土木工程拓展署
Civil Engineering and Development Department

Agreement No. CE 28/2004 (GE)

Landslide Preventive Works at Po Shan, Mid-levels Design and Construction (Natural Terrain Risk Mitigation Works)

Environmental Monitoring and Audit Manual

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1. INTRODUCTION

Project Description

Project Background

1.1 The study area can be broadly defined as encompassing the mostly undeveloped hillsides above the residential development at Po Shan Road and adjacent to the trimmed back slope on the site of the catastrophic 1972 Po Shan Road failure. Previous studies had been carried out and results indicated that the natural hillside above Po Shan Road is affected by high groundwater level and unfavourable geology. Sub-surface drainage measures by means of sub-horizontal drains had been installed in 1984-85. These measures have been successful in lowering the main ground water table, thus improving the stability of the slopes such that large-scale failures have not occurred in the last twenty years.

1.2 However, the hillside is susceptible to shallow failure and a shallow landslide had occurred during a rainstorm in June 2005.

1.3 The objective of the proposed project, namely "*Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction (Natural Terrain Risk Mitigation Works)*" (hereinafter referred to as "the Project"), is to carry out detailed design and supervision of landslide preventive works on local repair of the hillside to minimize slope deterioration and shallow instability.

Project Location and Scope

1.4 The proposed landslide preventive works would be constructed to protect the existing residential developments at the toe of the project site. The location of the project is shown in **Figure 1.1**.

1.5 The scope of works includes the installation about 700 numbers of soil nails and about 60 numbers of raking drains on the natural terrain within the concerned area. The length of the soil nails is about 20m with a spacing of 2m horizontally and 3m vertically; the length of raking drains is about 10m with a spacing of 5m horizontally and 15m vertically.

1.6 Rock slope stabilisation works will be provided for the rock outcrop / boulders at the upper portion of the natural terrain. Measures such as scaling, installation of rock bolts / dowels, construction of concrete buttress and provision of wire mesh protection will be provided where necessary.

1.7 No tree felling will be proposed under this Project.

Preliminary Construction Programme

1.8 The proposed works are scheduled to commence in November 2007 with duration of 10 months. The preliminary construction programme for the Project is presented in Appendix A.

Concurrent Projects

1.9 Another designated project "Agreement No. CE28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction" on-going during the same period within the captioned area which will also be carried out concurrently by the Project Proponent.

Need of an EM&A Programme

1.10 According to EPD's EM&A Guidelines for Development Projects in Hong Kong, the need of an EM&A programme for this Project is concluded with the following reasons:

- the project has the potential of causing environmental impacts which are or are likely to be prejudicial to the health or well being of the flora, fauna if the recommended mitigation measures are not properly implemented; and
- the project is situated in area of high conservation value."

Purpose of the Manual

1.11 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the set up of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to ensure the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme for the construction phase of the proposed Project. It aims to provide systematic procedures for monitoring, auditing and minimising environmental impacts associated with construction works and operation activities.

1.12 Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines have served as environmental standards and guidelines in the preparation of this Manual. In addition, the EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (EIAO-TM).

1.13 This Manual contains the following information:

- responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), and Environmental Team (ET), Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the project.
- project organisation for the project
- the basis for, and description of the broad approach underlying the EM&A programme
- requirements with respect to the construction programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact
- details of the methodologies to be adopted, including all field laboratories and analytical procedures, and details on quality assurance and quality control programme
- the rationale on which the environmental monitoring data will be evaluated and interpreted
- definition of Action and Limit levels
- establishment of Event and Action plans
- requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints
- requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures
- requirements for review of EIA predictions and the effectiveness of the mitigation measures / environmental management systems and the EM&A programme

1.14 For the purpose of this manual, the ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the EM&A requirements.

Project Organisation

1.15 The roles and responsibilities of the various parties involved in the construction phase EM&A process and the organisational structure of the organisations responsible for implementing the EM&A programme are outlined below. The proposed project organisation and lines of communication with respect to environmental protection works are shown in **Figure 1.2**.

Engineer or Engineer's Representative (ER)

1.16 The term Engineer or Engineer's Representative, refers to the organisation responsible for overseeing the construction works of the Project undertaken by various Contractors, and for ensuring that they are undertaken by the Contractors in accordance with the specification and contractual requirements. The ER should:

- monitor the Contractors' compliance with contract specifications, including the implementation and operation of the environmental mitigation measures and ensure their effectiveness, and other aspects of the EM&A programme
- monitor Contractors', ET's and IEC's compliance and ensure that the requirements in the EP and EM&A Manual are fully complied with
- provide assistance to the ET as necessary in the implementation of the EM&A programme
- appoint an IEC to audit the results of the EM&A works carried out by the ET
- Participate in joint site inspection undertaken by the ET and IEC
- comply with the agreed Event / Action Plan in the event of any exceedance
- adhere to the procedures for carrying out complaint investigation

The Contractor

1.17 The term "Contractor" should be taken to mean all construction contractors and sub-contractors, working on site at any one time. Besides reporting to the Engineer, the Contractor should:

- work within the scope of the relevant contract and other tender conditions
- employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of EM&A
- provide assistance to ET in carrying out monitoring
- participate in the site inspections undertaken by the ET as required, and undertake any corrective actions instructed by the Engineer
- provide information / advice to the ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions
- submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event / Action Plans
- implement measures to reduce impact where Action and Limit levels are exceeded
- adhere to the procedures for carrying out complaint investigation

Independent Environmental Checker (IEC)

1.18 The Independent Environmental Checker (IEC) should not be in any way an associated body of the Contractor or the ET for the Project. The IEC should be employed prior to the commencement of the construction of the Project. The IEC should have at least 7 years' experience in EM&A or environmental management, and have project management experience. The IEC should be appointed by the ER. The IEC should:

- advise the ER on environmental issues related to the project, independent from the management of construction works, but empowered to audit the environmental performance of construction and operation
- provide proactive advice to the ER and the Project Proponent on environmental matters.
- review and audit all aspects of the EM&A programme, including the implementation of environmental mitigation measures, submission relating to EP and EM&A, and any other

submission required under EP and EM&A Manual

- review and verify the monitoring data and all submissions relating to or under the EP and EM&A Manual submitted by the ET, including but not limited to the EM&A reports
- monitor the implementation of the EM&A programme and the overall level of environmental performance being achieved
- arrange and conduct regular, at least monthly site inspections of the works during construction and operation phases, and ad hoc inspections if significant environmental problems are identified
- comply with the agreed Event / Action Plan in the event of any exceedance
- check and ensure the procedures for carrying out complaint investigation being followed and check the effectiveness of corrective measures
- feedback audit results to ET by signing off relevant EM&A proforma
- Ensure the impact monitoring is conducted at the correct locations at the frequency identified in the EM&A Manual
- Check that the mitigation measures are effectively implemented
- Report the works conducted, the findings, recommendation and improvement of the site inspections, the findings, recommendation, and improvement after reviewing ET's and Contractor's works, and any advices to the ER and Project Proponent on a monthly basis

Environmental Team (ET)

1.19 The ET shall be employed to conduct the EM&A programme and be managed by the ET Leader. The ET Leader shall be a person who has at least 7 years' experience in EM&A or environmental management. Suitably qualified staff should be included in the ET, and resources for the implementation of the EM&A programme should be allocated in time under the Contract, to enable fulfilment of the Project's EM&A requirements as specified in the EM&A Manual during construction and operation of the Project. The ET shall report to the Engineer and the duties shall include:

- monitor and audit various environmental parameters as required in this EM&A Manual
- analyse the environmental monitoring and audit data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising
- carry out regular site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems
- monitor compliance with conditions in relevant Environmental Permit (EP), environmental protection, pollution prevention and control regulations and contract specifications
- audit environmental monitoring data and site environmental conditions
- report on the environmental monitoring and audit results to the IEC, Contractor, the ER and EPD or its delegated representative
- recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans
- liaise with the IEC on all environmental performance matters and timely submit all relevant EM&A proforma for the approval by IEC
- advise the Contractor on environmental improvement, awareness, enhancement matters, etc., on site
- adhere to the procedures for carrying out complaint investigation

- timely submit the EM&A Report to the Project Proponent and EPD

1.20 Sufficient and suitably qualified professional and technical staff should be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

2. ECOLOGY

Introduction

2.1 The baseline ecological surveys in the EIA Report identified that 4 habitats, including natural woodland, shrubland, developed area and freshwater habitat, were found within the assessment area. About 80% of the assessment area, particularly the area to be directly affected by the proposed Project, is natural woodland. Eight species of flora and 8 fauna of conservation interest have been recorded from the assessment area during the surveys. In which, two plant species of conservation interest, Small Persimmon and Common Tutcheria, would be directly affected by the Project. A habitat map of the assessment area is given in **Figure 2.1**.

2.2 The ecological impact assessment in the EIA Report identified that ecological impacts resulting from the proposed landslide preventive works are anticipated to be minor in scale. Nevertheless, measures were identified in the EIA Report that would minimise any potential ecological impact. Ecological mitigation measures are detailed in the following sections.

Ecological Mitigation Measures

2.3 Following EIAO-TM Annex 16 guidelines, mitigation measures are proposed in this section to avoid, minimise and compensate for identified ecological impacts.

Avoidance/ Minimising

2.4 The location of the soil nail installation should be carefully selected and adjusted on-site to avoid/minimise the damage of root system to the existing plants on slope surface. No tree felling is required.

2.5 The following measures should be implemented to minimise identified ecological impacts during the construction and operation phases.

Construction Phase

2.6 Fences should be erected and installed along the boundary of the proposed works area before the commencement of works in order to minimise the disturbance to the natural woodland and shrubland habitats by preventing tipping, vehicle movements and encroachment of personnel onto the adjacent areas.

