young woodland patches are mainly recorded in sheltered areas in the western part of the island and outside the Sites (ie Site 1 and Site 2). The young woodland was likely originated from *Acacia* plantation but is now dominated by native plant species and is considered to be of moderate ecological value. Modified areas are mainly building structures, concrete paths and cultivation, which are considered to be of low ecological value. A natural stream was found in the southern part of the island and the ecological value of this stream is considered to be moderate. A slightly modified stream of low to moderate ecological value was found close to the pier. No rare or protected plant species were recorded within the Study Area during the survey.

The major habitat type of the Project Site is shrubby grassland with plant height of not more than 0.5m (see *Figure B6*). For the construction works of this Project, the route of the cable trench will follow the southern boundary of the Site and the existing concrete paths within the Modified Area. The area of each habitat found within the Study Area and its corresponding ecological value are presented in *Table 4.6a* (details please refer to *Annex B*).

Table 4.6a Area and Ecological Value of Each Habitat Identified within the Study Area

Habitat	Area on Town Island	Ecological Value	Note
Young Woodland	~5 ha	Moderate	Young Woodland was found in the western part of the island. Neither rare nor protected plant species were recorded within the young woodland. The age of the young woodland is estimated to be not more than 15 years.
Shrubby Grassland	~47 ha	Low	Shrubby grassland was the dominant habitat type within the Study Area. Neither rare nor protected plant species were recorded in shrubby grassland.
Modified Area	~1.4 ha	Low	Modified area consisted of buildings, concrete paths and cultivation. Neither rare nor protected plant species were recorded in the modified area.
Stream	Stream 1 = ~10 m Stream 2 = ~30 m	Low to Moderate for Stream 1 Moderate for Stream 2	The water depth of both streams was shallow and the stream bed was rocky at Stream 1 and sandy at Stream 2. The lower course of Stream 1 was channelised with concrete bunds. Neither rare nor protected plant species were recorded.

Bird & Other General Wildlife

A total of 26 bird species were recorded during the quantitative and qualitative surveys and ten of these species were recorded during the qualitative surveys only (see *Annex B* for full list). Most of the species identified are common and widely distributed in Hong Kong, such as Barn Swallow *Hirundo rustica*, Black-collared Starling *Sturnus nigricollis* and Spotted Dove *Streptopelia chinensis*.

Black-naped Tern (~52% of total individuals recorded) was the most abundant species recorded (all observed over the open sea or near the shore), followed by Light-vented Bulbul (~14% of total individuals recorded) and Black Kite (~12% of total individuals recorded). Most of the birds observed were flying (~83% of total individuals recorded) and most individuals (~ 95% of total individuals recorded) were flying at heights below or above the blade tips of the type of wind turbine being considered (see also *Figure B7*).

In addition, two mammalian species, three amphibian species, three reptilian species, 10 dragonfly species and 26 butterfly species were recorded within the Study Area (see *Annex B* for full list).

There were five bird species of conservation interest and one mammalian species of conservation interest recorded within the Study Area during the surveys. *Table 4.6b* present the list of these faunal species and an evaluation according to the *EIAO-TM*.

Table 4.6b Evaluation of Faunal Species with Conservation Interest within the Study Area

Species	Location	Protection Status	Distribution	Rarity
Mammals				
Macaque *Macaca* sp	Recorded foraging in the shrubby grassland habitat	*WAPO (Cap 170) Class 2 Protected Animal of PRC CITES App. II*	Usually found in Kam Shan, Shing Mun, Tai Po Kau, Ma On Shan and Sai Kung Country Parks	Common and widespread in HK
Birds				
White-bellied Sea Eagle *Haliaeetus leucogaster*	Flying over open sea and shubby grassland in the central part of the Island	*WAPO (Cap 170) Class II Protected Animal of PRC CITES App. II*	Widely distributed in coastal areas throughout Hong Kong.	Uncommon in HK
Black Kite *Milvus migran*	Flying in all habitats above rotor area	*WAPO (Cap 170) Class II Protected Animal of PRC CITES App. II*	Found in many types of habitats; East Eurasia	Common and widespread in HK
Hwamei *Garrulax canorus*	Resting in all habitats	*WAPO (Cap 170) CITES Appendix II*	Widespread in HK Endemic in China	Common and widespread in HK
Greater Coucal *Centropus sinensis*	Resting and flying in shrubby grassland habitat in the central part of the Island.	*WAPO (Cap 170) Class II Protected Animal of PRC*	Widely distributed throughout HK	Common and widespread in HK
Lesser Coucal *Centropus bengalensis*	Resting and flying in shrubby grassland habitat in the central part of the Island.	*WAPO (Cap 170) Class II Protected Animal of PRC*	Widely distributed throughout HK	Common and widespread in HK

Within the Sites, only Black Kite was recorded flying while a number of passerines including Common Magpie, Crested Myna, Light-vented Bulbul, Spotted Dove and Long-tailed Shrike were flying over the underground cables. Hwamei was recorded resting in the Modified Area in the vicinity of the underground cable west of Site 2. All flying heights observed within the Site were above the blade tip height of the type of wind turbine being considered.

Overall, the abundance/richness of wildlife within the Study Area is considered low to moderate.

4.6.5 Construction and Operational Phase Impacts

The potential ecological impacts that may arise during the construction and operational phases of this Project are evaluated based on the results of the field surveys and the information gathered from the literature review.

Construction Phase

As a result of the construction activities (eg minor excavation works for the erection of chain-link fence and cable trench, and landtake of areas for the installation of PV panels, wind turbines, aviation warning light pole and the lightning pole), the following will likely occur to the habitats within and in the immediate proximity of the Site.

Habitat Loss due to Landtake

The potential impacts on the habitats affected by the Project are presented in *Table 4.6c*.

Table 4.6c Potential Impacts on Terrestrial Habitats from the Project

Impacted Habitat	Project Component	Area/Length of Habitat Impacted	Ecological Value	Overall Ecological Impact	Note
Shrubby grassland	Wind turbines, aviation warning light pole, PV panels, fencing, lightning pole and cable trench	~0.6 ha & ~260 m	Low	Low	Minimal vegetation clearance for the turbine installation works will be required. Only limited area of vegetation of low ecological value will be shaded by the PV panels installed. The impacted area is small in the context of the large extent of similar habitats in the vicinity.
Modified Area	Cable Trench	~240 m	Low	Low	The cable trench will follow the existing concrete path without any loss of natural habitat, thereby avoiding impacts on the surrounding vegetation.

Given the small scale of construction activities and the limited area of shrubby grassland (~1% of the total area of shrubby grassland within Study Area) and modified areas expected to be disturbed by the Project (as presented above in *Table 4.6c*), the impacts on terrestrial habitats due to habitat loss are expected to be low.

Impacts on Wildlife

- There are potential impacts on the surrounding habitat and associated wildlife due to physical disturbance of the habitat which may take the form of disturbance from the work activities, inappropriate storage or dumping of construction materials, or hill fire.

Impacts to wildlife with high mobility such as birds, herpetofauna, butterfly and dragonfly are expected to be minimal as there is a relatively large area of similar natural habitats in the vicinity of the Sites. The species of conservation interest identified within the Sites (ie Black Kite) is common and

widespread in Hong Kong and impacts on this species are thus expected to be minimal.

With the implementation of general environmental management measures and regular checks on construction practices, ecological impacts during construction phase are not expected to be unacceptable.

Impact on Streams

Cable laying will be carried out along the edge of the existing concrete footpath. Minor excavation for trenching work will be required but the trench will be backfilled immediately after the cable is laid. To avoid release of excavated spoils to the streams, especially the one that flows between Sites 1 and 2, the cable will be installed in G.I./PVC pipe and placed along the edge of the footpath and across the stream without the need for any excavation. Direct impact associated with stream habitat loss is not anticipated.

Based on the currently envisaged construction programme for the Project, the cable laying works will likely be carried out during the dry season and therefore potential disturbance to the stream and associated fauna could also be minimised.

Taking the above into account, no adverse impact on the stream is anticipated from the cable laying works.

Operational Phase

Ecological impact is not anticipated during the operational phase as low-lying PV panels will only be installed within a relatively small area of the island and other natural habitats including streams and young woodland will not be affected. These panels will also be provided with a non-reflective surface, and therefore no ecological impact from glare disturbance on the wildlife is anticipated.

The operation of the wind turbines has the potential to cause the following impacts to birds and their movements:

- Habitat avoidance/ disturbance due to the noise produced by and the presence of the wind turbines;
- Creation of a barrier effect to bird movement; and
- Bird injuries or death through collision with the operating wind turbine or as a result of being attracted to the turbine at night time.

Mortality due to collisions between birds and wind turbines has been suggested, although actual collision rate is low in operating wind energy facilities due to avoidance [1][2]. To date, no bird collisions have been

(1) DONG Energy, Vattenfall, The Danish Energy Authority and The Danish Forest and Nature Agency (2006) Danish offshore Wind – Key Environmental Issues.

(2) Percival SM (2001) Assessment of the Effects of Offshore Wind Farms on Birds. Prepared for Ecology Consulting.

recorded during the operation of the commercial scale wind turbine on Lamma Island (1). For this Project, only two small scale turbines having much lower hub heights and smaller rotor swept area than those of commercial scale wind farms will be installed. The air space of the wind turbine is approximately 24 m^2 ($\pi r^2 = 3.14 \times 2.75m \times 2.75m = 23.75\ m^2$, the maximum diameter of the rotor is 5.5m). Bird collisions may occur only when the flight path of the birds goes straight to the rotor and at a height of about 8m to 13.5m or 14m to 19.5m above ground level (for conservative assessment, the birds flying within the height range between 8m to 20m may consider to be potentially affected).

Based on the results of literature review and further field surveys, and notwithstanding potential presence of migratory birds and White-bellied Sea Eagle (WBSE), only a limited number of birds were recorded within the Sites, which were all flying above the risk height (ie rotor blade tip height) (2). Low abundance of WBSE (three individuals only) was recorded during the surveys, with all the individuals recorded flying above the rotor height and mainly over the open sea. As part of the approved EIA study for Hong Kong Offshore Wind Farm in Southeastern Waters, focussed vessel surveys were conducted in the eastern waters in 2006 and 2007 revealed that a total of 14 species were recorded in the vicinity of Study Area including Wong Nai Chau, Kong Tau Pai and Wang Chau. The approved EIA study also confirmed that the most abundant bird species recorded was the Black-naped Tern *Sterna sumatrana* (21% of total number) followed by the Bridled Tern *Sterna anaethetus* (17% of total number) (3). According to the results of the literature review and field surveys, the Sites are considered not located within the travelling path of the summer breeding tern species (ie Black-napped Tern, Roseate Tern and Bridled Tern) recorded in Hong Kong, with the majority of them flying over the open sea. This suggested that the Sites and areas in their vicinity are not important bird habitats and have relatively low utilisation. It is anticipated that the collision risk due to the operation of the Project is low and will not cause any unacceptable impacts on these bird species. Collision risk assessment conducted as part of the approved EIA study also revealed a low collision risk in four seasons for the bird species encountered in the vicinity of the Site (4). The impacts on birds in the form of habitat avoidance/ disturbance due to the noise produced by and the presence of the wind turbine, and the creation of barrier effect to bird movement are also expected to be low and insignificant (5).

An aviation warning light pole will be installed next to the small-scale wind turbine in Site 1 and Site 2 respectively. It has also been suggested that aviation warning lighting device has the potential to attract nocturnal migrant birds at night and subsequently increase the collision risk, especially in

(1) HEC wind turbine EM&A monitoring data. http://lammawindturbine.hec.com.hk/mreport/mreport.htm

(2) The flying heights of the three individuals of WBSE observed during the surveys varied from 30 to 120m; which were all above rotor area and outside the Project Site.

(3) BMT Asia Pacific (2009). *Hong Kong Offshore Wind Farm in Southeastern Waters - Environmental Impact Assessment.* EIA Report - Section 7 Avifauna.(Ref: ESB-146/2006).

(4) BMT Asia Pacific (2009). *Op Cit.*

(5) ERM (2004) *Environmental Impact Assessment for Renewable Energy by a Wind Turbine System on Lamma Island*

conditions of poor visibility [1]. The height of the pole will be the same at that of the wind turbine (ie either 13.5m or 19.5m) and red light [2] will be used. Survey results revealed that only limited number of birds recorded flying within the rotor height in the Study Area and all flying heights observed within the Sites were above rotor area (please refer to *Section 4.6.4 above*). The impacts due to the light of the wind turbine are therefore expected to be minimal as the Sites are not an important bird habitat and have relatively low utilisation.

4.6.6 Cumulative Impact

The redevelopment of DITRC is the only known planned project within the Study Area that may be undertaken concurrently. It is however understood that the majority of the buildings or facilities under the DITRC redevelopment will be built within the existing modified areas, and therefore no ecological cumulative impact is expected during the construction and operational phases.

4.7 LANDSCAPE AND VISUAL

4.7.1 Construction Phase

Site visits in July 2009 confirmed that both Sites 1 and 2 were only covered in short grass with some shrubs, which will need to be removed for the construction of the Project. No extensive vegetation clearance or tree felling will however be required. With the limited scale of vegetation removal, the small size of Sites (ie, 0.27 ha for Site 1 and 0.31 ha for Site 2) and the small number of construction equipment to be deployed, the impact on the existing landscape is expected to be transient and low.

4.7.2 Operational Phase

The key visually sensitive receivers (VSRs) during the operational phase of the Project are expected to be visitors to the Hong Kong National Geopark, who will travel to the area by boat. It is likely that these visitors will pass Town Island by boat when they visit the Sai Kung Volcanic Rock Region of the Hong Kong National Geopark, in particular the Ung Kong Group Geo-Area comprising Bluff Island, Basalt Island and Wang Chau.

The two wind turbines to be installed for the Project (ie, one wind turbine each at Site 1 and Site 2) will be about 13.5 m or 19.5m tall (blade tip to ground) and the PV panels arrays will stand at about 1.3m above ground only. The PV panels to be installed will be dark-coloured with non-reflective surface and the wind turbines will be grey in colour. Subdued colours will be chosen for the plant rooms, aviation warning light poles and lightning poles. With the low-lying PV panels and subdued colour scheme employed for the RE facilities,

(1) Kingsley A, Whittam B (2001) Potential Impacts of Wind Turbines on Birds at North Cape, Prince Edward Island. A report for the Prince Edward Island Energy Corporation.

(2) It is advised that aviation light will be omni-directional, red and non-flashing with a minimum intensity of 10 candelas.

the visibility of these facilities to the Hong Kong National Geopark visitors will be extremely low. For visitors travelling by boat to the west of the Project, their views to the RE facilities will be blocked by existing structures such as the water tanks and the natural terrain; and the new DITRC buildings (about 10m to 15m tall) after the completion of the DITRC redevelopment. For visitors travelling by boat to the north and the east of the Project, their views to the RE facilities will be blocked by the natural terrain. Only those visitors travelling by boat to the south of the Project may have a view of the facilities. It is anticipated that no visitors will visit the Hong Kong National Geopark at night-time, therefore, the lighting device will not cause any visual impact. Taking into account the extremely limited visibility of the RE facilities and the transient nature of the VSRs, the landscape and visual impact of the Project during its operation is considered minimal.

A visual illustration of the RE facilities (assuming installation of 19.5m tall wind turbines for a conservative assessment) at Sites 1 and 2, with indicative buildings or structures representing the DITRC redevelopment, as viewed from the sea to the south of the Project is provided in *Figure 4.7a*. The distance from the viewpoint to the site is about 400 m which is closer to the site than nearest boundary of Hong Kong National Geopark.

5 ENVIRONMENTAL PROTECTION MEASURES

5.1 AIR QUALITY

5.1.1 Construction Phase

The potential dust impacts associated with the construction of the Project is low. Notwithstanding this, it is recommended that proper dust control measures be implemented and good construction site management practices be adopted to ensure that the dust emissions from the Project are minimised. These include watering of exposed soil surfaces, covering of stockpiles of dusty materials with impervious sheeting, watering during excavation and use of well-maintained construction equipment to avoid black smoke emissions.

5.1.2 Operational Phase

Since no operational atmospheric emission is anticipated, no mitigation measure is required.

5.2 NOISE

5.2.1 Construction Phase

Implementation of standard construction site management measures for noise control, such as the use of well-maintained construction equipment and minimisation of the number of construction plant to be used, will be sufficient to ensure compliance with the construction noise limits and minimisation of noise disturbance.

5.2.2 Operational Phase

As no exceedance of criteria is predicted, no mitigation measure is required.

5.3 WATER QUALITY

5.3.1 Construction Phase

In the event of temporarily storage of excavated spoils required onsite, the stockpile will be located away as far as practicable from the stream or coastline to avoid the release of spoils and appropriate measures will be in place to control site surface runoff.

No trenching will be carried out for the section of cable in the vicinity of and crossing the stream between Sites 1 and 2 to avoid water quality impacts from the potential release of excavated spoils or site surface runoff. In addition, the cable trenching works will be scheduled to be carried out during dry season as far as practicable.

On top of the above, appropriate measures will be implemented in accordance with the guidelines stipulated in EPD's *Practice Note for Professional Persons on Construction Site Drainage ProPECC PN1/94* during the construction works, such as the stockpiled materials will be covered with tarpaulin during rainy season, to properly control site run-off and drainage and to minimise potential water quality impacts.

5.3.2 Operational Phase

Since no operational water quality impact is anticipated, no mitigation measure is required.

5.4 WASTE MANAGEMENT

5.4.1 Construction Phase

To minimise the amount of construction waste, good site management practice will be adopted by the contractors of the Project and waste on-site will be properly segregated to increase the potential for reuse and recycling. Construction waste generated from the Project, if any, will be transported offsite by boat for proper disposal. Chemical waste generated during the construction of the Project, if any, will be properly stored in accordance with *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste* by EPD before collection for disposal by a licensed Chemical Waste Collector. The quantity of general refuse to be generated on-site will be minimal owing to the small number of workers involved and will be taken away from the Site by the workers for proper disposal on a daily basis.

5.4.2 Operational Phase

Since no waste management issue is anticipated during the operation of the Project, no waste mitigation measure is required.

5.5 ECOLOGY

5.5.1 Construction Phase

Potential ecological impacts associated with the Project during the construction phase will likely be disturbance of shrubby grassland and associated wildlife. With the low ecological value of the habitat and high degree of modification to the modified area immediately surrounding the Project, potential ecological disturbance caused by the Project is anticipated to be minimal. Ecological disturbance could be further reduced through the implementation of good construction practices as follows:

- Avoid any damage and disturbance, particularly those caused by filling and illegal dumping, to the remaining and surrounding natural shrubby grassland and young woodland habitats;
- Regularly check the Site boundaries to ensure that they are not breached and that no damage occurs to surrounding areas;

- Prohibit and prevent open burning within the site boundary during construction and provide temporary fire fighting equipment in the work areas;

- Reinstate temporary work sites/disturbed areas, immediately after completion of the construction works;

- Schedule the cable trenching works to be carried out during dry season as far as practicable; and

- Adopt alternative method (installation of an above-ground pipe along the footpath to carry the cable to eliminate the need for any excavation) for laying a section of cable across the stream between Sites 1 and 2 to avoid disturbance of the stream.

5.5.2 Operational Phase

Based on the results of impact assessment, monitoring for bird collision during operation is recommended. The purpose of the operation monitoring is to confirm the impact (via collisions) of the wind turbines on birds, with a particular focus on species of conservation interest (especially the Birds of Prey including White-bellied Sea Eagle and Black Kite) and migratory birds (eg Black-naped Tern).

During the operation of the wind turbine, monitoring is proposed to be undertaken at monthly intervals for the first year of operation (1). An area of 50m radius will be searched for any bird carcass or injury bird around the base of each wind turbine. A *Quarterly Monitoring Report* which presents the monitoring results will be prepared and submitted to relevant government departments (ie EPD and the Agriculture, Fisheries and Conservation Department (AFCD)) upon completion of each three-month monitoring period. A *Final Monitoring Report* will be prepared after this one-year monitoring period.

In the event of any bird mortality or injury, relevant government departments (ie EPD and the Agriculture, Fisheries and Conservation Department (AFCD)) will be notified and the incident will be investigated to confirm if it is attributable to the operation of the wind turbines. Additional measures (for instance, suspending operation of selected turbines to lower collision risk if monitoring data show significant number of birds within the collision risk zone during adverse weather conditions such as low visibility) may be provided subject to the results of the review.

If, after the first-year operation monitoring period, review of all monitoring results revealed that the wind turbines have not caused any adverse impacts on birds in the area, the monitoring will be terminated.

(1) The proposed monitoring frequency and duration is in line with the approved EM&A requirement for the Hong Kong Electric Co Ltd's Lamma Winds project.

5.6 LANDSCAPE AND VISUAL IMPACT

5.6.1 Construction Phase

No adverse landscape and visual impact is expected during the construction phase and no mitigation measure is required.

5.6.2 Operational Phase

With the low visibility of the RE facilities to the Hong Kong National Geopark visitors, the landscape and visual impacts are expected to be minimal. No further mitigation measure is considered necessary in this respect.

5.7 ENVIRONMENTAL AUDITING

5.7.1 Construction Phase

During the construction phase, monthly environmental audit will be undertaken by qualified professionals (eg, CLP's chartered engineer) to ensure the implementation of the above recommended mitigation measures. The qualified professional will confirm to EPD implementation of the recommended mitigation measures and other environmental audit findings in the monthly audit report.

5.7.2 Operational Phase

During the first year of operational phase, monitoring for bird collision is recommended on monthly basis. The findings will be reported in Quarterly Report. The details of monitoring are summarized in *Section 5.5.2* above.

6 COMMENT ON POSSIBLE SEVERITY, DISTRIBUTION AND DURATION OF ENVIRONMENTAL EFFECTS

The Project is intended to provide a permanent improvement in electricity supply to DITRC and its future redevelopment. Different options for supplying power to Town Island, including a submarine cable and an overhead line, have been considered but both are not preferred due to reasons including:

- potential impacts on the marine environment (for the submarine cable option);
- visual intrusion (for the overhead line option);
- marine navigation safety (for the overhead line option); and
- amenability to maintenance.

The self-sustained RE option currently adopted for the Project serves to eliminate the above-mentioned issues associated with the submarine cable and overhead line options but still affords the same level of service to electricity users on Town Island.

The selection of sites for the RE facilities has taken into consideration the modified nature of the area to further reduce potential environmental disturbance to sensitive receivers arising from the implementation of the Project.

The scale of the construction works is small, requiring the use of only a limited number of small construction equipment and hand tools for a short duration of approximately a year. The Project will be unmanned in the operational phase and will not impose any adverse environmental impact. The overall environmental impacts potentially arising from the Project are considered to be minor. With the implementation of appropriate environmental control measures discussed in the preceding section, no adverse residual environmental impacts are anticipated.

During the conceptualisation of the Project, a broad spectrum of stakeholders were consulted, including the Rural Committee (Sai Kung and Sai Kung North), Sai Kung District Council, Energy Advisory Committee, The Conservancy Association, Green Lantau Association, CLPP Sai Kung Customer Advisory Committee and CLP Customer Consultative Group. The Project has also been publicised by CLP and widely reported by the media. Through the comprehensive public and stakeholder engagement programme, CLP has ensured and will continue to ensure that effective communication of information relating to the Project is maintained and concerns of the stakeholders are properly addressed.

7 *USE OF PREVIOUSLY APPROVED EIA REPORTS/DIRECT ENVIRONMENTAL PERMIT APPLICATIONS*

No Designated Project of a similar nature or scale has been undertaken in Hong Kong and no reference can be made for this direct application of Environmental Permit.

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1 基本資料

1.1 工程項目名稱

伙頭墳洲（又名晨曦島）可再生能源工程（以下簡稱「本項目」）。

1.2 工程項目倡議人名稱

中華電力有限公司（中電）

1.3 聯絡人姓名及電話號碼

姓名　　：　陳定國先生

職銜　　：　中華電力有限公司規劃及設計部一級工程師

電話號碼　：　2678 9049

1.4 工程項目的目的和性質

晨曦島位處香港東部水域糧船灣以南。香港晨曦會有限公司（由政府資助的非牟利組織）於島上營運晨曦島戒毒治療中心，提供住院式戒毒治療，爲該島唯一使用者。該中心現時有 50 至 70 名接受治療者，以及少數職員。

現時晨曦島戒毒治療中心的電力由柴油發電機和新近與中電合作裝設的臨時可再生能源系統供應。該再生能源系統位於迦密山宿舍東面，由臨時太陽能光伏板陣列和配電設施組成，共可產生約 20 千瓦電力，可短暫提升晨曦島戒毒治療中心電力供應的可靠程度。

據悉晨曦會正計劃重建晨曦島戒毒治療中心。該會已向分區地政處提交總綱發展藍圖，而有關申請仍在審議中。將予重建的現有設施包括碼頭附近的馬可宿舍，以及迦密山宿舍和活泉宿舍。上述現有單層宿舍會重建爲樓高三層的建築物，供接受治療者住宿和其他用途。爲了提供足夠電力予重建後的晨曦島戒毒治療中心，臨時可再生能源系統會被一套包括太陽能光伏板和小型風力發電機的永久系統取代，而現有的柴油發電機將轉作爲消防設備供電和可再生能源系統的備用設施。

本項目的倡議者曾經考慮多個爲晨曦島提供電力的方案，包括海底電纜和架空電纜，但都不可取，其原因包括：

- 對海洋環境的潛在影響（就海底電纜方案而言）；
- 視覺滋擾（就架空電纜方案而言）；
- 海上航行安全（就架空電纜方案而言）；及
- 方便維修的程度。

本項目現時所採用的自給自足式可再生能源方案（包括太陽能光伏板和小型風力發電機），並無上述各項與海底電纜和架空電纜有關的問題，卻能爲晨曦島上的電力用戶提供同等水平的供電服務。

本項目的可再生能源設施包括：太陽能光伏板系統、兩個 6 千瓦的風力發電機、地底電纜和相關設備。這些設施會分別裝設於島上兩個地區（即現有的迦密山宿舍旁的地點一和現有活泉宿舍旁的地點二）（見*圖 1.4a*）。有關可再生能源設備的詳情，請參閱*第 1.5 節*。

1.5 工程項目的地點、規模和工地簡史

自 1976 起，晨曦島戒毒治療中心便已在晨曦島上運作，一直都是該島的唯一使用者。據報島上曾有一條小漁村，而部分村內原有的建築物已由晨曦島戒毒治療中心接管使用。

本項目的可再生能源裝置分別設於兩個地點，即地點一和地點二。地點一位於該島中央區域，在碼頭東南約 230 米、迦密山宿舍以南約 15 米處。在地點一北面約 20 米處，有兩個食水缸（*圖 1.4a*）。該地點佔地約 0.27 公頃，大致上爲平地，標高介乎基準水平以上 26 至 28 米。

地點二位於活泉宿舍東北，即地點一的東南約 280 米處，與最近的晨曦島南面海岸線相距約 20 米。該地點佔地約 0.31 公頃，位處一幅向南斜坡之上，地勢略有起伏，標高介乎基準水平以上 14 至 20 米。

本項目將會包括下列元素：

<u>地點一</u>

- 永久的鐵絲網圍欄；
- 總發電量約爲 120 千瓦的不反光太陽能光伏板陣列(1)，以鋼支架固定於離地約 1.3 米的混凝土基座上，其傾角約爲 22.5°；
- 一台 6 千瓦的小型風力發電機(2)，以風能補充太陽能發電，從而提高晨曦島電力供應的可靠程度；
- 沿用臨時可再生能源系統的機房和截電箱；
- 新建機房和新設截電箱各一；
- 沿用臨時可再生能源系統的避雷桿；
- 在地點一北面邊界新設的避雷桿；
- 小型風力發電機旁的航空警示燈桿 (3)；及
- 連接至現有配電電路的地底低壓電纜。

<u>地點二</u>

- 永久的鐵絲網圍欄；
- 總發電量約爲 60 千瓦的不反光太陽能光伏板陣列，以鋼支架固定於離地約 1.3 米的混凝土基座上，其傾角約爲 22.5°；

(1) 地點一和地點二將分別裝設約 600 和 300 塊太陽能光伏板。太陽能光伏板的規格可參閱 Suntech Power 公布的資料單張，其網址爲：*http://www.suntech-power.com/images/August24/EN/STP210_18Ud_EN.pdf*。

(2) 有關 6 千瓦風力發電機的規格，請參考 http://www.turbineservices.co.uk/wind-turbines/proven/proven-6-kw/

(3) 因不能在市場上找到有空警示燈裝置的 6 千瓦風力發電機，將會在發電機旁另建一枝航空警示燈。航空警示燈將會是全方位，紅色及沒有閃光並最少相等於 10 個燭光的光亮度

- 一台 6 千瓦的小型風力發電機，以風能補充太陽能發電，從而提高晨曦島電力供應的可靠程度；
- 一個機房和截電箱；
- 在地點二西北面邊界新設的避雷桿；
- 小型風力發電機旁的航空警示燈桿 (1)；及
- 連接至現有配電電路的地底低壓電纜。

在拆除臨時可再生能源系統時，原有的太陽能光伏板、鋼支架、避雷桿、機房／截電箱和鐵絲網圍欄，均會再用於本項目的地點一和其他項目，以減少產生廢物。

地點一和地點二的初步平面圖，分別展示於*圖 1.5a* 和 *1.5b*。

爲了裝設太陽能光伏板和圍欄，需進行小規模的工地平整工程。此外，在建造基座時亦需要進行小量挖掘工程，但挖出物料的份量有限，並會在現場再用作回填物料。

擬設的太陽能光伏板將會是深色不反光的型號。*圖 1.5c* 顯示太陽能光伏板的典型安排縱剖圖。機房和截電箱均會在現場建造，並會包括蓄電池組、開關和電力調控系統。建造機房和截電箱過程只需進行小型的土木工程，例如澆灌混凝土和設備組裝。

本項目將於地點一和地點二各裝設一台 Proven WT6000 型自動調整風力發電機（或相近規格的最新型號）。該風力發電機的規格顯示其車葉直徑爲 5.5 米，而主桿的高度有 9 米和 15 米兩種。不過，由於風力發電機主桿的高度需待詳細設計階段才能確定，故此本項目簡介對兩種主桿高度都會加以考慮。有鑑於此，風力發電機的總高度（從混凝土基座至車葉尖端）會約達 13.5 米或 19.5 米(2)。風力發電機的車葉會以色調低沉的玻璃纖維熱塑複合物料製造。在建造風力發電機的地基時，需要進行小型挖掘工程。然而，挖出物料的份量有限，並會在現場再用作回填物料。

位於地點一北面邊界的臨時可再生能源系統的避雷桿，會在本項目再用。此外，亦會在地點一的東北面邊界和地點二的西北面邊界分別新設一根避雷桿。另外，在地點一和地點二的風力發電機旁亦會新設航空警示燈桿。新避雷桿和新航空警示燈桿的支柱會與永久圍欄合而爲一，以減少混凝土澆灌工程。

此外，本項目會沿著現有的混凝土小徑裝設新地底低壓電纜，連接至已經爲臨時可再生能源系統裝設的低壓配電電路。*圖 1.4a* 展示了地底電纜的初步走線安排。在建造風力發電機的地基時，需要進行小型挖掘工程。預計因此產生的挖出物料數量很少。這些物料會在現場被重用作修復小徑所需的回填物料。

在運作期間，可再生能源的發電系統和配電設施均無需人手操作。可再生能源設施亦只需偶爾進行維修，其頻率極低。大部分維修都是只需使用手工具的輕巧工作。

(1) 航空警示燈將會是全方位，紅色及沒有閃光並最少相等於 10 個燭光的光亮度

(2) 風力發電機總高= 9 米（風力發電機主桿）+ 2.75（車葉半徑）+基座高度= 13.5 米 或 15 米（風力發電機主桿）+2.75 米（車葉半徑）+基座高度= 19.5 米

1.6 工程項目簡介涵蓋的指定工程項目數目及種類

本項目爲《環境影響評估條例》（環評條例）附表 2 第 I 部 D 類－能源供應中，第 D.1 項－公用事業電力廠所界定的指定工程項目。

本項目需要建造和運作*第 1 章*所闡述的永久可再生能源系統。動工時間暫定爲 2010 年中；預計將於 2011 年啓用投產。

表 2.1 所展示的概略工程計劃，羅列了本項目現時可見的主要事項。地點一和地點二的可再生能源系統裝設工程，將會同時進行。

表 2.1 概略工程計劃

本項目主要階段	**預計需時**
地點一之裝設工程（暫定於 2010 年第 3/4 季動工）	
平整工地及裝設太陽能光伏板和鋼支架	3.5 個月
裝設風力發電機	1 個月
爲太陽能光伏板、電池和變流器安裝和接駁電纜	1 個月
喉管和排水工程	1.5 個月
機電工程、測試和啓用準備工作	2.5 個月
地點二之裝設工程（暫定於 2010 年第 3/4 季與地點一同時動工）	
平整工地及裝設太陽能光伏板和鋼支架	3.5 個月
裝設風力發電機	1 個月
爲太陽能光伏板、電池和變流器安裝和接駁電纜	1 個月
喉管和排水工程	1.5 個月
機電工程、測試和啓用準備工作	2.5 個月
地底電纜裝設工程（暫定於 2010 年第 4 季或 2011 年初動工）	
挖掘工程	1 個月
鋪設電纜	2 個星期
復原現有的路面鋪築	1 個月

晨曦島上可能進行的另一個項目是晨曦島戒毒治療中心重建工程，但現時仍未擬訂確實的施工計劃。按照晨曦島戒毒治療中心重建工程的進度推斷，其建造工程可能會與本項目同期進行。然而，可再生能源工程只需進行小量挖掘工程，而且只會在現場使用很少數量的施工設備。因此，預料這兩個可能同期進行的項目，只會產生十分輕微的累積影響。

晨曦島位於香港地質公園的西貢火山岩園區內，但並非該園區的景區(1)。

地點一和地點二的概略平面圖，分別展示於*圖 1.5a* 和 *1.5b*。地點一和毗鄰地區現時均由草和灌木覆蓋。該處有數項晨曦島戒毒治療中心的現有設施，其中包括兩個食水缸和一座單層宿舍（迦密山宿舍），分別位於地點一的正北面和西北面。

地點二和毗鄰地區與地點一相若，只有很少植物覆蓋，主要是草和灌木，並有零星的範圍沒有任何植物覆蓋。該地點位於島上的東南岸邊，在活泉宿舍的東北面，靠近懸崖。

在地點一和地點二之間及接近碼頭的地方分別有兩條小溪。

地底電纜會沿著現有的混凝土小徑裝設。

地點一和地點二周圍的現有環境，請參閱*圖 3.1a*。

(1) 香港地質公園地圖：http://www.geopark.gov.hk/publications/district_map.pdf

4 對環境可能造成的影響

4.1 引言

4.1.1 施工階段

預計本項目的建造工程包括：爲機房和截電箱澆灌混凝土基座、安裝太陽能光伏板和鋼支架、豎立圍欄、建造風力發電機基座、挖掘電纜坑槽和安裝風力發電機。

在施工期間，預計會有 20 至 25 名工人於兩個施工地點和地底電纜沿線工作。

工地上亦會使用小型挖掘機、發電機、絞車、小型混凝土攪拌機、手電鑽和空氣壓縮機。建築物料和設備均會以直升機或船隻運送至晨曦島。本項目由於涉及略爲平整工地、建造風力發電機的基座和開挖地底電纜坑槽，所以亦需進行小規模的挖掘工作，但挖出的泥土會馬上在現場回填。在挖掘電纜坑槽時所產生的小量破碎混凝土，則會棄置於公眾填土接收設施。

4.1.2 運作階段

太陽能光伏板、風力發電機、控制設備和附屬的配電系統在運作階段均無需人手操作，但需要偶爾進行檢查或維修。

4.1.3 本項目可能造成的環境影響摘要

本項目在施工和運作階段可能造成的環境影響羅列於*表 4.1a*。在施工階段的主要潛在影響包括：空氣質素、噪音、生態和工地徑流等影響。預計在運作階段的潛在影響會包括：由太陽能光伏板、機房和風力發電機所造成的噪音、生態和景觀及視覺影響，但其程度均屬輕微。以下章節會闡述各項潛在環境影響。

表4.1a　本項目在施工和運作階段可能造成的環境影響

潛在影響	施工階段	運作階段
• 氣體排放物	– (a)	–
• 塵埃	✓ (a)	–
• 氣味	–	–
• 噪音	✓	✓
• 夜間運作	–	✓
• 交通	–	–
• 污水、雨水或已污染徑流	✓	–
• 本項目產生的廢物或副產品	✓	–
• 危險物品的製造、存放、使用、處理、運送或處置	–	–
• 對生命的危害	–	–
• 廢棄物料的處置	✓	–
• 陸地生態	✓	✓
• 景觀和視覺	✓	✓
• 文化遺產	–	–
• 累積影響	✓	✓