2.7 To minimise the indirect impacts to the nearby stream course and drainage culvert, the following measures should be implemented:

- Any runoff and drainage water with high levels of suspended solids should be prevented from entering the nearby water-bodies.
- Site runoff should be directed towards regularly cleaned and maintained silt traps and oil/grease separators to avoid and minimise the risk of sedimentation and pollution of the nearby stream courses and drainage culvert. The silt and oil/grease separators should be appropriately designed for the local drainage and ground conditions.
- An outlet pipe extending above the slope surface should be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting.
- Air should be used as the flushing medium of the drilling equipment to avoid the groundwater being affected by the flushing medium.
- Permanent casing should be provided to the drillhole of soil nail within the permeable colluvium

layer as instructed by the Engineer.

- Debris and rubbish generated on-site should be collected, handled and disposed of properly.

2.8 It has been identified in the EIA report that two plant species of conservation interest (Hong Kong Pavetta, *Pavetta hongkongensis* and Common Tutcheria, *Tutcheria spectabilis*) (**Appendix 2.2**) would be potentially affected by the proposed construction of soil nailing. In view of this, specific mitigation measures have been recommended for these species:

- A detailed vegetation survey of the affected species of conservation interest should be conducted by a suitably qualified botanist/ecologist with over 7 years relevant experience to identify the affected individuals of the floral species of conservation concern, including but not limited to Small Persimmon, Common Tutcheria, Bird-nest Fern and Chinese Pholidota. These species should be labelled on site prior to the commencement of works for better protection.

2.9 To minimise disturbance to habitats adjacent to the works areas and the wildlife inhabiting, noise mitigation measures as listed below should be implemented:

- Quieter powered mechanical equipment should be used during the construction phase.
- Insulating fabric should be used for drill rigs during the drilling process in the construction of soil nailing.
- Noise generating construction works should be implemented at daytime only.
- Measures such as noise barriers should be used to minimise disturbance to the bat roost identified close to the western side of the works area.

2.10 To minimise the construction dust impact to the vegetation within and in vicinity of the proposed works area, the following mitigation measures as listed below should be implemented:

- Regular watering should be used during the construction of soil nailing.
- Any aggregate or dusty material storage piles should be completely covered.
- Dusty activities should be re-scheduled if high-wind conditions encountered.

2.11 Standard good site practice measures should be implemented throughout the construction phase. The measures should include:

- Placement of equipment or stockpile in designated works areas and access routes selected on existing disturbed land to minimise disturbance to natural or moderate-high ecological value habitats.
- Construction activities should be restricted to work areas that should be clearly demarcated. The work areas should be reinstated after completion of the works.
- Waste skips should be provided to collect general refuse and construction wastes. The wastes should be disposed of timely and properly off-site.
- General drainage arrangements should include sediment and oil traps to collect and control construction site run-off.
- Open burning on works sites is illegal, and should be strictly prohibited.
- Any soil contamination with fuel leaked from construction plants should be removed off-site.
- Disturbance to existing vegetation should be minimised wherever possible. In particular, adequate protection should be provided for mature trees located within or adjacent to the proposed works area.

Operation Phase

2.12 No substantial increases in direct or indirect ecological impacts are expected and ecological monitoring will not be required.

Compensation

2.13 Compensatory planting as listed below would be required due to the loss of trees and vegetations:

- Planting of suitable shrubs/herbs, including the Small Persimmon, should be provided within the within the impacted areas under this Project to compensate for the loss of understorey vegetation of the woodland habitat due to the construction of landslide preventive works.
- Chinese Fan-palm (*Livistona chinensis*) near the existing bat roost in the project area should be planted to provide suitable habitat for the Short-nosed Fruit Bat (*Cynopterus sphinx*) after the completion of landslide preventive works.

Ecological Monitoring and Audit Requirements

2.14 The proper implementation of mitigation measures during construction phase recommended in Sections 2.6 to 2.13 should be monitored and audited.

2.15 A suitably qualified local ecologist(s) with over 7 years relevant ecological experience as a member of the ET shall be responsible for carrying out a specific monitoring programme of the plant individuals of conservation interest identified within the proposed works area during the detailed vegetation survey. Regular monitoring of the trees, shrubs and herbs should be conducted to check on the health and condition of the plants. Monitoring should be conducted twice a month cover the whole construction period.

3. LANDSCAPE AND VISUAL

Introduction

3.1 Landscape and Visual Impact Assessment in the EIA Report has identified the key issues and the possible impacts due to the proposed work. It has also recommended mitigation measures for minimizing the impacts and for improving overall landscape and visual quality. The main Contractor to be employed by Project Proponent will be responsible for the implementation of mitigation measures. Both Project Proponent and the main Contractor shall employ their own qualified landscape consultants for the construction and during operation.

Monitoring Requirement

3.2 A Registered Landscape Architect (RLA) as a member of the ET shall be responsible for conducting the baseline review and monitoring the implementation of landscape and visual mitigation measures during construction phase in accordance with the EIA Report. Visual sensitive receivers (VSRs) identified in the EIA Study are shown in **Figure 3.1**.

Construction Phase

Baseline Review

3.3 A baseline review shall be undertaken at the commencement of the construction contracts. The purpose of the review is:

- to check the status of the landscape resources within, and immediately adjacent to, the construction sites and works areas
- to determine whether any change has occurred to the status of the landscape resources since the EIA
- to determine whether amendments in the design of the landscape and visual mitigation measures are required for those changes
- to recommend any necessary amendments to the design of the landscape and visual mitigation measures

Design of Landscape and Visual Mitigation Measures

3.4 The landscape and visual mitigation measures shall be incorporated to ensure the mitigation effect and achieve the intended aims as described in **Appendix B** of this Manual. Any changes to the mitigation measures that may be recommended as a result of the Baseline Review or ongoing Monitoring of the Design, Construction and Establishment Works shall be taken into account.

Landscape and Visual Monitoring

3.5 The design, implementation and maintenance of landscape and visual mitigation measures shall be checked bi-weekly to ensure that they are fully realised. Any potential conflicts between the proposed landscape measures and any other project works or operation requirements shall also be recorded for the Contractor to resolve in early stage, without compromising the intention of the mitigation measures.

Operation Phase

Landscape and Visual Monitoring

3.6 All landscape and visual mitigation measures shall be monitored monthly during the first year of the Operation Phase to ensure the effectiveness of the measures.

3.7 Monthly site inspections will be undertaken to ensure the compensatory planting and horticultural maintenance operations are properly established during the 12 month establishment period. Photo record will be submitted to EPD after each site inspection.

Mitigation Measures

Construction Phase

3.8 During the construction of the Project, due consideration on existing surrounding vegetation during construction should be given:

- Designation of 'no-intrusion zones', and to record any trespass by the Contractor, including the damage to existing vegetation
- Allowance for adjustment of soil nails on site for the avoidance of tree trunks and tree roots
- Dust and erosion control for exposed soil
- Tree planting operations, checking method statement against specification requirements
- All retained trees within the working boundary should be regularly checked during the construction phase. Any trespass by the main contractor, including damage to the tree canopy edge, should be reported to the Engineer.

3.9 Appearance and view considerations:

- control over the appearance of construction workers, hoarding, construction plants/ machines
- careful selection of security floodlights to avoid light pollution

3.10 Inspection / site supervision by qualified resident site staff, such as Registered Landscape Architect (RLA).

Operation Phase

3.11 Monthly site inspections should be undertaken to ensure the compensatory planting and horticultural maintenance operations are properly established during the 12 month establishment period. Inspection auditing should focus on the following horticultural maintenance operations:-

- Inspection for fungal / viral attacks and pest infestations
- Litter collection
- Watering
- Weeding removal
- Replacement of defective planting material
- Grass cutting / groundcover trimming and removal of arisings
- Fertilising application as required in specification
- Aeration / mulching application

3.12 The implementation for the recommended landscape and visual impact mitigation measures is presented in **Appendix B**.

4. CONSTRUCTION NOISE

Introduction

4.1 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during the construction phase of the Project are presented.

Methodology and Criteria

4.2 The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq\ (30\ minutes)}$ shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods, $L_{eq\ (15\ minutes)}$ shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.

4.3 Supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in **Appendix C** for reference.

4.4 Whilst the Noise Control Ordinance (NCO) does not provide for the statutory control of construction activities occurring on weekdays during normal working hours (i.e. Monday to Saturday inclusive 0700-1900 hours), a daytime standard of $L_{eq(30\ minute)}$ 75dB stipulated in Annex 5 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) shall be used as the appropriate criterion for all residential dwellings; while a daytime standard of $L_{eq(30\ minute)}$ 70dB will be adopted for all educational institutions during normal school days and $L_{eq\ (30\ minute)}$ 65dB during examination periods.

4.5 The NCO provides statutory controls on general construction works during restricted hours (i.e. 1900-0700 hours Monday to Saturday and at any time on Sundays and public holidays). The ANLs for evenings and holidays and for night-time are dependent on the Area Sensitivity Rating at the NSR. The relevant ANLs are provided in **Table 4.1**.

Table 4.1 Acceptable Noise Levels (ANLs)

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

4.6 The locations of noise sensitive receivers (NSRs) adjacent to the project area are shown in **Figure 4.1**. The Area Sensitivity Rating of the NSRs in the vicinity of the Project Area is considered as 'A'. However, construction works during the restricted hours for this Project is not expected.

Monitoring Equipment

4.7 As referred to the Technical Memorandum (TM) issued under the NCO, sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration levels from before and after the noise measurement agree to within 1.0 dB.

4.8 Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5ms^{-1} or wind with gusts exceeding 10ms^{-1}. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

4.9 The ET is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

Monitoring Locations

4.10 Based on the EIA Report, locations designated for construction noise monitoring are listed in **Table 4.2** and illustrated in **Figure 4.2**.

Table 4.2 Noise Monitoring Stations during Construction Phase

Identification No.	NSR ID in EIA Report	Noise Monitoring Location
CN1	N1	Block A, Po Shan Mansions
CN2	N2	Block A, Po Shan Mansions

4.11 Noise impacts during the operation phase included project-induced road traffic noise, fixed plant and entertainment noises. The EIA revealed that adverse project-induced traffic and fixed plant noise impacts on the NSRs would not occur.