註：
(a) '✓' = 可能；'–' = 預計不會出現

4.2　空氣質素

4.2.1　施工階段

在裝設可再生能源設備和配電系統時，需要進行小規模的建築工程。建造風力發電機和太陽能光伏板的基座，以及挖掘電纜坑槽等工序中，則需進行小規模的工地標高調整和小量挖掘工程。由於在工地內只有少數柴油機動設備（比如發電機）（請參閱附件 A1）會在同一時間運作，因此預計這些機動設備只會排放有限的空氣污染物。由於工地面積不大，因此，預計工程只會產生極小量挖掘物料。挖出的物料主要爲泥土，並會全部即時回填，因此無需臨時堆放儲存。在施工期間，將會實施《空氣污染管制（建造工程塵埃）規例》所規定的減少塵埃措施，亦會採用良好施工方法。因此，預料本項目在施工期間對四周的空氣質素只會造成極輕微的影響，且不會產生不良的空氣質素影響。

4.2.2　運作階段

預計本項目在運作期間不會有任何大氣排放，因此不會產生空氣質素影響。

4.3　噪音

4.3.1　基線情況

晨曦島上兩個工程地點都是鄉郊，附近主要是晨曦島戒毒治療中心的低層建築物。島上的背景噪音聲級是典型郊區環境的噪音聲級，主要的噪音來源是晨曦島戒毒治療中心的活動，以及海上經過的船隻。

爲了探討兩個工程地點的普遍的背景聲級，2009 年 8 月 17 至 18 日期間，顧問公司在迦密山宿舍進行了測量。該次測量採用了 SVAN 949 聲級計（一型），並以 SVAN 4231 型聲級校正儀，使用 1kHz 和 94.0 分貝(A) 的訊號進行校正。

收音器是放置於迦密山宿舍外，距離建築物外牆 1 米，因此所量得的數據，已包括外牆的反射效果。量度工作是按照《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》所闡述的校正及測量程序進行。有關是次測量工作所得的主要背景噪音聲級，請參閱*表 4.3a*。

表 4.3a　　主要背景噪音聲級量度結果

測量地點	**測量時段**	**測量得之噪音聲級，分貝(A)**
迦密山宿舍	日間：下午六時至十一時	46 – 58
	上午七時至十時	46 – 47
	夜間：下午十一時至上午五時	44 – 56

4.3.2　　噪音敏感受體

顧問公司根據《環境影響評估程序技術備忘錄》（以下簡稱《環評技術備忘錄》）*附錄 13* 所規定的準則，鑑別了現有和已規劃的具代表性噪音敏感受體，並羅列於*表 4.3b*。*圖 4.3a* 和 *4.3b* 則分別展示現有和已規劃的噪音敏感受體位置。

表 4.3b　　具代表性噪音敏感受體

噪音敏感受體代號	**說明**	**土地用途類別**	**建築物高度**
N1	迦密山宿舍	住宅	1 層（地面層）
N2	活泉宿舍	住宅	1 層（地面層）
N3	重建後的迦密山宿舍（已規劃）(a)	住宅	3 層（地面層至 2 樓）
N4	重建後的活泉宿舍（（已規劃）(a)	住宅	3 層（地面層至 2 樓）

註：

(a) *圖 4.3b* 所示的噪音敏感受體位置和佈局，均以晨曦會所提供的最佳可得資料爲依據，但該等資料仍有待當局對有關規劃申請作出批准。

4.3.3　　施工階段

建築噪音準則

按照《環評條例》的規定，一般建築工程在正常工作時間（即在非星期日或公眾假期的任何日子上午七時至下午七時）對建築物內各個可開啓窗戶單位的潛在噪音影響，均須以《環評技術備忘錄》所註明的噪音準則進行評估。該等噪音標準羅列於*表 4.3c*。

表 4.3c　　《環評技術備忘錄》之日間建築噪音標準（30 分鐘等效連續聲級分貝(A)）

土地用途	**噪音標準（分貝(A)）**
住宅樓宇	75
教育機構（平常授課時段）	70
教育機構（考試時段）	65

若需於晚間（即晚上十一時至早上七時）進行工程，承建商必須持有有效的「建築噪音許可證」，並須確保工程完全符合《噪音管制條例》（第 400 章）的各項要求。《管制建築工程噪音（撞擊式打樁除外）技術備忘錄》和《管制

指定範圍的建築工程噪音技術備忘錄》，均詳述了環境保護署（環保署）評估這類申請慣用的程序。

建築工作和計劃

本項目在施工階段使用機動設備，可能會影響附近的噪音敏感受體。主要的建築工作包括：裝設圍欄、建造太陽能光伏板的支架和基座、建造風力發電機的基座、建造機房，以及喉管和排水工程。本項目只會在日間進行各項建築工程。

裝設太陽能光伏板的地方會豎立鐵絲網圍欄。太陽能光伏板和圍欄的安裝工程都無需進行大型挖掘工程或工地平整工程。機房和截電箱的安裝工程亦同樣無需進行大型挖掘工程或工地平整工程。

在下文所述的建築噪音評估中，假定本項目會採用*附件 A1* 所羅列的建議建築機器和工程計劃。工程項目倡議者已審閱此等計劃及機器清單，並確認其合理並可容本項目於預計時限內完成。

評估方法

是次建築噪音影響評估，按照《管制建築工程噪音（撞擊式打樁除外）技術備忘錄》（該備忘錄則是根據《噪音管制條例》頒佈）和《環評技術備忘錄》闡述的程序進行。以下是評估方法的摘要：

- 找出可能會受本項目影響的具代表性噪音敏感受體；
- 根據既定的機器清單，決定各項工作所需要的機器組合；
- 根據《管制建築工程噪音（撞擊式打樁除外）技術備忘錄》和其他常見機動設備的聲功率級資料 (1)，爲每項機動設備訂定聲功率級；
- 根據噪音敏感受體和工地內估計的噪音源位置之間的距離，計算修正系數；
- 若有任何特別情況，例如屏蔽效果和聲音反射等，均應在計算中作出適當修正；及
- 預測在沒有任何緩解措施時，在噪音敏感受體處的建築噪音聲級。

預測所得的噪音聲級其後會與《環評技術備忘錄》的日間建築噪音上限（30 分鐘等效連續聲級，分貝(A)）比較，以評估各個已知噪音敏感受體的潛在噪音影響。由於本項目的施工應有機會與晨曦島戒毒治療中心重建工程同時進行，因此在進行建築噪音評估時，只考慮了現有的噪音敏感受體。

影響評估

由建築工作所產生的外牆噪音聲級，按照《管制建築工程噪音（撞擊式打樁除外）技術備忘錄》闡述的方法計算。結果顯示，預測外牆噪音聲級會介乎 63 至

(1) 噪音管制監督（即環保署）所出版的《其它常見機動設備的聲功率級資料」，其網址爲：
http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

75 分貝(A)之間，亦即符合*表 4.3c* 所展示的噪音準則。*表 4.3d* 羅列了各項計算結果，而計算詳情則於*附件 A2* 闡述。

表 4.3d　　預測建築噪音聲級

噪音敏感受體代號	說明	預計噪音聲級（分貝(A)）	噪音準則，30 分鐘等效連續聲級，分貝(A)
N1	迦密山宿舍	62 – 75	75
N2	活泉宿舍	65 – 70	75

由於預計噪音聲級符合噪音準則，因此無需任何噪音緩解措施。

晨曦島戒毒治療中心的重建工程可能會與本項目同期進行。由於晨曦島戒毒治療中心重建工程的規劃申請仍在當局審議中，因此尚未有該項重建工程的詳細施工計劃，或將會使用的建築設備種類等資料。縱然如此，由於本項目的建築工程規模小，且在現場只會使用有限數量的建築設備，故此因晨曦島戒毒治療中心重建工程和本項目同期進行而令噪音超出標準的可能性極低，。

4.3.4　　運作階段

固定機器噪音準則

《環評技術備忘錄》和《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》均註明了適用於本項目運作階段的可接受噪音聲級。可接受噪音聲級視乎不同的地區噪音感應級別和每日的不同時段而定。*表 4.3e* 羅列了可接受噪音聲級。

表 4.3e　　用作營運噪音準則的可接受噪音聲級

時段	30 分鐘等效連續 A 聲級（分貝(A)）		
	地區噪音感應級別 A	地區噪音感應級別 B	地區噪音感應級別 C
日間（即上午七時至下午七時）	60	65	70
晚間（即下午七時至晚上十一時）	60	65	70
凌晨（即晚上十一時至上午七時）	50	55	60

固定機器噪音是按照《噪音管制條例》*第 13 條*加以管制；其噪音聲級則按照《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》進行預測。《環評技術備忘錄》對於指定工程項目的規劃和設計，亦有註明下列噪音準則：

- 最接近項目的噪音敏感受體，其正面噪音聲級，須比《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》所註明適用的可接受噪音聲級（參見*表 4.3e*）最少低 5 分貝(A)。

- 背景普遍的噪音聲級（適用於低噪音地區，即比適用的可接受噪音聲級低 5 分貝(A) 的地區）。

從*表 4.3e* 可見，《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》所規定的噪音準則，也視乎噪音敏感受體的地區噪音感應級別而定。

由於噪音敏感受體位於離島上，亦沒有受到任何影響因素影響，因此，其地區噪音感應級別屬 A 級。顧問公司在工程地點進行了背景噪音測量，以探討該處的普遍背景聲級。所測量到的普遍背景 30 分鐘等效連續聲級（已包括外牆的反射效果）介乎 44 至 58 分貝(A)之間。基於上述情況，本項目採用了最低的普遍背景聲級，即 30 分鐘等效連續聲級 44 分貝(A) 作爲評估本項目在日間和晚間運作噪音影響的準則。此準則較《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》規定的任何噪音準則爲嚴。

固定機器噪音來源

運作期間的固定噪音來源包括兩個工程項目地點的 6 千瓦風力發電機。兩個地點均會設置機房，用以放置蓄電池組和開關。機房會裝設抽氣扇，在有需要時作抽氣通風之用。預計抽氣扇於晚間無需運作；而且，抽氣扇發出的噪音在距離 1 米處會低於 50 分貝(A)。基於上述情況，預計機房的運作不會造成不良噪音影響。

風力發電機噪音來源

在風力發電機運作時的噪音來源包括：機電零件的轉動，以及空氣流過車葉所產生的空氣動力噪音。通常會產生噪音的機電零件包括齒輪箱、發電機和變壓器。空氣動力噪音通常會隨著轉速增加而提高。

擬設的風力發電機的車葉特別設計成以低速運轉，務求減少空氣動力噪音。該種風力發電機採用直接驅動式的永磁發電機，車葉轉軸直接與發電機耦合，因此無需齒輪箱。這樣便消除了齒輪箱所發出的低沉噪音。在有齒輪箱的風力發電機中，這是重要噪音來源之一。此外，車葉尖端的形狀也經過特別設計，可以減少葉端的擾流，令氣流噪音減至最低。

風力發電機噪音來源情況

擬議風力發電機的發電量爲 6 千瓦，設計最高轉速約爲每分鐘 200 轉。這種設計限制了噪音的產生，因此也限制了對已知噪音敏感受體可能造成的噪音影響。

根據風力發電機供應商所提供的資料，一台發電量爲 6 千瓦，主桿高 9 米或 15 米的風力發電機，在風速爲每秒 5 米和 20 米時，主桿基座處的聲壓級分別爲 45 分貝(A) 和 65 分貝(A)。

風力發電機的運作說明

本項目擬設的風力發電機的車葉會於風速達每秒 2.5 米時啓動。當風速超過每秒 12 米時，車葉的角度會自動調節，令轉速維持每分鐘 200 轉，達最高發電量但不超出負荷。

表 4.3f 摘錄了香港天文台的西貢和塔門自動氣象站從 2008 年 10 月至 2009 年 9 月間所錄得的每小時風速數據。整套數據則羅列於*附錄 A4*。

表 4.3f　　西貢和塔門自動氣象站從 2008 年 10 月至 2009 年 9 月的風速數據

氣象站	風速（米／秒）		
	平均	最低	最高
西貢	3.1	0.7	10.9
塔門	3.0	0.1	7.6

從上述風速數據可見，西貢和塔門自動氣象站所錄得的數據中，分別有 88%和 85%低於每秒 5 米。因此，以每秒 10 米的平均風速作爲評估風力發電機運作期間噪音影響的依據，應屬合理。而且，根據一般觀察所得，當風速超過每秒 10 米時，風的噪音會逐漸超過和掩蓋風力發電機在運作時所產生的噪音。因此，在評估噪音影響時，假定了當風速爲每秒 10 米時，主桿基座處的整體聲壓級爲 52 分貝(A)。這個聲壓級是根據風力發電機製造商在風速爲每秒 5 米和 20 米時所測量到的聲壓級而作出的估計（*附件 A3*）。

在技術上，可以透過適當的工程設計，把本項目考慮使用的風力發電機在每秒 10 米的風速下運作時，主桿基座處的噪音聲級，限制在 52 分貝(A)以下，而且沒有任何聲學上的音調特性、脈衝特性和斷續特性。因此，本項目的風力發電機招標規格，會註明發電機在每秒 10 米的風速中運作時，主桿基座處的聲壓級爲 52 分貝(A)，而且沒有任何音調特性、脈衝特性和斷續特性（*附件 A3*）。

根據上述情況，無論風力發電機的主桿有多高，均假定在風速達每秒 10 米時，整體聲壓級爲 52 分貝(A)。由於兩個工程項目地點的風力發電機和噪音敏感受體均處於高度相若的地面，因此，假若發電機的主桿較矮（即 9 米），兩者之間的斜距便會較短，而風力發電機運作時所發出的預測運作噪音聲級亦會較高。因此，在預測風力發電機的噪音時，都假定機桿高度爲 9 米，以取得較審慎的評估結果。

評估方法

對風力發電機在運作期間的噪音影響評估工作，是按照《ISO 9613 聲學－戶外聲音傳播之衰減》（以下簡稱「ISO 9613」）、《噪音管制條例》所頒佈的《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》和《環評技術備忘錄》等所闡述的程序而進行。評估時亦考慮了噪音敏感受體和噪音來源之間的距離，並按照《管制非住用處所、非公眾地方或非建築地盤噪音技術備忘錄》的要求，因應噪音的音調因素、脈衝因素和斷續因素而作出修正。

影響評估

表 4.3g 羅列了噪音敏感受體的外牆噪音聲級預測數值。這些預計噪音聲級均符合指定 44 分貝(A)的日間和晚間噪音準則。有關這些噪音的計算詳情，請參閱*附件 A5*。

表 4.3g　　預計運作噪音聲級

噪音敏感受體代號	說明	預計噪音聲級（分貝(A)）	日間和晚間時段的噪音準則，30 分鐘等效連續聲級，分貝(A)
N1	迦密山宿舍（地面層）	37	44
N2	活泉宿舍（地面層）	39	44
N3	重建後的迦密山宿舍（二樓）	38	44
N4	重建後的活泉宿舍（二樓）	39	44

一台風力發電機在每秒 10 米的風速中對主桿基座處產生 52 分貝(A) 的聲壓級，而且沒有任何音調、脈衝和斷續特性；在這種情況下，所有已知的現有和已規劃噪音敏感受體的預計外牆噪音聲級均會符合日間和晚間的噪音準則。

4.4　水質

4.4.1　施工階段

本項目只需要進行小量挖掘工程，而且所有挖出的泥土都會馬上回填。若有需要在工地暫時儲存挖出的泥土，也會將土堆盡量遠離河溪或海岸線，以免泥土進入水中。同時也會實施適當措施，以控制地面徑流。由於本項目的工程規模都很小，而且爲時短暫，因此，在實施妥善的工地徑流控制措施後，不會造成不良的水質影響。

4.4.2　運作階段

由於本項目只需偶爾進行清潔，而且只會產生極少廢水，因此，預計不會造成水質影響。在裝有圍欄的地區，特別是架設了太陽能光伏板的地區內，都會採用預製的混凝土磚覆蓋，並會進行噴草工程，以免水土流失和阻塞引水道。

4.5　廢物管理

4.5.1　施工階段

本項目的建築工程可能會產生下列廢物：

- 數量有限的建造及拆卸物料（拆建物料），主要是建造風力發電機基座和裝設地底電纜時所產生的惰性物料。
- 非常小量的化學廢物，例如在維修施工設備時所使用的電池和潤滑油；及
- 小量一般垃圾，包括現場工人所產生的饍餘和建築材料的包裝物料。

所有挖出的泥土都會在原地回填，而混凝土碎則會由船隻運離工地，再送至公眾填料接收設施作妥善處置。至於一般垃圾，則會由工人每日攜離工地，並作妥當處置。

建築工程只需要使用非常小量的施工設備。因此，在例行維修時只會產生微不足道的化學廢物，預計不會影響環境。至於本項目在施工階段產生的垃圾，若

能妥善地實施工地管理和垃圾收集措施，預計只會造成極輕微的影響，甚至沒有影響。

4.5.2 運作階段

由於本項目在運作時無需人手，亦沒有任何會產生廢物的過程，因此，預計不會造成任何廢物管理問題。

4.6 生態

4.6.1 引言

本節闡述陸地生態資源（特別是鳥類）的生態基線情況。有關的資料是透過檢閱文獻和專門實地調查而取得。實地調查是在 2009 年 6 月至 8 月間，在研究區內進行（即在晨曦島各工程地點邊界外 500 米範圍內的地區）。

4.6.2 有關環境的法例和指引

下列各項法例和指引，爲香港的具生態價值物種和生境保護工作，以及生態影響評估工作，提供了法律架構。

- 《林區及郊區條例》（第 96 章）
- 《城市規劃條例》（第 131 章）
- 《野生動物保護條例》（第 170 章）
- **《保護瀕危動植物物種條例》（第 586 章）；及**
- 《香港規劃標準與準則：第 10 章》。

在評估潛在生態影響時，也參考了根據《環境影響評估條例》而擬訂的《環境影響評估程序技術備忘錄》（以下簡稱《環評技術備忘錄》）。

4.6.3 審閱有關研究區生態特點的文獻

根據*附件 B* 所闡述的文獻審閱結果，有關研究區生境和其他野生動植物的生態資料非常有限，但仍可在項目鄰近的地點找到一些旱季和雨季的鳥類資料。爲了補充和更新這些數量有限的基線資料，已於 2009 年 6 月 15 和 22 日、2009 年 7 月 23 和 24 日，以及 2009 年 8 月 18 和 28 日對研究區進行了陸地生態基線情況調查，其中包括生境／植被、陸地哺乳類動物和鳥類。有關調查方法和結果的詳情，請參閱附件 B。

4.6.4 生態基線情況摘要

生境和植被

研究區內的陸地生境包括未成長林地、灌木狀草地和經修改地區（*圖 B5* 和 *B6*）。灌木狀草地是研究區的主要生境，其生態價值偏低。未成長林地主要位於該島西部的有屏蔽地區，以及在兩個工程地點（即地點一和地點二）之外。未成長林地可能源自洋槐，但現在則以本土植物爲主，具有中等生態價值。經修改地區主要是建築物、混凝土小徑和耕地，均屬低生態價值地區。島的南部

有一條天然小溪，其生態價值屬中等。在碼頭附近有一條曾略作修改的小溪，其生態價值屬偏低至中等。是次調查沒有在研究區內找到任何稀有或受保護的植物。

項目地點內的主要生境是灌木狀草地，當中的植物高度都不超過 0.5 米（見*圖 B6*）。本項目的地底電纜坑槽，會沿著工程項目地點的南面邊界，及經修改地區內現有的混凝土小徑建造。*表 4.6a* 羅列了在研究區內找到的各種生境面積和生態價值（詳情請參閱附件 B）。

表4.6a　　研究區內已知生境之面積和生態價值

生境	於晨曦島上之面積	生態價值	備註
未成長林地	~5 公頃	中等	島西有未成長林地。林地內沒有任何稀有或受保護植物。估計該等林地的年齡不會超過 15 年。
灌木狀草地	~47 公頃	偏低	灌木狀草地是研究區內的主要生境。草地上沒有任何稀有或受保護的植物。
經修改地區	~1.4 公頃	偏低	經修改地區包括有建築物、混凝土小徑和耕地。區內沒有任何稀有或受保護的植物。
小溪	小溪 1 = ~10 米 小溪 2 = ~30 米	小溪 1 屬偏低至中等 小溪 2 屬中等	兩條小溪都很淺，小溪 1 的河床爲石質，而小溪 2 則爲沙質。小溪 1 的下游是以混凝土堤建成的人工河道。沿溪地區都沒有任何稀有或受保護植物。

鳥類和其他一般野生動物

在進行定量和定性調查時，共錄得二十六種鳥類，其中十種是在進行定性調查時錄得（有關這些鳥類的完整列表，請參閱*附件 B*）。這些雀鳥大都屬於香港常見和分佈廣泛的種類，例如家燕（*Hirundo rustica*）、黑領椋鳥（*Sturnus nigricollis*）和珠頸斑鳩（*Streptopelia chinensis*）。

黑枕燕鷗（~記錄總數的 52%）是這次調查所錄得數量最多的鳥類（全都在開闊海域或海岸附近發現），其次是白頭翁（~記錄總數的 14%）和黑鳶（~記錄總數的 12%）。大部份被觀察到的雀鳥都在飛行（~記錄總數的 83%），其中大部份（~記錄總數的 95%）的飛行高度都在考慮採用的風力發電機的車葉尖端之下或之上（見*圖 B7*）。

此外，研究區內亦錄得兩種哺乳類動物、三種兩棲動物、三種爬行動物、十種蝴蝶和二十六種蜻蜓（完整列表請參閱*附件 B*）。

在調查期間，在研究區內共錄得五種具保育價值的鳥類和一種哺乳類動物。*表 4.6b* 羅列了這些動物品種，以及按照《環評技術備忘錄》而進行的評估結果。

表4.6b　　研究區內具保育價值的動物評估結果

種類	位置	保護情況	分佈	稀有性
哺乳類動物				
獼猴（*Macaca* sp）	在灌木狀草地上覓食	*《野生動物保護條例》（第170章）* *中國二級受保護動物* *《瀕危物種貿易公約附錄II》*	通常在金山、城門、大埔坳、馬鞍山和西貢等郊野公園發現	在香港常見而且分佈很廣
鳥類				
白腹海鵰（*Haliaeetus leucogaster*）	在該島的開闊海域和該島中部的灌木狀草地上空飛翔	*《野生動物保護條例（第170章）》* *中國二級受保護動物* *《瀕危物種貿易公約附錄II》*	廣泛分佈於香港境內的海岸地區	在香港不常見
黑鳶（*Milvus migran*）	在所有生境高於風力發電機車葉葉尖高度的上空飛翔	*《野生動物保護條例》（第170章）* *中國二級受保護動物* *《瀕危物種貿易公約附錄II》*	在多種生境中都有發現 歐亞大陸東部	在香港常見而且分佈很廣
畫眉（*Garrulax canorus*）	在所有生境中休憩	*《野生動物保護條例》（第170章）* *《瀕危物種貿易公約附錄II》*	在香港分佈很廣 屬中國的風土物種	在香港常見而且分佈很廣
褐翅鴉鵑（*Centropus sinensis*）	在該島中部的灌木狀草地休憩和飛翔	*《野生動物保護條例》（第170章）* *中國二級受保護動物*	在香港分佈很廣	在香港常見而且分佈很廣
小鴉鵑（*Centropus bengalensis*）	在該島中部的灌木狀草地休憩和飛翔	*《野生動物保護條例》（第170章）* *中國二級受保護動物*	在香港分佈很廣	在香港常見而且分佈很廣

是次調查在兩個工程地點內只錄得黑鳶在飛翔，但有多種雀形目鳥類在地底電纜沿線上空飛行，其中包括喜鵲、八哥、白頭翁、珠頸斑鳩和棕背伯勞。此外，亦錄得畫眉在地點二西面的地底電纜附近的經修改地區內休憩。在這個地點內所觀察到的所有鳥類飛行高度，都超過考慮採用的風力發電機車葉頂端的高度。

總括而言，研究區內的野生動物多樣性和數量都屬偏低至中等。

4.6.5　　施工和運作階段的影響

根據實地調查和審閱文獻所收集到的資料，評估了本項目在施工和運作階段可能造成的生態影響。

施工階段

由於進行各種建築工程（例如裝設鐵絲網圍欄和纜槽所需進行的小型挖掘工程、裝設太陽能光伏板、風力發電機、航空警示燈桿和避雷桿等而需佔用土地），在工程地點內及附近的生境都可能發生下列事項。

佔用土地而令生境消失

表 4.6c 羅列了本項目對各種生境的潛在影響。

表4.6c　本項目對陸地生境的潛在影響

受影響生境	本項目所涉及的部份	受影響生境的面積／長度	生態價值	整體生態影響	備註
灌木狀草地	風力發電機、航空警示燈桿、太陽能光伏板、圍欄、避雷桿和纜槽	~0.6 公頃 和 ~260 米	偏低	偏低	需要爲發電機安裝工程清理極小量植物。只有有限範圍內的低生態價值的植物會被新裝設的太陽能光伏板遮蔽。 與附近大片相若的生境相比，受影響地區的範圍細小。
經修改地區	纜槽	~240 米	偏低	偏低	纜槽會沿著現有的混凝土小路伸延，不會令任何天然生境受損，因此可以避免影響附近植物。

由於各項建築工程的規模細小，而且，預計只有面積不大的灌木狀草地（~研究區內灌木狀草地總面積的 1%）和經修改地區會受到本項目影響（請參閱*表 4.6c*），因此，生境的消失只會對陸地生境造成低度影響。

對野生動物的影響

- 附近生境及其野生動物都可能因爲工程的滋擾、以不適當的方式存放或傾倒建築物料，或發生山火等情形而受到影響。

預計流動性較高的野生動物，例如雀鳥、爬蟲類、蝴蝶和蜻蜓等，只會受到極輕微影響，因爲工程地點附近有較大面積的類似天然生境。工程地點內的已知具保育價值物種（即黑鳶）是香港常見和分佈很廣的動物，因此，預計本項目只會對牠們造成極輕微的影響。

若能實施一般環境管理措施，並定期審視施工方法，預計本項目在施工階段不會造成不可接受的生態影響。

對河溪的影響

電纜鋪設工程會沿著現有混凝土小徑的邊緣進行。這項工程需要進行小量的纜槽挖掘工作，但在鋪設好電纜後，便會馬上把槽溝填回原狀。爲免挖出的泥土進入河溪，特別是位於地點一和二之間的河溪，會把電纜裝設於塑料管內，然後放置在行人路邊和橫過河溪，因此不需要進行任何挖掘工程。所以，預計工程對河溪生境不會造成直接影響。

根據現時本項目的預計施工計劃，電纜敷設工程可能會在旱季進行，因此，工程對河溪及相關動物的潛在滋擾亦會減至最低。

所以，預計電纜敷設工程不會對河溪造成不良影響。

運作階段

預計本項目在運作階段不會對生態及其他自然生境，包括河溪和未成長的樹林造成影響，因爲太陽能光伏板比較低矮，而且只會在島上的小範圍內裝設。同時，這些太陽能光伏板的表面都不反光，因此，預計不會因爲產生眩光而影響野生動物。

風力發電機的運作可能會對雀鳥和牠們的活動造成下列影響：

- 風力發電機所產生的噪音令雀鳥受到滋擾並迴避有關生境；
- 妨礙雀鳥的活動；及
- 雀鳥因爲與運作中的風力發電機發生碰撞，或在晚間被吸引至發電機而受傷或死亡。

雀鳥與風力發電機碰撞而死亡的可能性是受到關注的事項，雖然在已運作的風力發電設施中，雀鳥大都會加以迴避而令真正的碰撞率降低(1)(2)。截至目前爲止，南丫島上已在運作的商業規模風力發電機仍未錄得任何雀鳥碰撞的情形(3)。本項目只有兩台小規模的發電機，其車葉轉軸的高度比商業規模的風力發電機較低，而且車葉劃過的範圍亦較小。風力發電機的空中面積約爲 24 平方米（πr^2 = 3.14 × 2.75 米 × 2.75 米 = 23.75 平方米，車葉的最長直徑是 5.5 米）。雀鳥只會在飛行路徑直接對著車葉，而且高度約在離地 8 米至 13.5 米之間或 14 米至 19.5 米之間的情況下，才會與發電機發生碰撞（保守估計，常於離地 8 至 20 米之間飛行的雀鳥估計會有潛在影響）。

根據審閱文獻和進一步實地調查所得，縱使有路過的候鳥和白腹海鵰存在，工地內只錄得數量有限的雀鳥，而全數都在危險高度（即車葉頂端的高度）以上飛翔。是次調查記錄到的白腹海鵰數量很少（只有三隻），牠們全都在車葉高度之上飛行，而且主要是在開闊海域上空。在香港離岸風力發電場進行東南部海域環評研究時，曾於 2006 年和 2007 年對東部海域的船隻進行專門調查。結果顯示，共有 14 種雀鳥出現在研究區鄰近的地點，包括黃泥洲、光頭排和橫洲。同時，這個環評研究也確定了數量最多的雀鳥是黑枕燕鷗（*Sterna sumatrana*）（佔總數的 21%），其次是褐翅燕鷗（*Sterna anaethetus*）（佔總數的 17%）(4)。根據審閱文獻和實地調查的結果，兩個工程地點所在的位置，並非位處香港錄得的夏季繁殖燕鷗品種（即黑枕燕鷗、粉紅燕鷗和褐翅燕鷗）的飛行路線上。該等燕鷗品種大都在開闊海域上空飛行。換言之，兩個工程地點及其附近地區都不是重要的雀鳥生境，而且使用率亦相對較低。因此，預計本項目在運作期間的碰撞風險較低，並不會對這些鳥類造成任何不可接受的影響。同時，上述環評研究所作出的碰撞風險評估也披露了在項目鄰近地點的雀

(1) DONG Energy,、Vattenfall、丹麥能源局及丹麥樹林及自然管理署 (2006)，丹麥離岸風況 – 主要環境事宜。

(2) Percival SM (2001) 離岸風力發電場對雀鳥的影響評估。生態顧問報告。

(3) 港燈風力發電機的環境監察與審核數據。http://lammawindturbine.hec.com.hk/mreport/mreport.htm

(4) BMT Asia Pacific (2009). Hong Kong Offshore Wind Farm in Southeastern Waters – Environment Impact Assessment. EIA Report – Section 7: Avifauna. (Ref: ESB-146/2006). （香港東南海域之離岸風力發電場 – 環境影響評估 – 第 7 章：鳥類）

鳥在四季的碰撞風險較低[1]。雖然風力發電機所產生的噪音和發電機本身會對雀鳥造成滋擾，並令牠們迴避有關生境，以及妨礙牠們的活動，然而，這些因素亦只會對雀鳥造成偏低和不顯著的影響[2]。

項目在地點一和地點二的小型風力發電機附近將分別新設一根航空警示燈。換言之，航空警示燈上的照明設備在夜間可能會吸引夜間候鳥並因此增加碰撞風險，尤以能見度較低時爲甚[3]。燈桿的高度將會等同風力發電機的高度，（例如13.5 米或者 19.5 米），並且將會用穩定的紅色光[4]。調查結果表明在研究區內只有少量數目的雀鳥被記錄到在車葉高度範圍內飛行，並且它們全都在車葉高度之上飛行（請參閱第 4.6.4 章）。由於工程地點不是重要的雀鳥生境，而且使用率較低。因此，風力發電機上的光線對雀鳥造成輕微影響。

4.6.6 累積影響

研究區內只有晨曦島戒毒治療中心重建工程一個已規劃項目可能與本項目同期進行。據了解，這個重建項目的大部份建築物或設施，都會在曾經修改的地區內建造，因此，預計在施工和運作階段都不會造成累積生態影響。

4.7 景觀和視覺

4.7.1 施工階段

於 2009 年 7 月進行的實地考察證實，地點一和地點二都只有短草和一些灌木覆蓋。這些植物都需要加以清理，以便本項目施工，但無需大範圍地清理植物或砍伐樹木。由於清理植物的規模有限，工程地點的面積亦很細小（地點一有 0.27 公頃；地點二有 0.31 公頃），而且只會使用小量施工設備，因此，預計本項目對現有景觀只會造成短暫的低度影響。

4.7.2 運作階段

預計在本項目的運作階段中，主要的視覺敏感受體將會是乘船前往香港國家地質公園的訪客。當此等訪客前往香港國家地質公園的西貢火山岩園區，特別是前往由沙塘口山、火石洲、橫洲等多個島嶼組成的甕缸群島地質景區時，可能會乘船經過晨曦島。

本項目計劃安裝的兩台風力發電機（即地點一和地點二各一台）的高度約爲 13.5 米或 19.5 米（從車葉尖端至地面），而太陽能光伏板亦只會在地面以上約 1.3 米高。擬議安裝的太陽能光伏板會採用沉色和表面不反光的類型，同時，風力發電機則會選用灰色。機房、避雷桿和航空警示燈也會選用柔和的顏色。由於可再生能源設施的太陽能光伏板比較低矮，而且選用柔和顏色，因此，對前往香港國家地質公園的設客而言，這些設施的能見度極低。至於乘船前往本項目西面的訪客，他們朝向可再生能源設施的視線，會被現有的結構，例如儲水缸和天然地勢，以及晨曦島戒毒治療中心重建工程完成後的新建築物（高約 10 米至 15 米）遮擋。乘船前往本項目北面和東面的訪客，他們朝向這些設施的視

(1) BMT Asia Pacific (2009). 同上。

(2) ERM (2004) 南丫島風力發電系統之可再生能源環境影響評估。

(3) Kingsley A, Whittam B (2001) 愛德華王子島北開普風電機組對鳥類的潛在影響。愛德華王子島能源公司的報告。

(4) 建議航空警示燈爲是全方位，紅色及沒有閃光並最少相等於 10 個燭光的光亮度

線，會被天然地勢遮擋。只有乘船前往本項目南面的訪客可能會看見這些設施。預料夜間不會有訪客到香港地質公園，因此，警示燈具將會不造成任何視覺影響。由於各項可再生能源設施的能見度都極爲有限，而且有關的視覺敏感受體亦屬過渡性質，因此，本項目在運作時所造成的景觀及視覺影響非常輕微。

圖 4.7a 所示，是從海上望向本項目的南面時所見到的地點一和地點二可再生能源設施的視覺效果圖（爲了作出較審慎的評估，假設將會安裝高 19.5 米的風力發電機），當中包括示意性質的建築物或結構，用以代表晨曦島戒毒治療中心重建工程。從觀測點到工程地點的距離大概是 400 米，這個距離相對於其離香港地質公園最近的邊界處還要近。

5 環境保護措施

5.1 空氣質素

5.1.1 施工階段

本項目在施工階段的潛在塵埃影響屬偏低。然而，仍建議實施適當的塵埃控制措施，以及良好的工地管理方法，以確保能夠減少本項目產生的塵埃。這些措施包括：在有泥土外露的地面灑水、以不透氣的布覆蓋多塵的物料堆、在進行挖掘工作時灑水，以及使用有良好保養的建築設備，以免排出黑煙。

5.1.2 運作階段

預計本項目在運作期間不會任何大氣排放，因此無需實施任何緩解措施。

5.2 噪音

5.2.1 施工階段

若能實施有關噪音控制的標準工地管理措施，例如使用有良好保養的施工設備和盡量減少使用建築機器的數目等，便足以確保本項目能夠符合有關建築噪音的限制，並減少噪音滋擾。

5.2.2 運作階段

預計本項目在運作階段的噪音不會超出相關準則，因此無需實施任何緩解措施。

5.3 水質

5.3.1 施工階段

若有需要在工地暫時儲存挖出的泥土，會把土堆盡量遠離河溪或海岸線，以免泥土進入水域。同時也會實施適當措施，以便控制地面徑流。

在地點一和地點二之間的河溪附近鋪設電纜時，以及在鋪設跨過該河溪的一段電纜時，都不會進行挖掘工程，以免挖出的泥土或工地徑流進入水中而影響水質。此外，亦會盡可能把纜槽挖掘工程安排在旱季進行。

除了上述各項措施，本項目也會在進行建築工程時，按照環保署的《專業人士專業守則之建築工地的排水渠》（專業人士環保事務諮詢委員會專業守則 1/94 號）所規定的指引，實施適當的措施，比如在雨季堆放物料要覆蓋蓬布，務求妥善地控制工地徑流和排水，並減少潛在水質影響。