4.12 The status and location of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from the ER and agreement from the IEC and deposit the proposal with EPD. When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:

- Monitoring at sensitive receivers close to the major site activities which are likely to have noise impacts
- Monitoring at the noise sensitive receivers as defined in the Technical Memorandum
- Assurance of minimal disturbance to the occupants during monitoring

4.13 The monitoring station shall normally be at a point 1m from the exterior of the noise sensitive facade and be at a position 1.2m above ground. If there is a problem with access to the normal monitoring position, an alternative position should be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. The ET shall agree with the IEC and deposit with EPD on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

Baseline Noise Environment

4.14 Regular noise monitoring is carried out at the designated monitoring stations under the adjacent on going CEDD project which was controlled under Environmental Permit EP-235/2005/A. These noise monitoring results could be referenced as the baseline noise levels for this Project.

Impact Monitoring

4.15 Noise monitoring shall be carried out at all the designated monitoring stations. The monitoring frequency shall depend on the scale of the construction activities. An initial guide on the monitoring is to obtain one set of 30-minute measurement at each station between 0700 and 1900 hours on normal weekdays at a frequency of once a week when construction activities are underway.

4.16 If construction works are extended to include works during the hours of 1900 – 0700, or general holidays and Sundays, impact monitoring in terms of 3 consecutive $L_{eq\ (5\ minutes)}$ shall be carried out at a minimum frequency of once a week during evening, general holiday or night-time works. Applicable construction noise permits (CNP) under NCO shall be obtained by the Contractor.

4.17 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in Event / Action Plan in **Table 4.5** shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

4.18 The ER or ET shall maintain communication with the local residents through the liaison office established by the adjacent CEDD concurrent project which was controlled under Environmental Permit EP-235/2005/A.

Event and Action Plan

4.19 The action and limit levels for construction noise are defined in **Table 4.4**. Should non-compliance of the criteria occur, action in accordance with the Event / Action Plan in **Table 4.5** shall be carried out. If exceedances are resulted from cumulative impacts, all steps stipulated in the Event / Action Plan shall be carried out.

Table 4.4 Action and Limit Levels for Construction Noise

Time Period	Action Level	Limit Level
0700 – 1900 hours on normal weekdays	When one documented complaint is received from any one of the sensitive receivers	75 dB(A)*
1900-2300 on all days and 0700-2300 on general holidays (including Sundays)		60/65/70 dB(A)**
2300-0700 on all days		45/50/55 dB(A)**

* Reduced to 70dB(A) for schools or institution and 65dB(A) during school examination periods

** To be selected based on the Area Sensitivity Rating of A/B/C, and the conditions of the applicable CNP(s) must be followed.

Table 4.5 Event / Action Plan for Construction Noise

Event	Action			
	ET	Contractor	ER	IEC
Action Level	1. Identify source. 2. Notify IEC, ER and Contractor. 3. Conduct additional noise monitoring to investigate the causes. 4. Report the investigation results to the IEC, ER and Contractor. 5. Discuss with Contractor for their formulation of remedial measures if the exceedance is related to construction works. 6. Conduct additional monitoring to check mitigation effectiveness.	1. Take immediate action to avoid further exceedance. 2. Submit noise mitigation proposals to ET, ER and IEC. 3. Implement noise mitigation proposals.	1. Confirm receipt of notification of failure in writing. 2. Notify Contractor. 3. Require Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented.	1. Review the analysed results submitted by the ET. 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly. 3. Supervise and confirm in writing the implementation of remedial measures
Limit Level	1. Identify source. 2. Notify EPD, IEC, ER and Contractor. 3. Conduct additional noise monitoring and analyse Contractor's working procedures to determine possible cause of exceedance. 4. Provide interim report to EPD, IEC and ER on the causes and proposed actions to be taken for the exceedances if exceedance is related to construction works 5. Assess effectiveness by additional monitoring and report to EPD, IEC, ER and Contractor the results. 6. If exceedance stops, cease additional monitoring.	1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to ET, ER and IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.	1. Confirm receipt of notification of failure in writing. 2. Notify Contractor. 3. Require Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Discuss amongst ER, ET and Contractor on the potential remedial actions. 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly. 3. Supervise and confirm in writing the implementation of remedial measures.

Mitigation Measures

Good Site Practice

4.20 Although the noise mitigation effects are easily quantifiable and the benefits may vary with site conditions and operating conditions, good site practices are easy to implement and do not impact upon the works schedule. The site practices listed below should be followed during each phase of construction:

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program
- Mobile plant, if any, should be sited as far from NSRs as possible
- Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum
- Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs
- Material stockpiles and other structures should be effectively utilized, wherever practicable, in screening noise from on-site construction activities

Adoption of Quieter Plant

4.21 In order to reduce the excessive noise impacts at the affected NSRs during normal daytime working hours, quieter plants are recommended. The Contractors do not have to use specific items of quiet plant adopted in this assessment. The Contractors may use other type of quiet plant, which have the same total SWL, to meet their needs.

Use of Movable Noise Barrier

4.22 The use of movable barrier for certain PME could further alleviate the construction noise impacts. In general, 5dB(A) reduction for movable PME and 10dB(A) for stationary PME can be achieved depending on the actual design of movable noise barrier.

4.23 The Contractor should be responsible for design of the movable noise barrier with due consideration given to the size of the PME and the requirement of intercepting the line of sight between the NSRs and PME. Barrier material of surface mass in excess of 7kg/m^2 is recommended to achieve the predicted screening effect.

Use of Noise Insulating Fabric

4.24 As Works Area E is close to the NSRs, noise insulating fabric has to be adopted when drill rig is operating in this area. The maximum number of drill rig to be operated in Works Area E is two.

5. CONSTRUCTION WATER QUALITY

Introduction

5.1 The water quality impact assessment in the EIA Report identified that no adverse impact would occur during the construction of the Project provided the recommended mitigation measures were correctly implemented. It is recommended that regular site inspections (at least weekly) be undertaken to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

Site Inspection

5.2 The site inspection should be conducted at least weekly to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

Mitigation Measures

Construction Phase

Construction Site Run-off and Drainage

5.3 The site practices outlined in ProPECC PN 1/94 "*Construction Site Drainage*" should be followed as far as practicable in order to minimise surface runoff and the chance of erosion. The specified mitigation measures and practices include the following:

- Provision of perimeter drains to intercept storm-runoff from outside the works area. These shall be constructed in advance of site formation works and earthworks. Earth bunds or sand bag barriers should be provided on-site to direct storm water to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the Contractor prior to the commencement of construction.
- Sand/silt removal facilities such as sand/silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the Water Pollution Control Ordinance. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. The detailed design of the sand/silt traps will be undertaken by the Contractor prior to the commencement of construction.
- Air should be used as the flushing medium of the drilling equipment to avoid the groundwater being affected by the flushing medium. In addition, permanent casing may be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer to minimize the impact to the groundwater table situated at the permeable soil stratum.
- An outlet pipe extending above the slope surface should be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.
- Exposed slope/soil surface should be covered by tarpaulin as soon as possible to reduce the potential of soil erosion. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94.

- Open stockpiles of construction materials or construction wastes on-site of more than $50m^3$ should be covered with tarpaulin or similar fabric during rainstorms.

5.4 The Contractor should ensure that all site runoff and drainage arising from the works area are properly treated by the use of sedimentation tank, and that the discharge standards as stipulated in the "Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters" are met. The treated site runoff and drainage water should be discharged to the licensed point near the tunnel portal of the concurrent landslide preventive works at Po Shan under Agreement No. CE28/2004 (GE).

General Construction Activities

5.5 Debris and rubbish generated on-site should be collected, handled and disposed of properly to avoid being flushed or blown by wind into the drainage culvert. Stockpiles of cement and other construction materials should be kept covered when not being used.

5.6 Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.

Sewage from Construction Workforce

5.7 Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor would be responsible for appropriate disposal of waste matter and maintenance of these facilities.

5.8 The implementation schedule for the recommended water quality mitigation measures is presented in **Appendix B**.

6. CONSTRUCTION AIR QUALITY

Introduction

6.1 This section presents the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impacts during the construction phase of the Project.

6.2 The objectives of the air quality monitoring shall be:

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

Methodology and Criteria

6.3 The criteria against which ambient air quality monitoring shall be assessed are:

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

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

Monitoring Equipment

6.5 1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust. The TSP levels shall be measured by following the standard method as set out in *High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA*.

6.6 Air shall be drawn through a high volume sampler (HVS) fitted with a conditioned, pre-weighed filter paper, at a controlled rate. After sampling for 24-hours, the filter paper with retained particles is collected and returned to the laboratory for drying in a desiccator followed by accurate weighing. 24-hour average TSP levels are calculated from the ratio of the mass of particulates retained on the filter paper to the total volume of air sampled.

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

6.8 HVS in compliance with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:

- 0.6 - 1.7 m^3 per minute (20 - 60 standard cubic feet per minute) adjustable flow range.
- equipped with a timing / control device with ± 5 minutes accuracy for 24 hours operation.
- installed with elapsed-time meter with ± 2 minutes accuracy for 24 hours operation.

- capable of providing a minimum exposed area of 406 cm^2 (63 in^2).
- flow control accuracy: ± 2.5% deviation over 24-hour sampling period.
- incorporated with an electronic mass flow rate controller or other equivalent devices.
- equipped with a flow recorder for continuous monitoring.
- provided with a peaked roof inlet.
- incorporated with a manometer.
- able to hold and seal the filter paper to the sampler housing at horizontal position.
- easy to change the filter.
- capable of operating continuously for 24-hour period.

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

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

6.11 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down on the data sheet as mentioned in **Appendix C**.

Monitoring Locations

6.12 Two potentially worst affected locations have been identified for TSP dust monitoring as shown in **Table 6.1** and illustrated in **Figure 6.1**. Prior to the commencement of the EM&A programme, the proposed air quality monitoring stations shall be discussed and agreed with the Engineer, the ET, IEC and deposit with EPD.

Table 6.1 Air Monitoring Station during Construction Phase

Identification No.	ASR ID in EIA Report	Air Quality Monitoring Location
CA1	A1	Access road to Po Shan Mansions
CA2	A2	Podium of Hamilton Court

6.13 When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:

- monitoring at sensitive receivers close to the major site activities which are likely to have air quality impacts.
- monitoring at the air sensitive receivers as defined in the Technical Memorandum.
- assurance of minimal disturbance to the occupants during monitoring.

6.14 When positioning the HVS samplers, the following points shall be noted:

- a horizontal platform with appropriate support to secure the samples against gusty wind shall be provided.
- no two samplers shall be placed less than 2 m apart.
- the distance between the sampler and an obstacle, such as buildings, must be at least twice the

height that the obstacle protrudes above the sampler.

- a minimum of 2 m separation from walls, parapets and penthouses is required for rooftops samplers.
- a minimum of 2 m separation from any supporting structure, measures horizontally is required.
- no furnace or incinerator flue is nearby.
- airflow around the sampler is unrestricted.
- the sampler is more than 20 m from the dripline.
- any wire fence and gate to protect the sampler, shall not cause any obstruction during monitoring.
- permission must be obtained to set up the samplers and to obtain access to the monitoring stations.
- a secured supply of electricity is needed to operate the samplers.

Baseline Monitoring

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

6.16 TSP baseline monitoring shall be carried out for a continuous period of at least 7 days under typical weather conditions with the 24-hour and three 1-hour ambient measurements taken daily at each monitoring location. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources shall also be recorded throughout the baseline monitoring period.

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

6.18 If the ET considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the baseline levels and air quality criteria, after consultation and agreement with the ER, the IEC and deposit with EPD.

Impact Monitoring

6.19 The monthly schedule of the compliance and impact monitoring programme shall be drawn up by the ET one month prior to the commencement of the scheduled construction period. At the initial stage of the construction, impact monitoring with sampling frequency of at least once in every 7-days shall be strictly observed at all of the monitoring stations for 24-hour TSP monitoring. 1-hour TSP monitoring shall also be conducted at least three times in every 7 days when the highest dust impacts are likely to occur. The impact monitoring programme at the initial stage is summarised in **Table 6.2**.

Table 6.2 Initial Impact Monitoring Programme (TSP)

Sampling duration	Frequency
1 hour	3 times every 7 days
24 hours	Once every 7 days

6.20 As the EIA Study concluded that the potential construction air quality impact is expected to be minimal, the ET could halt the air quality monitoring if the monitoring results of the first month are below the Action / Limit Levels (see Section 6.22) after consultation and agreement with the ER, the

IEC and deposit with EPD. Should any complaint on the air quality impact is received, the monitoring have to be carried out again to verify the issue. The ER or ET shall maintain communication with the local residents through the liaison office established by the adjacent CEDD concurrent project which was controlled under Environmental Permit Ep-235/2005/A.

6.21 Before commencing the monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct an on-site audit to ensure the accuracy of the impact monitoring results.

Compliance Assessment

6.22 Action and Limit levels that provide an appropriate framework for the interpretation of monitoring results have to be agreed between ET, IEC, EPD and the Engineer before commencement of the air monitoring. The air quality monitoring data shall be checked against the agreed A/L levels. Recommended A/L levels are listed in **Table 6.3**.

Table 6.3 Proposed Action and Limit Levels for Impact Monitoring

Parameter	Action Level (1)	Limit Level
TSP (24 hour average)	• BL ≤ 200 μg m^{-3}, AL = (BL * 1.3 + LL)/2 • BL > 200 μg m^{-3}, AL = LL	260 μg m^{-3}
TSP (1 hour average)	• BL ≤ 384 μg m^{-3}, AL = (BL * 1.3 + LL)/2 • BL > 384 μg m^{-3}, AL = LL	500 μg m^{-3}

(1) BL = Baseline level, AL = Action level, LL = Limit level.

Event and Action Plan

6.23 The principle upon which the Event and Action Plan is based on the prescription of procedures and actions associated with the measurement of certain defined levels of air pollution recorded by the environmental monitoring process and the agreed A/L levels. In cases where exceedance of these A/L levels occurs, the ET, the IEC, the ER and the Contractor shall strictly observe the relevant actions listed in **Table 6.4**.

Table 6.4 Event / Action Plan for Air Quality

Event	Action			
Action Level	**ET**	**Contractor**	**ER**	**IEC**
Exceedance for one sample	1. Identify source 2. Notify IEC, ER and Contractor 3. Conduct additional monitoring to investigate the causes. 4. Report the investigation results and if exceedance is due to contractor's construction works to the IEC, ER and Contractor. 5. Increase monitoring frequency to once per 2 days for 24-hour TSP and daily for 1-hour TSP until exceedance stops if exceedances are considered related to contractor's construction works and report the results to IEC, ER and Contractor.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice. 2. Submit air mitigation proposal to IEC and ER for agreement if ET indicated that exceedance is related to the construction works 3. Implement agreed proposal within a time scale agreed with ER and IEC.	1. Confirm receipt of notification of failure in writing. 2. Notify Contractor. 3. Require Contractor to submit air mitigation proposal. 4. Ensure remedial measures are properly implemented.	1. Review monitoring data and investigation report submitted by ET. 2. Review Contractor's air mitigation proposal and advise the ER accordingly. 3. Supervise and confirm in writing the implementation of remedial measures.
Exceedance for two or more consecutive samples	1. Identify source 2. Notify EPD, IEC, ER and Contractor 3. Conduct additional monitoring to investigate the causes. 4. Report the investigation results and if exceedances are due to contractor's construction works to EPD, IEC, ER and Contractor within 3 working days after additional monitoring. 5. Increase monitoring frequency to daily for 24-hour TSP and 1-hour TSP if exceedances are considered related to contractor's construction works until exceedance stops, and report the results to EPD, IEC, ER and Contractor. 6. If exceedances continue after 1-week monitoring events, request ER to arrange meeting with ER, IEC and contractor to discuss remedial actions.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice 2. In consultation with the IEC, submit air mitigation proposal to IEC and ER for agreement within 3 working days of notification if ET indicated that exceedances are related to construction works 3. Implement agreed proposal within a time scale agreed with ER and IEC. 4. Amend working methods if appropriate.	1. Confirm receipt of notification of failure in writing. 2. Notify Contractor. 3. Require Contractor to submit air mitigation proposal. 4. Ensure remedial measures are properly implemented.	1. Review monitoring data and investigation report submitted by ET. 2. Discuss amongst ER, ET and Contractor in order to formulate air mitigation proposal. 3. Review Contractor's air mitigation proposal and advise the ER accordingly. 4. Supervise and confirm in writing the implementation of remedial measures.

Event Limit Level	Action			
	ET	**Contractor**	**ER**	**IEC**
Exceedance for one sample	1. Identify source 2. Notify EPD, IEC, ER and Contractor 3. Conduct additional monitoring to investigate the causes. 4. Report the investigation results and if exceedances are due to contractor's construction works to EPD, IEC, ER and Contractor within 3 working days after additional monitoring. 5. Increase monitoring frequency to daily if exceedances are considered related to contractor's construction works until exceedance stops, and report the results to EPD, IEC, ER and Contractor.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice 2. In consultation with the IEC, submit air mitigation proposal to IEC and ER for agreement within 3 working days of notification if ET indicated that exceedances are related to construction works 3. Implement agreed proposal within a time scale agreed with ER and IEC. 4. Amend working methods if appropriate.	1. Confirm receipt of notification of failure in writing. 2. Notify Contractor. 3. Require Contractor to submit air mitigation proposal. 4. Ensure remedial measures are properly implemented.	1. Review monitoring data and investigation report submitted by ET. 2. Discuss amongst ER, ET and Contractor in order to formulate air mitigation proposal. 3. Review Contractor's air mitigation proposal and advise the ER accordingly. 4. Supervise and confirm in writing the implementation of remedial measures.
Exceedance for two or more consecutive samples	1. Identify source 2. Notify EPD, IEC, ER and Contractor 3. Conduct additional monitoring to investigate the causes. 4. Report the investigation results and if exceedances are due to contractor's construction works to EPD, IEC, ER and Contractor within 3 working days after additional monitoring. 5. Increase monitoring frequency to daily if exceedances are considered related to contractor's construction works until exceedance stops, and report the results to EPD, IEC, ER and Contractor. 6. If exceedances continue after 2 consecutive monitoring events, request ER to arrange meeting with IEC and contractor to discuss remedial actions.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice 2. In consultation with the IEC, submit air mitigation proposal to IEC and ER for agreement within 3 working days of notification if ET indicated that exceedances are related to construction works 3. Implement agreed proposal within a time scale agreed with ER and IEC. 4. Amend working methods and proposal if appropriate. 5. Stop relevant portion(s) of works as required by ER, ET and IEC	1. Confirm receipt of notification of failure in writing. 2. Notify Contractor. 3. Require Contractor to submit air mitigation proposal. 4. Ensure remedial measures are properly implemented. 5. If exceedances continue arrange meeting with Contractor, IEC and ET and to consider what portion(s) of works should be further mitigated or have to stop.	1. Review monitoring data and investigation report submitted by ET. 2. Discuss amongst ER, ET and Contractor in order to formulate air mitigation proposal. 3. Review Contractor's air mitigation proposal and advise the ER accordingly. 4. Supervise and confirm in writing the implementation of remedial measures.

Mitigation Measures

6.24 The EIA Report recommended air quality control and mitigation measures during the construction phase of the Project in accordance with the Air Pollution Control (Construction Dust) Regulation and good site practices are summarised below.

- Covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines.
- Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs.
- Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.
- Use of vehicle wheel and body washing facilities at the exit points of the site.
- Provision of wind shield and dust extraction units or similar dust mitigation measures at the loading points, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons/ periods.
- Dusty activities should be re-scheduled if high-wind conditions are encountered.

6.25 The implementation schedule for the recommended air quality impact mitigation measures is presented in **Appendix B**.

7. WASTE MANAGEMENT

Introduction

7.1 Waste management during the construction phase will be the contractor's responsibility. The contractor must ensure that all wastes produced during the construction phase of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The recommended mitigation measures should form the basis of the site Waste Management Plan to be developed by the Contractor in the construction stage and deposit with EPD.