5.3.2 運作階段

預計本項目在運作期間不會造成水質影響，因此無需實施任何緩解措施。

5.4 廢物管理

5.4.1 施工階段

爲了減少建築廢物的數量，本項目的承建商會採用良好的工地管理方法，並會把現場的廢物分類，藉此增加它們被重新再用和循環再造的潛力。若本項目產生任何建築廢物，便會用船運離工地，並作妥當處置。若在施工期間產生任何化學廢物，都會按照環保署的《包裝、標識及存放化學廢物的工作守則》，先作適當儲存，然後由持牌的化學廢物收集商收集和處置。由於本項目的工作人員很少，所以在現場產生的一般垃圾數量也會極少，而且都會由工作人員每日攜離工程地點，並作妥善處置。

5.4.2 運作階段

預計本項目在運作期間不會出現任何廢物管理問題，因此無需實施任何廢物緩解措施。

5.5 生態

5.5.1 施工階段

本項目在施工階段的潛在生態影響包括對灌木狀草地及其野生動物造成滋擾。由於本項目附近的生境只具有偏低的生態價值，而已修改地區的修改程度則屬偏高，因此預計，由本項目引起的潛在生態滋擾亦會極之輕微。縱然如此，仍可透過實施下列各項良好施工方法來進一步減少生態滋擾：

- 避免令附近的其他天然灌木狀草地和未成長樹林受到任何破壞和滋擾，特別是受到填土和非法傾倒物料的破壞；
- 定時檢查工程地點的邊界，以確保它們沒有受損，而且附近地區也沒有被破壞；
- 在施工期間，禁止和預防在工地範圍內以明火焚燒任何物品，並應在工程地區提供臨時消防設備；
- 在建造工程結束後，立即復原各個臨時工地／受滋擾地區；
- 盡量把纜槽挖掘工程安排在旱季進行；及
- 在電纜橫過地點一和地點二之間的河溪時，採用其他電纜鋪設方法（例如沿著行人路裝設架空電纜管道來避免進行任何控掘工程），以免滋擾河溪。

5.5.2 運作階段

根據影響評估結果，建議監察運作期間的雀鳥碰撞情況。在運作階段進行監察的目的，是要證實風力發電機對鳥類的影響（透過碰撞造成），特別注意具保育價值的種類（特別是猛禽，包括白腹海鵰和黑鳶）和具遷徙性的候鳥（例如黑枕燕鷗）。

在風力發電機的首年運作期間，建議每個月進行一次監察工作(1)。具體而言，將會在每台風力發電機基座四周的 50 米範圍內，搜尋雀鳥屍體或受傷的雀鳥。每當完成三個月的監察後，須向相關的政府部門（即環保署和漁農自然護理署（漁護署））提交闡述相關監察結果的季度監察報告。每當完成一年的監察後，亦須提交年度監察報告。

若有任何雀鳥的死亡或受傷，須通知有關的政府部門（即環保署和漁農自然護理署（漁護署）），並調查意外是否由風力發電機的運作造成。經檢討有關雀鳥死亡或受傷的成因後，可能會採取額外的措施（例如，監察數據顯示在低能見度等惡劣天氣條件下，有大量鳥類聚集在有碰撞風險的範圍內，風力發電機將會停開，以減低碰撞風險。）

假若經過一年的監察，監察報告的結果顯示風力發電機沒有對區內的雀鳥造成任何不良影響，監察工作便會終止。

5.6 景觀及視覺影響

5.6.1 施工階段

預計本項目在施工階段內不會造成景觀及視覺影響，因此無需實施任何緩解措施。

5.6.2 運作階段

對於香港國家地質公園的訪客而言，可再生能源設施的能見度偏低，預計本項目只會造成極輕微的景觀及視覺影響。因此無需再實施更多緩解措施。

5.7 環境監察

5.7.1 施工階段

在施工階段內，建議由合資格人士〔例如：中電特許工程師〕每月進行環境監察確保以上所建議的援解措施在施工階段時已執行。合資格人士將會在每月提交環境監察報告與環保署確定在施工階段時已執行上述所建議的援解措施及其他環境監察結果。

5.7.2 運作階段

在運作階段的第一年，建議每個月進行一次雀鳥碰撞監察。每月監察的結果將會在季度監察報告內提供。監察工作已在 5.5.2 部分詳細闡述。

(1) 建議監察工作的次數和持續時間是符合通過的港燈南丫鳥風力項目的環境監察與審核要求。

本項目是要永久改善晨曦島戒毒治療中心及其未來重建計劃的電力供應。本項目的倡議者曾經考慮多個爲晨曦島提供電力的方案，包括海底電纜和架空電纜，但都不可取，其原因包括：

- 對海洋環境的潛在影響（就海底電纜方案而言）；
- 視覺滋擾（就架空電纜方案而言）；
- 海運安全（就架空電纜方案而言）；及
- 方便維修的程度。

本項目現時所採用的自給自足式可再生能源方案，可以避免上述各項與海底電纜和架空電纜方案有關的問題，但仍能爲晨曦島上的用電者提供相應水平的電力供應服務。

在爲可再生能源設施選址時，已經考慮了該區爲經修改地區，藉此進一步減少本項目對敏感受體的潛在環境滋擾。

本項目的建築工程規模細小，只需使用數量有限的小型施工設備和手攜工具，而且爲時短暫，大約只需一年。在運作階段，本項目無需人手操作，亦不會造成不良環境影響。因此，潛在的整體環境影響只屬輕微。在實施上文有關章節所探討的環境控制措施後，本項目將不會造成不良的剩餘環境影響。

在構思本項目期間，工程項目倡議人諮詢了範圍廣泛的持份者，其中包括：鄉事委員會（西貢和西貢北）、西貢區議會、能源諮詢委員會、長春社、綠色大嶼山協會、中電西貢顧客諮詢委員會和中電顧客諮詢組。本項目亦已由中電公布，並經傳媒廣泛報道。中電透過全面的公眾及持份者參與計劃，確保了各界都能夠就本項目的資料作出有效溝通，並會確保這種情況得以持續，而且持份者所關注的事項，都得到妥善處理。

香港在過去並未進行過與本項目性質或規模都相近的指定工程項目，因此，是次直接申請環境許可證，沒有其他相近項目可供參考。

Figures

附圖

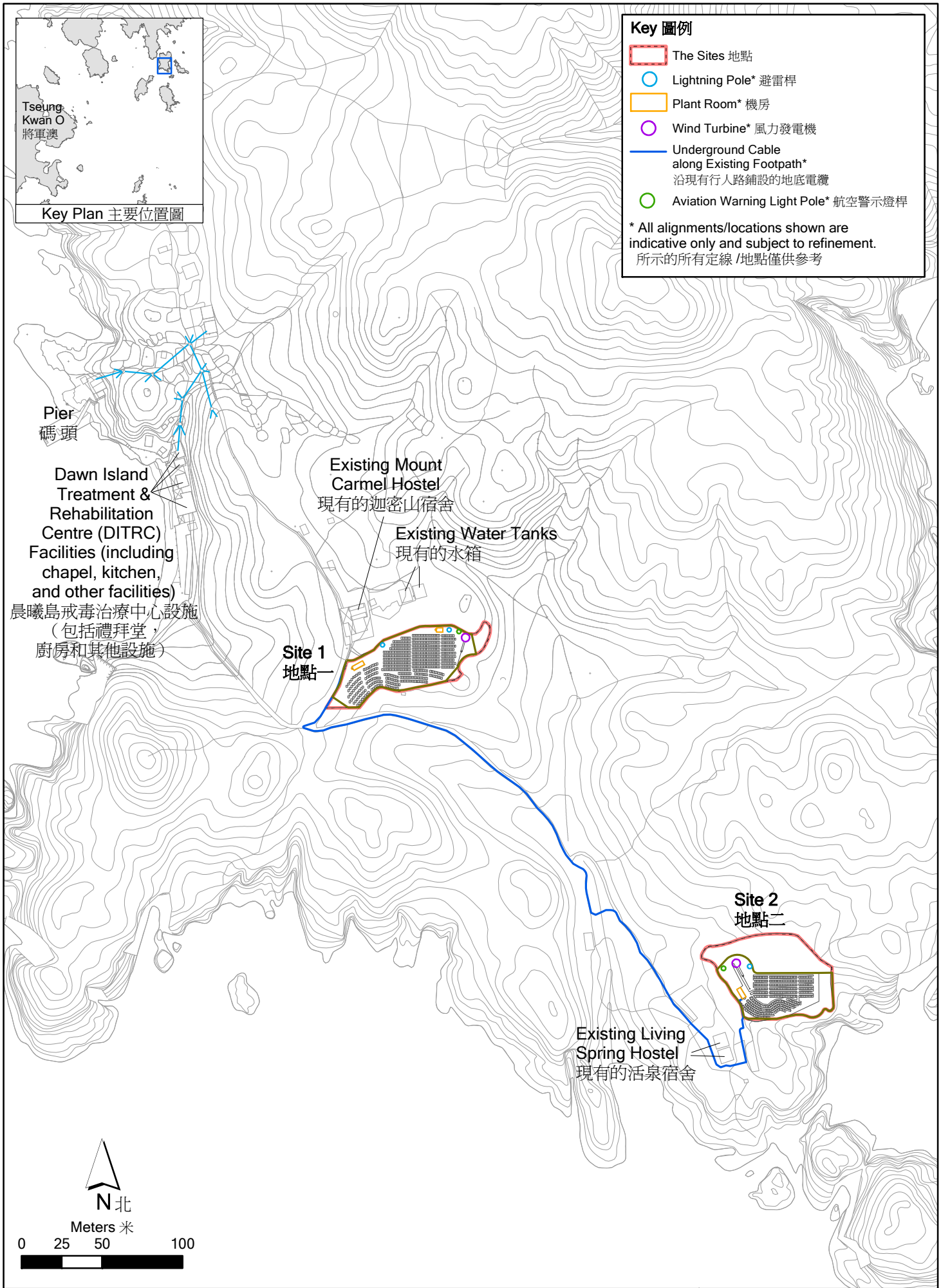

Figure 1.4a
圖 1.4a

Indicative Location of the Sites
所示的地點位置

File: eng chi\0103677_cableBC_revised.mxd
Date: 12/05/2010

Environmental Resources Management
ERM

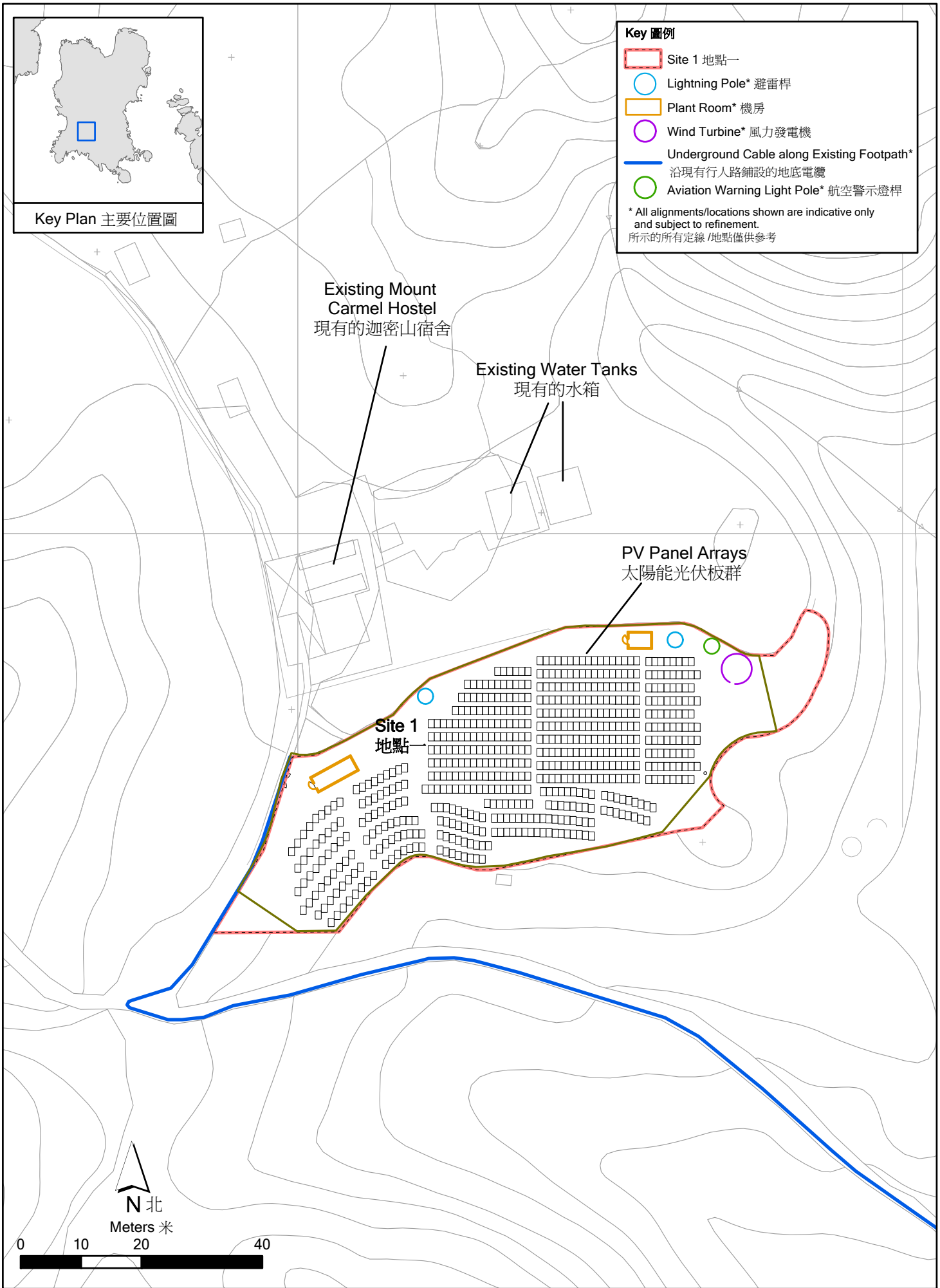

Figure 1.5a
圖 1.5a

Layout Plan of Site 1
地點一平面圖

File: eng chi\0103677_cableB.mxd
Date: 12/05/2010

Environmental Resources Management
ERM

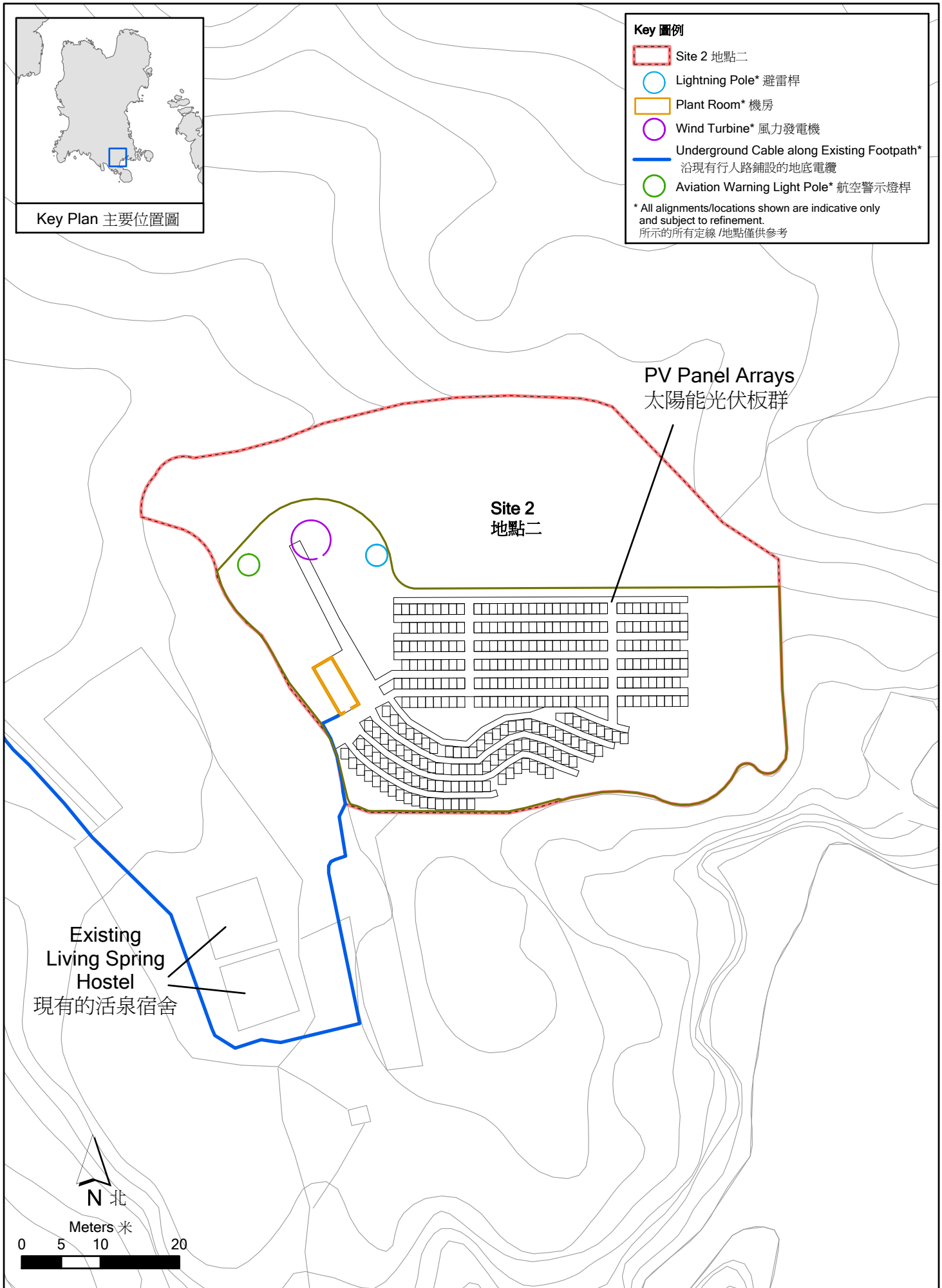

Figure 1.5b
圖 1.5b

Layout Plan of Site 2
地點二平面圖

File: eng chi\0103677_cableC.mxd
Date: 12/05/2010

Environmental Resources Management
ERM

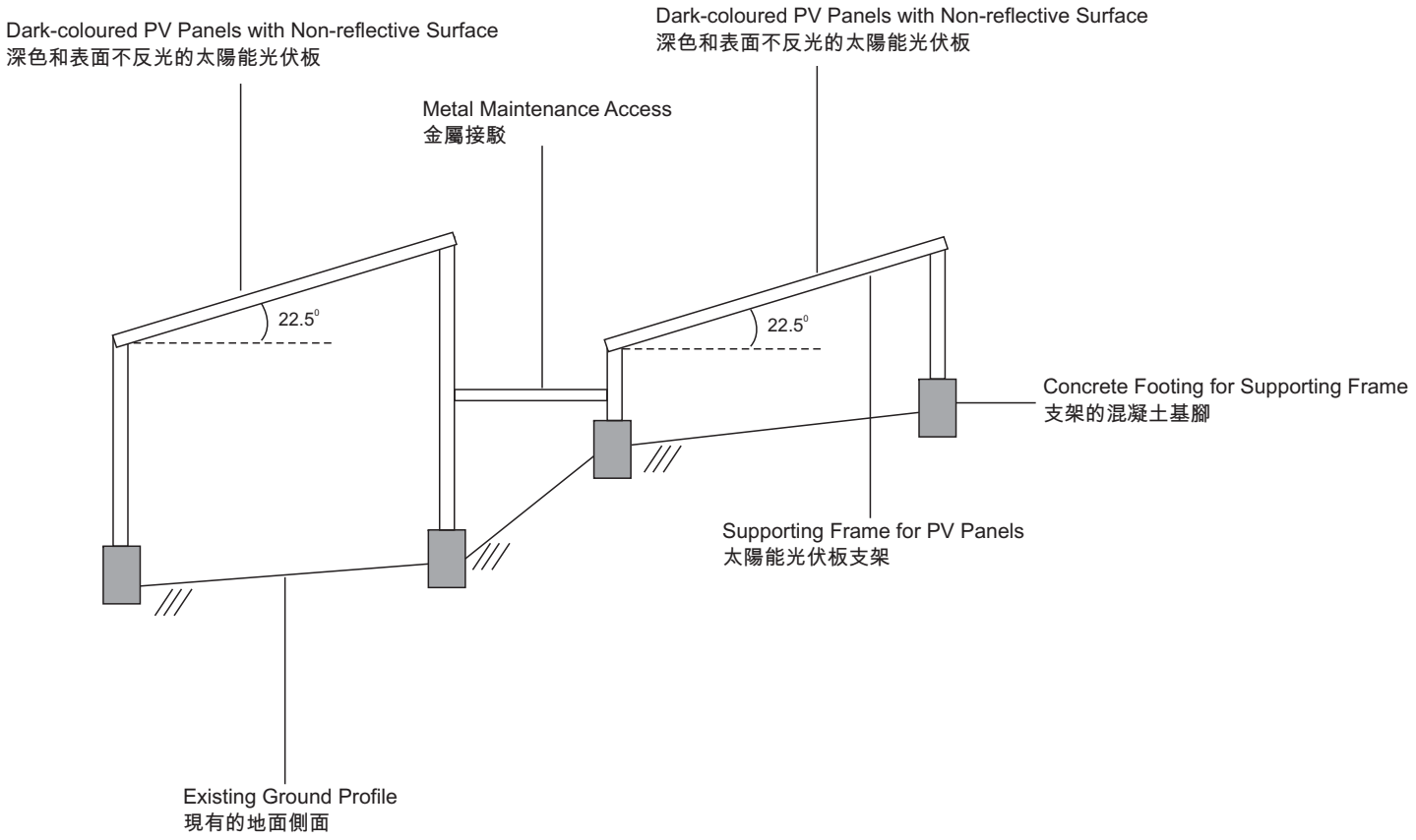

Figure 圖 1.5c

Typical Section of PV Arrays (Indicative)
太陽能光伏板群標準斷面圖（概略）

FILE: 0103677c-chi
DATE: 11/05/2010

Environmental Resources Management

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Key Plan 主要位置圖

Pak Fu Shan
白虎山

Key 圖例
- Underground Cable Indicative Alignment 地底電纜參考定線
- The Sites 地點
- Study Area (500m from Project Boundary) 研究區（離項目邊界500米）
- Stream 溪流


Stream 溪流



Mount Carmel Hostel & Cultivated Land
迦密山宿舍及耕地


Existing Water Tank
現有的水箱


Site 1 地點一


Stream 溪流


Cliff 懸崖



DITRC Facilities
(chapels, hostel & facilities)
晨曦島戒毒治療中心設施
（禮拜堂，營舍和其他設施）


Existing Footpath
現有行人路


Living Spring Hostel
活泉宿舍

Wang Chau
橫洲




Site 2 地點 二

N 北

Meters 米

0 100 200 400

Figure 3.1a
圖 3.1a

Existing Environment of Surrounding Area
現有的周圍環境

File: eng chi\0103677_existing env.mxd
Date: 12/05/2010

Environmental Resources Management

ERM

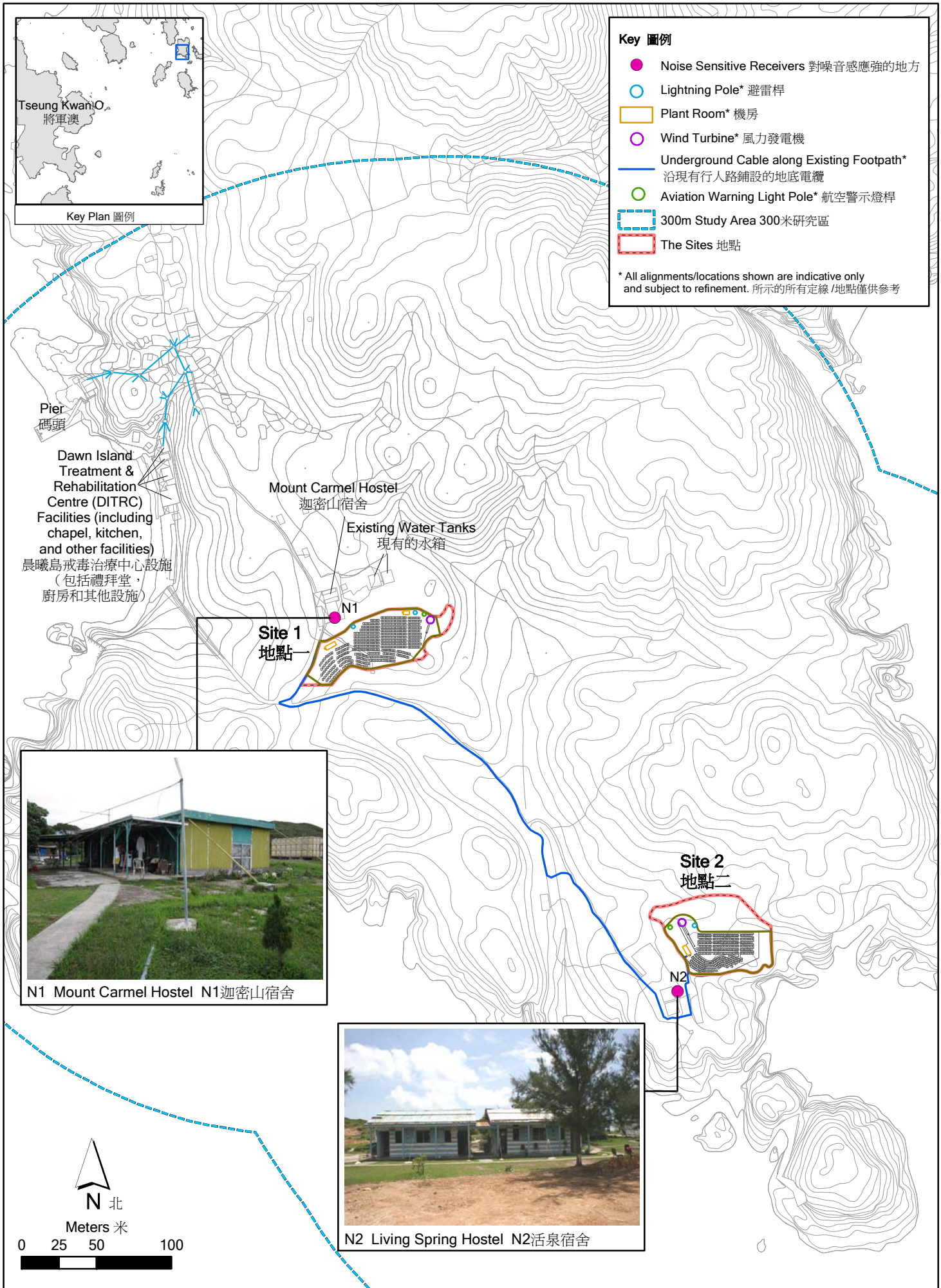

Figure 4.3a
圖 4.3a

Locations of Existing Noise Sensitive Receivers
現有噪音感應強的位置

File: eng chi\0103677_cableBC_NSR.mxd
Date: 12/05/2010

Environmental Resources Management
ERM

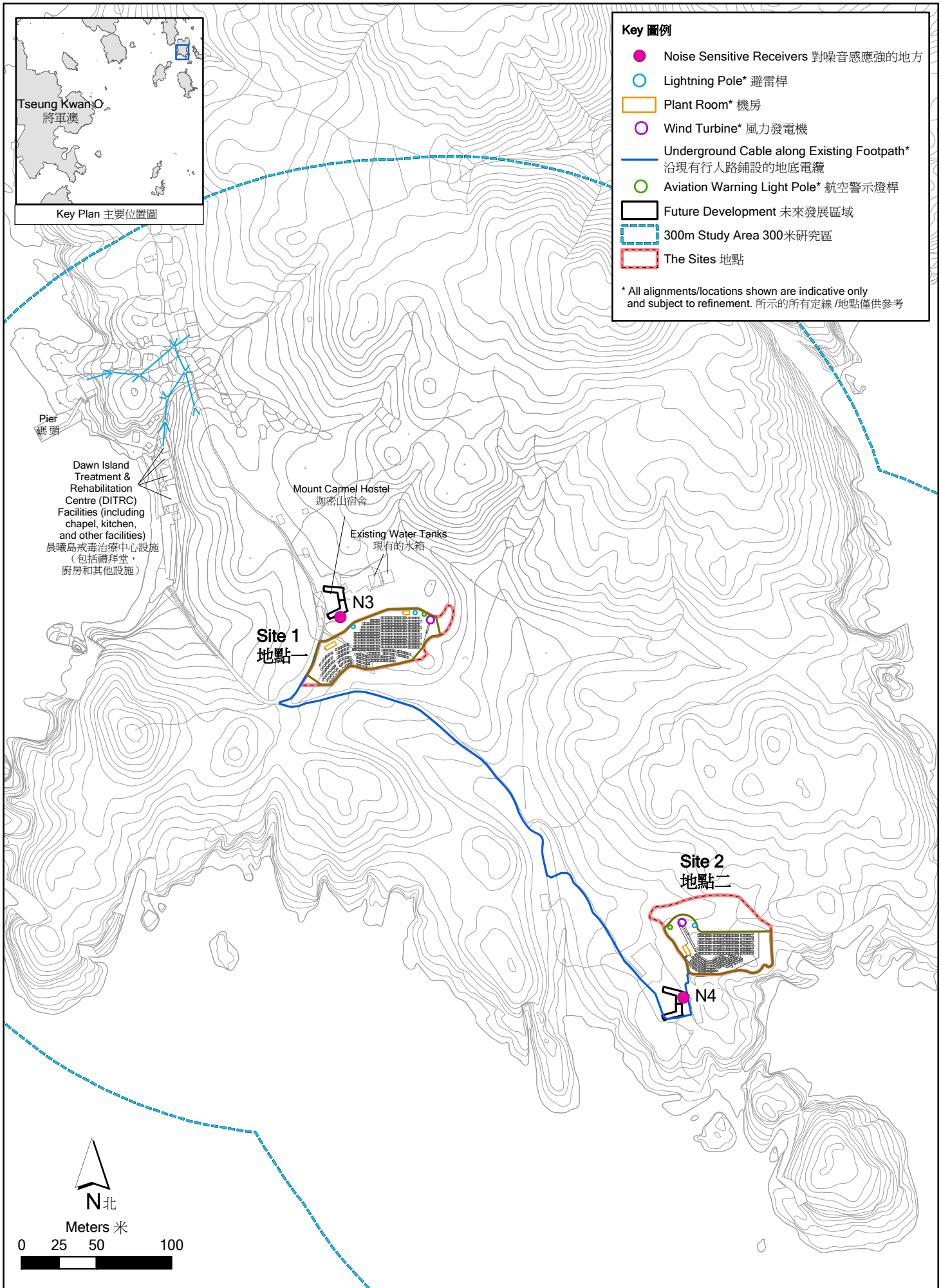

Figure 4.3b
圖 4.3b

Locations of Planned Noise Sensitive Receivers
已規劃噪音噪音感應強的位置

File: eng chi\0103677_cableBC_NSR_new plan.mxd
Date: 12/05/2010

Environmental Resources Management
ERM

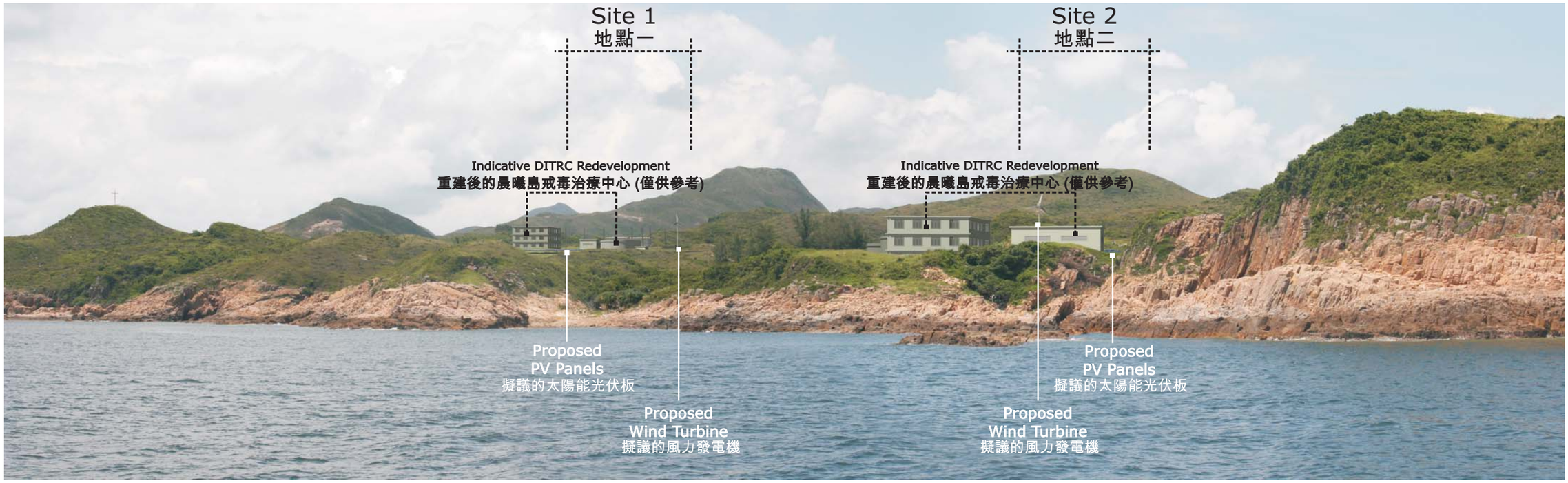

Figure 4.7a
圖 4.7a

FILE: 0103677-Fig4.7a-Visual illustration-chi
DATE: 11/05/2010

Visual Illustration of RE Facilities at Sites 1 & 2
可再生能源設施在地點一和地點二的視覺效果圖

Environmental
Resources
Management

ERM

Annex A
附件A

Noise Impact Assessment Supporting Information
噪音影響評估輔助資料

Annex A1
附件A1

Construction Plant Inventory and Programme
施工時使用的機動設備及流程圖

Annex A1-1
附錄 A1-1

Construction Plant Inventory
施工時使用的機動設備

No. 編號	Activities 工序	PME 機動設備	CNP ref or Note [1]. 技術備忘錄的辨認代碼或附註[1]	No. of PME 數量	On-time % 運作時間百分比	Unit SWL 單機聲功率級 (分貝(A))	SWL, dB(A) 修正後的聲功率級[3] (分貝(A))	Total SWL, dB(A) 總聲功率級[4] (分貝(A))
I)	**Site 1 (地點1)**							
1	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**104**
		Air Compressor, air flow < 10m3/min 空氣壓縮機，氣流量<10米3／分鐘	CNP 001	1	100%	100	100	
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	
		Farmer Vehicle, 農夫卡車	EPD/PME/13	1	100%	94	94	
		Drill, hand-held 鑽，手提式（電動）	EPD/PME/11	1	100%	89	89	
2	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**103**
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	
		Farmer Vehicle, 農夫卡車	EPD/PME/13	1	100%	94	94	
		Winch (electric) 絞車（電動）	CNP 262	1	100%	95	95	
3	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**103**
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	
		Farmer Vehicle, 農夫卡車	EPD/PME/13	1	100%	94	94	
		Concrete mixer (electric) 混凝土攪拌器 (電動)	CNP 045	1	100%	96	96	
		Bar bender and cutter (electric) 鋼筋屈曲機及切割器(電動)	CNP 021	1	100%	90	90	
4	Plumbing and Drainage Works (配管及渠務工程)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**101**
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	
II)	**Site 2 (地點2)**							
5	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**104**
		Air Compressor, air flow < 10m3/min 空氣壓縮機，氣流量<10米3／分鐘	CNP 001	1	100%	100	100	
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	
		Farmer Vehicle, 農夫卡車	EPD/PME/13	1	100%	94	94	
		Drill, hand-held 鑽，手提式（電動）	EPD/PME/11	1	100%	89	89	
6	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**103**
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	
		Farmer Vehicle, 農夫卡車	EPD/PME/13	1	100%	94	94	
		Winch (electric) 絞車（電動）	CNP 262	1	100%	95	95	
7	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**103**
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	
		Farmer Vehicle, 農夫卡車	EPD/PME/13	1	100%	94	94	
		Concrete mixer (electric) 混凝土攪拌器 (電動)	CNP 045	1	100%	96	96	
		Bar bender and cutter (electric) 鋼筋屈曲機及切割器(電動)	CNP 021	1	100%	90	90	
8	Plumbing and Drainage Works (配管及渠務工程)	Excavator, mini-robot mounted (挖土機, 配有自動控制裝置)	EPD/PME/13	1	100%	94	94	**101**
		Generator, silenced, 75dB(A) at 7m (發電機, 靜音, 7米處爲75分貝)	CNP 102	1	100%	100	100	

Note 附註[1] SWL based on the document prepared by the Noise Control Authority 聲功率級參考噪音管制監督編制的文件 (http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf)