7.2 Other waste materials generated during construction activities, such as construction and demolition (C&D) materials and general refuse, are recommended to be audited at regular intervals (at least quarterly) to ensure that proper storage, transportation and disposal practices are being implemented. The Contractor will be responsible for the implementation of any mitigation measures to minimise waste or redress problems arising from the waste materials.

Mitigation Measures

7.3 Mitigation measures for waste management are summarised below. With the appropriate handling, storage and removal of waste arising during the construction works as defined below, the potential to cause adverse environmental impacts will be minimised. The implementation schedule of the recommended mitigation measures is presented in **Appendix B**. During the site inspections, the ET shall pay special attention to the issues relating to waste management and check whether the Contractor has implemented the recommended good site practices and other mitigation measures.

Good Site Practices

7.4 It is not anticipated that adverse waste management related impacts would arise, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:

- Nomination of an approved personnel, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site
- Training of site personnel in proper waste management and chemical handling procedures
- Provision of sufficient waste disposal points and regular collection for disposal
- Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers
- Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors

Waste Reduction Measures

7.5 Good management and control can prevent the generation of significant amount of waste. Waste reduction during construction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal.
- Encourage collection of aluminium cans, PET bottles and paper by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the work force.

- Any unused chemicals or those with remaining functional capacity shall be recycled.
- Proper storage and site practices to minimise the potential for damage or contamination of construction materials.
- Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.

7.6 In addition to the above good site practices and waste reduction measures, specific mitigation measures are recommended below for the identified waste arisings to minimise environmental impacts during handling, transportation and disposal of these wastes.

General Refuse

7.7 General refuse should be stored in enclosed bins or compaction units separate from C&D material. A licensed waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

Construction and Demolition Material

7.8 In order to monitor the disposal of public fill at public fill reception facilities and to control fly tipping, a trip-ticket system should be established in accordance with ETWB TCW No. 31/2004.

Chemical Wastes

7.9 If chemical wastes are produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes, to either the Chemical Waste Treatment Centre at Tsing Yi, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

8. ENVIRONMENTAL AUDITING

Site Inspections

8.1 Site inspection provides a direct means to initiate and enforce specified environmental protection and pollution control measures. These shall be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. The site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.

8.2 The ET Leader shall be responsible for formulating the environmental site inspection, the deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal for site inspection and deficiency and action reporting procedures to the Contractor for agreement, and to the ER for approval. The ET's proposal for rectification would be made known to the IEC.

8.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it should also review the environmental situation outside the works area which is likely to be affected, directly or indirectly, by the site activities. The ET shall make reference to the following information in conducting the inspection:

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures
- ongoing results of the EM&A program
- works progress and programme
- individual works methodology proposals (which shall include proposal on associated pollution control measures)
- contract specifications on environmental protection
- relevant environmental protection and pollution control laws
- previous site inspection results undertaken by the ET and others

8.4 The Contractor shall keep the ET Leader updated with all relevant information on the construction contract necessary for him to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 24 hours for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.

8.5 The ET shall also carry out ad hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work.

Compliance with Legal and Contractual Requirements

8.6 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which construction activities must comply.

8.7 In order that the works are in compliance with the contractual requirements, all works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for

vetting to see whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Appendix B**.

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

8.9 The Contractor shall regularly copy relevant documents to the ET Leader so that works checking can be carried out. The document shall at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licence / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary shall also be available for the ET Leader's inspection upon his request.

8.10 After reviewing the documentation, the ET Leader shall advise the Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he shall also advise the Contractor accordingly.

8.11 Upon receipt of the advice, the Contractor shall undertake immediate action to correct the situation. The ER shall follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

Environmental Complaints

8.12 Handling of environmental complaints should follow the environmental complaint flow diagram and reporting channel as presented in **Figure 8.1**.

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

9. REPORTING

General

9.1 The reporting requirements of EM&A information are based upon a paper-documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach.

9.2 Types of reports that the ET Leader shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the Director of Environmental Protection. The exact details of the frequency, distribution and time frame for submission shall be agreed with EPD prior to commencement of works.

Electronic Reporting

9.3 The use of an electronic communication and data recording system for the EM&A programme would facilitate the rapid and effective communication of the site environmental status, as well as serving as a management tool for the Contractors. This can achieve real-time monitoring and notify the ER any exceedance of the pre-set environmental quality so as to trigger immediate remedial actions, thus increasing the efficiency in resolving the environmental problems. The system will also track the actions undertaken by relevant parties. The system could also function as a database for the entry of all recorded monitoring and audit information.

9.4 In addition, the system could:

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

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

Baseline Monitoring Report

9.6 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 14 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the IEC, the ER and the EPD. The ET

Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be deposited with EPD prior to submission.

9.7 The baseline monitoring report shall include at least the following:

(i) up to half a page executive summary

(ii) brief project background information

(iii) drawings showing locations of the baseline monitoring stations

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

- monitoring methodology
- name of laboratory and types of equipment used and calibration details
- parameters monitored
- monitoring locations (and depth)
- monitoring date, time, frequency and duration
- quality assurance (QA) / quality control (QC) results and detection limits

(v) details of influencing factors, including:

- major activities, if any, being carried out on the site during the period
- weather conditions during the period
- other factors which might affect results

(vi) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored

(vii) revisions for inclusion in the EM&A Manual

(viii) comments, recommendations and conclusions.

Monthly EM&A Reports

9.8 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report shall be submitted to the following parties: the Contractor, the IEC, the ER and the EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

9.9 The ET leader shall review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

First Monthly EM&A Report

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

(i) executive summary (1-2 pages):

- breaches of Action and Limit levels
- complaint log
- notifications of any summons and successful prosecutions
- reporting changes
- future key issues

(ii) basic project information:

- project organisation including key personnel contact names and telephone numbers
- construction programme
- management structure
- works undertaken during the month

(iii) environmental status:

- works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates etc)
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations)
- advice on status of compliance with environmental permit including the status of submissions under the environmental permit

(iv) a brief summary of EM&A requirements including:

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

(v) implementation status:

- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA, summarised in the updated Implementation Schedule

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

- monitoring methodology
- name of laboratory and types of equipment used and calibration details
- parameters monitored
- monitoring locations
- monitoring date, time, frequency, and duration
- weather conditions during the period
- graphical plots of the monitored parameters in the month annotated against:
  - the major activities being carried out on site during the period
  - weather conditions that may affect the monitoring results
  - any other factors which might affect the monitoring results
  - any other factors which might affect the monitoring results
  - QA/QC results and detection limits

(vii) report on change, non-compliance, complaints, and notifications of summons and successful prosecutions:

- record of change established from the organisation and interpretation of monitoring results in the month
- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
- record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
- review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures

- description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance

(viii) others

- compare and contrast the EM&A data in the month with the EIA predictions and annotate with explanation for any discrepancies
- an account of the future key issues as reviewed from the works programme and work method statements
- advice on the solid and liquid waste management status during the month including waste generation and disposal records
- comments including effectiveness of the environmental management systems, practices, procedures and mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions

Subsequent Monthly EM&A Reports

9.11 Subsequent monthly EM&A reports shall include the following:

(i) executive summary (1 - 2 pages):

- breaches of Action and Limit levels
- complaints log
- notifications of any summons and successful prosecutions
- reporting changes
- future key issues

(ii) environmental status:

- construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month
- works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.) including key personnel contact names and telephone numbers
- drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- advice on status of compliance with environmental permit including the status of submissions under the environmental permit

(iii) implementation status:

- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA, summarised in the updated implementation schedule

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

- monitoring methodology
- name of laboratory and types of equipment used and calibration details
- parameters monitored
- monitoring locations
- monitoring date, time, frequency, and duration
- weather conditions during the period
- graphical plots of the monitored parameters in the month annotated against:
  - the major activities being carried out on site during the period
  - weather conditions that may affect the monitoring results
  - any other factors which might affect the monitoring results
  - QA / QC results and detection limits

(v) report on change, non-compliance, complaints, and notifications of summons and successful prosecutions:

- record of change established from the organisation and interpretation of monitoring results in the month
- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
- record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
- review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
- description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance

(vi) others

- compare and contrast the EM&A data in the month with the EIA predictions and annotate with explanation for any discrepancies
- an account of the future key issues as reviewed from the works programme and work method statements
- advice on the solid and liquid waste management status during the month including waste generation and disposal records
- comments including effectiveness of the environmental management systems, practices, procedures and mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions

(vii) appendix

- Action and Limit levels
- graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
  - major activities being carried out on site during the period
  - weather conditions during the period
  - any other factors that might affect the monitoring results
  - monitoring schedule for the present and next reporting period
  - cumulative statistics on complaints, notifications of summons and successful prosecutions
  - outstanding issues and deficiencies

Quarterly EM&A Summary Reports

9.12 A quarterly EM&A summary report of around five pages shall be produced and shall contain at least the following information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

(i) up to half a page executive summary

(ii) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter

(iii) a brief summary of EM&A requirements including:

- monitoring parameters
- environmental quality performance limits (Action and Limit levels)
- environmental mitigation measures, as recommended in the project EIA Final Report

(iv) advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Final Report, summarised in the updated implementation schedule

(v) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations

(vi) graphical plots of any trends in monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:

- the major activities being carried out on site during the period
- weather conditions during the period
- any other factors which might affect the monitoring results

(vii) advice on the solid and liquid waste management status during the quarter including waste generation and disposal records

(viii) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)

(ix) a brief review of the reasons for and the implications of any non-compliance, including a review of pollution sources and working procedures

(x) a summary description of actions taken in the event of non-compliance and any follow-up procedures related to any earlier non-compliance

(xi) a summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken

(xii) comments (for examples, a review of the effectiveness and efficiency of the mitigation measures); recommendations (for example, any improvement in the EM&A programme) and conclusions for the quarter

(xiii) proponents' contacts and any hotline telephone number for the public to make enquiries.

Final EM&A Review Report

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

9.14 Prior to the proposed termination, it may be advisable to consult relevant local communities (such as village representatives/communities and/or District Boards). The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the Engineer and the Project proponent followed by deposit of the proposal with the Director of Environmental Protection.

9.15 The final EM&A summary report should include, inter alia, the following information:

(i) an executive summary

(ii) basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the entire construction period

(iii) a brief summary of EM&A requirements including:

- monitoring parameters
- environmental quality performance limits (Action and Limit levels)
- environmental mitigation measures, as recommended in the project EIA study final report

(iv) advice on the implementation status of environmental and pollution control/mitigation measures, as recommended in the project EIA study final report, summarised in the updated implementation status proformas

(v) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations

(vi) graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations, including the post-project monitoring annotated against:

- the major activities being carried out on site during the period
- weather conditions during the period
- any other factors which might affect the monitoring results
- the return of ambient environmental conditions in comparison with baseline data

(vii) compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies

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

(ix) advice on the solid and liquid waste management status

(x) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)

(xi) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures

(xii) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance

(xiii) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken

(xiv) review the monitoring methodology adopted and with the benefit of hindsight, comment and its effectiveness (including cost effectiveness)

(xv) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results

(xvi) review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), recommend any improvement in the EM&A programme

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

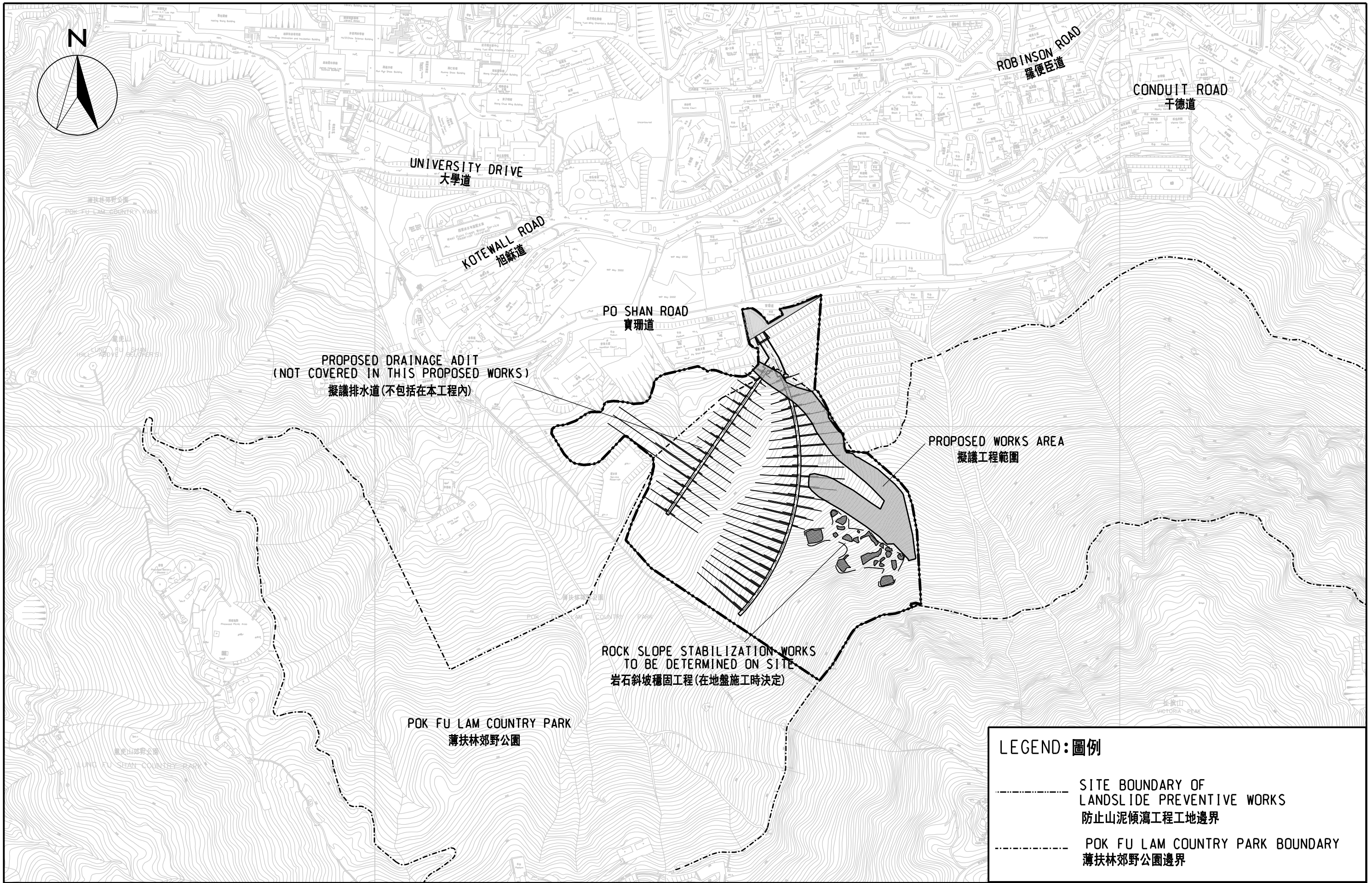
Data Keeping

9.16 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in magnetic media form, and the software copy must be available upon request. Data format shall incorporate the views of EPD. All documents and data shall be kept for at least one year following completion of the construction contract.

Interim Notifications of Environmental Quality Limit Exceedances

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

Figures



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Maunsell Environmental
Management Consultants Ltd

LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS

半山區寶珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程

LOCATION PLAN FOR THE PROJECT

工程項目位置圖

SCALE	A3 1:3500	DATE	MAY 07
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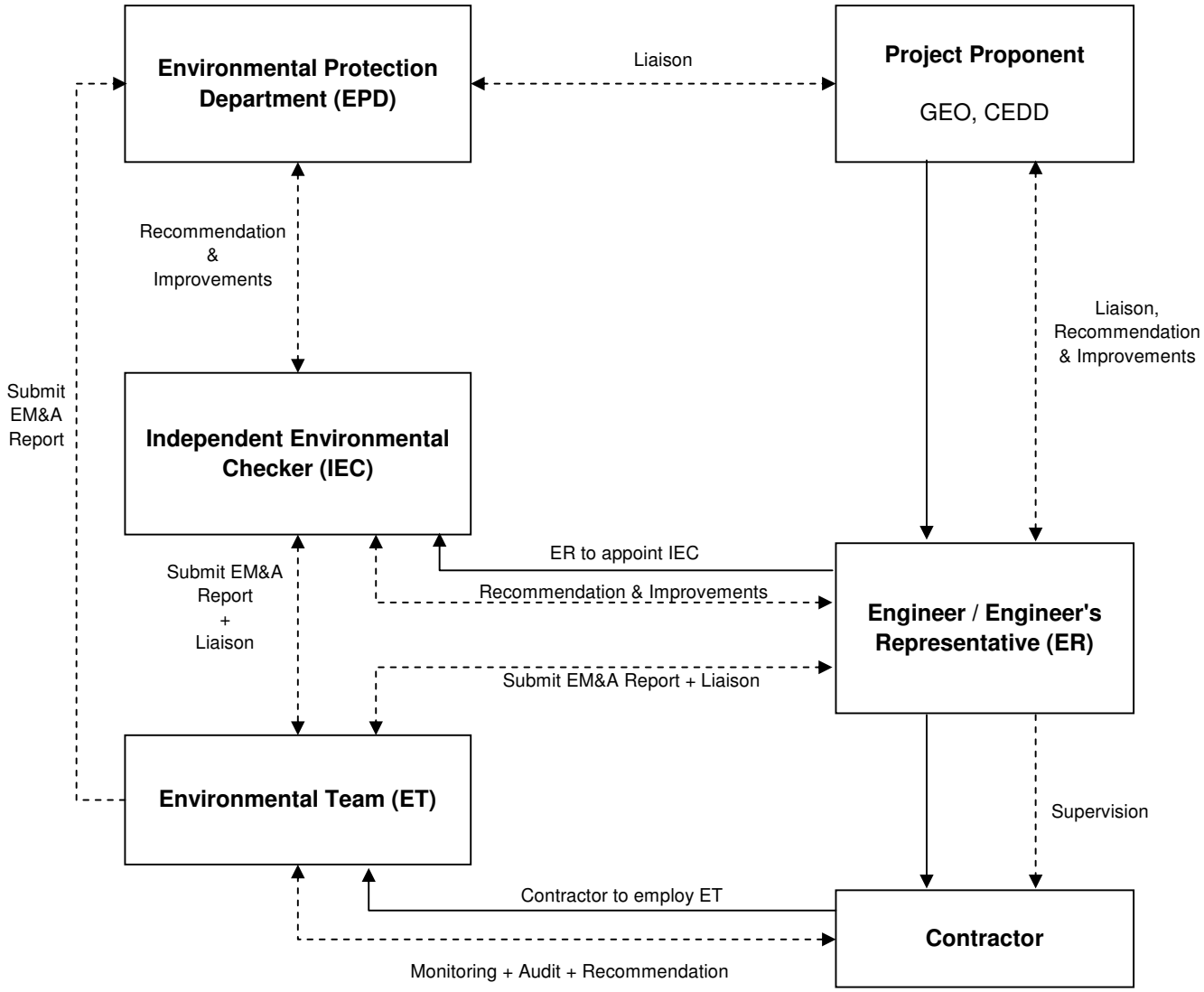

Employment Relationship

Working Relationship

MAUNSELL AECOM Maunsell Environmental Management Consultants Ltd	Landslide Preventive Works at Po Shan, Mid Level - Natural Terrain Mitigation Works Environmental Monitoring and Audit Manual Project Organization for Environmental Management	SCALE	N.T.S.	DATE	May-07
		CHECK	FKKN	DRAWN	CWHY
		JOB NO. 60017196 (2.1)		FIGURE NO. 1.2	Rev. B