Note 附註[2] The construction plant inventory for the Project and the concurrent adjacent works was confirmed reasonable and practicable for the Contractor to achieve the construction programme. 這些施工機動設備都已確定是合理和切實可讓承建商按照其施工計劃完成工程。

Note 附註[3] SWL = Unit SWL + Correction for no. of PME + Correction for On-time %
修正後的聲功率級=單機聲功率級+數量修正+運作時間修正

Note 附註[4] Total SWL = Total of all SWL calculated in Note [3] for each Activity
總聲功率級=各工序之修正後的聲功率級總和

Annex A1-2
附錄 A1-2

Construction Programme
施工流程圖

No. 編號	Activity Description 工序	Month 月份						
		1	2	3	4	5	6	7
I)	**Site 1 (地點1)**							
1	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	Y	Y	Y	Y			
2	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)					Y		
3	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)						Y	
4	Plumbing and Drainage Works (配管及渠務工程)							Y
II)	**Site 2 (地點2)**							
5	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	Y	Y	Y	Y			
6	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)					Y		
7	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)						Y	
8	Plumbing and Drainage Works (配管及渠務工程)							Y

Annex A2
附件A2

Construction Noise Impact Assessment
建築噪音影響評估

Annex A2-1
附錄 A2-1

Summary of Predicted Noise Levels 建築噪音評估的總結

	NSR Location 噪音感應強的地方	Predicted Construction Noise Level (dB(A)) 預計的建築噪音聲級 (分貝(A)) Months							Max. dB(A) 最高數值 (分貝(A))
		1	2	3	4	5	6	7	
N1	Site 1 - Mount Carmel Hostel 地點一—迦密山宿舍	75	75	75	75	62	74	72	75
N2	Site 2 - Living Spring Hostel 地點二—活泉宿舍	70	70	70	70	65	69	67	70

Annex A2-2
附錄 A2-2

Construction Noise Assessment
建築噪音評估

NSR: N1 Mount Carmel Hostel 迦密山宿舍
噪音感應強的位置

No. 號數	Activities 工序	SWL 聲功率級 dB(A)	Distance 距離 m	Distance Corr.[1] 距離衰減 dB(A)	Corr. For Topo 地形衰減 dB(A)	Façade Corr. 聲音反射修正 dB(A)	Predicted Construction Noise Level (dB(A)) 預計的建築噪音聲級 (分貝(A)) Month (月份) 1	2	3	4	5	6	7	Max. CNL dB(A) 經修正的噪音聲級最高數值 (分貝(A))
I)	**Site 1 (工地1)**													
1	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	104	16	-32	0.0	3	75	75	75	75				
2	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)	103	16	-32	0.0	3					74			
3	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)	103	60	-44	0.0	3						62		
4	Plumbing and Drainage Works (配管及渠務工程)	101	16	-32	0.0	3							72	
II)	**Site 2 (工地2)**													
5	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	104	300	-58	0.0	3	50	50	50	50				
6	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)	103	300	-58	0.0	3					48			
7	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)	103	310	-58	0.0	3						48		
8	Plumbing and Drainage Works (配管及渠務工程)	101	300	-58	0.0	3							46	
						Predicted Noise Level, dB(A) 預計建築噪音聲級，分貝(A)	75	75	75	75	74	63	72	75

Note 註釋:
[1] Distance Correction 距離衰減 = $10\log(2\pi r^2)$; where r = distance between NSR and the site 噪音感應強的地點與施工地點之間的距離

Annex A2-3
附錄 A2-3

Construction Noise Assessment
建築噪音評估

NSR: N2 Living Spring Hostel 活泉宿舍
噪音感應強的位置

No. 號數	Activities 工序	SWL 聲功率級 dB(A)	Distance 距離 m	Distance Corr.[1] 距離衰減 dB(A)	Corr. For Topo 地形衰減 dB(A)	Façade Corr. 聲音反射 修正 dB(A)	Predicted Construction Noise Level (dB(A)) 預計的建築噪音聲級 (分貝(A)) Month (月份) 1	2	3	4	5	6	7	Max. CNL dB(A) 經修正的 噪音聲級最高數值 (分貝(A))
I)	**Site 1 (地點1)**													
1	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	104	285	-57	0.0	3	50	50	50	50				
2	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)	103	290	-57	0.0	3					48			
3	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)	103	285	-57	0.0	3						49		
4	Plumbing and Drainage Works (配管及渠務工程)	101	285	-57	0.0	3							47	
II)	**Site 2 (地點2)**													
5	Construction of Footings and Erection of Supporting Frame of Solar Photovoltaic (建造太陽能光伏板支架基座及設置太陽能光伏板支架)	104	29	-37	0.0	3	70	70	70	70				
6	Construction of Footing and Erection of Wind Turbine (建造風力發電機基座及設置風力發電機)	103	42	-40	0.0	3					65			
7	Construction of Footings and Superstructure of Plant Room (Structural) (建造機房的地基及上層結構)	103	29	-37	0.0	3						69		
8	Plumbing and Drainage Works (配管及渠務工程)	101	29	-37	0.0	3							67	
						Predicted Noise Level, dB(A) 預計建築噪音聲級，分貝(A)	70	70	70	70	65	69	67	70

Note 註釋:
[1] Distance Correction 距離衰減 = $10\log(2\pi r^2)$; where r = distance between NSR and the site 噪音感應強的地點與施工地點之間的距離

Annex A3
附件A3

Noise Report for a 6kW Wind Turbine
6千瓦風力發電機之噪音報告

Proven WT6000 Wind Turbine

ON TM900 9M SELF-SUPPORTING TOWER

Noise Emission Report

GENERAL

The dB (A) scale is the most common measure used to quantify noise. It covers sound intensity over the entire audible scale *and* takes account of the sensitivity of the human ear to give an overall measure of "loudness".

TYPICAL DB(A) LEVELS

Sound Level	dB (A)
Threshold of hearing	0
Whisper	30
Talking	60
City Traffic	90
Rock Concert	120
Jet Engine (10m away)	150

CURRENT BEST PRACTICE

In assessing the noise from a proposed wind turbine installation we are often interested in what noise levels will be at various distances from the wind turbine. It is accepted practice to *calculate* noise contributions from the wind turbine. This is because it is only practical to *measure* the wind turbine contribution accurately when it is 10 dBA above background noise. For example, background noise in a "quiet" environment is typically 30-40 dBA making it impossible to *measure* contributions less than 40-50 dB(A).

PROVEN WT6000 WIND TURBINE NOISE CALCULATIONS

Figure 1 shows how the noise emitted by a Proven WT6000 wind turbine on a 9m mast will disperse over the local environment. Maximum noise output at the base of the machine was recorded at 65dB(A) at a wind speed of 20 m/s. The noise output at the base of the mast in light winds 5m/s was 45 dB(A). The sound meter was held at a height of 1.5m from the ground. Background noise is louder than the turbine when more than 25m from the mast in both cases.

Figure 2 shows how the combined noise of wind turbine plus background; this is what will be detected by the human ear.

Figure 3 graphs the dBA difference between wind turbine and background plus common complaint classifications. *It can be generally taken that there will be no noise complaints where the turbine specific noise is 10dBA less than background*. This happens at a distance of 40-75m depending on wind speed.

Details of the calculations used in these graphs are given in Appendices B & C.

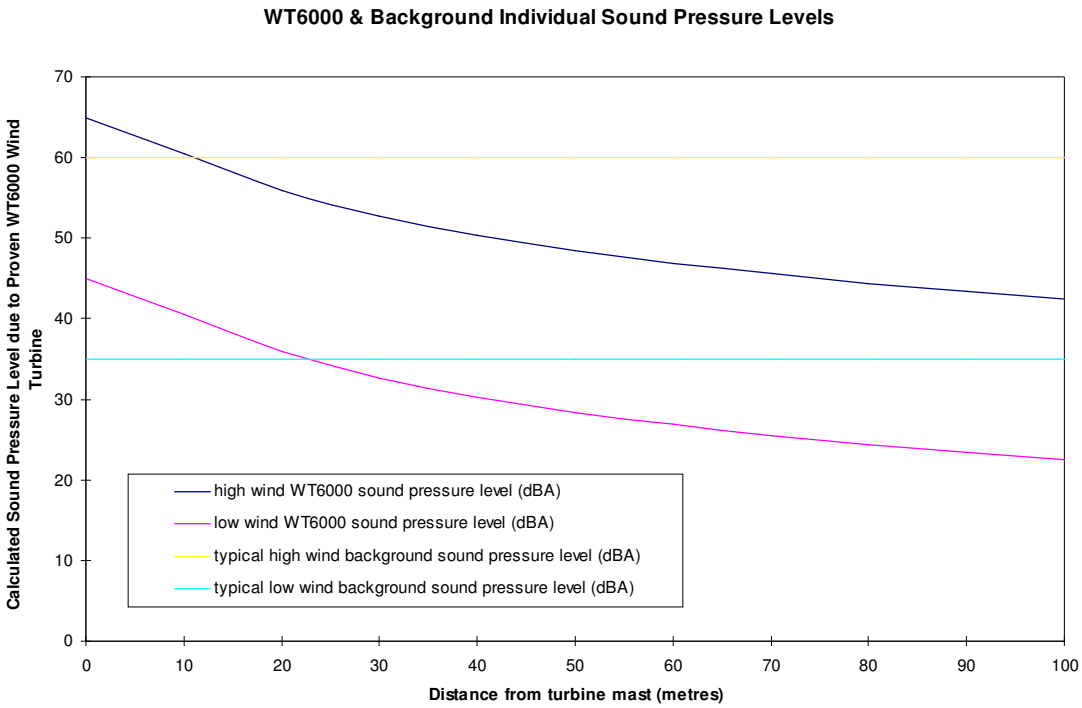

Figure 1

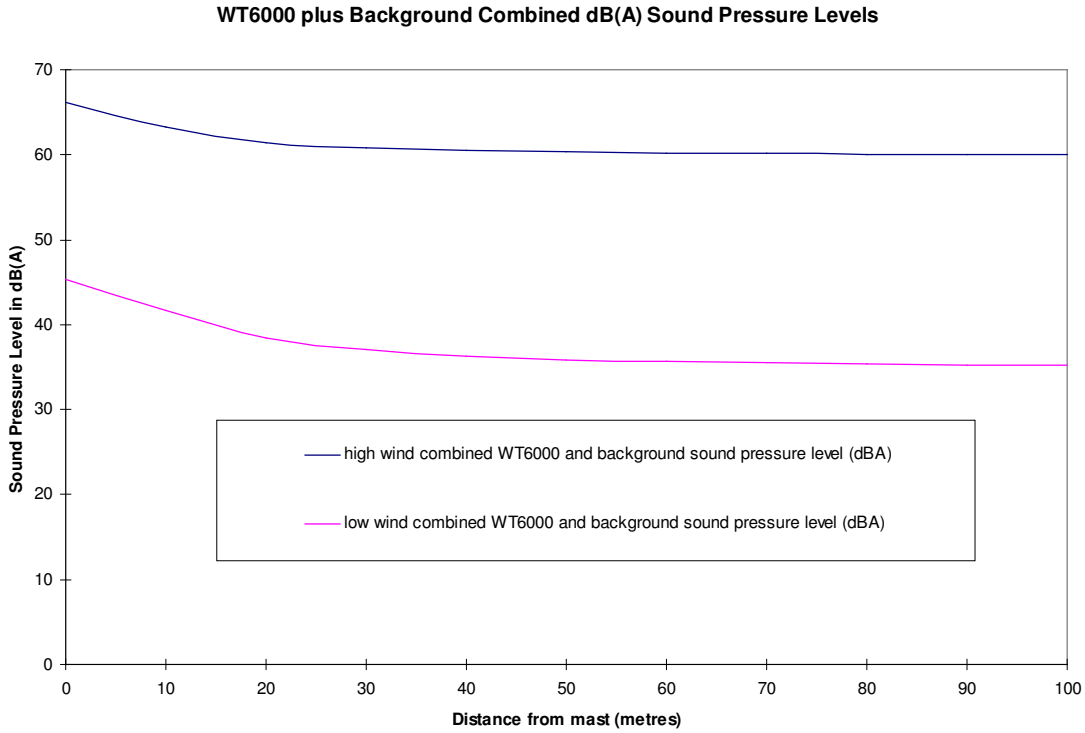

Figure 2

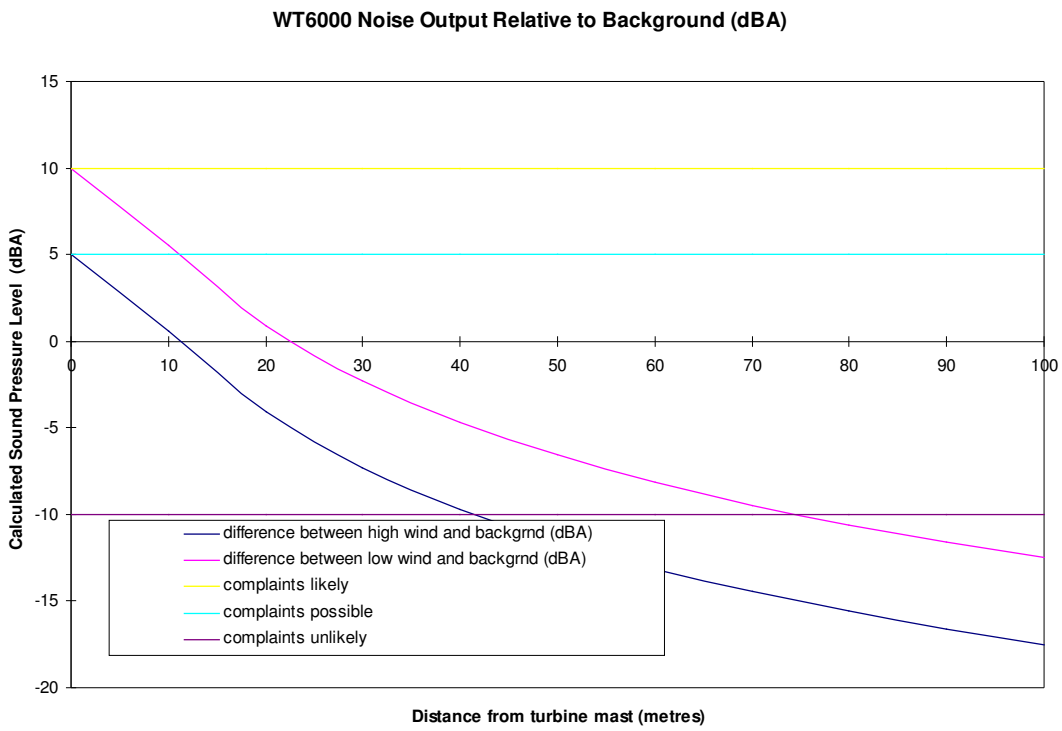

Figure 3

NOTE ON MEASUREMENTS USED IN THIS REPORT

All measurements were taken on a portable SL-25 dBA sound meter at our demonstration wind turbine site in Stewarton. Proven Wind Turbines emit a swishing noise only - we do not believe full tonal analysis is needed for our small wind turbines (see also Appendix A).

COMMENT ON THE CALCULATIONS AND ASSUMPTIONS USED IN THIS REPORT

The above method does not take account of wind "streaming" noise to the downwind side of the turbine. In practice, turbine dBA levels will be shifted downwind by a variable amount depending on the individual site.

In both cases the dB(A) readings taken as coming from the wind turbine **certainly also included a contribution from background noise in a nearby tree.** Secondly, in the graphs shown, the typical background dBA readings have been chosen very conservatively (low).

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Appendix A - Noise Reduction Features in Proven Wind Turbines

Feature	Benefit
Proven rotors are specially designed to operate at low rpm (typical max Tip Speed Ratio 6)	Blades and bearings rotate slowly keeping air noise to a minimum.
Direct Drive Permanent Magnet Generator	There is no gearbox as the rotor is coupled direct to the generator. This eliminates the gearbox hum which is the main source of noise in turbines with gearboxes. There are no touching parts.
Specially shaped blade tips	The rounded tips on Proven Wind Turbine blades are designed to reduce the vortices present at the end of any aerofoil. This keeps wind noise to a minimum.

Appendix B - Calculating Sound Pressure Levels

DEFINITIONS

1. Sound Pressure Level in dB(A) = 10 x $\log_{10}$ (sound power in W/m^2)

2. Sound Power in Watts/m^2 = $10^{0.1 \text{ x (dB-120)}}$

Given a sound power P_1 at distance d_1 from a noise source the sound power P_2 at distance d_2 may be calculated by the formula

3. $P_2 = P_1 x \left(\frac{d_1}{d_2} \right)^2$

ADDING DBA SOUND PRESSURE LEVELS FROM DIFFERENT SOURCES AT POINT X

First convert the dBA ratings at their initial distances to sound powers using equation 2.

Use the equation 3 to work out the sound powers at point X where you are interested in the total sound pressure level

Add all the sound powers together to find P_{total}

Convert back using equation 1 to find $dB(A)_{total}$

Appendix C - Calculations used in this report

	height to hub	9		dBA high	65							
	height meter	1.5		dBA low	45							
	initial height	7.5										
	inital dist	0										
	db=10log(power in w/m2)+120											
	sound power=10^(0.1(db-120)											
	horizontal distance (m)	actual distance	sound high (w/m2)	sound low (W/m2)	high wind WT2500 sound pressure level (dBA)	low wind WT2500 sound pressure level (dBA)	typical high wind backgrou nd sound pressure level (dBA)	typical low wind backgrou nd sound pressure level (dBA)	combined WT6000 plus backgrou nd sound high	combined WT6000 plus backgrou nd sound low	high wind combined WT6000 and backgrou nd sound pressure level (dBA)	low wind combined WT6000 and backgrou nd sound pressure level (dBA)
	0	7.5	3.16E-06	3.16E-08	65	45	60	35	4.16E-06	3.48E-08	66	45
	10	12.5	1.14E-06	1.14E-08	61	41	60	35	2.14E-06	1.45E-08	63	42
	20	21.4	3.9E-07	3.9E-09	56	36	60	35	1.39E-06	7.06E-09	61	38
	30	30.9	1.86E-07	1.86E-09	53	33	60	35	1.19E-06	5.02E-09	61	37
	40	40.7	1.07E-07	1.07E-09	50	30	60	35	1.11E-06	4.24E-09	60	36
	50	50.6	6.96E-08	6.96E-10	48	28	60	35	1.07E-06	3.86E-09	60	36
	60	60.5	4.87E-08	4.87E-10	47	27	60	35	1.05E-06	3.65E-09	60	36
	70	70.4	3.59E-08	3.59E-10	46	26	60	35	1.04E-06	3.52E-09	60	35
	80	80.4	2.76E-08	2.76E-10	44	24	60	35	1.03E-06	3.44E-09	60	35
	90	90.3	2.18E-08	2.18E-10	43	23	60	35	1.02E-06	3.38E-09	60	35
	100	100.3	1.77E-08	1.77E-10	42	22	60	35	1.02E-06	3.34E-09	60	35
							sound w/m	sound w/m2				
							0.000001	3.16E-09				

Details of the calculations used in these graphs are given in Appendices B & C.

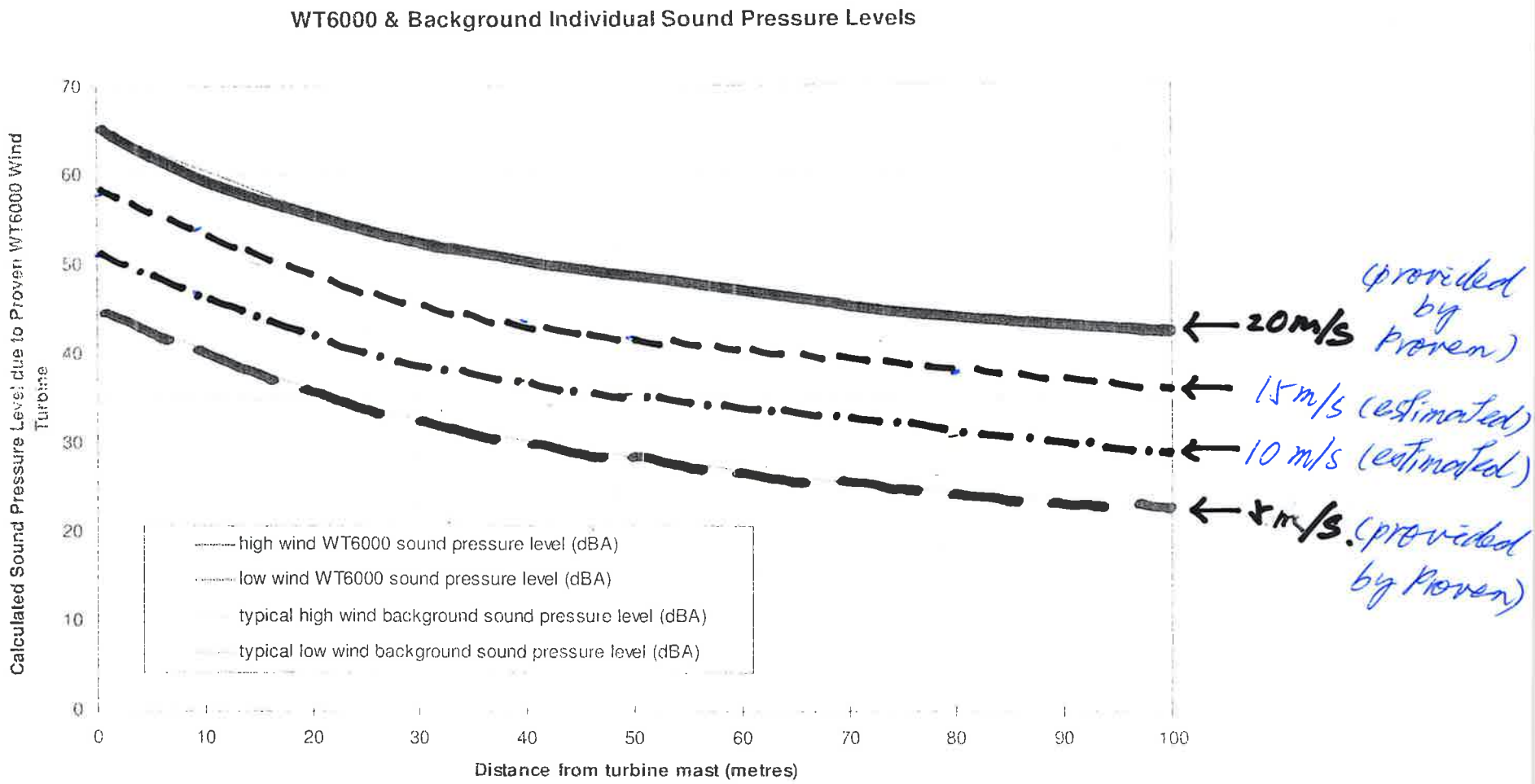

Figure 1

Annex A4
附件A4

Wind Data from Hong Kong Observatory
香港天文台之氣象數據

Extract of Meteorological Observations from Hong Kong Observatory 從香港天文台摘錄的氣象資料

Sai Kung Automatic Weather Station 西貢自動氣象站

Elevation of Anemometer above mean sea-level = 31m
風速計的高度爲高於平均海平面31米

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
01/09/2009	*****	20	12.6	3.5
02/09/2009	*****	30	13.5	3.8
03/09/2009	*****	90	15.9	4.4
04/09/2009	*****	160	10.5	2.9
05/09/2009	*****	70	10.5	2.9
06/09/2009	*****	110	9.3	2.6
07/09/2009	*****	170	7.8	2.2
08/09/2009	*****	170	8.0	2.2
09/09/2009	*****	70	12.5	3.5
10/09/2009	*****	60	28.6	7.9
11/09/2009	*****	70	24.3	6.8
12/09/2009	*****	70	15.8	4.4
13/09/2009	*****	30	6.8	1.9
14/09/2009	*****	20	33.4	9.3
15/09/2009	*****	160	37.2	10.3
16/09/2009	*****	150	22.0	6.1
17/09/2009	*****	150	10.4	2.9
18/09/2009	*****	30	4.5	1.3
19/09/2009	*****	40	4.7	1.3
20/09/2009	*****	160	9.5	2.6
21/09/2009	*****	160	8.8	2.4
22/09/2009	*****	20	17.4	4.8
23/09/2009	*****	30	18.8	5.2
24/09/2009	*****	80	21.7	6.0
25/09/2009	*****	70	15.4	4.3
26/09/2009	*****	30	8.1	2.3
27/09/2009	*****	20	15.2	4.2
28/09/2009	*****	10	16.1	4.5
29/09/2009	*****	10	17.2	4.8
30/09/2009	*****	10	10.4	2.9
01/08/2009	*****	40	5.5	1.5
02/08/2009	*****	160	8.3	2.3
03/08/2009	*****	40	15.3	4.3
04/08/2009	*****	60	29.6	8.2
05/08/2009	*****	160	33.5	9.3
06/08/2009	*****	150	21.6	6.0
07/08/2009	*****	240	6.2	1.7
08/08/2009	*****	280#	7.5#	2.1
09/08/2009	*****	230	6.3	1.8
10/08/2009	*****	160	6.1	1.7
11/08/2009	*****	30	7.3	2.0
12/08/2009	*****	210	5.0	1.4
13/08/2009	*****	210	3.9	1.1
14/08/2009	*****	160	4.7	1.3
15/08/2009	*****	160	6.5	1.8
16/08/2009	*****	160	7.9	2.2
17/08/2009	*****	170	5.5	1.5
18/08/2009	*****	170	7.7	2.1
19/08/2009	*****	160	8.4	2.3
20/08/2009	*****	160	7.4	2.1
21/08/2009	*****	160	7.3	2.0
22/08/2009	*****	30	4.6	1.3
23/08/2009	*****	40	7.2	2.0
24/08/2009	*****	170	5.5	1.5
25/08/2009	*****	70	10.3	2.9
26/08/2009	*****	170	5.6	1.6
27/08/2009	*****	160	6.9	1.9
28/08/2009	*****	40	4.2	1.2
29/08/2009	*****	170	7.6	2.1
30/08/2009	*****	170	7.4	2.1
31/08/2009	*****	30	7.8	2.2
01/07/2009	*****	190	12.0	3.3
02/07/2009	*****	200	10.9	3.0
03/07/2009	*****	190	13.3	3.7
04/07/2009	*****	190	8.0	2.2
05/07/2009	*****	240	5.4	1.5
06/07/2009	*****	160	6.6	1.8
07/07/2009	*****	30	5.6	1.6
08/07/2009	*****	180	6.5	1.8
09/07/2009	*****	160	5.5	1.5
10/07/2009	*****	40	8.5	2.4
11/07/2009	*****	70	25.3	7.0

Tap Mun Automatic Weather Station 塔門自動氣象站

Elevation of Anemometer above mean sea-level = 35m
風速計的高度爲高於平均海平面35米

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
01/09/2009	0.0	130	10.8	3.0
02/09/2009	0.0	120	11.4	3.2
03/09/2009	0.0	120	13.2	3.7
04/09/2009	0.0	120	10.0	2.8
05/09/2009	0.0	130	12.4	3.4
06/09/2009	0.0	130	10.7	3.0
07/09/2009	0.0	130	11.1	3.1
08/09/2009	0.0	130	9.1	2.5
09/09/2009	0.0	120	12.3	3.4
10/09/2009	0.0	80	22.8	6.3
11/09/2009	0.0	100	19.1	5.3
12/09/2009	0.0	90	13.3	3.7
13/09/2009	2.5#	300#	5.2#	1.4
14/09/2009	*****	***	*****	***
15/09/2009	*****	***	*****	***
16/09/2009	*****	***	*****	***
17/09/2009	*****	***	*****	***
18/09/2009	*****	***	*****	***
19/09/2009	*****	***	*****	***
20/09/2009	*****	***	*****	***
21/09/2009	3.0#	120#	7.5#	2.1
22/09/2009	0.0	350	13.5	3.8
23/09/2009	0.0	350	13.3	3.7
24/09/2009	0.0	90	18.0	5.0
25/09/2009	0.0	130	14.5	4.0
26/09/2009	0.0	130	7.4	2.1
27/09/2009	0.0	360	9.1	2.5
28/09/2009	43.5	360	11.2	3.1
29/09/2009	55.5	40	12.7	3.5
30/09/2009	3.0	360	9.0	2.5
01/08/2009	0.2	260#	3.3#	0.9
02/08/2009	0.0	120	6.0	1.7
03/08/2009	14.0	90	12.1	3.4
04/08/2009	18.0	90	25.5	7.1
05/08/2009	18.5	140#	27.2#	7.6
06/08/2009	1.5#	140#	15.3#	4.3
07/08/2009	0.0	280	7.9	2.2
08/08/2009	0.0	280#	16.1#	4.5
09/08/2009	0.0	270	11.2	3.1
10/08/2009	0.0	130	5.9	1.6
11/08/2009	20.0	130	7.1	2.0
12/08/2009	3.0	210	4.0	1.1
13/08/2009	9.0	200	3.4	0.9
14/08/2009	17.0	220	3.9	1.1
15/08/2009	0.0#	120#	4.7#	1.3
16/08/2009	0.0	150	5.6	1.6
17/08/2009	0.0	120	5.3	1.5
18/08/2009	0.5	130	8.5	2.4
19/08/2009	0.0	130	6.3	1.8
20/08/2009	0.0	220	4.6	1.3
21/08/2009	0.0	220	4.5	1.3
22/08/2009	0.0	230	3.8	1.1
23/08/2009	0.0	280	5.1	1.4
24/08/2009	0.0	130	7.2	2.0
25/08/2009	0.0	120	10.2	0.1
26/08/2009	0.0	130	7.1	2.0
27/08/2009	0.0	130	5.6	1.6
28/08/2009	0.0	290	5.2	1.4
29/08/2009	0.0	130	7.1	2.0
30/08/2009	0.5	130	7.1	2.0
31/08/2009	0.0	340	8.1	2.3
01/07/2009	0.0	200	7.3	2.0
02/07/2009	0.0#	220#	6.6#	1.8
03/07/2009	*****#	***	*****	***
04/07/2009	*****	***	*****	***
05/07/2009	*****	***	*****	***
06/07/2009	*****	***	*****	***
07/07/2009	0.0#	120#	6.3#	1.8
08/07/2009	0.0	200	5.8	1.6
09/07/2009	0.0	210	5.4	1.5
10/07/2009	0.0	290	9.0	2.5
11/07/2009	11.0	100	18.5	5.1

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
12/07/2009	*****	140	14.9	4.1
13/07/2009	*****	160	7.7	2.1
14/07/2009	*****	150	6.3	1.8
15/07/2009	*****	80	15.6	4.3
16/07/2009	*****	130	15.3	4.3
17/07/2009	*****	170	7.2	2.0
18/07/2009	*****	350	14.8	4.1
19/07/2009	*****	190	21.5	6.0
20/07/2009	*****	160	16.0	4.4
21/07/2009	*****	170	9.4	2.6
22/07/2009	*****	170	10.0	2.8
23/07/2009	*****	210	7.4	2.1
24/07/2009	*****	200	7.5	2.1
25/07/2009	*****	200	8.4	2.3
26/07/2009	*****	220	7.4	2.1
27/07/2009	*****	210	8.8	2.4
28/07/2009	*****	170	9.3	2.6
29/07/2009	*****	160	11.6	3.2
30/07/2009	*****	130	15.2	4.2
31/07/2009	*****	130	15.2	4.2
01/06/2009	*****	160	8.6	2.4
02/06/2009	*****	170	14.2	3.9
03/06/2009	*****	190	12.3	3.4
04/06/2009	*****	320	6.8	1.9
05/06/2009	*****	160	8.4	2.3
06/06/2009	*****	160	7.0	1.9
07/06/2009	*****	150	12.5	3.5
08/06/2009	*****	160	21.4	5.9
09/06/2009	*****	150	13.3	3.7
10/06/2009	*****	160	6.2	1.7
11/06/2009	*****	30	4.0	1.1
12/06/2009	*****	40	2.5	0.7
13/06/2009	*****	170	5.7	1.6
14/06/2009	*****	140	4.8	1.3
15/06/2009	*****	90	8.0	2.2
16/06/2009	*****	130	11.5	3.2
17/06/2009	*****	170	6.2	1.7
18/06/2009	*****	160	9.3	2.6
19/06/2009	*****	180	5.5	1.5
20/06/2009	*****	30	6.2	1.7
21/06/2009	*****	200	8.4	2.3
22/06/2009	*****	200	8.3	2.3
23/06/2009	*****	190	7.7	2.1
24/06/2009	*****	180	4.6	1.3
25/06/2009	*****	160	7.7	2.1
26/06/2009	*****	60	20.3	5.6
27/06/2009	*****	200	7.7	2.1
28/06/2009	*****	270	6.3	1.8
29/06/2009	*****	190	12.3	3.4
30/06/2009	*****	190	14.5	4.0
01/05/2009	*****	60	16.3	4.5
02/05/2009	*****	180	8.0	2.2
03/05/2009	*****	170	7.3	2.0
04/05/2009	*****	120	8.2	2.3
05/05/2009	*****	70	12.1	3.4
06/05/2009	*****	70	16.8	4.7
07/05/2009	*****	70	15.3	4.3
08/05/2009	*****	100	8.6	2.4
09/05/2009	*****	90	10.3	2.9
10/05/2009	*****	90	12.3	3.4
11/05/2009	*****	90	10.7	3.0
12/05/2009	*****	160	9.5	2.6
13/05/2009	*****	160	11.4	3.2
14/05/2009	*****	90	12.8	3.6
15/05/2009	*****	90	9.3	2.6
16/05/2009	*****	170	3.7	1.0
17/05/2009	*****	160	3.4	0.9
18/05/2009	*****	160	7.3	2.0
19/05/2009	*****	170	18.3	5.1
20/05/2009	*****	170	16.6	4.6
21/05/2009	*****	160	7.6	2.1
22/05/2009	*****	90	12.1	3.4
23/05/2009	*****	70	24.1	6.7
24/05/2009	*****	90	19.3	5.4
25/05/2009	*****	90	21.0	5.8
26/05/2009	*****	80	11.6	3.2
27/05/2009	*****	90	19.6	5.4
28/05/2009	*****	90	17.0	4.7
29/05/2009	*****	80	9.1	2.5
30/05/2009	*****	10	8.1	2.3

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
12/07/2009	0.0	120	14.0	3.9
13/07/2009	0.0	210	6.0	1.7
14/07/2009	0.0	130	7.2	2.0
15/07/2009	5.5	110	14.0	3.9
16/07/2009	2.0	120	15.0	4.2
17/07/2009	0.0	120	7.4	2.1
18/07/2009	17.0	280	18.2	5.1
19/07/2009	81.5	130	22.1	6.1
20/07/2009	5.5	120	13.2	3.7
21/07/2009	0.0	120#	9.6#	2.7
22/07/2009	0.0#	130#	9.2#	2.6
23/07/2009	*****	***	*****	***
24/07/2009	0.5#	210#	5.6#	1.6
25/07/2009	0.0	210#	5.5#	1.5
26/07/2009	7.5	160#	6.4#	1.8
27/07/2009	3.5	150#	5.6#	1.6
28/07/2009	0.0#	150#	6.9#	1.9
29/07/2009	4.5	130	8.5	2.4
30/07/2009	15.5	120#	14.5#	4.0
31/07/2009	2.0	120#	17.5#	4.9
01/06/2009	0.0	130#	7.7#	2.1
02/06/2009	0.0	160	8.5	2.4
03/06/2009	6.0	210#	8.8#	2.4
04/06/2009	50.0	290	8.2	2.3
05/06/2009	0.0	240#	6.9#	1.9
06/06/2009	0.0#	120#	6.1#	1.7
07/06/2009	0.0#	***#	*****#	***#
08/06/2009	0.0#	***#	*****#	***#
09/06/2009	5.5#	***#	*****#	***#
10/06/2009	3.0#	140#	6.5#	1.8
11/06/2009	13.0	290	4.0	1.1
12/06/2009	3.0	310	4.0	1.1
13/06/2009	16.5	110	5.0	1.4
14/06/2009	19.0	130	7.0	1.9
15/06/2009	15.0	120	10.9	3.0
16/06/2009	69.5	100	13.3	3.7
17/06/2009	0.0	130	8.4	2.3
18/06/2009	0.0	130	8.3	2.3
19/06/2009	0.0	120	8.5	2.4
20/06/2009	8.5	300	6.0	1.7
21/06/2009	0.0	280	10.3	2.9
22/06/2009	0.5	220	6.0	1.7
23/06/2009	16.0	210	5.5	1.5
24/06/2009	2.0	170	5.2	1.4
25/06/2009	0.0	130	9.4	2.6
26/06/2009	12.5	100	18.8	5.2
27/06/2009	53.5	220	9.3	2.6
28/06/2009	28.5	130	7.0	1.9
29/06/2009	0.0	190	9.4	2.6
30/06/2009	0.5	210	9.5	2.6
01/05/2009	0.0	120	13.5	3.8
02/05/2009	0.0	130	9.5	2.6
03/05/2009	1.0	120	7.8	2.2
04/05/2009	3.0	130	10.3	2.9
05/05/2009	0.0	120	15.8	4.4
06/05/2009	0.0	130	16.4	4.6
07/05/2009	0.0	120	13.2	3.7
08/05/2009	0.0	130	12.7	3.5
09/05/2009	0.0	120	10.4	2.9
10/05/2009	0.0	120	11.2	3.1
11/05/2009	0.0	130	10.8	3.0
12/05/2009	0.0	120	6.1	1.7
13/05/2009	0.0	130	9.5	2.6
14/05/2009	0.0	120	14.4	4.0
15/05/2009	0.0	120	10.1	2.8
16/05/2009	0.5	110	4.4	1.2
17/05/2009	0.5	120	6.0	1.7
18/05/2009	0.0	110	5.7	1.6
19/05/2009	1.5	140	11.5	3.2
20/05/2009	10.0	150	11.5	3.2
21/05/2009	6.0	130	7.3	2.0
22/05/2009	0.5	120	9.8	2.7
23/05/2009	45.0	90	20.3	5.6
24/05/2009	61.5	110	20.9	5.8
25/05/2009	4.0	100	18.0	5.0
26/05/2009	25.5	110	11.1	3.1
27/05/2009	16.5	100	18.7	5.2
28/05/2009	1.5	120	20.0	5.6
29/05/2009	1.0	050#	8.4#	2.3
30/05/2009	0.0	360	8.5	2.4