N

MATCH LINE
FOR CONTINUATION
SEE DWG HABITAT MAP_b

LEGEND

- STUDY AREA
- NATURAL WOODLAND
- SHRUBLAND
- DEVELOPED AREA
- STREAM COURSE
- LONG-LEAVED BIRTHWORT
- HONG KONG PAVETTA
- CHAMPION'S RHODODENDRON
- SMALL PERSIMMON
- LAMB OF TARTARY
- SILVER-BACK ARTOCARPUS
- INCENSE TREE
- LESSER SPINY FROG
- HONG KONG CASCADE FROG
- COMMON TUTCHERIA
- SHORT-NOSED FRUIT BAT
- GREATER COUCAL
- COLLARED SCOPS OWL
- PALLAS'S SQUIRREL
- MOUNTAIN CRAB
- PROPOSED WORKS AREA
- ROCK SLOPE STABILIZATION WORKS AREA

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Maunsell Environmental Management Consultants Ltd

AGREEMENT NO. CE 28/2004 (GE)
LANDSLIDE PREVENTIVE WORKS AT PO SHAN ROAD, MID-LEVELS - DESIGN AND CONSTRUCTION

HABITAT MAP

(SHEET 1 OF 2)

SCALE	A3 1:5000	DATE	FEB 07
CHECK	CHECK	DRAWN	ILPY
JOB No.	60017196(2.1)	DRAWING No.	2.1
		REV	–

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MATCH LINE
FOR CONTINUATION
SEE DWG HABITAT MAP_a

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LEGEND

- STUDY AREA
- NATURAL WOODLAND
- SHRUBLAND
- DEVELOPED AREA
- STREAM COURSE
- LONG-LEAVED BIRTHWORT
- HONG KONG PAVETTA
- CHAMPION'S RHODODENDRON
- SMALL PERSIMMON
- LAMB OF TARTARY
- SILVER-BACK ARTOCARPUS
- INCENSE TREE
- LESSER SPINY FROG
- HONG KONG CASCADE FROG
- COMMON TUTCHERIA
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- COLLARED SCOPS OWL
- PALLAS'S SQUIRREL
- MOUNTAIN CRAB
- PROPOSED WORKS AREA
- ROCK SLOPE STABILIZATION WORKS AREA

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Maunsell Environmental Management Consultants Ltd

AGREEMENT NO. CE 28/2004(GE)
LANDSLIDE PREVENTIVE WORKS AT PO SHAN ROAD, MID-LEVELS - DESIGN AND CONSTRUCTION

HABITAT MAP

(SHEET 2 OF 2)

SCALE	A3 1:5000	DATE	FEB 07
CHECK	CHECK	DRAWN	ILPY
JOB No.	60017196(2.1)	DRAWING No.	2.1
		REV	-

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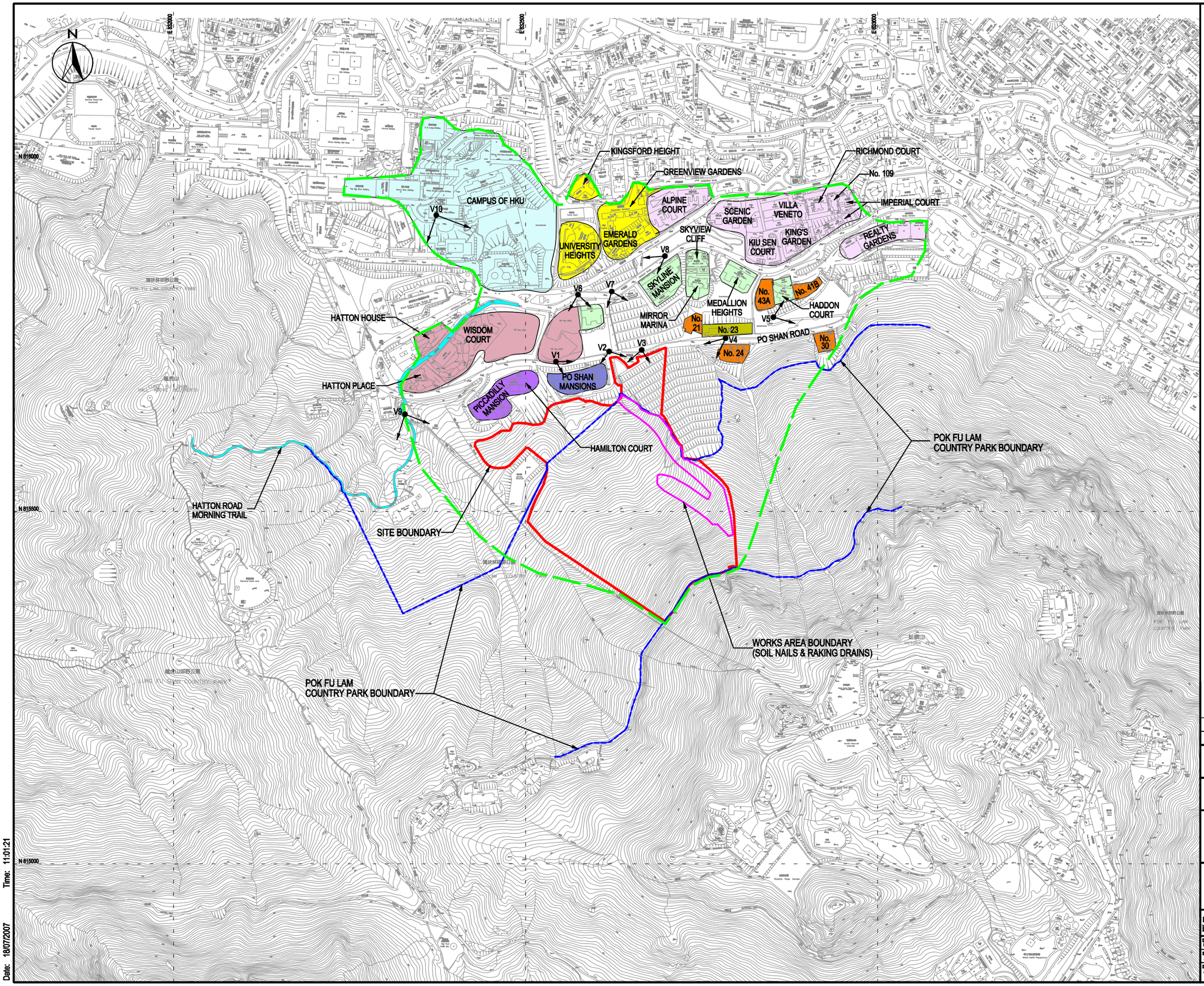

LEGEND:

- SITE BOUNDARY
- POK FU LAM COUNTRY PARK BOUNDARY
- WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
- PRIMARY ZONE OF VISUAL INFLUENCE
- HATTON ROAD MORNING TRAIL
- PHOTO VIEW POINTS

VISUAL SENSITIVE RECEIVERS:

- R1A
- R1B
- R1C
- R1D
- R1E
- R1F
- R2
- R3
- G/C 1

REV. 修訂	DESCRIPTION 內容摘要	CHKD 查核	P.E.	APPROVED 批准人	DATE 日期

Civil Engineering and Development Department

CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS AT PO SHAN ROAD, MID-LEVELS

ZONE OF VISUAL INFLUENCE & VISUAL SENSITIVE RECEIVERS

MAUNSELL AECOM
Maunsell Geotechnical Services Ltd.
茂盛土力工程顧問有限公司

DRG.NO. 圖紙編號: 3.1

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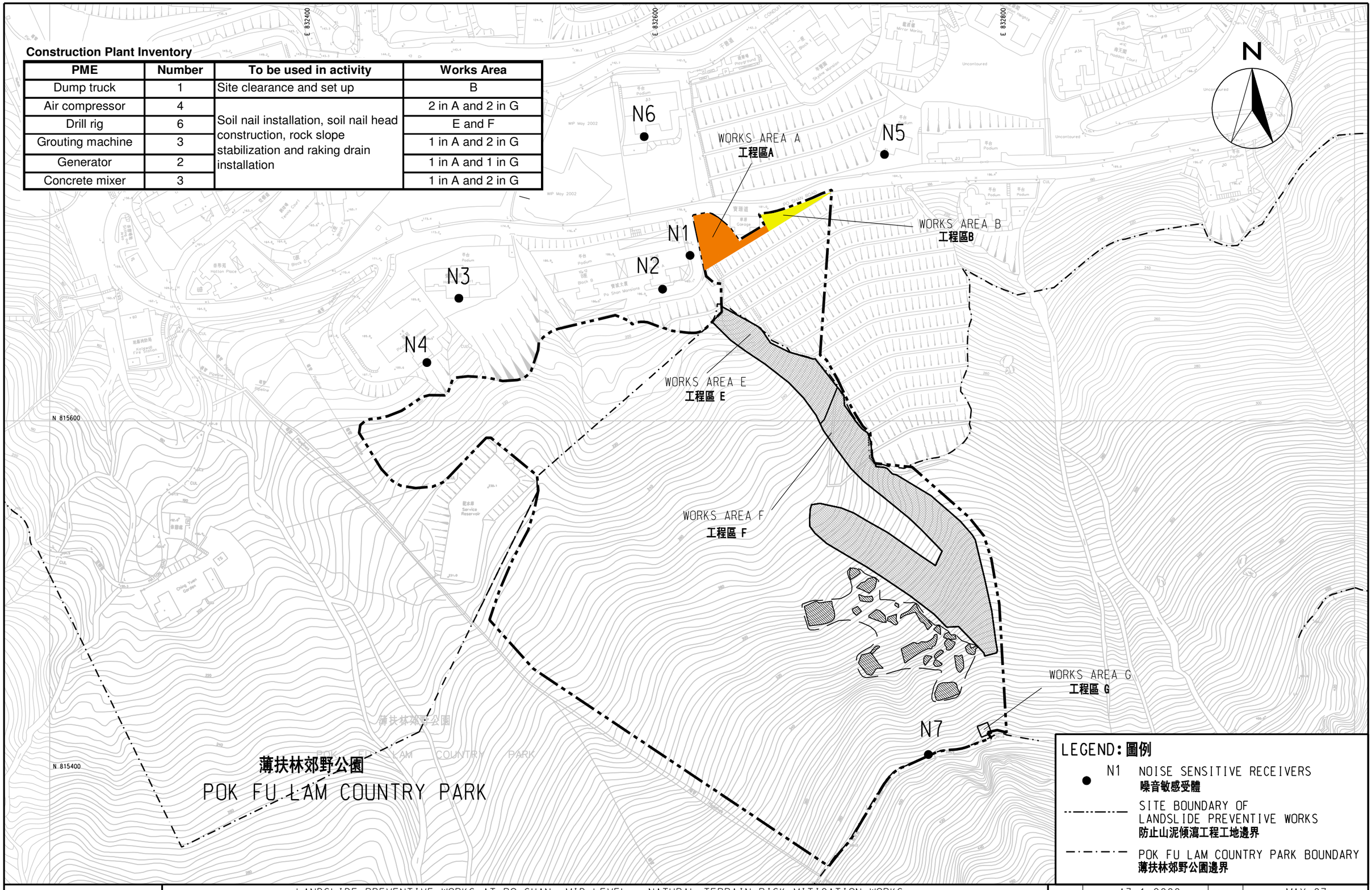
Construction Plant Inventory