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
31/05/2009	*****	170	5.8	1.6
01/04/2009	*****	90	17.2	4.8
02/04/2009	*****	80	22.0	6.1
03/04/2009	*****	100	11.3	3.1
04/04/2009	*****	110	6.1	1.7
05/04/2009	*****	180	8.1	2.3
06/04/2009	*****	20	11.5	3.2
07/04/2009	*****	360	5.6	1.6
08/04/2009	*****	170	6.2	1.7
09/04/2009	*****	90	13.5	3.8
10/04/2009	*****	80	8.0	2.2
11/04/2009	*****	90	8.0	2.2
12/04/2009	*****	180	6.5	1.8
13/04/2009	*****	180	4.6	1.3
14/04/2009	*****	180	5.6	1.6
15/04/2009	*****	70	9.2	2.6
16/04/2009	*****	100	8.0	2.2
17/04/2009	*****	90	11.7	3.3
18/04/2009	*****	70	18.7	5.2
19/04/2009	*****	190	12.1	3.4
20/04/2009	*****	190	9.9	2.8
21/04/2009	*****	80	15.7	4.4
22/04/2009	*****	90	9.6	2.7
23/04/2009	*****	100	7.7	2.1
24/04/2009	*****	230	5.0	1.4
25/04/2009	*****	20	9.4	2.6
26/04/2009	*****	10	13.0	3.6
27/04/2009	*****	100	14.3	4.0
28/04/2009	*****	80	19.1	5.3
29/04/2009	*****	80	13.8	3.8
30/04/2009	*****	80	17.0	4.7
01/03/2009	*****	80	9.0	2.5
02/03/2009	*****	30	10.8	3.0
03/03/2009	*****	30	8.5	2.4
04/03/2009	*****	100	7.9	2.2
05/03/2009	*****	90	7.1	2.0
06/03/2009	*****	20	15.5	4.3
07/03/2009	*****	20	13.1	3.6
08/03/2009	*****	20	7.3	2.0
09/03/2009	*****	20	10.1	2.8
10/03/2009	*****	90	12.6	3.5
11/03/2009	*****	100	8.0	2.2
12/03/2009	*****	110	7.1	2.0
13/03/2009	*****	360	10.5	2.9
14/03/2009	*****	20	20.8	5.8
15/03/2009	*****	170	6.9	1.9
16/03/2009	*****	180	6.0	1.7
17/03/2009	*****	170	6.7	1.9
18/03/2009	*****	180	5.3	1.5
19/03/2009	*****	180	4.2	1.2
20/03/2009	*****	170	4.6	1.3
21/03/2009	*****	180	4.3	1.2
22/03/2009	*****	180	4.5	1.3
23/03/2009	*****	170	5.0	1.4
24/03/2009	*****	80	8.7	2.4
25/03/2009	*****	60	10.2	2.8
26/03/2009	*****	80	12.5	3.5
27/03/2009	*****	150	4.9	1.4
28/03/2009	*****	190	4.8	1.3
29/03/2009	*****	20	10.3	2.9
30/03/2009	*****	80	12.8	3.6
31/03/2009	*****	10	11.7	3.3
01/02/2009	*****	110	6.6	1.8
02/02/2009	*****	210	6.9	1.9
03/02/2009	*****	190	5.1	1.4
04/02/2009	*****	80	7.3	2.0
05/02/2009	*****	180	6.2	1.7
06/02/2009	*****	170	8.5	2.4
07/02/2009	*****	180	8.5	2.4
08/02/2009	*****	100	8.5	2.4
09/02/2009	*****	180	6.3	1.8
10/02/2009	*****	180	5.4	1.5
11/02/2009	*****	170	6.3	1.8
12/02/2009	*****	170	8.2	2.3
13/02/2009	*****	180	9.7	2.7
14/02/2009	*****	180	5.4	1.5
15/02/2009	*****	100	4.3	1.2
16/02/2009	*****	90	12.5	3.5
17/02/2009	*****	100	14.9	4.1
18/02/2009	*****	170	8.5	2.4

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
31/05/2009	0.0	190	4.8	1.3
01/04/2009	0.0	100	14.0	3.9
02/04/2009	0.0	120	18.8	5.2
03/04/2009	0.0	130	16.2	4.5
04/04/2009	0.0	140	10.5	2.9
05/04/2009	0.0	350	6.9	1.9
06/04/2009	4.0	360	10.7	3.0
07/04/2009	3.0	120	7.6	2.1
08/04/2009	0.0	130	9.1	2.5
09/04/2009	0.0	130	15.8	4.4
10/04/2009	0.0	130	12.0	3.3
11/04/2009	0.0	130	13.8	3.8
12/04/2009	1.0	130	9.2	2.6
13/04/2009	1.0	110	5.2	1.4
14/04/2009	0.0	130	6.4	1.8
15/04/2009	6.0	130	12.0	3.3
16/04/2009	16.0	140	7.8	2.2
17/04/2009	0.0	120	11.3	3.1
18/04/2009	40.5	110	15.3	4.3
19/04/2009	52.0	190	8.5	2.4
20/04/2009	0.5	350	7.3	2.0
21/04/2009	0.0	350	14.5	4.0
22/04/2009	4.0	130	14.8	4.1
23/04/2009	2.5	130	14.6	4.1
24/04/2009	0.5	140	12.7	3.5
25/04/2009	32.0	360	9.3	2.6
26/04/2009	4.5	110	12.3	3.4
27/04/2009	0.0	120	14.8	4.1
28/04/2009	0.0	120	18.8	5.2
29/04/2009	0.0	130	13.9	3.9
30/04/2009	0.0	130	14.2	3.9
01/03/2009	1.5	10	9.2	2.6
02/03/2009	0.0	10	10.1	2.8
03/03/2009	0.0	360	10.4	2.9
04/03/2009	3.0	130	13.9	3.9
05/03/2009	26.0	140	11.5	3.2
06/03/2009	28.0	360	17.3	4.8
07/03/2009	1.5	350	13.0	3.6
08/03/2009	1.0	360	8.1	2.3
09/03/2009	1.5	350	12.7	3.5
10/03/2009	0.0#	120#	17.6#	4.9
11/03/2009	0.0	140	16.5	4.6
12/03/2009	0.0	140	16.2	4.5
13/03/2009	0.0	350	10.2	2.8
14/03/2009	0.0	360	14.2	3.9
15/03/2009	0.0	130	10.2	2.8
16/03/2009	0.0	120	6.7	1.9
17/03/2009	0.0	250	6.6	1.8
18/03/2009	0.0	130	7.2	2.0
19/03/2009	0.0	120	4.5	1.3
20/03/2009	0.0	290	5.5	1.5
21/03/2009	0.0	150	8.8	2.4
22/03/2009	0.0	110	4.5	1.3
23/03/2009	0.5	130	11.0	3.1
24/03/2009	10.0	130	9.6	2.7
25/03/2009	16.5	360	9.7	2.7
26/03/2009	0.5	130	11.4	3.2
27/03/2009	6.0	140	7.6	2.1
28/03/2009	0.5	140	7.6	2.1
29/03/2009	25.5	360	10.3	2.9
30/03/2009	0.0	120	8.2	2.3
31/03/2009	0.0	360#	11.4#	3.2
01/02/2009	0.0	130	12.0	3.3
02/02/2009	0.0	140	8.3	2.3
03/02/2009	0.0	120	5.9	1.6
04/02/2009	0.0	130	9.8	2.7
05/02/2009	0.0	130	8.0	2.2
06/02/2009	0.0	130	12.3	3.4
07/02/2009	0.0	130	10.7	3.0
08/02/2009	0.0	130	9.7	2.7
09/02/2009	0.0	130	7.8	2.2
10/02/2009	0.0	140	9.0	2.5
11/02/2009	0.0	120	6.1	1.7
12/02/2009	0.0	130	8.2	2.3
13/02/2009	0.0	140	6.4	1.8
14/02/2009	0.0	130	8.4	2.3
15/02/2009	1.0	150	8.8	2.4
16/02/2009	0.0	***	14.3	***
17/02/2009	0.0	***	18.1	***
18/02/2009	0.5	***	13.2	***

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
19/02/2009	*****	170	4.9	1.4
20/02/2009	*****	20	12.8	3.6
21/02/2009	*****	90	13.4	3.7
22/02/2009	*****	200	3.3	0.9
23/02/2009	*****	180	3.8	1.1
24/02/2009	*****	190	5.3	1.5
25/02/2009	*****	180	5.3	1.5
26/02/2009	*****	90	8.0	2.2
27/02/2009	*****	110	7.5	2.1
28/02/2009	*****	100	7.8	2.2
01/01/2009	*****	20	20.6	5.7
02/01/2009	*****	20	12.7	3.5
03/01/2009	*****	80	10.3	2.9
04/01/2009	*****	30	8.3	2.3
05/01/2009	*****	100	8.4	2.3
06/01/2009	*****	80	12.2	3.4
07/01/2009	*****	20	13.3	3.7
08/01/2009	*****	010#	17.3#	4.8
09/01/2009	*****	10	24.5	6.8
10/01/2009	*****	10	22.5	6.3
11/01/2009	*****	330	7.3	2.0
12/01/2009	*****	10	15.4	4.3
13/01/2009	*****	10	20.7	5.8
14/01/2009	*****	10	10.4	2.9
15/01/2009	*****	340	9.5	2.6
16/01/2009	*****	330#	5.9#	1.6
17/01/2009	*****	330	4.8	1.3
18/01/2009	*****	190	4.3	1.2
19/01/2009	*****	80	7.2	2.0
20/01/2009	*****	80	6.1	1.7
21/01/2009	*****	180	5.1	1.4
22/01/2009	*****	180	5.0	1.4
23/01/2009	*****	20	19.6	5.4
24/01/2009	*****	30	19.8	5.5
25/01/2009	*****	30	10.4	2.9
26/01/2009	*****	30	12.0	3.3
27/01/2009	*****	30	12.2	3.4
28/01/2009	*****	20	5.4	1.5
29/01/2009	*****	80	9.2	2.6
30/01/2009	*****	20	13.2	3.7
31/01/2009	*****	50	10.3	2.9
01/12/2008	*****	330	6.2	1.7
02/12/2008	*****	320	5.6	1.6
03/12/2008	*****	330	5.1	1.4
04/12/2008	*****	10	11.8	3.3
05/12/2008	*****	10	28.3	7.9
06/12/2008	*****	20	17.9	5.0
07/12/2008	*****	360	10.0	2.8
08/12/2008	*****	10	11.7	3.3
09/12/2008	*****	20	7.5	2.1
10/12/2008	*****	330	6.0	1.7
11/12/2008	*****	190	6.5	1.8
12/12/2008	*****	80	8.9	2.5
13/12/2008	*****	20	7.9	2.2
14/12/2008	*****	10	17.3	4.8
15/12/2008	*****	20	9.8	2.7
16/12/2008	*****	330	8.0	2.2
17/12/2008	*****	330	5.3	1.5
18/12/2008	*****	180	8.4	2.3
19/12/2008	*****	70	11.6	3.2
20/12/2008	*****	300	4.8	1.3
21/12/2008	*****	110	4.4	1.2
22/12/2008	*****	20	25.9	7.2
23/12/2008	*****	20	12.7	3.5
24/12/2008	*****	30	11.0	3.1
25/12/2008	*****	30	8.5	2.4
26/12/2008	*****	80	15.2	4.2
27/12/2008	*****	180	6.0	1.7
28/12/2008	*****	40	4.0	1.1
29/12/2008	*****	20	15.0	4.2
30/12/2008	*****	20	17.4	4.8
31/12/2008	*****	30	23.0	6.4
01/11/2008	*****	80	17.1	4.8
02/11/2008	*****	100	17.5	4.9
03/11/2008	*****	20	11.1	3.1
04/11/2008	*****	90	12.8	3.6
05/11/2008	*****	80	14.4	4.0
06/11/2008	*****	90	11.6	3.2
07/11/2008	*****	80	6.7	1.9
08/11/2008	*****	20	22.6	6.3

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
19/02/2009	1.5	***#	8.3#	2.3
20/02/2009	0.0	350	11.6	3.2
21/02/2009	0.0	130	20.0	5.6
22/02/2009	0.0	150	10.0	2.8
23/02/2009	0.0	140	5.8	1.6
24/02/2009	0.0	140	8.7	2.4
25/02/2009	0.5	130	6.7	1.9
26/02/2009	0.0	130	12.8	3.6
27/02/2009	0.0	130	10.7	3.0
28/02/2009	0.0	140	15.2	4.2
01/01/2009	0.0	360	17.4	4.8
02/01/2009	0.0	360	13.1	3.6
03/01/2009	0.0	130	12.6	3.5
04/01/2009	0.0	120	12.8	3.6
05/01/2009	0.0	130	10.5	2.9
06/01/2009	0.0	130	12.3	3.4
07/01/2009	0.0	350	14.7	4.1
08/01/2009	0.0	350	19.2	5.3
09/01/2009	0.0	350	21.4	5.9
10/01/2009	0.0	350	17.0	4.7
11/01/2009	0.0	360	9.1	2.5
12/01/2009	0.0	360	12.4	3.4
13/01/2009	0.0	360	15.6	4.3
14/01/2009	0.0	350	11.4	3.2
15/01/2009	0.0	70	12.6	3.5
16/01/2009	0.0	130	8.8	2.4
17/01/2009	0.0	140	6.0	1.7
18/01/2009	0.0	250	4.7	1.3
19/01/2009	0.0	130	9.4	2.6
20/01/2009	0.0	140	14.7	4.1
21/01/2009	0.0	130	6.4	1.8
22/01/2009	0.0	120	7.5	2.1
23/01/2009	0.0	360	13.2	3.7
24/01/2009	0.0	360	18.9	5.3
25/01/2009	0.0	350	8.6	2.4
26/01/2009	0.0	350	12.9	3.6
27/01/2009	0.0	350	12.7	3.5
28/01/2009	0.0	360	5.6	1.6
29/01/2009	0.0	280	8.1	2.3
30/01/2009	0.0	350	16.6	4.6
31/01/2009	0.0	130	11.2	3.1
01/12/2008	0.0	30	5.8	1.6
02/12/2008	0.0	250	6.6	1.8
03/12/2008	0.0	120	6.3	1.8
04/12/2008	0.0	360	8.3	2.3
05/12/2008	0.0	360	20.3	5.6
06/12/2008	0.0	360	13.8	3.8
07/12/2008	0.0	10	8.2	2.3
08/12/2008	0.0	350	10.9	3.0
09/12/2008	0.0	350	6.9	1.9
10/12/2008	0.0	250	4.8	1.3
11/12/2008	0.0	120	7.4	2.1
12/12/2008	0.0	130	12.5	3.5
13/12/2008	0.0	350	7.3	2.0
14/12/2008	0.0	360	14.5	4.0
15/12/2008	0.0	350	11.3	3.1
16/12/2008	0.0	70	8.1	2.3
17/12/2008	0.0	250	4.0	1.1
18/12/2008	0.0	120	9.5	2.6
19/12/2008	0.0	110	9.9	2.8
20/12/2008	0.0	240	6.2	1.7
21/12/2008	0.0	250	5.4	1.5
22/12/2008	0.0	360	20.0	5.6
23/12/2008	0.0	350	11.8	3.3
24/12/2008	0.0	350	10.5	2.9
25/12/2008	0.0	120	11.4	3.2
26/12/2008	0.0	120	14.8	4.1
27/12/2008	0.0	130	9.8	2.7
28/12/2008	0.0	140	7.3	2.0
29/12/2008	1.0	350	14.2	3.9
30/12/2008	6.0	360	15.3	4.3
31/12/2008	2.0	360	20.8	5.8
01/11/2008	0.0	270	14.2	3.9
02/11/2008	0.0	270	15.3	4.3
03/11/2008	19.0	150	10.8	3.0
04/11/2008	0.0	270	8.9	2.5
05/11/2008	0.0	280	10.1	2.8
06/11/2008	0.0	280	11.6	3.2
07/11/2008	0.0	180#	7.0#	1.9
08/11/2008	0.0	350	18.8	5.2

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
09/11/2008	*****	20	31.7	8.8
10/11/2008	*****	10	26.5	7.4
11/11/2008	*****	10	19.1	5.3
12/11/2008	*****	10	12.7	3.5
13/11/2008	*****	10	10.7	3.0
14/11/2008	*****	20	8.0	2.2
15/11/2008	*****	20	7.1	2.0
16/11/2008	*****	320	7.0	1.9
17/11/2008	*****	150	8.5	2.4
18/11/2008	*****	10	20.0	5.6
19/11/2008	*****	20	28.1	7.8
20/11/2008	*****	20	13.3	3.7
21/11/2008	*****	360	10.3	2.9
22/11/2008	*****	20	9.5	2.6
23/11/2008	*****	20	6.2	1.7
24/11/2008	*****	20	16.3	4.5
25/11/2008	*****	20	12.1	3.4
26/11/2008	*****	10	10.8	3.0
27/11/2008	*****	20	39.1	10.9
28/11/2008	*****	20	19.1	5.3
29/11/2008	*****	360	13.0	3.6
30/11/2008	*****	10	9.7	2.7
01/10/2008	*****	30	7.5	2.1
02/10/2008	*****	100	10.8	3.0
03/10/2008	*****	70	20.4	5.7
04/10/2008	*****	150	22.2	6.2
05/10/2008	*****	150	24.7	6.9
06/10/2008	*****	360	13.5	3.8
07/10/2008	*****	20	12.8	3.6
08/10/2008	*****	70	10.3	2.9
09/10/2008	*****	70	14.6	4.1
10/10/2008	*****	50	8.7	2.4
11/10/2008	*****	80	12.0	3.3
12/10/2008	*****	70	20.8	5.8
13/10/2008	*****	70	18.7	5.2
14/10/2008	*****	10	10.4	2.9
15/10/2008	*****	90	12.5	3.5
16/10/2008	*****	180	5.8	1.6
17/10/2008	*****	100	9.0	2.5
18/10/2008	*****	90	13.5	3.8
19/10/2008	*****	160	7.7	2.1
20/10/2008	*****	70	13.7	3.8
21/10/2008	*****	80	13.1	3.6
22/10/2008	*****	330	6.4	1.8
23/10/2008	*****	160	4.5	1.3
24/10/2008	*****	90	16.7	4.6
25/10/2008	*****	70	17.0	4.7
26/10/2008	*****	180	6.1	1.7
27/10/2008	*****	100	10.7	3.0
28/10/2008	*****	90	10.0	2.8
29/10/2008	*****	110	8.6	2.4
30/10/2008	*****	100	7.4	2.1
31/10/2008	*****	70	12.2	3.4
		Average 平均值		**3.1**
		Min 最小值		**0.7**
		Max 最大值		**10.9**
% of days with wind speed at or below 5m/s 風速達到或低於 5米/秒的天數所佔的百分比				**88%**

Date 日期	Total Rainfall (mm) 總雨量（毫米）	Prevailing Wind Direction (degrees) 盛行風向（度）	Mean Wind Speed (km/hr) 平均風速（千米/時）	Mean Wind Speed (m/s) 平均風速（米/秒）
09/11/2008	0.0	360	21.8	6.1
10/11/2008	0.0	360	20.5	5.7
11/11/2008	0.0	360	18.3	5.1
12/11/2008	0.0	350	11.3	3.1
13/11/2008	0.0	350	10.8	3.0
14/11/2008	0.0	120	10.2	2.8
15/11/2008	0.0	130	6.9	1.9
16/11/2008	0.0	130	9.9	2.8
17/11/2008	0.0	130	11.0	3.1
18/11/2008	0.0	360	15.5	4.3
19/11/2008	0.0	360	19.3	5.4
20/11/2008	0.0	360	13.0	3.6
21/11/2008	0.0	120	12.9	3.6
22/11/2008	0.0	40	8.3	2.3
23/11/2008	0.0	10	4.9	1.4
24/11/2008	0.0	350	16.0	4.4
25/11/2008	0.0	350	13.4	3.7
26/11/2008	0.0	350	10.4	2.9
27/11/2008	0.0	360	21.5	6.0
28/11/2008	0.0	360	15.8	4.4
29/11/2008	0.0	360	13.2	3.7
30/11/2008	0.0	360	9.0	2.5
01/10/2008	0.0	150	10.8	3.0
02/10/2008	0.0	280	10.4	2.9
03/10/2008	1.0	250	14.1	3.9
04/10/2008	0.5	290	22.1	6.1
05/10/2008	54.5	300	21.3	5.9
06/10/2008	0.0	150	17.6	4.9
07/10/2008	0.0	150	12.7	3.5
08/10/2008	0.0	200	5.8	1.6
09/10/2008	0.0	250	12.0	3.3
10/10/2008	0.0	290	7.3	2.0
11/10/2008	0.0	280	10.0	2.8
12/10/2008	0.0	250	12.5	3.5
13/10/2008	0.0	240	11.2	3.1
14/10/2008	0.0	160	8.5	2.4
15/10/2008	0.0	250	9.0	2.5
16/10/2008	0.0	290	4.6	1.3
17/10/2008	0.0	280	6.3	1.8
18/10/2008	0.0	270	10.8	3.0
19/10/2008	0.0	280	8.0	2.2
20/10/2008	0.0	280	14.8	4.1
21/10/2008	0.0	290	11.7	3.3
22/10/2008	0.0	280	3.5	1.0
23/10/2008	0.0	50	2.0	0.6
24/10/2008	0.0	160#	14.5#	4.0
25/10/2008	0.0	260	10.3	2.9
26/10/2008	0.0	280	4.0	1.1
27/10/2008	0.0	280	8.2	2.3
28/10/2008	0.0	***	10.3	***
29/10/2008	0.0	***	6.7	***
30/10/2008	0.0	***	8.0	***
31/10/2008	0.0	***	9.5	***
		Average 平均值		**3.0**
		Min 最小值		**0.1**
		Max 最大值		**7.6**
% of days with wind speed at or below 5m/s 風速達到或低於 5米/秒的天數所佔的百分比				**85%**

missing (less than 24 hourly observations a day) 缺失（1日的觀測時間少於 24小時）
*** unavailable 未能提供

Annex A5
附件A5

Wind Turbine Noise Impact Assessment
風力發電機噪音影響評估

Annex 附錄 A5-1

Calculation of Noise Level Due to Operation of Wind Turbine 風力發電機運行時的噪音評估

NSR 噪音感應強的位置: **N1 - Mount Carmel Hostel (G/F) N1 - 迦密山宿舍(首層)**

Ground level 地面高度: **26** **mPD**

Noise Source 噪音來源	Ground level of the wind turbine 風力發電機所在地面高度, mPD	Wind speed 風速, m/s	Sound Pressure Level 聲壓級[1], dB(A)	Vertical distance between microphone and rotor 收音器和車葉之間的垂直距離(d1) , m	Horizontal distance between NSR and wind turbine 噪音感應強的位置與風力發電機的水平距離, m	Slant distance between NSR and rotor 噪音感應強的位置與車葉斜距(d2), m	Distance Correction 距離衰減[2], dB(A)	Façade Correction 聲音反射修正, dB(A)	Corrected Noise Level 經修正的噪音聲級, dB(A)
Wind turbine at Site 1 地點一的風力發電機	25	10	52	7.5	60	60.2	-18.1	3.0	37
Wind turbine at Site 2 地點二的風力發電機	16	10	52	7.5	310	310.0	-32.3	3.0	23
							Total CNL 總噪音聲級 =		**37**

NSR 噪音感應強的位置: **N2 - Living Spring Hostel (G/F) N2 - 活泉宿舍(首層)**

Ground level 地面高度: **15** **mPD**

Noise Source 噪音來源	Ground level of the wind turbine 風力發電機所在地面高度, mPD	Wind speed 風速, m/s	Sound Pressure Level 聲壓級[1], dB(A)	Height between microphone and rotor 收音器和車葉之間的高度, m	Horizontal distance between NSR and wind turbine 噪音感應強的位置與風力發電機的水平距離, m	Slant distance between NSR and rotor 噪音感應強的位置與車葉斜距, m	Distance Correction 距離衰減[2], dB(A)	Façade Correction 聲音反射修正, dB(A)	Corrected Noise Level 經修正的噪音聲級, dB(A)
Wind turbine at Site 1 地點一的風力發電機	25	10	52	7.5	290	290.4	-31.8	3.0	23
Wind turbine at Site 2 地點二的風力發電機	16	10	52	7.5	50	50.5	-16.6	3.0	38
							Total CNL 總噪音聲級 =		**39**

Notes:

[1] In accordance with the noise report for a 6kW wind turbine (see *Annex A3*), sound pressure levels of 45dB(A) and 65dB(A) were measured at the base of the mast at wind speeds of 5m/s and 20m/s, respectively. It is estimated that the sound pressure level will be about 52dB(A) at wind speed of 10m/s. This estimated level has been also endorsed by the wind turbine manufacturer.
根據6千瓦的風力發電機的噪音報告（附錄A3），當風速爲每秒5米和每秒20米時，在主桿底部測得的聲壓級分別爲45分貝(A)和65分貝(A)。因此，估計當風速爲每秒10米時，主桿底部的聲壓級爲52分貝(A)。風力發電機的製造商已同意上述估計值。

[2] Distance correction 距離衰減, dB(A) = - [$10*\log(2\pi d_2^2) - 10*\log(2\pi d_1^2)$]

Annex 附錄 A5-2

Calculation of Noise Level Due to Operation of Wind Turbine 風力發電機運行時的噪音評估

NSR 噪音感應強的位置: **N3 - Redevelopment of Mount Carmel Hostel (2/F) N3 - 重建後的迦密山宿舍(第二層)**

Ground level 地面高度: **26** **mPD**

Noise Source 噪音來源	Ground level of the wind turbine 風力發電機所在地面高度, mPD	Wind speed 風速, m/s	Sound Pressure Level 聲壓級[1], dB(A)	Vertical distance between microphone and rotor 收音器和車葉之間的垂直距離(d1) , m	Horizontal distance between NSR and wind turbine 噪音感應強的位置與風力發電機的水平距離, m	Slant distance between NSR and rotor 噪音感應強的位置與車葉斜距(d2), m	Distance Correction 距離衰減[2], dB(A)	Façade Correction 聲音反射修正, dB(A)	Corrected Noise Level 經修正的噪音聲級, dB(A)
Wind turbine at Site 1 地點一的風力發電機	25	10	52	7.5	55	55.0	-17.3	3.0	38
Wind turbine at Site 2 地點二的風力發電機	16	10	52	7.5	300	300.2	-32.0	3.0	23
							Total CNL 總噪音聲級 =		**38**

NSR 噪音感應強的位置: **N4 - Redevelopment of Living Spring Hostel (2/F) N4 - 重建後的活泉宿舍(第二層)**

Ground level 地面高度: **15** **mPD**

Noise Source 噪音來源	Ground level of the wind turbine 風力發電機所在地面高度, mPD	Wind speed 風速, m/s	Sound Pressure Level 聲壓級[1], dB(A)	Height between microphone and rotor 收音器和車葉之間的高度, m	Horizontal distance between NSR and wind turbine 噪音感應強的位置與風力發電機的水平距離, m	Slant distance between NSR and rotor 噪音感應強的位置與車葉斜距, m	Distance Correction 距離衰減[2], dB(A)	Façade Correction 聲音反射修正, dB(A)	Corrected Noise Level 經修正的噪音聲級, dB(A)
Wind turbine at Site 1 地點一的風力發電機	25	10	52	7.5	290	290.2	-31.8	3.0	23
Wind turbine at Site 2 地點二的風力發電機	16	10	52	7.5	50	50.0	-16.5	3.0	39
							Total CNL 總噪音聲級 =		**39**

Notes:

[1] In accordance with the noise report for a 6kW wind turbine (see *Annex A3*), sound pressure levels of 45dB(A) and 65dB(A) were measured at the base of the mast at wind speeds of 5m/s and 20m/s, respectively. It is estimated that the sound pressure level will be about 52dB(A) at wind speed of 10m/s. This estimated level has been also endorsed by the wind turbine manufacturer.
根據6千瓦的風力發電機的噪音報告（附錄A3），當風速爲每秒5米和每秒20米時，在主桿底部測得的聲壓級分別爲45分貝(A)和65分貝(A)。因此，估計當風速爲每秒10米時，主桿底部的聲壓級爲52分貝(A)。風力發電機的製造商已同意上述估計值。

[2] Distance correction 距離衰減, dB(A) = - [10*log ($2\pi d_2^2$) - 10*log ($2\pi d_1^2$)]

Annex B
附件B

Baseline Terrestrial Ecological Resources
基線陸地生態資源

B1 BASELINE TERRESTIRAL ECOLOGICAL SURVEYS

B1.1 INTRODUCTION

The literature review indicates that there is limited ecological information available within the Site and the Study Area. To supplement the baseline information, terrestrial ecological baseline surveys were therefore conducted from June to August 2009, which included habitat/vegetation, terrestrial mammal and bird. This section presents the details of survey methodology and findings of the surveys.

B1.2 LITERATURE REVIEW OF ECOLOGICAL CHARACTERISTICS OF THE STUDY AREA

According to the results of literature review, although there is limited ecological information available on habitats and general wildlife within the Study Area (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11), some information is available on the avifauna in the close vicinity of the Project Site from various surveys covering dry and wet seasons. A total of 14 species were recorded in the vicinity of Study Area including Wong Nai Chau, Kong Tau Pai and Wang Chau (*Table B1*) (12)(13).

(1) *Porcupine!* Newsletter of Department of Ecology & Biodiversity, University of Hong Kong Issues 1 to 33.

(2) AFCD Biodiversity Newsletters.

(3) Hong Kong Bird Watching Society (1990 -2000). Annual Reports.

(4) Karsen, S. J., Lau, M. W. N. and Bogadek, A. (1998). *Hong Kong Amphibians and Reptiles*. Urban Council, Hong Kong

(5) AFCD (2005). *A Field Guide to the Amphibians of Hong Kong*. Friends of Country Park.

(6) Wilson, K.D.P. (2004). *Fuide Guide to the Dragonflies of Hong Kong*. Friends of Country Park.

(7) Yiu V (2004). *Field Guide to the butterflies of Hong Kong*. Friends of Country Park.

(8) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001). *The Avifauna of Hong Kong*. Hong Kong Bird Watching Society, Hong Kong.

(9) Xing, F.W., Ng, S.C., Chau, L.K.C. (2000). Gymnosperms and angiosperms of Hong Kong. *Memoirs of the Hong Kong Natural History Society*. 23: 21-136.

(10) Siu L P (2000). Orchidaceae of Hong Kong. *Memoirs of the Hong Kong Natural History Society*. 23: 137-147.

(11) AFCD (2003). *New View Points-Country Park in Focus*. Friends of the Country Park.

(12) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001). The Avifauna of Hong Kong. Hong Kong Bird Watching Society, Hong Kong.

(13) BMT Asia Pacific (2009). *Hong Kong Offshore Wind Farm in Southeastern Waters - Environmental Impact Assessment*. EIA Report - Section 7 Avifauna.(Ref: ESB-146/2006).

Table B1 Bird Species Recorded in the vicinity of Study Area

Common Name	Species Name	Status [1]
Crested Myna	*Acridotheres cristatellus*	• Widespread and common in Hong Kong
Black Drongo	*Dicrurus macrocercus*	• Widespread and common in Hong Kong
Pacific Reef Egret	*Egretta sacra*	• Uncommon but localised in Hong Kong • PRC Class II Protected Species • CITES *Appendix II* Species
Masked Laughingthrush	*Garrulax perspicillatus*	• Widespread and common in Hong Kong
White-bellied Sea Eagle	*Haliaeetus leucogaster*	• Uncommon but localised in Hong Kong • PRC Class II Protected Species • CITES *Appendix II* Species
Long-tailed Shrike	*Lanius schach*	• Widespread and common in Hong Kong
Black Kite	*Milvus migrans*	• Widespread and common in Hong Kong • PRC Class II Protected Species • CITES *Appendix II* Species
Red-necked Pharlarope	*Phalaropus lobatus*	• Common in Hong Kong
Common Magpie	*Pica pica*	• Widespread and common in Hong Kong
Chinese Bulbul	*Pycnonotus sinensis*	• Widespread and common in Hong Kong
Bridled Tern	*Sterna anaethetus*	• Common in Hong Kong
Roseate Tern	*Sterna dougallii*	• Uncommon in Hong Kong
Common Tern	*Sterna hirundo*	• Common in Hong Kong
Black-naped Tern	*Sterna sumatrana*	• Common in Hong Kong

The breeding bird survey conducted by Hong Kong Bird Watch Society (HKBWS) have recorded three breeding tern species, including Black-naped Tern *Sterna sumatrana* Bridled Tern, *Sterna anaethetus* and Roseate Tern *Sterna dougallii*, within Hong Kong eastern waters [2] (*Figure B1*). Regular monitoring programme and the breeding tern surveys in 2003 has revealed that breeding colonies were found on several islands; in Mirs Bay, at Shek Ngau Chau, Kung Chau and Port Island [3]. In addition they were found at Round Island, Wong Nai Chau; the eastern tip of Kat O Island, Kai Kung Tau, and Waglan Island and a breeding colony was found at Kong Tau Pai in the Sai Kung area near the High Island Reservoir. Among these recorded species, it has been documented that the nesting locations of Black-naped Tern were found in Kong Tau Pai and Wong Nai Chau respectively [4] [5], which are located about 600m away from Town Island.

(1) AFCD (2006). Hong Kong Online Biodiversity Database. http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp

(2) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001). The Avifauna of Hong Kong. Hong Kong Bird Watching Society, Hong Kong.

(3) Hong Kong Bird Watching Society (2003). *Pilot project to increase awareness of the ecological importance of the breeding colonies of terns in Hong Kong (ECF Project 23/2002).* Unpublished by the Hong Kong Bird Watching Society.

(4) Agriculture, Fisheries and Conservation Department (AFCD) (2007) Unpublished data adopted from BMT Asia Pacific (2009).

(5) Hong Kong Bird Watching Society (2006). *Seabird migration survey in southern and southeastern Hong Kong, spring 2006 (ECF Projet 2005-10).* Unpublished by the Hong Kong Bird Watching Society.

As part of the approved EIA study for Hong Kong Offshore Wind Farm in Southeastern Waters, focussed vessel surveys were conducted in the eastern waters in 2006 and 2007 revealed the most abundant bird species recorded was the Black-naped Tern *Sterna sumatrana* (21% of total number) followed by the Bridled Tern *Sterna anaethetus* (17% of total number) (*Figure B2*). Results also revealed that the majority of the birds recorded were restricted to nearshore coastal waters and all bird species recorded belong to surface-feeding species [(1)].

Study conducted in 2003 estimated that there were a total of 39 White-bellied Sea Eagles (WBSEs) in Hong Kong including 23 adults and 16 immatures/juveniles [(2)]. The focussed vessel surveys for the EIA study for Hong Kong Offshore Wind Farm in Southeastern Waters also revealed a total of 138 sighting records of WBSEs in Hong Kong south-eastern waters but restricted to coastal waters [(3)] (*Figure B3*). WBSEs are also known to have nesting colonies in Hong Kong, particularly in eastern waters. A total of 12 nesting locations have been identified in which 7 locations are located in Hong Kong eastern waters including Tsim Chau, Yeung Chau, Tai Ngam Hau, Tsang Pang Kok, Wang Chau, Steep Island and Ninepin Group [(4)] (*Figure B3*). The breeding adult pair observed in Wang Chau was, however, believed to have left the island and moved the nest outside the area [(5)]. A study also revealed that their foraging distance could reach as far as 2km from nesting locations with peak foraging period during the evening [(6)].

B1.3 SURVEY METHODOLOGY

To supplement the limited available baseline information on Town Island, more focussed terrestrial ecological baseline surveys were therefore carried out to characterise the existing ecological conditions. Survey transects and sampling points were mainly located at or close to the Project Site and along the new underground cables where the work activities to be carried out during construction (*Figure B4*). The methodologies of all surveys made reference to those proposed in the *Technical Guidance Notes 7/2002* and *10/2004* of the *EIA Ordinance*.

B1.3.1 Habitats and Vegetation

Habitat and vegetation surveys were performed in June 2009. The aim of the surveys was to record and map habitat characteristics and distribution, as well

(1) BMT Asia Pacific (2009). *Hong Kong Offshore Wind Farm in Southeastern Waters - Environmental Impact Assessment.* EIA Report - Section 7 Avifauna.(Ref: ESB-146/2006).

(2) Tsim ST, Lee WH, Cheung CS, Chow KL, Ma YN, Liu KY (2003) *The Population and Breeding Ecology of white-bellied Sea-eagles in Hong Kong.* Hong Kong Biodiversity, AFCD Newsletter: Issue 5.

(3) BMT Asia Pacific (2009). *Hong Kong Offshore Wind Farm in Southeastern Waters - Environmental Impact Assessment.* EIA Report - Section 7 Avifauna.(Ref: ESB-146/2006).

(4) Agriculture, Fisheries and Conservation Department (AFCD) (2007) Unpublished data adopted from BMT Asia Pacific (2009).

(5) BMT Asia Pacific (2009). *Ibid.*

(6) Tsim *et al* (2003) *Op cit.*

as floral composition within the Study Area, and to establish the ecological profile of habitat and vegetation within the Study Area.

Habitats were mapped based on recent government aerial photograph and field ground truthing. Representative areas of each habitat type were surveyed on foot. Plant species of each habitat type encountered and their relative abundance were recorded with special attention to any rare or protected species. Nomenclature and conservation status of plant species follow Xing *et al* (1), Wu and Lee (2) and AFCD (3)(4).

B1.3.2 Birds

Habitats and areas of potential ecological importance for avifauna within the Study Area were identified in a reconnaissance survey. Baseline surveys of bird populations were undertaken within those selected habitats using quantitative (vantage count) and qualitative (transect line) methods. Surveys were conducted with special focus on the summer breeding seasons (June to August) of the three tern species (ie Black-naped Tern, Roseate Tern and Bridled Tern) when high numbers of these species have been recorded (5). As such baseline avifauna surveys were conducted in June, July and August 2009 in order to collect detailed abundance and distribution data of bird species. Ornithological nomenclature followed Carey *et al* (6).

- **Vantage Point Method:** The aim of the vantage point method was to determine flight activity patterns over the proposed wind turbines in order to:

  - identify areas of critical importance to birds; and

  - estimate collision likelihood with reference to the recorded flight path and direction of the potentially affected bird species (ERM 2004) (7).

  A vantage point (VP) was identified to observe the entire Project Site (including Sites 1 and 2) for the vantage point survey (*Figure B4*). It is noted that the wide coverage of the VP meant that ~ 80% of the Study Area was visible. Watches were undertaken by a single observer (bird specialist) in all weather conditions except poor visibility (<300m). Weather conditions (wind direction, precipitation and visibility) were recorded during the survey. During each watch, the arc visible from the VP was scanned constantly until a bird was detected in flight. Once detected, detected information on bird species, sex and age where

(1) Xing, F.W., Ng, S.C., Chau, L.K.C. (2000). Op cit.

(2) Wu, S. H and Lee.T. C (2000). Op cit.

(3) AFCD (2003). *Rare and Precious Plants of Hong Kong*. Cosmos Books Ltd.

(4) Wu, S. H and Lee.T. C (2000). Op cit.

(5) Hong Kong Bird Watching Society (2003). *Pilot project to increase awareness of the ecological importance of the breeding colonies of terns in Hong Kong (ECF Project 23/2002).* Unpublished by the Hong Kong Bird Watching Society.

(5) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001) The Avifauna of Hong Kong. Hong Kong Bird Watching Society, Hong Kong.

(6) ERM HK (2004). *Environmental Impact Assessment for Renewable Energy by a Wind Turbine System on Lamma Island*.

feasible, abundance, observed location, bird activities, flying height and path were recorded. The bird's flying height was estimated at the point it entered the arcview and classified as flying height of < 8m, 8m to 20m or > 20m above the sea or ground level (subject to the location observed) according to the rotor height (see *Section 1*).

- **Transect Line Method:** For the transect line method, species encountered along the transect lines within the Study Area were also recorded to produce a complete species list. Signs of breeding (eg nests, recently fledged juveniles) were also recorded.

5.1.2 Other Wildlife

Surveys of other wildlife within the Study Area were conducted in July and August 2009.

As most mammals occur at low densities, all sightings, tracks, and signs of mammals were actively searched along the survey transects (see *Figure B4*). Nomenclature for mammals followed AFCD (2006b) (1). No quantification of abundance of mammals in the Study Area was made, due to the difficulties in translating sights and tracks (eg burrows) to actual abundance.

Herpetofauna surveys were conducted through direct observation and active searching in all major habitat types along the survey transects and in potential hiding places such as among leaf litter, inside holes and under stones and logs within the Study Area. Auditory detection of species-specific calls was also used to survey frogs and toads. During the surveys, all reptiles and amphibians sighted and heard were recorded. Nomenclature and status used for reptiles followed Karen *et al* (1998) (2) while that of amphibians followed AFCD (2005) (3).

Dragonflies, damselflies and butterflies encountered along the survey transects were identified and counted. Relative abundance of dragonflies, damselflies and butterflies in each type of habitat were estimated. Nomenclature for butterflies follows Walthew (1997) (4) and Yiu (2004) (5), and dragonfly nomenclature follows Wilson (2004) (6).

(1) AFCD (2006b) *A Field Guide to the Terrestrial Mammals of Hong Kong*. Chen S K., Cheung K.S., Ho C. Y, Lam F. N., Tang W, S (Authors). Published by AFCD.

(2) Karen, SJ, Lau, MWN. and Bogadek, A (1998). Hong Kong Amphibians and Reptiles. Urban Council, HK

(3) AFCD (2005). A Field Guide to the Amphibians of Hong Kong. Friends of Country Park.

(4) Walthew, G.. (1997). The status and flight periods of Hong Kong butterflies Porcupine! 16: 34-37

(5) Yiu V (2004). *Field Guide to the butterflies of Hong Kong*. Hong Kong Discovery Ltd.

(6) Wilson, K.D.P. (2004). *Field Guide to the Dragonflies of Hong Kong.* Agriculture, Fisheries and Conservation Department, Friends of Country Park and Cosmos Book Ltd. Hong Kong.

B1.4 SURVEY RESULTS

B1.4.1 Existing Terrestrial Habitat and Vegetation

The Study Area consisted of young woodland, shrubby grassland and modified areas (*Figure B5*). Colour photographs of recorded habitat types are presented in *Figure B6*.

Shrubby grassland is the dominant habitat within the Study Area (comprised of approximately 47 ha) and is considered to be of low ecological value. Young woodland patches are mainly recorded in sheltered areas in the western part of the island and outside the Sites (ie Site 1 and Site 2). The young woodland was likely originated from *Acacia* plantation but is now dominated by native plant species and is considered to be of moderate ecological value. Modified areas are mainly building structures, concrete paths and cultivation, which are considered to be of low ecological value. A natural stream was found in the southern part of the island and the ecological value of this stream is considered to be moderate. A slightly modified stream of low to moderate ecological value was found close to the pier. No rare or protected plant species were recorded within the Study Area during the survey. The major habitat type of the Site is shrubby grassland with plant height of not more than 0.5m (see *Figure B6*). The route of the cable trench will follow the southern boundary of the Site and the existing concrete paths within the Modified Area. The area of each habitat found within the Study Area and its corresponding ecological value are presented in *Table B2*.

Table B2 Area and Ecological Value of Each Habitat Identified within the Study Area

Habitat	Area on Town Island	Ecological Value	Note
Young Woodland	~5 ha	Moderate	Young Woodland was found in the western part of the island. 81 plant species were recorded within the young woodland during the survey. The young woodland was dominated by native tree species such as *Bridelia tomentosa, Daphniphyllum calycinum, Ficus microcarpa, Sterculia lanceolata, Macaranga tanariu* and exotic species such as *Acacia confusa* and *Leucaena leucocephala.* The undergrowth was dominated by native shrubs and groundcovers species including *Psychotria asiatica, Rhodomyrtus tomentosa, Melastoma candidum, Ilex asprella*, *Plantango major* and *Dicranopteris pedata.* Neither rare nor protected plant species were recorded within the young woodland. The age of the young woodland is estimated to be not more than 15 years.
Shrubby Grassland	~47 ha	Low	Shrubby grassland was the dominant habitat type within the Study Area. 40 plant species were recorded in this habitat during the survey. The shrubby grassland was dominated by a few native groundcover species including *Lindsaea ensifolia, Baeckea frutescens, Lindernia oblonga, Lygodium japonicum* and *Alyxia sinensis.* Individual trees such as *Mangifera indica, Acacia confuse* and *Bridelia tomentosa* were also recorded within the shrubby grassland. Neither rare nor protected plant species were recorded in shrubby grassland.

Habitat	Area on Town Island	Ecological Value	Note
Modified Area	~1.4 ha	Low	Modified area consisted of buildings, concrete paths and cultivation with a total number of 36 plant species recorded during the survey. The modified area was dominated by groundcover species such as *Ageratum conyzoides*, *Elephantopus scaber*, *Plantago major* and *Wedelia trilobata*. The vegetables and fruit trees found within the cultivation included *Benincasa hispida var. chieh-qua*, *Lycopersicon esculentum*, *Mangifera indica*, *Carica papaya* and *Psidium guajava*. Neither rare nor protected plant species were recorded in the modified area.
Stream	Stream 1 = ~10 m Stream 2 = ~30 m	Low to Moderate for Stream 1 Moderate for Stream 2	The water depth of both streams was shallow and the stream bed was rocky at Stream 1 and sandy at Stream 2. The stream side vegetation was quite enclosed and was dominated by *Acacia confusa*, *Mussaenda pubescens*, *Macaranga tanrius*, *Melastoma candidum*. The lower course of Stream 1 was channelised with concrete bunds. Neither rare nor protected plant species were recorded.

A total of 123 plant species were recorded as shown in *Table B3.* No rare or protected plant species were recorded within the Study Area during the survey.

Table B3 Plant Species Recorded within Study Area [(a)]

Species name	Growth form	Origin	Status	YW	SG	MA	Project Site
Acacia confusa	T	E	VC	A		O	
Ageratum conyzoides	H	E	VC			A	
Alangium chinense	S	N	VC	S			
Alpinia hainanensis	H	N	VC	S			
Alyxia sinensis	C	N	C		A		
Amaranthus viridis	H	N	VC			F	
Antirhea chinensis	T	N	VC		S		
Archidendron lucidum	T	N	VC	S			
Asparagus cochinchinensis	H	N	C	S			
Baeckea frutescens	S	N	VC		A		
Benincasa hispida var. chieh-qua	C	E	VC			O	
Berchemia lineata	S	N	R	S			
Blechnum orientale	H	N	VC	S			
Bombax ceiba	T	E	VC			S	
Borreria stricta	H	N	C	F	O		O
Breynia fruticosa	S	N	VC	O	S		
Bridelia tomentosa	S	N	VC	O	S	O	S
Carica papaya	S	E	VC			O	
Cassytha filiformis	C	N	VC	S			
Casuarina equisetifolia	T	E	VC	S		S	
Celastrus hindsii	C	N	VC	O			
Celtis biondii	S	N	RE	S			
Centella asiatica	H	N	VC		F	O	F
Chrysopogon aciculatus	H	N	VC		F		O
Cinnamomum camphora	T	N	C			S	
Citrus japonica	S	E	VC			S	

Species name	Growth form	Origin	Status	YW	SG	MA	Project Site
Clerodendrum inerme	S	N	C	S			
Croton crassifolius	S	N	VC		O		
Curcuma aromatica	H	N	C			S	
Cuscuta japonica	C	N	C		O		
Cyclosorus parasiticus	H	N	VC	S		O	
Daphniphyllum calycinum	T	N	C	S			
Dendrotrophe frutescens	C	N	VC	O			
Desmodium triflorum	H	N	VC		O		S
Dianella ensifolia	H	N	VC	O	S		
Dicranopteris pedata	H	N	VC	A	O		
Dimocarpus longan	T	E	C	S			
Dioscorea bulbifera	C	N	C	S			
Dracaena fragrans	S	E	C			S	
Dracaena marginata	S	E	C			S	
Eclipta prostrata	H	N	C		S		S
Elephantopus scaber	H	N	C	A	O	F	A
Embelia laeta	C	N	VC	S	S		
Emilia sonchifolia	H	E	VC			S	
Euphorbia hirta	H	E	VC	O		F	
Eurya nitida	S	N	VC	S	O		
Ficus microcarpa	T	N	VC	S			
Ficus pumila	C	N	VC	O			
Ficus subpisocarpa	T	N	VC	S			
Gardenia jasminoides	S	N	VC	S			
Glochidion eriocarpum	S	N	VC	O			
Glochidion wrightii	S	N	VC		S		
Gymnanthera oblonga	C	N	C	S			
Gymnema sylvestre	C	N	VC	S			
Hedyotis acutangula	H	N	VC		S		
Hedyotis uncinella	H	N	VC		F		O
Helicteres angustifolia	S	N	VC		O		F
Heterosmilax japonica	C	N	C	O			
Hibiscus tilliaceus	T	N	VC	S			
Homalium cochinchinensis	T	N	C	S			
Hypserpa nitida	C	N	VC	O			
Ilex asprella	S	N	VC	O			
Imperata koenigii	H	N	VC		O		A
Ipomoea pes-caprae	C	N	C		S		
Ischaemum barbatum	H	N	VC		S		
Lantana camara	S	E	VC	O			
Leonurus japonicus	H	N	C			F	
Leucaena leucocephala	T	E	VC	O			
Lindernia oblonga	H	N	RE		O	S	O
Lindsaea ensifolia	H	N	VC		F		
Liriope spicata	H	N	VC	O			
Litsea glutinosa	T	N	VC	O		S	
Litsea rotundifolia	T	N	VC	O	S		S
Lonicera macrantha	C	N	C	S			

Species name	Growth form	Origin	Status	YW	SG	MA	Project Site
Lycopersicon esculentum	H	E	C			O	
Lygodium japonicum	C	N	VC	F	S	F	O
Lygodium scandens	C	N	C	S			
Macaranga tanarius	T	N	C	F		O	
Mallotus paniculatus	T	N	VC	O			
Mallotus repandus	C	N	C	S			
Mangifera indica	T	E	VC	S		S	
Melastoma candidum	S	N	VC	S			
Melia azedarach	T	E	C	S		S	
Mikania micrantha	H	E	VC			O	
Millettia speciosa	C	N	VC	O			
Morinda parvifolia	C	N	VC	F			
Morus alba	T	N	C	S		S	
Mussaenda pubescens	C	N	VC	O			
Oxalis corniculata	H	N	VC	F			
Oxalis corymbosa	H	E	VC	S			
Paederia scandens	C	N	C	F			
Phoenix hanceana	T	N	C	S			
Phyllanthus cochinchinensis	S	N	VC	F	S	S	
Phyllanthus urinaria	H	N	C			O	
Pinus massoniana	T	N	C		S		S
Plantago major	H	N	VC	O		A	
Prunus persica	T	E	VC	S		S	
Psidium guajava	T	E	VC			S	
Psychotria asiatica	S	N	VC	A			
Psychotria serpens	C	N	VC		S		
Pteris dispar	H	N	C	S			
Rhodomyrtus tomentosa	S	N	VC	O	S		S
Rhus hypoleuca	S	N	VC	O	S		
Rhus succedanea	S	N	VC	O			
Rhynchospora rubra	H	N	VC		S		
Rubus parvifolius	H	N	C	O	O		S
Sageretia thea	S	N	VC	S			
Scaevola taccada	S	N	VC		S		
Schefflera heptaphylla	T	N	VC	F		S	
Severinia buxifolia	S	N	C	S			
Sterculia lanceolata	T	N	VC	S			
Strophanthus divaricatus	C	N	C		S		
Tadehagi triquetrum	H	N	VC	S			
Tetracera asiatica	C	N	VC	O			
Thuja orientalis	T	E	C		S		S
Tylophora ovata	C	N	C	S	S		
Uvaria macrophylla	S	N	C	S			
Vernonia cinerea	H	N	VC	O		S	
Viburnum odoratissimum	T	N	VC	S			
Vitex negundo var. cannabifolia	S	N	RE	S			
Wedelia trilobata	H	E	C			A	
Wikstroemia indica	S	N	C		O		

Species name	Growth form	Origin	Status	YW	SG	MA	Project Site
Zanthoxylum nitidum	C	N	VC	S			
			Total no. of species recorded	*81*	*40*	*36*	*17*

Note:

(a) Abundance: A=Abundant; F=Frequent; O=Occasional; S=Scarce;
Growth Form: G=Grass; Climber; H=Herb; P=Palm; S=Shrub; T=Tree, Se=Sedge
Origin: N=Native; E=Exotic; Status: C=Common; VC=Very Common; P=Protected
Habitat: YW = Young Woodland, SG = Shrubby Grassland, MA = Modified Area

B1.4.2 Bird

Species Composition & Distribution

A total of 26 bird species were recorded during the quantitative and qualitative surveys and ten of these 26 species were recorded during the qualitative surveys only (*Table B4*). Most of the species identified are common and widely distributed in Hong Kong such as Barn Swallow *Hirundo rustica*, Black-collared Starling *Sturnus nigricollis* and Spotted Dove *Streptopelia chinensis*.

Table B4 *Bird Species recorded within Study Area during the surveys (Jun 09 to Aug 09)*

Bird Group Name	Common Name	Species Name	Common-ness [a]	Main HK Status [b]	Protection Status
Birds of Prey	Black Kite	*Milvus migrans*	CW	R, WV	PRC Class II, CITES App. II
	White-bellied Sea Eagle	*Haliaeetus leucogaster*	UC	R	PRC Class II, CITES App. II
Terns	Black-naped Tern	*Sterna sumatrana*	C	SV	nil
Passerines	House Swift	*Apus affinis*	CW	R,SpM	nil
	Common Magpie	*Pica pica*	CW	R	nil
	Black Drongo	*Dicrurus macrocercus*	CW	SV	nil
	Barn Swallow	*Hirundo rustica*	CW	PM, SV	nil
	Brown Shrike	*Lanius cristatus*	CW	PM	nil
	Long-tailed Shrike	*Lanius schach*	CW	R	nil
	Richard's Pipit	*Anthus richardi*	C	PM, WV	nil
	Great Tit*	*Parus major*	CW	R	nil
	Eurasian Tree Sparrow*	*Passer montanus*	CW	R	nil
	Light-vented Bulbul	*Pycnonotus sinensis*	CW	R	nil
	Red-whiskered Bulbul	*Pycnonotus jocosus*	CW	R	nil
	Sooty-headed Bulbul	*Pycnonotus aurigaster*	UC	R	nil
	Crested Myna	*Acridotheres cristatellus*	CW	R	nil
	Black-collared Starling*	*Sturnus nigricollis*	CW	R	nil
	Common Tailorbird*	*Orthotomus sutorius*	CW	R	nil
	Hwamei*	*Garrulax canorus*	CW	R	CITES App. II
	Masked Laughingthrush*	*Garrulax perspicillatus*	CW	R	nil
	Oriental Magpie Robin*	*Copsychus saularis*	CW	R	nil
	Japanese White-eye*	*Zosterops japonicus*	CW	R	nil
Others	White-throated Kingfisher	*Halcyon smyrnensis*	CW	R	nil
	Spotted Dove	*Streptopelia chinensis*	CW	R	nil
	Greater Coucal*	*Centropus sinensis*	CW	R	PRC Class II
	Lesser Coucal*	*Centropus bengalensis*	CW	R	PRC Class II

Notes:

Bird Group Name	Common Name	Species Name	Common-ness [a]	Main HK Status [b]	Protection Status

(a) Commonness & Distribution: CW = common and widespread, UC = uncommon and localised

(b) Status in Hong Kong followed Viney (2005) [1] and AFCD (2006) [2]: R = Resident, WV = Winter Visitor, SV = Summer Visitor; PM = Passage/Seasonal Migrant; Sp = Spring Migrant; AM = Autumn Migrant

(c) Species that were recorded during qualitative surveys only are marked with asterisk. Species of Conservation Interest is highlighted. All bird species are protected under *WAPO* (Cap 170) in Hong Kong.

About 45% of the total numbers of birds were observed over the open sea southwest of the Island and about half of the total (~55%) were found onshore which were mainly distributed in shubby grassland habitat in the central part of the Island (*Figure B7)*. Neither raptor nor waterbird nests (active or abandoned) were found during the surveys.

Abundance, Bird Activities & Flying Heights

Tables B5 & B6 presented the total number of individuals recorded during the quantitative surveys under each bird activities and at different flying heights within Study Area.

Table B5 Bird Activities observed within Study Area during the Six Survey Days

Bird Group	Common Name	Total No. of Individuals Recorded			Total No.	Mean No. per Survey Day
		Flying	Soaring	Foraging		
Birds of Prey	Black Kite	28	24	1	53	8.8
	White-bellied Sea Eagle	2	1	0	3	0.5
Terns	Black-naped Tern [a]	181	0	50	231	38.5
Passerines	Barn Swallow	24	0	0	24	4.0
	Black Drongo	21	0	0	21	3.5
	Brown Shrike	1	0	0	1	0.2
	Common Magpie	13	0	0	13	2.2
	Crested Myna	12	0	0	12	2.0
	House Swift	1	0	0	1	0.2
	Light-vented Bulbul	62	0	0	62	10.3
	Long-tailed Shrike	5	0	0	5	0.8
	Red-whiskered Bulbul	8	0	0	8	1.3
	Richard's Pipit	4	0	0	4	0.7
	Sooty-headed Bulbul	3	0	0	3	0.5
Others	Spotted Dove	3	0	0	3	0.5
	White-throated Kingfisher	1	0	0	1	0.2
	Total	***369***	***25***	***51***	***445***	***74.2***

Note:

(a) All of the Black-naped Terns were observed over the open sea or near the shore, but not

(1) Viney C, Phillipps K, Lam CY. (2005). The Birds of Hong Kong and South China. Information Services Department, Hong Kong.

(2) AFCD (2006). Hong Kong Online Biodiversity Database. *http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp*

Bird Group	Common Name	Total No. of Individuals Recorded			Total No.	Mean No. per Survey Day
		Flying	Soaring	Foraging		
passing over the island.						

Table B6 *Bird Flying Heights observed within Study Area during the Six Survey Days*

Bird Group	Common Name	Total No. of Individuals Recorded		
		Below Rotor Area (0 - <8 m)	Within Rotor Area (8 - 13.5m)	Above Rotor Area (> 13.5m)
Birds of Prey	Black Kite	1	8	44
	White-bellied Sea Eagle	0	0	3
Terns	Black-naped Tern (a)	212	11	8
Passerines	Barn Swallow	0	0	24
	Black Drongo	0	0	21
	Brown Shrike	0	0	1
	Common Magpie	3	1	9
	Crested Myna	0	1	11
	House Swift	0	0	1
	Light-vented Bulbul	0	0	62
	Long-tailed Shrike	0	0	5
	Red-whiskered Bulbul	0	0	8
	Richard's Pipit	0	0	4
	Sooty-headed Bulbul	0	0	3
Others	Spotted Dove	0	0	3
	White-throated Kingfisher	0	0	1
	Total	***216***	***21***	***208***

Note:

(a) All of the Black-naped Terns were observed over the open sea or near the shore, but not passing over the island.

Black-naped Tern (~52%) was the most abundant species recorded (all observed over the open sea or near the shore), followed by Light-vented Bulbul (~14%) and Black Kite (~12%). Most of the birds observed were flying (~83%) and most individuals were flying height below or above rotor height (*Figure B7*). Small numbers of birds (~5%) were seen flying within rotor height over open sea or nearshore.

Species of Conservation Interest

There were five bird species of conservation interest recorded within the Study Area during the surveys (*Table B4*). The distribution of these species is shown in *Figure B8.* Individuals of Black Kite were widely distributed in all habitats and therefore their exact locations were not shown in *Figure B8.*

- White-bellied Sea Eagle *Haliaeetus leucogaster* – recognised as Class II protected species in the PRC and listed in CITES Appendix II. It is an uncommon resident in Hong Kong. Only three individuals (one adult and two juveniles) of this eagle were recorded from the surveys and they

were flying over open sea and shubby grassland in the central part of the Island. All of them were flying above rotor height (see also *Figure B9*).

- Black Kite *Milvus migrans* – recognised as Class II protected species in the PRC and listed in CITES Appendix II. It is a common and widespread resident in Hong Kong. They were recorded in all habitats within the Study Area and they were mainly flying above rotor height (see also *Figure B10*).

- Hwamei *Garrulax canorus* – listed in CITES Appendix II. This bird is common and widespread in Hong Kong. This bird was recorded during the qualitative survey and was seen resting in all habitats within the Study Area.

- Greater Coucal *Centropus sinensis* – recognised as Class II protected species in the PRC and a common and widespread resident in Hong Kong. This bird was recorded during the qualitative survey and was seen resting and flying in shrubby grassland habitat in the central part of the Island.

- Lesser Coucal *Centropus bengalensis* – recognised as Class II protected species in the PRC and a common and widespread resident in Hong Kong. This bird was recorded during the qualitative survey and was seen resting and flying in shrubby grassland habitat in the central part of the Island.

- Although not considered as species of conservation interest, Black-naped Tern *Sterna sumatrana,* was selected for further analysis due to the presence of nesting site in the vicinity of the Study Area (the closest being Wong Nai Chau which is over 600 m away from Town Island, see *Section 4.6.3*). Black-naped Tern is a common summer visitor and breeding in Hong Kong. They were observed flying over open sea or near shore below rotor height and a number of foraging groups were also found in open waters west of the island (*Figure B11*).

B1.4.3 Other Wildlife

Two mammalian species were recorded within the Study Area during the survey period including Wild Boar *Sus scrofa* and Macaque *Macaca* sp. Tracks of wild boar were recorded in various habitats along transects. Wild boar is common and widespread in Hong Kong. One individual of Macaque was recorded foraging in the Shrubby Grassland habitat (see *Figure B8* for location). This species is protected under the *Wild Animals Protection Ordinance (WAPO) Cap 170* in Hong Kong, and listed in CITES Appendix II and PRC Class II protected species. Macaque is common and widespread in Hong Kong and usually found in Kam Shan, Shing Mun, Tai Po Kau, Ma On Shan, Sai Kung country parks (1).

(1) AFCD (2006) Hong Kong Online Biodiversity Database.

Three species of amphibians including the Asian Common Toad (*Bufo melanosticus*), Guenther's Frog (*Rana guentheri*) and Brown Tree Frog (*Polypedates megacephalus*) were recorded in the stream habitats during the surveys. All recorded species were common and widespread in Hong Kong.

Three reptiles were recorded, including the Chinese Gecko (*Gekko chinensis*), Large-spotted Cat Snake (*Boiga multomaculata*) and Rufous Burrowing Snake (*Achalinus rufescens)*. The two snake species were found captive in the public toilet facility on the Island. The Chinese Gecko and Large-spotted Cat Snake are common in Hong Kong while Rufous Burrowing Snake is uncommon but widespread in Hong Kong.

Ten dragonfly species including Fiery Emperor *Anax immaculifrons*, Dingy Dusk-hawker *Gynacantha subinterrupta*, Common Blue Skimmer *Orhtetrum glaucum*, Common Red Skimmer *Orthetrum pruinosum neglectum*, Red-faced Skimmer *Orthetrum chrysis*, Wandering Glider *Plantala flavescens*, Saddlebag Glider *Tremea Virginia*, Crimson Dropwing *Trithemis aurora*, Indigo Dropwing *Trithemis festiva* and Dingy Dusk-darter *Zyxomma petiolatum* were recorded within the Study Area during the surveys. Neither rare nor protection species was recorded.

A total of 26 butterfly species, including Chestnut Angle *Odontoptilum argrlatum*, Water Snow Flat *Tagiades litigiosus*, Common Bluebottle *Graphium sarpedon*, Common Mine *Chilasa clytia*, Chinese Peacock *Papilio bianor*, Lime Butterfly *Papilio demoleus*, Red Helen *Papilio heleus*, Common Mormon *Papilio polytes*, Lemon Emigrant *Catopsilia Pomona*, Common Grass Yellow *Eurema hecabe*, Slate Flash *Rapala manea*, Dark Cerulean *Jamides bochus*, Pale Grass Blue *Zizeeria maha*, Plum Judy *Abisara echerius*, Punchinello *Zemeros flegyas*, Common Palmfly *Elymnias hypermnestra*, Banded Tree Brown *Lethe confuse*, Common Evening Brown *Melanitis leda*, Dark-band Bush Brown *Mycalesis mineus*, Common Five-ring *Ypthima baldus*, Rustic *Cupha erymanthis*, Colour Sergeant *Athyma nefte*, Common Sailer *Neptis hylas*, South Sullied Sailer *Neptis clinia*, Common Indian Crow *Euploea core* and Ceylon Blue Tiger *Ideopsis similis*, were recorded within the Study Area during the surveys. All of the recorded butterfly species are common or very common in Hong Kong.

B1.4.4 Exiting Condition of the Site

The proposed Sites 1 and 2 are located at southwestern and southern parts of the island, respectively. A wind turbine with a capacity of 6kW will be installed in each Site 1 and Site 2. Preliminary dimensions are not expected to exceed a maximum tip height of 20m above ground level with a maximum rotor diameter of 5.5m.

Literature review revealed the presence of known breeding sites of Black-naped Tern and White-bellied Sea Eagle in the vicinity of Town Island. The closest location of the breeding sites of Black-naped Tern is Wong Nai Chau

http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp

which is over 600 m away from Town Island. The nearest White-bellied Sea Eagle nesting location was previously reported in Wang Chau (approximately 500 m from Town island) (1). But it should be noted that the breeding adult pair observed in Wang Chau was believed to have left the island and moved the nest outside the area (2).

Results of field surveys indicated that the Site consisted of shrubby grassland habitat while the underground cables will pass through modified area, shrubby grassland and young woodland habitats.

Focussed bird surveys revealed that only Black Kite was recorded flying within the Project Site while a number of passerines including Common Magpie, Crested Myna, Light-vented Bulbul, Spotted Dove and Long-tailed Shrike were flying over the underground cables. Hwamei was recorded resting in the Modified Area in the vicinity of the Project's underground cable west of Site 2. All flying heights observed within the Site were above rotor area.

(1) Agriculture, Fisheries and Conservation Department (AFCD) (2007) Unpublished data adopted from BMT Asia Pacific (2009).

(2) BMT Asia Pacific (2009). *Ibid.*

B1 基線陸地生態調查

B1.1 引言

第4.6.3節 所述的文獻審閱結果顯示，有關工程地點和研究區的生態資料很有限。爲了補充這些基線資料，於2009年6月至8月期間進行了陸地生態基線情況調查，其中包括生境／植被、陸地哺乳類動物和鳥類。本章詳述了這些調查的方法和結果。

B1.2 審閱有關研究區生態特點的文獻

根據審閱文獻的結果，有關研究區生境和一般野生動物的生態資料非常有限(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)，但仍可在項目鄰近的地點找到一些旱季和雨季的鳥類資料。在研究區附近，包括黃泥洲、光頭排和橫洲，共錄得14個物種（*表B1*）(12) (13)。

表B1 研究區附近錄得之鳥類

通用名稱	學名	狀況(14)
八哥	*Acridotheres cristatellus*	• 在香港分布很廣，亦很常見
黑卷尾	*Dicrurus macrocercus*	• 在香港分布很廣，亦很常見

(1) *Porcupine!* 香港大學生態及生物多樣化系系訊，1 to 33期。

(2) 漁農自然護理署生物多樣化通訊。

(3) 香港觀鳥會 (1990 -2000)。年報。

(4) Karsen, S. J., Lau, M. W. N. and Bogadek, A. (1998). *香港兩棲動物及爬行動物。* 香港市政局

(5) 漁農自然護理署 (2005)。 *蛙蛙世界*。郊野公園之友會。

(6) Wilson, K.D.P. (2004). *香港蜻蜓圖鑑* 郊野公園之友會。

(7) Yiu V (2004). *Field Guide to the butterflies of Hong Kong*.（香港蝴蝶圖鑑） 郊野公園之友會。

(8) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001). *The Avifauna of Hong Kong*.（香港的雀鳥） Hong Kong Bird Watching Society, Hong Kong.（香港觀鳥會）

(9) Xing, F.W., Ng, S.C., Chau, L.K.C. (2000). Gymnosperms and angiosperms of Hong Kong. （香港的裸子植物和被子植物） *Memoirs of the Hong Kong Natural History Society*. 23: 21-136.

(10) Siu L P (2000). Orchidaceae of Hong Kong.（香港的蘭科植物） *Memoirs of the Hong Kong Natural History Society*. 23: 137-147.

(11) 漁農自然護理署 (2003). *New View Points-Country Park in Focus*.（郊野新角度） 郊野公園之友會。

(12) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001). The Avifauna of Hong Kong.（香港的雀鳥） Hong Kong Bird Watching Society, Hong Kong.（香港觀鳥會）

(13) BMT Asia Pacific (2009). *Hong Kong Offshore Wind Farm in Southeastern Waters - Environmental Impact Assessment*. EIA Report - Section 7 Avifauna.(Ref: ESB-146/2006). （香港東南海域之離岸風力發電場－環境影響評估報告－第7章：鳥類）

(14) 漁農自然護理署 (2006). 香港生物多樣性資料庫：http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp

通用名稱	學名	狀況[14]
岩鷺	*Egretta sacra*	• 不常見但集中於香港局部地區 • 中國二級受保護動物 • 瀕危物種貿易公約附錄II物種
黑臉噪鹛	*Garrulax perspicillatus*	• 在香港分布很廣，亦很常見
白腹海鵰	*Haliaeetus leucogaster*	• 不常見但集中於香港局部地區 • 中國二級受保護動物 • 瀕危物種貿易公約附錄II物種
棕背伯勞	*Lanius schach*	• 在香港分布很廣，亦很常見
黑鳶	*Milvus migrans*	• 在香港分布很廣，亦很常見 • 中國二級受保護動物 • 瀕危物種貿易公約附錄II物種
紅頸瓣蹼鷸	*Phalaropus lobatus*	• 在香港常見
喜鵲	*Pica pica*	• 在香港分布很廣，亦很常見
白頭鴨	*Pycnonotus sinensis*	• 在香港分布很廣，亦很常見
褐翅燕鷗	*Sterna anaethetus*	• 在香港常見
粉紅燕鷗	*Sterna dougallii*	• 在香港不常見
普通燕鷗	*Sterna hirundo*	• 在香港常見
黑枕燕鷗	*Sterna sumatrana*	• 在香港常見

由香港觀鳥會進行的繁殖中的鳥類調查，在香港東部海域(1)記錄到三種繁殖中的燕鷗，包括黑枕燕鷗（*Sterna sumatrana*）、褐翅燕鷗（*Sterna anaethetus*）和粉紅燕鷗（*Sterna dougallii*）（*圖B1*）。根據對繁殖中的燕鷗所進行的定期監察計劃，以及在2003年進行的調查結果顯示，在香港多個離島上都有繁殖中的燕鷗群，包括：大鵬灣、石牛洲、弓洲和赤洲 (2)。此外，在白沙洲、黃泥洲、吉澳東端、雞公頭和橫瀾島也可以找到這種鳥。還有一群繁殖中的燕鷗在西貢萬宜水庫附近的光頭排。根據文獻記載，在這些被錄得的鳥類中，黑枕燕鷗分別於光頭排和黃泥洲有築巢地點 (3) (4)，距離晨曦島約600米。

在香港離岸風力發電場進行東南部海域環評研究時，曾於2006年和2007年於東部海域進行了船上觀察的專門生態調查。結果顯示，數量最多的雀鳥是黑枕燕鷗（*Sterna sumatrana*）（佔總數的21%），其次是褐翅燕鷗（*Sterna anaethetus*）（佔總數17%）（*圖B2*）。該次研究結果亦顯示，大部份錄得的鳥類都局限於近岸海域，而且全都是在海面覓食的種類 (5)。

(1) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001). The Avifauna of Hong Kong. （香港的鳥類） 香港觀鳥會

(2) Hong Kong Bird Watching Society (2003). *Pilot project to increase awareness of the ecological importance of the breeding colonies of terns in Hong Kong (ECF project 23/2002).* Unpublished by the Hong Kong Bird Watching Society. （香港觀鳥會之未發表報告：爲促進公眾認識香港繁殖中燕鷗群之生態價值而進行之試驗計劃）

(3) 漁農自然護理署 (AFCD) (2007) Unpublished data adopted from BMT Asia Pacific (2009).

(4) Hong Kong Bird Watching Society (2006). *Seabird migration survey in Southern and Southeastern Hong Kong, Spring 2006 (ECF project 2005-10).* Unpublished by the Hong Kong Bird Watching Society.（香港觀鳥會之未發表報告：香港南部及東南部之海鳥遷徙調查（2006年春季）。）

(5) BMT Asia Pacific (2009). *Hong Kong Offshore Wind Farm in Southeastern Waters - Environmental Impact Assessment.* EIA Report - Section 7 Avifauna.(Ref: ESB-146/2006).（香港西南海域之離岸風力發電場－環境影響評估報告－第7章：鳥類）

按照2003年的研究估計，全港共有39隻白腹海鵰，其中有23隻已成長和16隻未成長／幼鳥 (1)。香港東南海域離岸風力發電場環評研究的船上觀察專門調查，亦在香港東南部海域合共錄得138次有關白腹海鵰的目擊記錄，但都只局限於岸邊海域 (2)（*圖B3*）。這種鳥也有在香港築巢，特別是在東部海域。已知的築巢群落共有12個，其中7個位於香港東部海域，包括尖洲、洋洲、大岩口、罌棚角、橫洲、青洲和果洲群島 (3)（*圖B3*）。然而，曾被發現在橫洲繁殖的一雙成年海鵰目前應已離開該島，並把巢遷離該區(4)。另一項研究亦發現，牠們的覓食距離可以遠達離巢2公里，而覓食的高峰時間爲黃昏(5)。

B1.3 調查方法

爲了彌補晨曦島有限的基線情況資料，顧問公司進行了專門的陸地生態基線情況調查，務求了解該島現有的生態情況。是次調查的狹樣區和取樣點都主要位於或貼近項目地點，以及沿著將會進行施工的新地底電纜鋪設路線（*圖B4*）。所有調查所用的方法，都參考了根據《環評條例》而頒佈的*7/2002號* 和 *10/2004號技術指引*。

B1.3.1 生境和植被

顧問公司於2009年6月進行了生境和植被調查，目的是要記錄研究區內各種生境的特點和分佈情況，以及了解植物的種類，並繪成地圖；以及確定研究區內的生境和植物的生態狀況。

各種生境都按照政府最新發表的空中照片和實地驗證結果標誌於地圖上。對於每種生境的具代表性地區，都以徒步方式進行實地調查。在每種生境中見到的植物品種和數量多寡都加以記錄，並會特別注意任何稀有或受保護的物種。有關植物種類的名命方法和保育狀況，都是依照Xing等人(6)、Wu and Lee (7) 和漁護署 (8)(9) 的方法。

B1.3.2 鳥類

顧問公司在對研究區進行的偵察調查中，找出了與鳥類相關的生境和具生態價值地區。此外，亦以定量（定點點算）和定性（狹樣區）方法，對這些被選定的生境進行雀鳥數目的基線情況調查。由於記錄中的燕鷗（即黑枕燕鷗、粉紅燕鷗和褐翅燕鷗）數目在夏天較多，而夏天也是這三種燕鷗的繁殖期(6-8

(1) Tsim ST, Lee WH, Cheung CS, Chow KL, Ma YN, Liu KY (2003) *The Population and Breeding Ecology of white-bellied Sea-eagles in Hong Kong.*（香港白腹海鵰數量和繁殖生態） 香港物種探索，漁護署通訊：第5期。

(2) BMT Asia Pacific (2009). *Hong Kong Offshore Wind Farm in Southeastern Waters - Environmental Impact Assessment.* EIA Report - Section 7 Avifauna.(Ref: ESB-146/2006). （香港西南海域之離岸風力發電場－環境影響評估報告－第7章：鳥類）

(3) 漁農自然護理署 (AFCD) (2007) 摘自BMT Asia Pacific (2009) 之未發表數據。

(4) BMT Asia Pacific (2009). （同上）

(5) Tsim *et al* (2003) （同上）

(6) Xing, F.W., Ng, S.C., Chau, L.K.C. (2000). （同上）

(7) Wu, S. H and Lee.T. C (2000). （同上）

(8) 漁農自然護理署 (2003). *香港稀有及珍貴植物* 天地圖書有限公司。

(9) Wu, S. H and Lee.T. C (2000). （同上）

月)[1] 。因此，爲了收集詳細的雀鳥數量和分佈數據，雀鳥基線情況調查是在2009年6月、7月和8月進行。鳥類的命名則依照Carey等人所述方法(2)。

- **定點法：**定點法的目的，是要確定雀鳥在擬建風力發電機附近的飛行模式，以便達到下列目的：

  - 找出對雀鳥極之重要的地區；及

  - 對於可能會受影響的雀鳥，參考有關牠們的飛行路線和方向記錄（ERM 2004）(3)，並估計牠們與本項目的設施發生碰撞的可能性。

  研究人員找到一個可以觀察整個項目地點（包括地點一和地點二）的有利地點來進行定點調查（*圖B4*）。值得注意的，是從該個有利地點可以觀察到~80%的研究區。除了在能見度欠佳的時候（<300米），否則，在其他所有天氣情況下，都是由一位觀察者（雀鳥專家）進行觀察。在進行調查時，也記錄了天氣情況（風向、降水情況和能見度）。在進行觀察時，觀察員會不斷掃視可見的範圍，直至發現飛行中的雀鳥。在發現雀鳥後，便會把雀鳥的種類、性別和年齡（若可能）、數量、觀察到的地點、雀鳥的活動、飛行高度和途徑等資料加以記錄。雀鳥的飛行高度是按牠進入視野時那一點加以估計，並按照車葉的高度把飛行高度分類爲：在海面和地面（視乎觀察到雀鳥的地點而定）以上<8米、8-20米、或 >20米。

- **狹樣區法：**按照狹樣區方法，在研究區內各個狹樣區所見到的種類都加以記錄，以便得出一份完整的種類清單。與繁殖有關的標誌（例如鳥巢、羽毛剛豐的幼鳥等）也加以記錄。

5.1.2 其他野生動物

顧問公司於2009年7月和8月對研究區內的其他野生動物進行了調查。

由於哺乳類動物大都以低密度方式活動，因此，研究人員都沿著狹樣區主動地找尋哺乳類動物，以及各種踪跡。（見*圖B4*）。哺乳類動物的命名，是按照漁護署（2006b）(4) 的方法。是次調查沒有記錄研究區內的哺乳類動物數量，因爲難以把目擊次數和踪跡數目（例如：洞穴）轉換成實際的動物個數。

對於爬蟲類的調查，是在研究區的所有重要生境內，沿著各條狹樣區和所有可能藏匿的地方，例如落葉堆、洞穴內，以及大石和大木之下等，進行直接觀察和主動找尋。對於蛙類和癩蛤蟆，也會聆聽不同種類的獨特叫聲。在調查期間，所有被見到和聽到的爬行動物和兩棲動動都加以記錄。爬行動物的命名和

(1) Hong Kong Bird Watching Society (2003). *Pilot project to increase awareness of the ecological importance of the breeding colonies of terns in Hong Kong (ECF project 23/2002).* Unpublished by the Hong Kong Bird Watching Society.（香港觀鳥會之未發表報告：爲促進公眾認識香港繁殖中燕鷗群之生態價值而進行之試驗計劃）

(2) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001) The Avifauna of Hong Kong.（香港的雀鳥） Hong Kong Bird Watching Society, Hong Kong.（香港觀鳥會）

(3) ERM HK (2004). *Environmental Impact Assessment for Renewable Energy by a Wind Turbine System on Lamma Island*.（南丫島風力發電系統之可再生能源環境影響評估）

(4) 漁農自然護理署 (2006b) *A Field Guide to the Terrestrial Mammals of Hong Kong*.（香港陸上哺乳動物圖鑑） Chen S K., Cheung K.S., Ho C. Y, Lam F. N., Tang W, S (Authors). Published by AFCD.（漁護署出版）

狀況，是依照Karen等人（1998）(1) 的方法，而兩棲動物則按照漁護署（2005）(2) 的做法。

在狹樣區內遇到的蜻蜓、蜻蛉和蝴蝶都會加以識別和點算。對於每種生境中的蜻蜓、蜻蛉和蝴蝶，都會估計其相對數量。蝴蝶的名稱是依照Walthew (1997) (3) 和Yiu (2004) (4)；而蜻蜓名稱則依照Wilson (2004) (5)。

B1.4 調查結果

B1.4.1 現有陸地生境和植物

研究區內的陸地生境包括未成長林地、灌木狀草地和經修改地區（*圖B5*）。*圖B6*展示了記錄中各種生境的彩色照片。

研究區（約47公頃）的主要生境，是生態價值偏低的灌木狀草地。未成長林地主要位於該島西部的有屏蔽地區，以及在兩個工程地點（即地點一和地點二）之外。未成長林地可能源自洋槐，但現在則以本土植物爲主，具有中等生態價值。經修改地區主要是建築物、混凝土小徑和耕地，均屬低生態價值地區。島的南部有一條天然小溪，其生態價值屬中等。在碼頭附近有一條曾略作修改的小溪，其生態價值屬偏低至中等。是次調查沒有在研究區內找到任何稀有或受保護的植物。項目地點內的主要生境是灌木狀草地，當中的植物高度都不超過0.5米（見*圖B6*）。本項目的地底電纜槽，會沿著工程地點的南面邊界，及經修改地區內的現有混凝土小徑建造。*表B2*羅列了在研究區內找到的每種生境的面積和生態價值。

(1) Karen, SJ, Lau, MWN. and Bogadek, A (1998). Hong Kong Amphibians and Reptiles.（香港的兩棲動物和爬行動物） Urban Council, HK（香港市政局）

(2) 漁農自然護理署 (2005). A Field Guide to the Amphibians of Hong Kong.（蛙蛙世界） Friends of Country Park.（郊野公園之友會）

(3) Walthew, G.. (1997). The status and flight periods of Hong Kong butterflies（香港蝴蝶的狀況及飛行時間） Porcupine! 16: 34-37

(4) Yiu V (2004). *Field Guide to the butterflies of Hong Kong*.（香港蝴蝶圖鑑） Hong Kong Discovery Ltd.

(5) Wilson, K.D.P. (2004). *Field Guide to the Dragonflies of Hong Kong*.（香港蜻蜓圖鑑） Agriculture, Fisheries and Conservation Department, Friends of Country Park and Cosmos Book Ltd. Hong Kong.

表B2　　研究區內已知生境之面積和生態價值

生境	於晨曦島上之面積	生態價值	備註
未成長林地	~5公頃	中等	島西有未成長林地。調查期間在未成長林地內記錄到81種植物。未成長林地內主要是本土樹木，例如：土蜜樹、牛耳楓、細葉榕、假蘋婆、血桐和其他外來品種，例如台灣相思和銀合歡。下層植物主要是本土灌木和覆地植物，包括山大刀、崗梔、野牡丹、梅葉冬青、大車前和芒萁。林地內沒有任何稀有或受保護植物。估計該等林地的年齡不會超過15年。
灌木狀草地	~47公頃	偏低	研究區內的主要生境是灌木狀草地。調查期間，在這種生境內共錄得40種植物。灌木狀草地是以幾種本土覆地植物爲主，其中包括：劍葉鱗始蕨、崗松、棱萼母草、海金沙和鏈珠藤（念珠藤）在灌木狀草地上也有個別樹木，例如杧果、台灣相思和土蜜樹。灌木狀草地上沒有任何稀有或受保護的植物。
經修改地區	~1.4公頃	偏低	經修改地區內有建築物、混凝土行人路和耕地；調查期間共錄得36種植物。經修改地區內主要是覆地植物，例如：勝紅薊、地膽草、大車前和三裂葉蟛蜞菊。在耕地上找到的植物和果樹包括：節瓜、蕃茄、杧果、木瓜和番石榴。區內沒有任何稀有或受保護的植物。
小溪	小溪1 = ~10米 小溪1 = ~30米	小溪1屬偏低至中等 小溪2屬中等	兩條小溪的水都很淺。小溪1屬石底，而小溪2.屬沙底。溪邊的植物都很封閉，主要有台灣相思、玉葉金花、血桐、野牡丹。小溪1的下游河道是由混凝土堤建成。沿溪地區都沒有任何稀有或受保護植物。

從*表B3*可見，是次調查共記錄到123種植物。是次調查沒有在研究區內找到任何稀有或受保護的植物。

表B3　　研究區內記錄到的植物種類[a)]

物種名稱	生長形式	來源	狀況	YW	SG	MA	項目地點
台灣相思	T	E	VC	A		O	
勝紅薊	H	E	VC			A	
八角楓	S	N	VC	S			
草豆蔻	H	N	VC	S			
鏈珠藤（念珠藤）	C	N	C		A		
野莧菜	H	N	VC			F	
毛茶	T	N	VC		S		
亮葉猴耳環	T	N	VC	S			
天門冬	H	N	C	S			
崗松	S	N	VC		A		
節瓜	C	E	VC			O	
小葉黃鱔藤	S	N	R	S			
烏毛蕨	H	N	VC	S			
木棉	T	E	VC			S	
豐花草	H	N	C	F	O		O
黑面神	S	N	VC	O	S		
土蜜樹	S	N	VC	O	S	O	S
木瓜	S	E	VC			O	
無根藤	C	N	VC	S			

物種名稱	生長形式	來源	狀況	YW	SG	MA	項目地點
木麻黃	T	E	VC	S		S	
青江藤	C	N	VC	O			
紫彈朴	S	N	RE	S			
雷公根	H	N	VC		F	O	F
竹節草	H	N	VC		F		O
樟樹	T	N	C			S	
金橘	S	E	VC			S	
苦郎樹	S	N	C	S			
雞骨香	S	N	VC		O		
鬱金	H	N	C			S	
日本菟絲子	C	N	C		O		
華南毛蕨	H	N	VC	S		O	
牛耳楓	T	N	C	S			
寄生藤	C	N	VC	O			
蠅翼草	H	N	VC		O		S
山菅蘭	H	N	VC	O	S		
芒萁	H	N	VC	A	O		
龍眼	T	E	C	S			
黃獨	C	N	C	S			
巴西鐵樹	S	E	C			S	
紅馬尾鐵	S	E	C			S	
白花鬍鉏菊	H	N	C		S		S
地膽草	H	N	C	A	O	F	A
酸藤子	C	N	VC	S	S		
一點紅	H	E	VC			S	
大飛揚草	H	E	VC	O		F	
細齒葉柃	S	N	VC	S	O		
細葉榕	T	N	VC	S			
薜荔（文頭郎）	C	N	VC	O			
豆果榕	T	N	VC	S			
梔子 (水橫枝)	S	N	VC	S			
毛果算盤子	S	N	VC	O			
白背算盤子	S	N	VC		S		
海島藤	C	N	C	S			
匙羹藤	C	N	VC	S			
金草	H	N	VC		S		
狗骨消	H	N	VC		F		O
山芝麻	S	N	VC		O		F
肖菝葜	C	N	C	O			
黃槿	T	N	VC	S			
天料木	T	N	C	S			
夜花藤	C	N	VC	O			
梅葉冬青	S	N	VC	O			
絲茅	H	N	VC		O		A
海灘牽牛	C	N	C		S		
粗毛鴨嘴草	H	N	VC		S		
馬纓丹	S	E	VC	O			
益母草	H	N	C			F	

物種名稱	生長形式	來源	狀況	YW	SG	MA	項目地點
銀合歡	T	E	VC	O			
棱萼母草	H	N	RE		O	S	O
劍葉鱗始蕨	H	N	VC		F		
山麥冬	H	N	VC	O			
潺槁樹	T	N	VC	O		S	
豺皮樟	T	N	VC	O	S		S
大花忍冬	C	N	C	S			
蕃茄	H	E	C			O	
海金沙	C	N	VC	F	S	F	O
小葉海金沙	C	N	C	S			
血桐	T	N	C	F		O	
白楸	T	N	VC	O			
石岩楓	C	N	C	S			
杧果	T	E	VC	S		S	
野牡丹	S	N	VC	S			
楝	T	E	C	S		S	
薇甘菊	H	E	VC			O	
美麗崖豆藤	C	N	VC	O			
雞眼藤	C	N	VC	F			
桑	T	N	C	S		S	
玉葉金花	C	N	VC	O			
酢漿草	H	N	VC	F			
紅花酢漿草	H	E	VC	S			
雞屎藤	C	N	C	F			
刺葵	T	N	C	S			
越南葉下珠	S	N	VC	F	S	S	
葉下珠	H	N	C			O	
馬尾松	T	N	C		S		S
大車前	H	N	VC	O		A	
桃	T	E	VC	S		S	
番石榴	T	E	VC			S	
山大刀	S	N	VC	A			
蔓九節	C	N	VC		S		
天草鳳尾蕨	H	N	C	S			
崗棯	S	N	VC	O	S		S
白背漆	S	N	VC	O	S		
野漆樹	S	N	VC	O			
刺子莞	H	N	VC		S		
茅莓	H	N	C	O	O		S
雀梅藤	S	N	VC	S			
草海桐	S	N	VC		S		
鴨腳木	T	N	VC	F		S	
酒餅簕	S	N	C	S			
假蘋婆	T	N	VC	S			
羊角拗	C	N	C		S		
葫蘆茶	H	N	VC	S			
錫葉藤	C	N	VC	O			
側柏	T	E	C		S		S

物種名稱	生長形式	來源	狀況	YW	SG	MA	項目地點
娃兒藤	C	N	C	S	S		
紫玉盤	S	N	C	S			
夜香牛	H	N	VC	O		S	
珊瑚樹	T	N	VC	S			
牡荊	S	N	RE	S			
三裂葉蟛蜞菊	H	E	C			A	
了哥王	S	N	C		O		
兩面針	C	N	VC	S			
			錄得物種總數	*81*	*40*	*36*	*17*

註：

(a) 數量： A=豐富； F=經常發現； O=偶然發現； S=稀少；
生長形式： G=草； 攀爬植物； H=草木植物； P=棕櫚； S=灌木； T=樹木； Se=苔
來源： N=本土植物； E=外來植物； 狀況： C=常見； VC=十分常見 P=受保護
生境：YW = 未成長林地， SG = 灌木狀草地， MA = 經修改地區

B1.4.2 鳥類

種類和分布情況

在進行定量和定性調查時，共錄得26種鳥類，其中十種是在進行定性調查時錄得（*表B4*）。這些鳥大都屬於香港常見和分佈廣泛的種類，例如家燕（*Hirundo rustica*）、黑領椋鳥（*Sturnus nigricollis*）和珠頸斑鳩（*Streptopelia chinensis*）。

表B4　　調查期間（09年6月至09年8月）在研究區記錄到的雀鳥種類

鳥類名稱	通用名稱	物種名稱	普遍程度[a]	香港主要狀況	保護情況
猛禽	黑鳶	*Milvus migrans*	CW	R, WV	中國二級 瀕危物種貿易公約附件 II
	白腹海鵰	*Haliaeetus leucogaster*	UC	R	中國二級 瀕危物種貿易公約附件 II
燕鷗	黑枕燕鷗	*Sterna sumatrana*	C	SV	無
雀形目	小白腰雨燕	*Apus affinis*	CW	R,SpM	無
	喜鵲	*Pica pica*	CW	R	無
	黑卷尾	*Dicrurus macrocercus*	CW	SV	無
	家燕	*Hirundo rustica*	CW	PM, SV	無
	紅尾伯勞	*Lanius cristatus*	CW	PM	無
	棕背伯勞	*Lanius schach*	CW	R	無
	田鷚	*Anthus richardi*	C	PM, WV	無
	大山雀* [c]	*Parus major*	CW	R	無
	樹麻雀*	*Passer montanus*	CW	R	無
	白頭翁	*Pycnonotus sinensis*	CW	R	無
	紅耳鵯	*Pycnonotus jocosus*	CW	R	無
	白喉紅臀鵯	*Pycnonotus aurigaster*	UC	R	無
	八哥	*Acridotheres cristatellus*	CW	R	無
	黑領椋鳥*	*Sturnus nigricollis*	CW	R	無
	長尾蓬葉鶯*	*Orthotomus sutorius*	CW	R	無
	畫眉	*Garrulax canorus*	CW	R	瀕危物種貿易公約附錄 II
	黑臉噪鸝*	*Garrulax perspicillatus*	CW	R	無
	鵲鴝*	*Copsychus saularis*	CW	R	無
	暗綠繡眼鳥*	*Zosterops japonicus*	CW	R	無
其他	白胸翡翠	*Halcyon smyrnensis*	CW	R	無
	珠頸斑鳩	*Streptopelia chinensis*	CW	R	無
	褐翅鴉鵑*	*Centropus sinensis*	CW	R	中國二級
	小鴉鵑*	*Centropus bengalensis*	CW	R	中國二級

註：

(a) 普遍程度和分布：CW = 常見和分布很廣， UC = 不常見和局部地區

(b) 於香港之情況依照Viney (2005) [1] 和漁護署 (2006) [2]：R = 常駐， WV = 冬臨鳥， SV = 夏臨鳥； PM = 路過／季節性遷徙； Sp = 春移鳥； AM = 秋移鳥

(c) 有星號者代表只在定性調查中錄得的種類。具保育價值的鳥類以顏色網底標示。在香港的所有鳥類都受到「野生動物保護條例」（170章）的保護。

(1) Viney C, Phillipps K, Lam CY. (2005). The Birds of Hong Kong and South China.（香港及華南雀鳥） Information Services Department, Hong Kong.

(2) 漁農自然護理署 (2006). 香港生物多樣性資料庫：*http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp*

在所有被發現的雀鳥當中，約有45%是在該島西南面的開闊海域上空見到，而約有一半（~55%）則是在岸上，主要分佈於該島中部的灌木狀草地（*圖B7*）。調查期間，沒有發現任何猛禽或水鳥的巢（無論是仍在使用或已棄置）。

雀鳥的數量、活動和飛行高度

*表B5*和*B6*羅列了在定性調查期間，在研究區內錄得每種雀鳥的數量，分別按照鳥類的活動和不同飛行高度列出。

表B5　　在六天的調查期間在研究區觀察到的雀鳥活動

雀鳥種類	**通用名稱**	**記錄到之雀鳥總數**			**總數**	**每個調查日平均數**
		發行	**上飛**	**覓食**		
猛禽	黑鳶	28	24	1	53	8.8
	白腹海鵰	2	1	0	3	0.5
燕鷗	黑枕燕鷗[a]	181	0	50	231	38.5
雀形目	家燕	24	0	0	24	4.0
	黑卷尾	21	0	0	21	3.5
	紅尾伯勞	1	0	0	1	0.2
	喜鵲	13	0	0	13	2.2
	八哥	12	0	0	12	2.0
	小白腰雨燕	1	0	0	1	0.2
	白頭翁	62	0	0	62	10.3
	棕背伯勞	5	0	0	5	0.8
	紅耳鵯	8	0	0	8	1.3
	田鷚	4	0	0	4	0.7
	白喉紅臀鵯	3	0	0	3	0.5
其他	珠頸斑鳩	3	0	0	3	0.5
	白胸翡翠	1	0	0	1	0.2
	合計	***369***	***25***	***51***	***445***	***74.2***

註：

(a) 所有黑枕燕鷗都是在開闊海域或靠近海岸的上空被觀察到，而不是在橫過該島。

表B6　　在六天的調查期間在研究區觀察到的雀鳥飛行高度

雀鳥種類	通用名稱	記錄到之雀鳥總數		
		低於車葉範圍 (0 - <8 米)	在車葉範圍內 (8 - 13.5米)	高於車葉範圍 (> 13.5米)
猛禽	黑鳶	1	8	44
	白腹海鵰	0	0	3
燕鷗	黑枕燕鷗(a)	212	11	8
雀形目	家燕	0	0	24
	黑卷尾	0	0	21
	紅尾伯勞	0	0	1
	喜鵲	3	1	9
	八哥	0	1	11
	小白腰雨燕	0	0	1
	白頭翁	0	0	62
	棕背伯勞	0	0	5
	紅耳鵯	0	0	8
	田鷚	0	0	4
	白喉紅臀鵯	0	0	3
其他	珠頸斑鳩	0	0	3
	白胸翡翠	0	0	1
	合計	***216***	***21***	***208***

註：

(a) 所有黑枕燕鷗都是在開闊海域或靠近海岸的上空被觀察到，而不是在橫過該島。

黑枕燕鷗（~52%）是這次調查所錄得數量最多的鳥類（全都在開闊海域或海岸附近發現），其次是白頭翁（~14%）和黑鳶（~12%）。調查期間所觀察到的雀鳥大都在飛行中（~83%），而大部份的飛行高度都是在風車葉之下或之上（*圖B7*）。有少數雀鳥（~5%）以風車葉範圍的高度，在開闊海域或近岸上空飛行。

具保育價值物種

在調查期間，在研究區內共記錄到五種具保育價值的鳥類（*表B4*）。有關牠們的分布情況，請參閱*圖B8*。由於黑鳶廣泛地分佈於所有生境，因此，*圖B8*沒有顯示牠們的位置。

- 白腹海鵰（*Haliaeetus leucogaster*）– 在中國屬二級受保護物種，亦被列入瀕危物種貿易公約附件II。這種鳥長住香港，但不常見。在調查期間只錄得三隻這種海鵰（一隻已成長和兩隻幼鳥），當時牠們都在開闊海域和島中央的灌木狀草地上空飛翔。三隻海鵰的飛行高度都超過風車葉（請亦參閱*圖B9*）。

- 黑鳶（*Milvus migrans*）– 在中國屬二級受保護物種，亦被列入瀕危物種貿易公約附件II。在香港分布很廣，亦很常見。研究區內所有生境都有錄得牠們的蹤跡。牠們的主要飛行高度超過風車葉（請亦參閱*圖B10*）。

- 畫眉（*Garrulax canorus*）－被列入瀕危物種貿易公約附件II。這種鳥在香港分布很廣，亦很常見。這次是在進行定性調查時錄得牠們。研究區內的所有生境都見到牠們在休憩。

- 褐翅鴉鵑（*Centropus sinensis*）－在中國屬二級受保護物種。牠們在香港分佈很廣，也很常見，是本港的長駐雀鳥之一。這種鳥是在進行定性調查時記錄到，都是在島中央的灌木狀草地上休息和飛翔。

- 小鴉鵑（*Centropus bengalensis*）－在中國屬二級受保護物種。牠們在香港分佈很廣，也很常見，是本港的長駐雀鳥之一。這種鳥是在進行定性調查時記錄到，都是在島中央的灌木狀草地上休息和飛翔。

- 雖然黑枕燕鷗（*Sterna sumatrana*）並非具保育價值的物種，但仍被選作深入分析，因爲牠們的築巢地點在研究區附近（最近的一個在黃泥洲，離晨曦島超過600米，見*第4.6.3節*）。黑枕燕鷗是在夏季到香港繁殖的常見雀鳥。在調查期間看到牠們在開闊海域或近岸上空，以低於風車葉的高度飛行；另外亦有多群在島西的開闊海域覓食（*圖B11*）。

B1.4.3 其他野生動物

在調查期間錄得兩種哺乳類動物在研究區內，包括野豬（*Sus scrofa*）和獼猴（*Macaca* sp.）。在狹樣區沿線的各種生境中，都錄得野豬的蹤跡。野豬在香港分布很廣，亦很常見。在灌木狀草地生境中，亦錄得一隻獼猴在覓食（具體位置請參閱*圖B8*）。這種動物受到香港「野生動物保護條例」（第170章）的保護，亦被列入瀕危物種貿易公約附件II，同時也是中國二級受保護動物。獼猴在香港是常見和分佈很廣的動物，通常在金山、城門、大埔坳、馬鞍山和西貢等郊野公園都可找到(1)。

調查期間在河溪生境中錄得三種兩棲動物，包括黑眶蟾蜍（*Bufo melanosticus*）、沼蛙（*Rana guentheri*）和斑腿泛樹蛙（*Polypedates megacephalus*）。這三種兩棲動物都是香港常見和分佈很廣的物種。

研究區內亦記錄到三種爬行動物，包括中國壁虎（*Gekko chinensis*）、繁花林蛇（*Boiga multomaculata*）和棕脊蛇（*Achalinus rufescens*）。在被發現時，兩種蛇都是被捕狀態，被放於島上的公廁內。中國壁虎和繁花林蛇都是香港常見的物種；而棕脊蛇則屬不常見但分佈很廣。

在調查期間，在研究區內共錄得十種蜻蜓，包括：黃偉蜓（*Anax immaculifrons*）、細腰長尾蜓（*Gynacantha subinterrupta*）、黑尾灰蜻（*Orhtetrum glaucum*）、赤褐灰蜻（*Orthetrum pruinosum neglectum*）、華麗灰蜻（*Orthetrum chrysis*）、黃蜻（*Pantala flavescens*）、華斜痣蜻（*Tremea virginia*）、曉褐蜻（*Trithemis aurora*）、慶褐蜻（*Trithemis festiva*）和細腹綠眼蜻（*Zyxomma petiolatum*）。沒有錄得任何稀有或受保護物種。

(1) 漁農自然護理署 (2006) 香港生物多樣性資料庫：
http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp

調查期間，在研究區內共錄得26種蝴蝶，包括：角翅弄蝶（*Odontoptilum angulatum*）、沾邊裙弄蝶（*Tagiades litigiosus*）、青鳳蝶（*Graphium sarpedon*）、斑鳳蝶（*Chilasa clytia*）、碧鳳蝶（*Papilio bianor*）、無尾鳳蝶（*Papilio demoleus*）、玉斑鳳蝶（*Papilio helenus*）、玉帶鳳蝶（*Papilio polytes*）、遷粉蝶（*Catopsilia pomona*）、寬邊黃粉蝶（*Eurema hecabe*）、燕灰蝶（*Rapala manea*）、雅灰蝶（*Jamides bochus*）、酢漿灰碟（*Zizeeria maha*）、蛇目褐蜆蝶（*Abisara echerius*）、波蜆蝶（*Zemeros flegyas*）、翠袖鋸眼蝶（*Elymnias hypermnestra*）、白帶黛眼蝶（*Lethe confusa*）、暮眼蝶（*Melanitis leda*）、小眉眼蝶（*Mycalesis mineus*）、矍眼蝶（*Ypthima baldus*）、黃襟蛺蝶（*Cupha erymanthis*）、相思帶蛺蝶（*Athyma nefte*）、中環蛺蝶（*Neptis hylas*）、珂環蛺蝶（*Neptis clinia*）、幻紫斑蝶（*Euploea core*）和擬旖斑蝶（*Ideopsis similis*）。這些蝴蝶都是在香港常見或十分常見的品種。

B1.4.4 項目地點現況

地點一和地點二分別位於晨曦島的西南和南面。兩個工程地點都會各裝一台6千瓦的風力發電機。據初步尺寸估計，發電機最高點不會超過地面以上20米，而車葉的最大直徑約爲5.5米。

根據文獻記載，晨曦島附近有黑枕燕鷗和白腹海鵰的繁殖地點。最近的黑枕燕鷗繁殖地點在黃泥洲，距離晨曦島逾600米。按照先前已有的資料，最接近的白腹海鵰築巢地點位於橫洲（離晨曦島約500米）(1)。然而，應予注意的，是該雙成年海鵰應已離開該島，並把巢遷離該區(2)。

根據實地調查結果，項目地點內的生境以灌木狀草地爲主。地底電纜則會經過已修改地區、灌木狀草地和未成長林地等生境。

根據專題雀鳥調查結果，工程地點內只錄得黑鳶在飛翔，但有多種雀形目的鳥類在地底電纜上方飛行，其中包括喜鵲、八哥、白頭翁、珠頸斑鳩和棕背伯勞。此外，亦錄得畫眉在地點二西面的地底電纜附近的經修改地區內休憩。在項目地點內觀察到的雀鳥飛行高度，全都在車葉的範圍之上。

(1) 漁農自然護理署 (AFCD) (2007) 摘自BMT Asia Pacific (2009)之未發表數據。

(2) BMT Asia Pacific (2009). （同上）

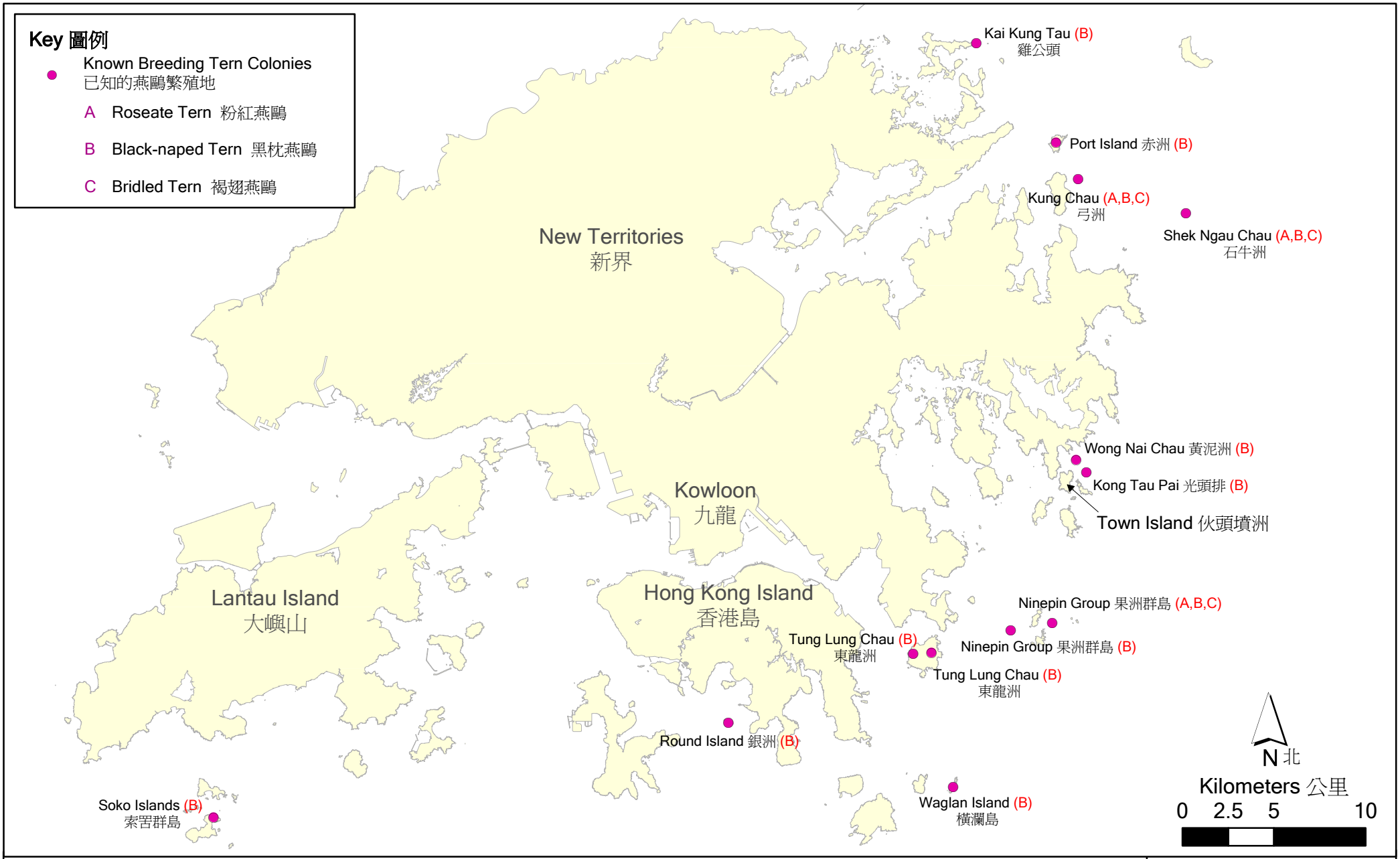

Figure B1
圖 B1

Known Breeding Tern Colonies in Hong Kong (Reference: HKBWS 2006)
燕鷗在香港已知的繁殖地(参考:HKBWS 2006)

File: eng chi\0103677_Breeding Tern Colonies.mxd
Date: 12/05/2010

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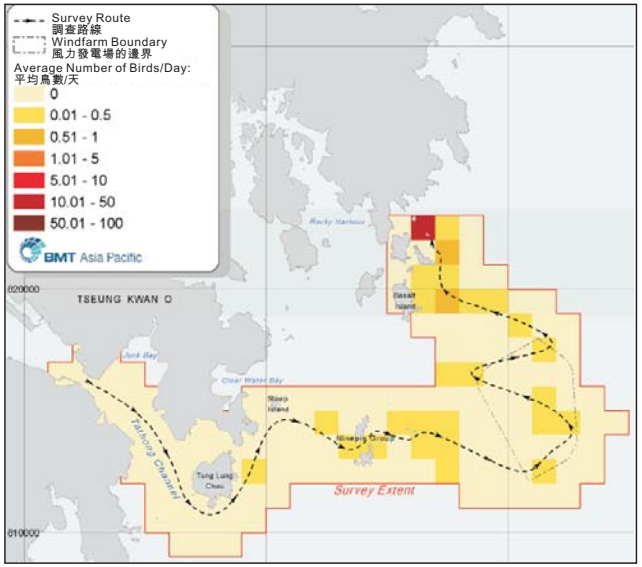
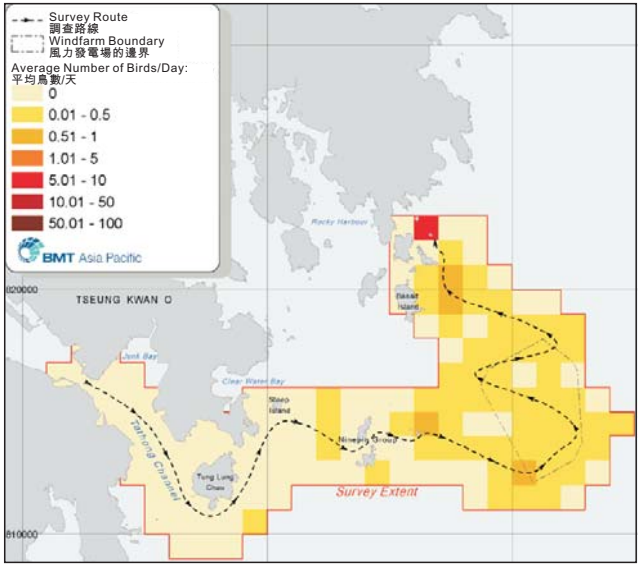
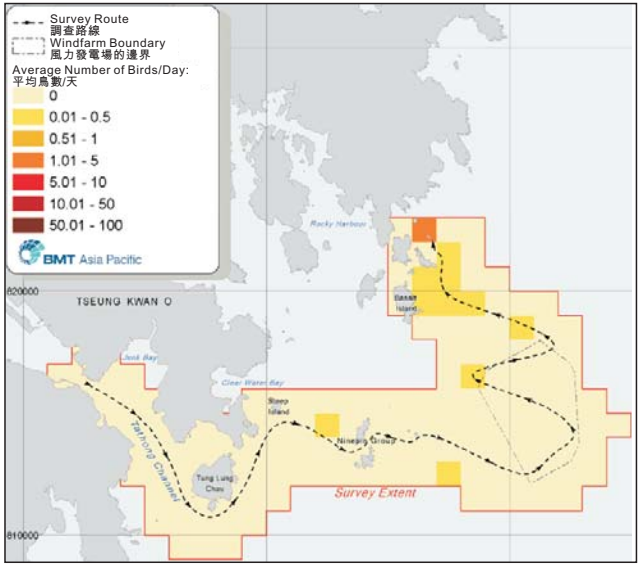


Black-naped Tern *Sterna sumatrana* 黑枕燕鷗



Bridled Tern *Sterna anaethetus* 褐翅燕鷗



Roseate Tern *Sterna dougallii* 粉紅燕鷗

Figure B2
圖 B2

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DATE: 11/05/2010

Distribution of Summer Breeding Tern Species Recorded during the HKOWL's EIA Study

(Surveys conducted from May 2006 to August 2006, from December 2006 to May 2007, and August 2007 to December 2007)
(Graphs adopted from Approved EIA Study for Hong Kong Offshore Wind Farm in Southeastern Waters)

香港離岸風力發電場的環評研究中關於夏季繁殖的燕鷗物種的分佈記錄

（調查進行的時間為2006年5月至2006年8月，2006年12月至2007年5月和2007年8月至2007年12月）
（圖片來自已審批的香港東南海域之離岸風力發電場的環境影響評估研究）

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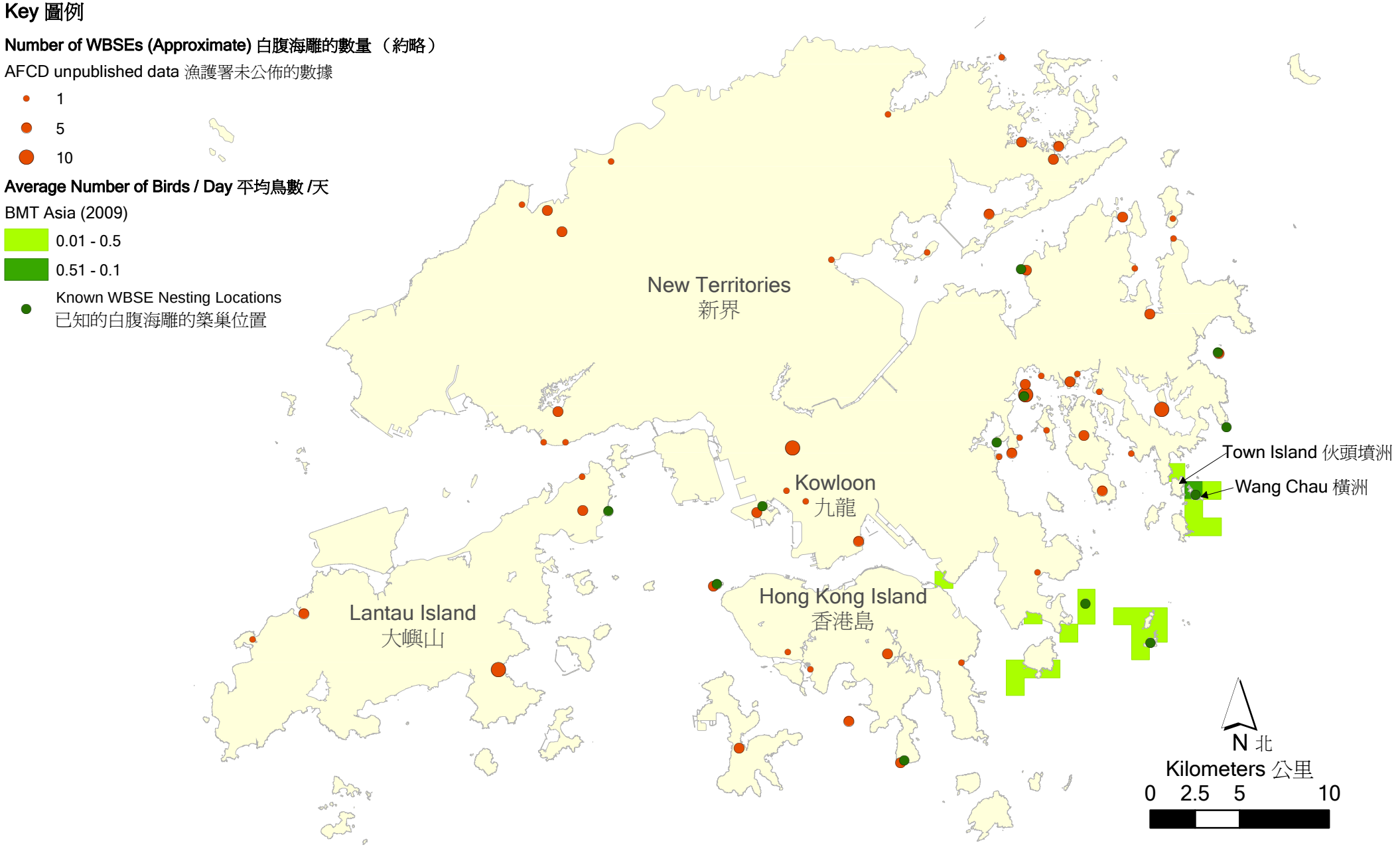

Figure B3
圖 B3

Sighting and Nesting Locations of White-bellied Sea Eagle (WBSE) (Reference: BMT Asia 2009)
白腹海雕(WBSE) 的觀察及築巢位置(參考:BMT Asia 2009)

File: eng chi\0103677_WBSE_AFCD.mxd
Date: 12/05/2010

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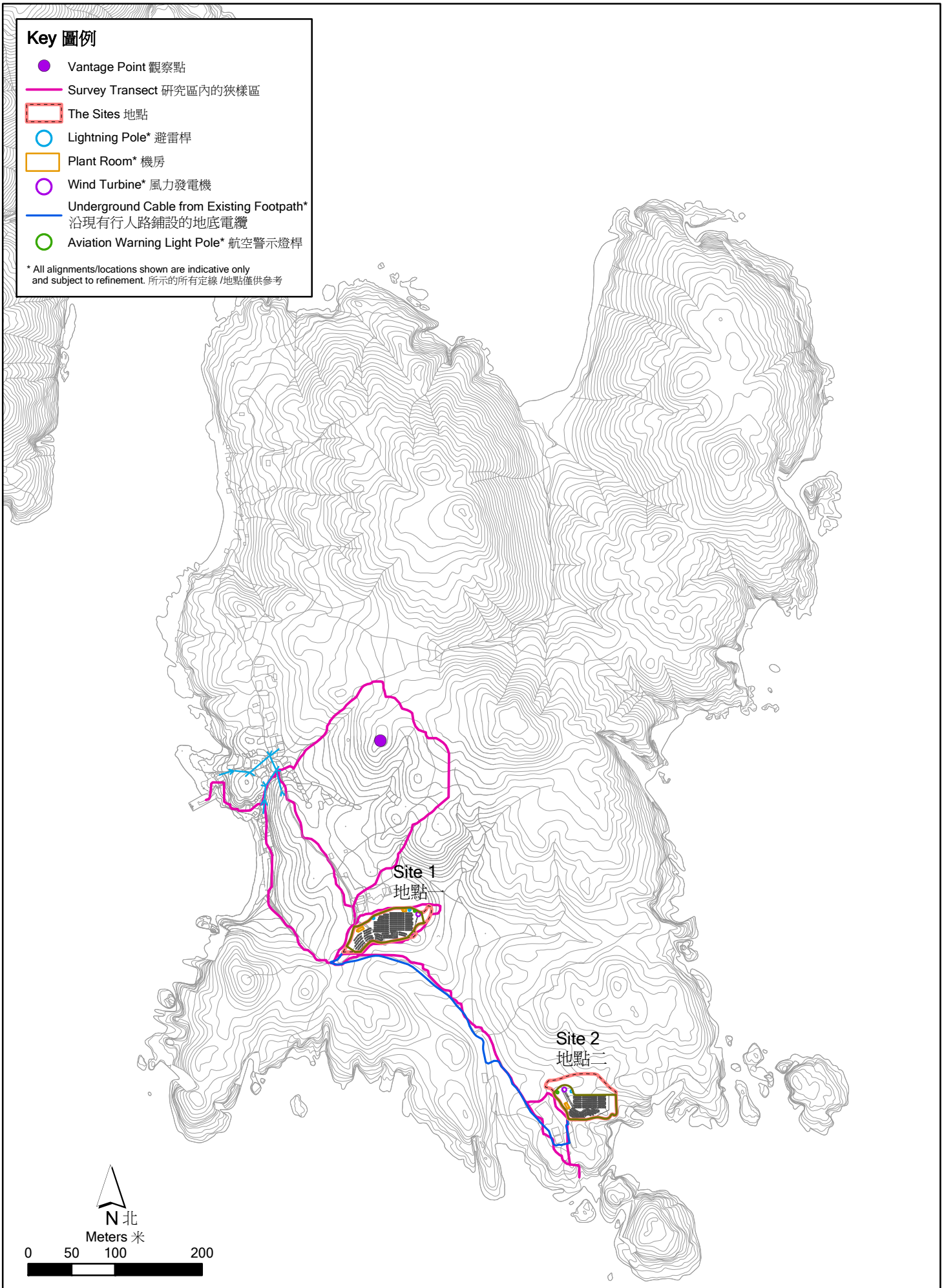

Figure B4
圖 B4

Survey Transect and Vantage Point within the Study Area
研究區內的狹樣區調查及定點法調查觀察點

File: eng chi\0103677_Survey Transect.mxd
Date: 12/05/2010

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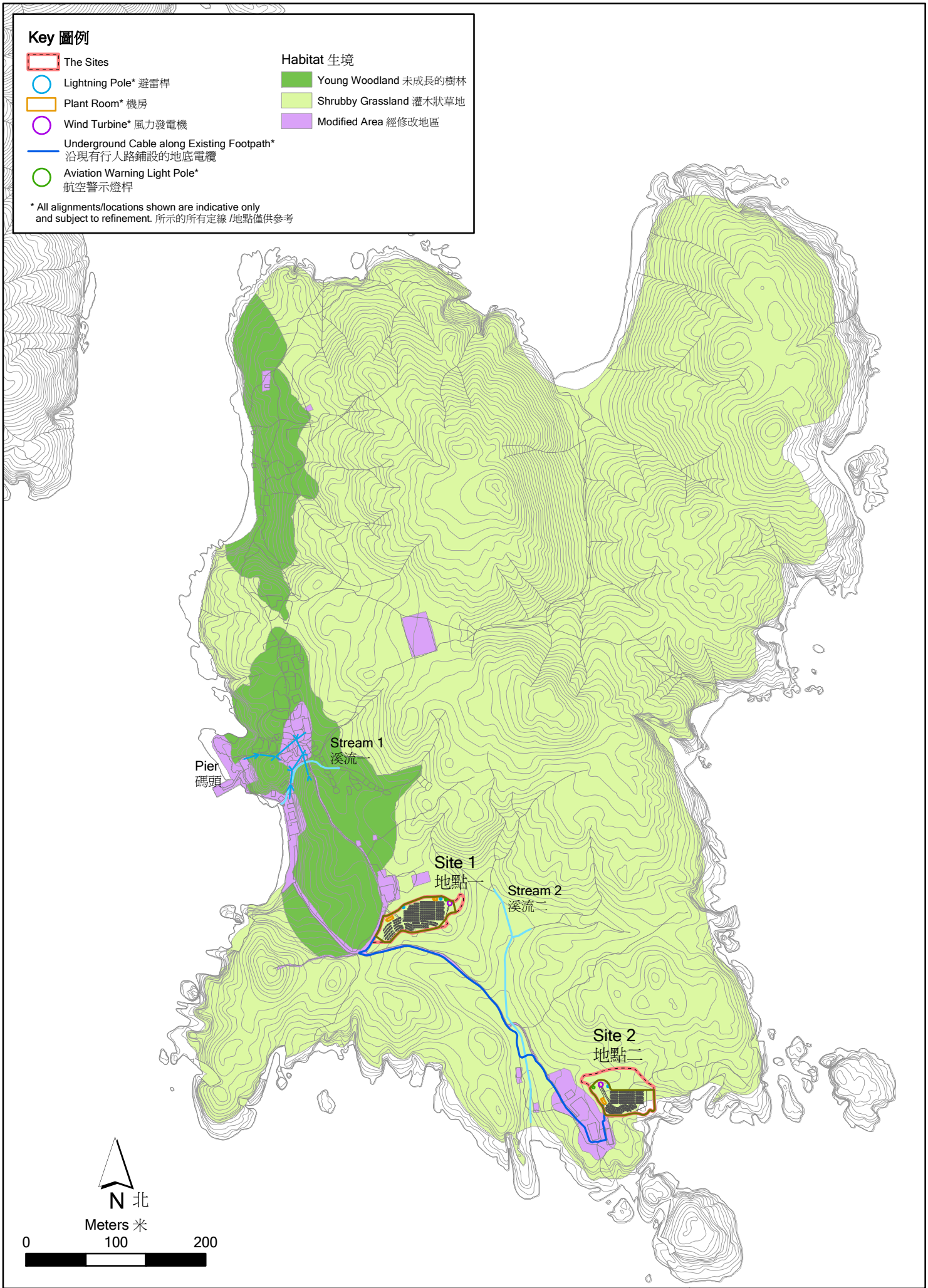

Figure B5
圖 B5

Terrestrial Habitat of Town Island
伙頭墳洲陸地生態

File: eng chi\0103677_habitat4.mxd
Date: 12/05/2010

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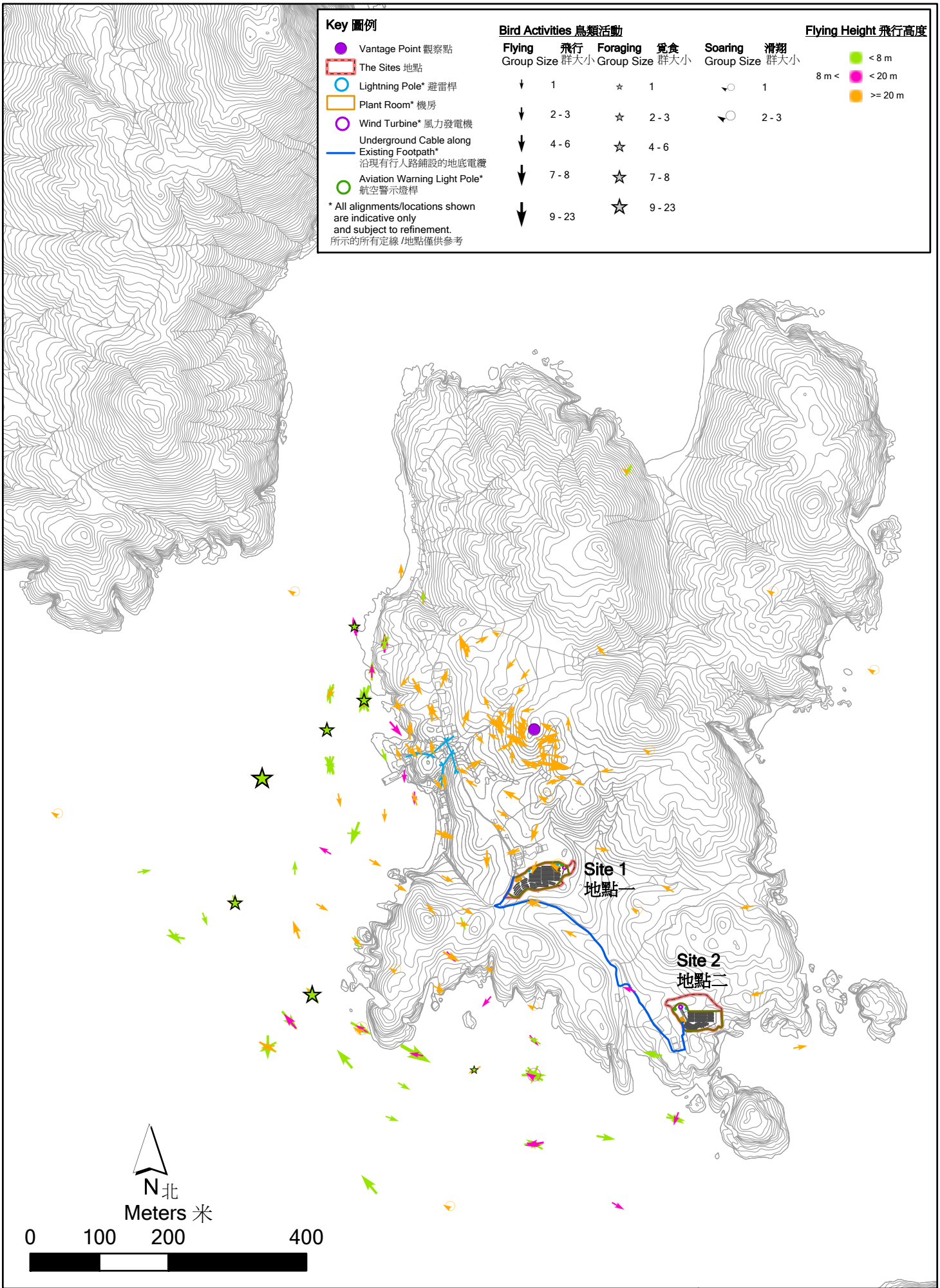

Figure B7
圖 B7

Sightings of All Birds (Jul 09 - Aug 09)
所有鳥類的觀察 (09 年7 月到09 年8 月)

File: eng chi\0103677_bird_JulAug09.mxd
Date: 12/05/2010

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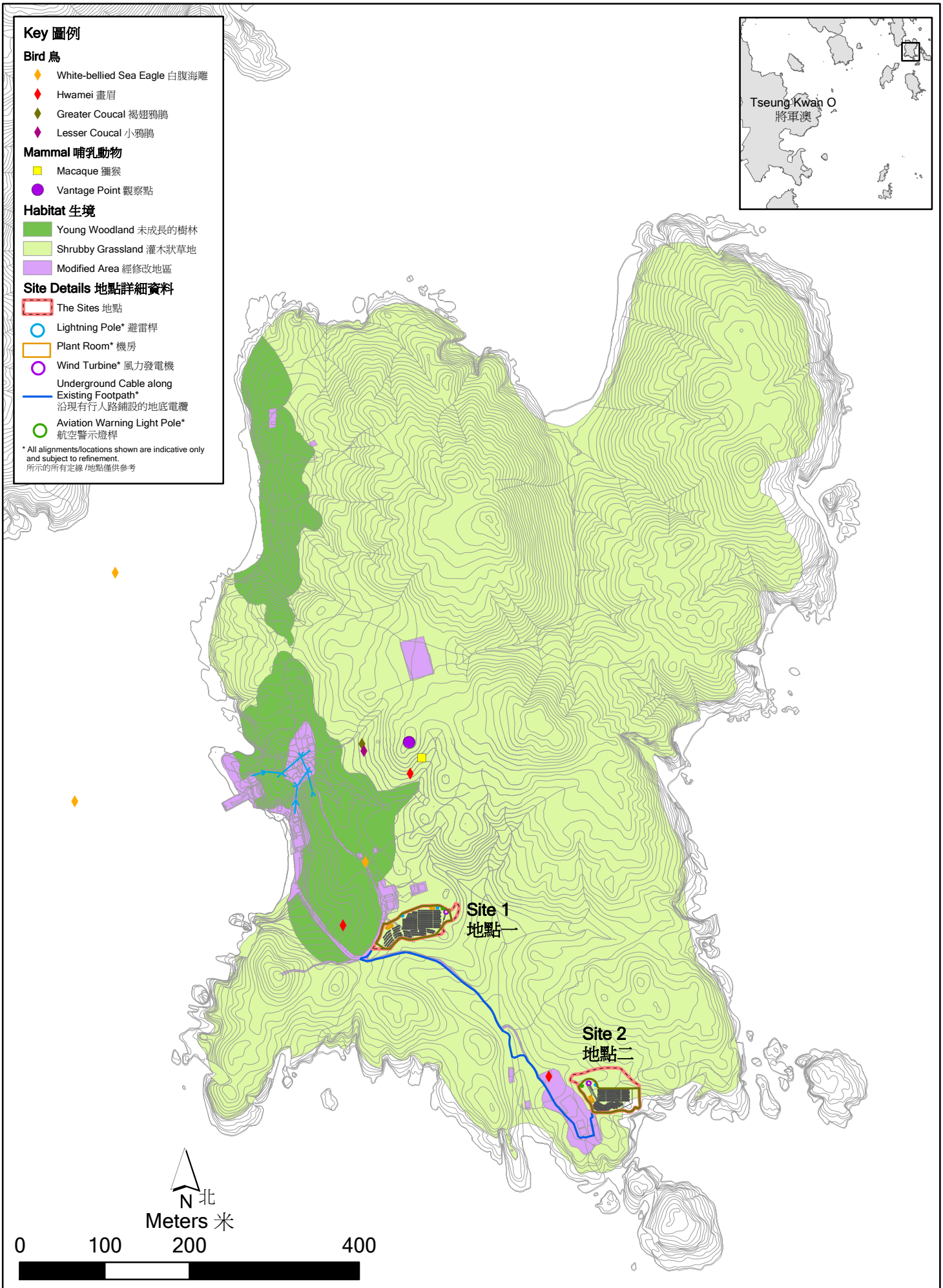

Figure B8
圖B8 Location of Species of Conservation Interest recorded within Study Area
研究區內具保護價值的物種的位置記錄

File: eng chi\0103677_conservation interest.mxd
Date: 12/05/2010

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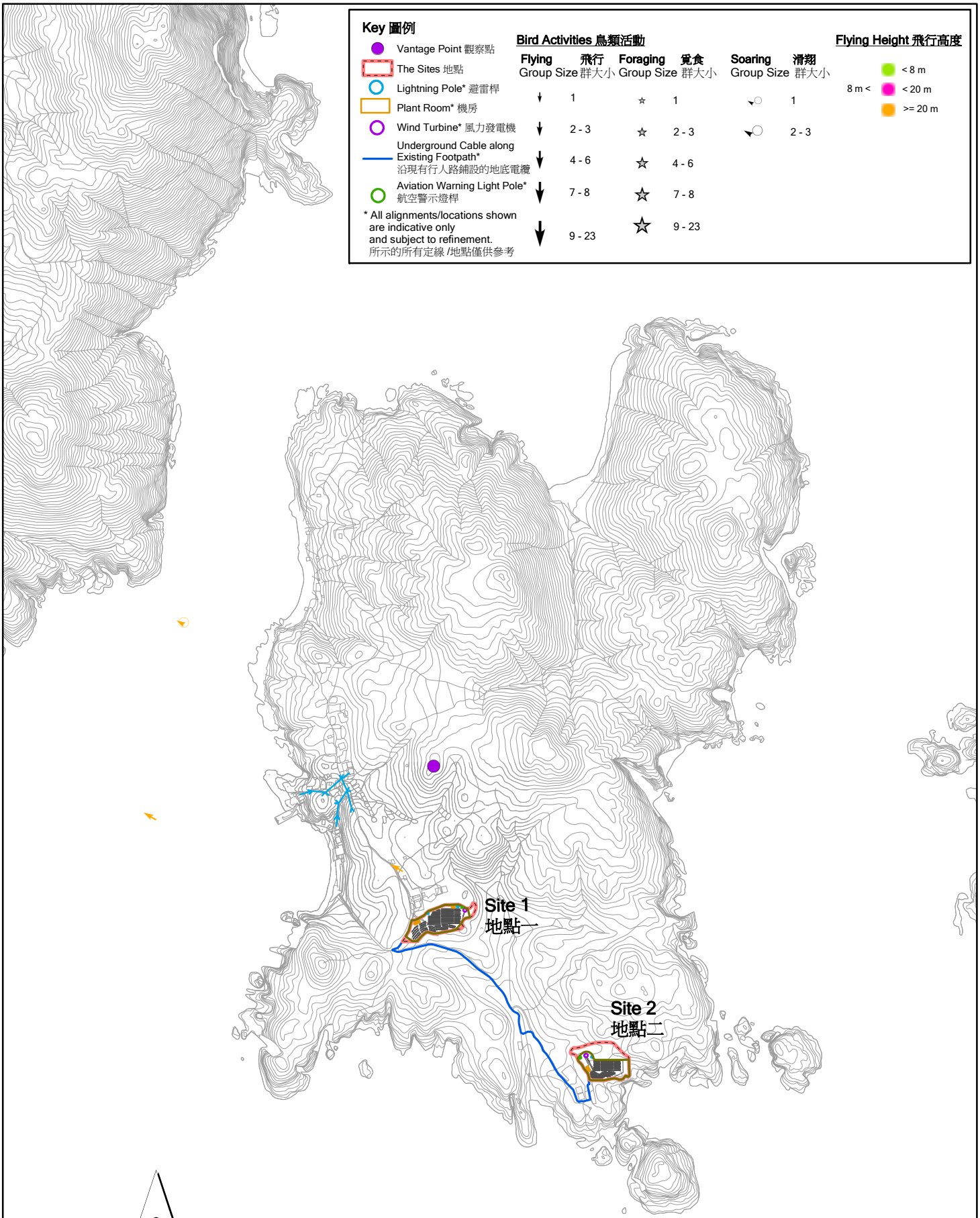

Figure B9
圖B9

Sightings of White-bellied Sea Eagle (Jul 09 - Aug 09)
白腹海雕的觀察記錄 (09 年7 月到09 年8 月)

File: eng chi\0103677_White-bellied Sea Eagle2.mxd
Date: 12/05/2010

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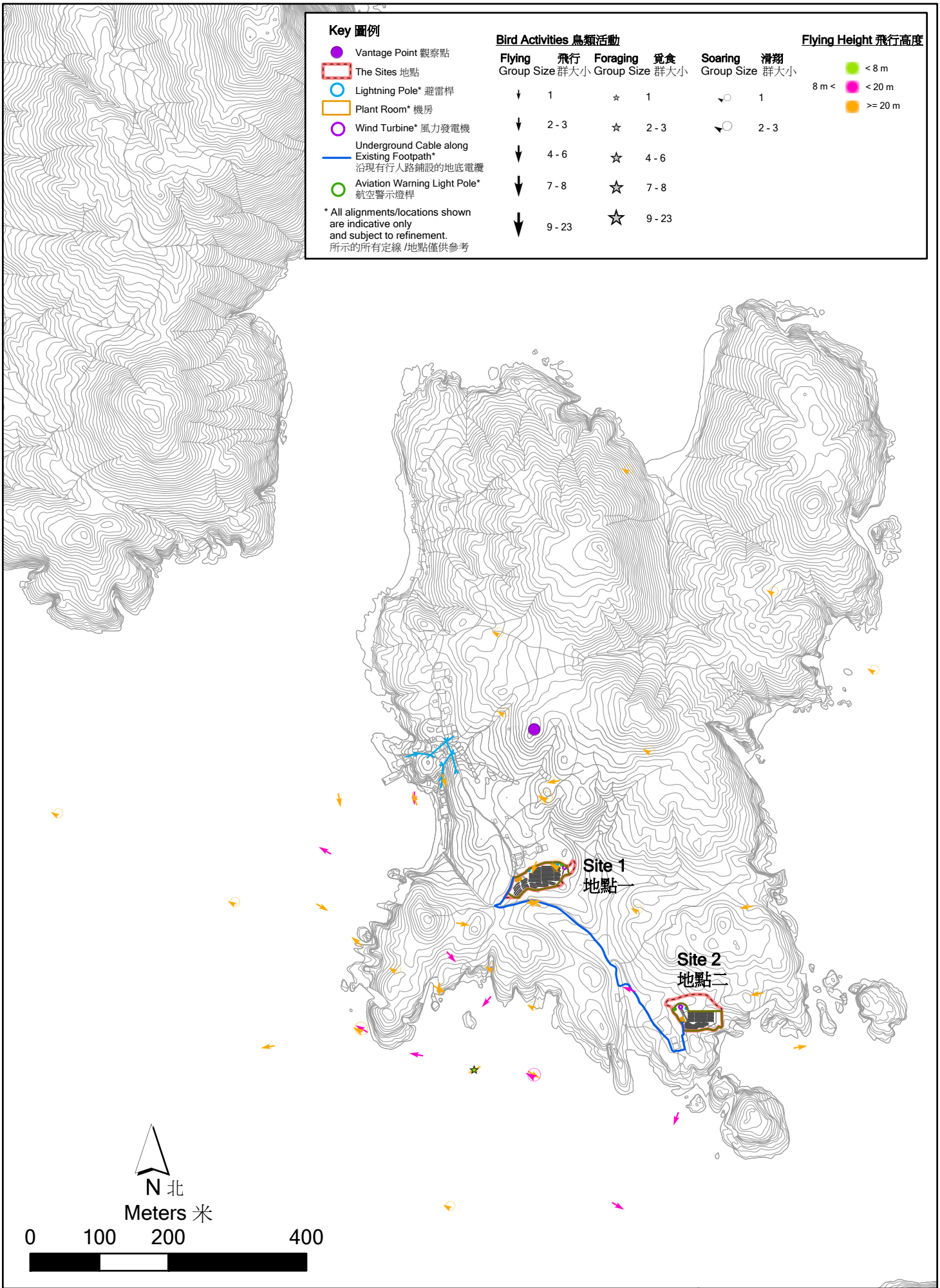

Figure B10
圖B10

Sightings of Black Kite (Jul 09 - Aug 09)
黑鳶的觀察記錄(09 年7 月到09 年8 月)

File: eng chi\0103677_Black Kite2.mxd
Date: 12/05/2010

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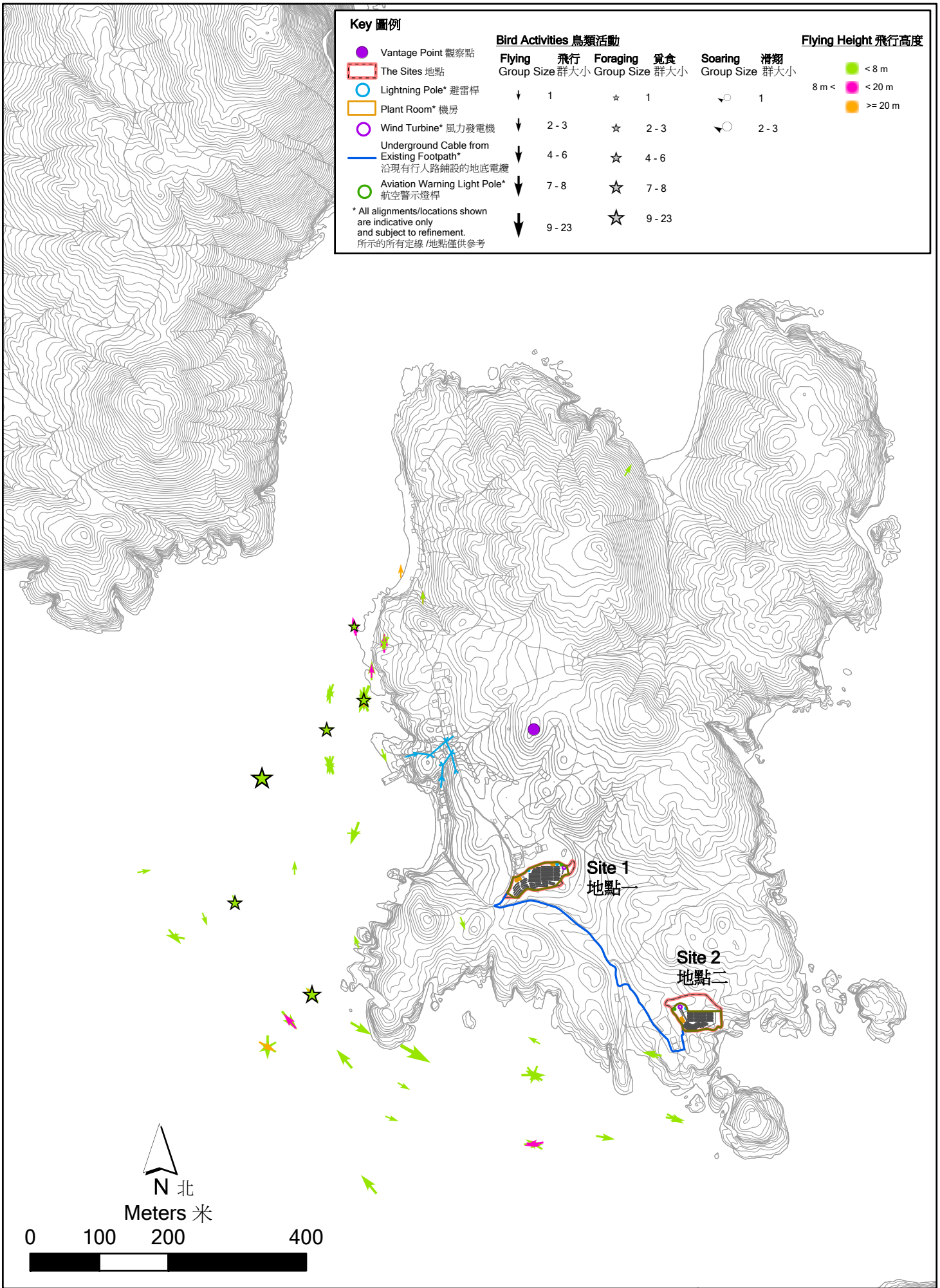

Figure B11
圖B11

Sightings of Black-naped Tern (Jul 09 - Aug 09)
黑枕燕鷗的觀察記錄(09 年7 月到09 年8 月)

File: 0103677_Black-naped Tern2.mxd
Date: 03/02/2010

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