PME	Number	To be used in activity	Works Area
Dump truck	1	Site clearance and set up	B
Air compressor	4	Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation	2 in A and 2 in G
Drill rig	6		E and F
Grouting machine	3		1 in A and 2 in G
Generator	2		1 in A and 1 in G
Concrete mixer	3		1 in A and 2 in G



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LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS

半山區寶珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程

LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS

具代表性的噪音敏感受體位置圖

SCALE	A3 1:2000	DATE	MAY 07	
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JOB No.	60017196(2.1)	DRAWING No.	4.1	REV -

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N

E 832400

E 832600

E 832800

N 815800

N 815600

N 815400

WORKS AREA A
工程區A

WORKS AREA B
工程區B

CN1

CN2

WORKS AREA E
工程區 E

WORKS AREA F
工程區 F

WORKS AREA G
工程區 G

薄扶林郊野公園
POK FU LAM COUNTRY PARK

LEGEND: 圖例

- CN1 NOISE MONITORING STATION
  噪音監察站
- SITE BOUNDARY OF LANDSLIDE PREVENTIVE WORKS
  防止山泥傾瀉工程工地邊界
- POK FU LAM COUNTRY PARK BOUNDARY
  薄扶林郊野公園邊界

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LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS

半山區寶珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程

PROPOSED CONSTRUCTION NOISE MONITORING STATION

擬議之建築噪音監察站位置圖

SCALE	A3 1:2000	DATE	MAY 07
CHECK	FKKN	DRAWN	LCWK
JOB No.	60017196(2.1)	DRAWING No.	4.2
		REV	-

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N 815800

N 815600

N 815400

E 832400

E 832600

E 832800

CA1

CA2

PROPOSED WORKS AREA
擬議工程範圍

POK FU LAM COUNTRY PARK
薄扶林郊野公園

LEGEND: 圖例

- CA1 AIR MONITORING STATION
  空氣質素監察站
- SITE BOUNDARY OF LANDSLIDE PREVENTIVE WORKS
  防止山泥傾瀉工程工地邊界
- POK FU LAM COUNTRY PARK BOUNDARY
  薄扶林郊野公園邊界

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LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS

半山區寶珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程

PROPOSED AIR MONITORING STATION

擬議之空氣質素監察站位置圖

SCALE	A3 1:2000	DATE	MAY 07
CHECK	FKKN	DRAWN	LCWK
JOB No.	60017196(2.1)	DRAWING No.	6.1
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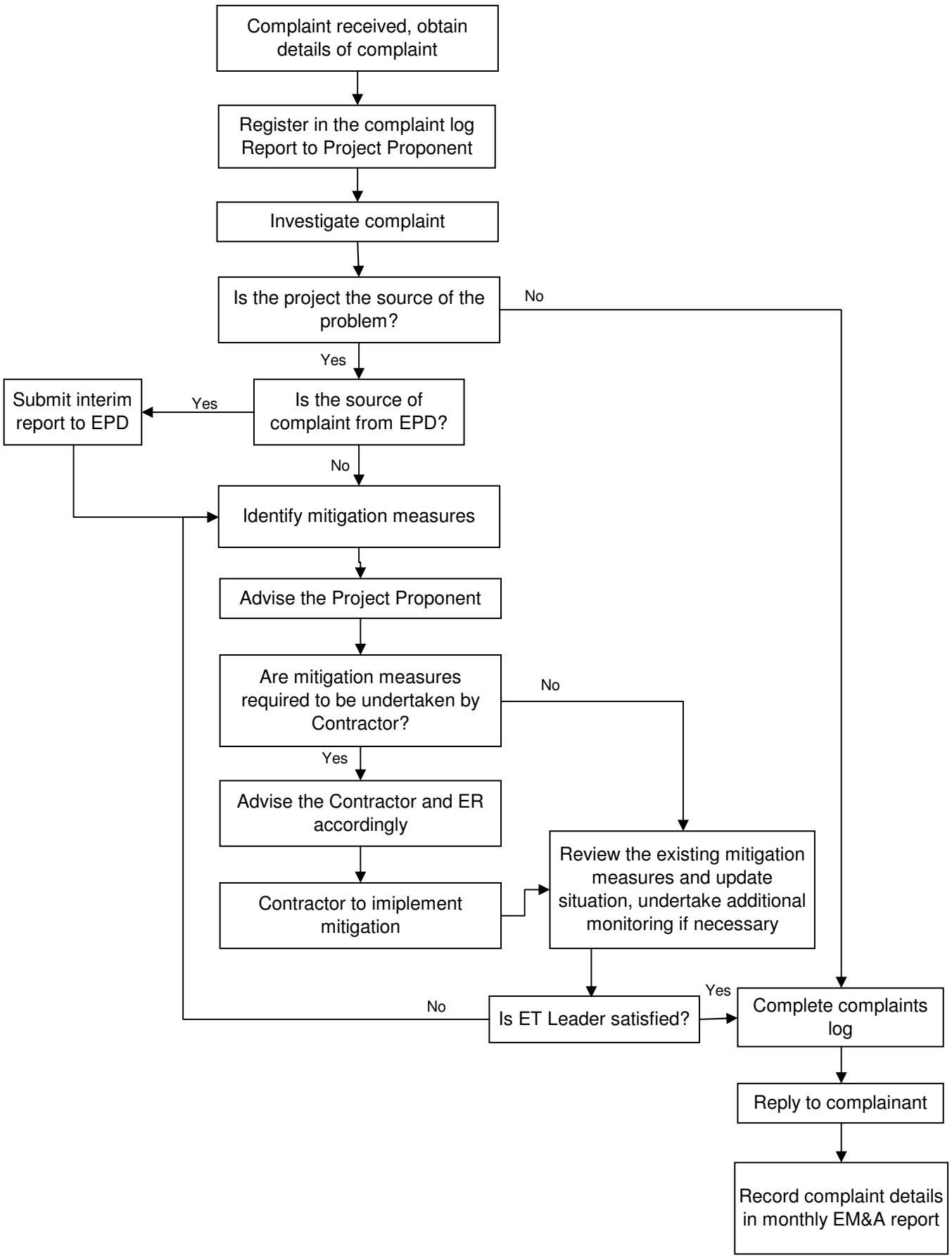

MAUNSELL AECOM Maunsell Environmental Management Consultants Ltd	Landslide Preventive Works at Po Shan, Mid Level - Natural Terrain Mitigation Works Environmental Monitoring and Audit Manual Environmental Complaint Flow Diagram	SCALE	N.T.S.	DATE	May-07
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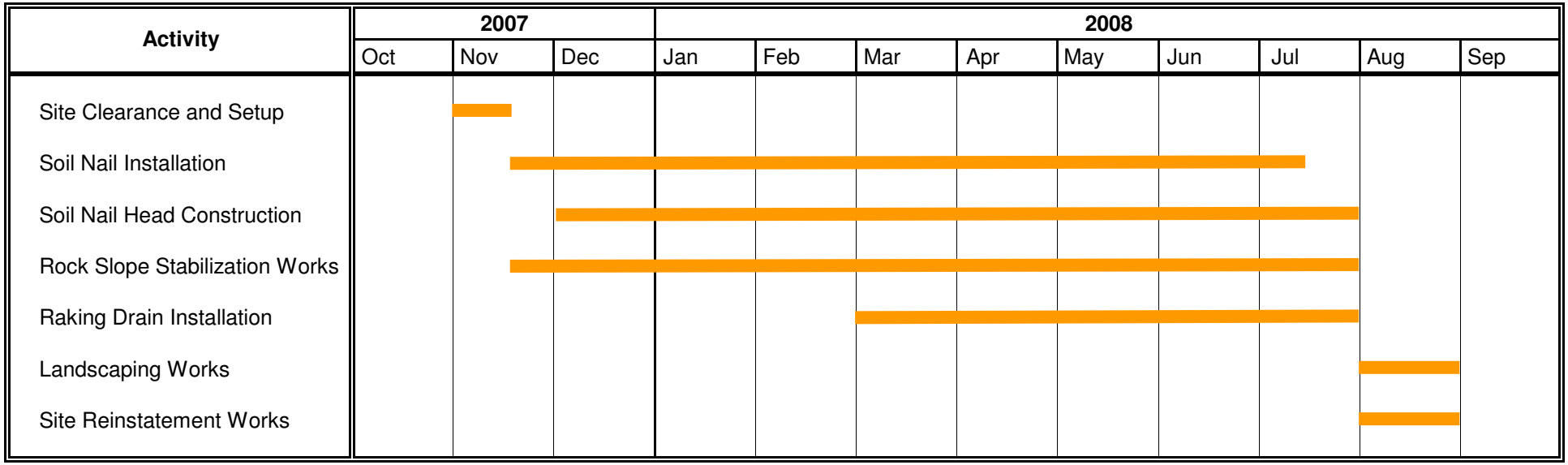
				Rev	-

Appendix A Preliminary Construction Programme

Appendix A Preliminary Construction Programme



Appendix B Implementation Schedule of Mitigation Measures

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Appendix B Implementation Schedule

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
Construction Noise Impact						
5.13, 5.24, 5.26		No more than 6 drill rigs will be operating at the same time in Works Areas E and F. No more than two drill rigs could be operating in Works Area E. Noise insulating fabric has to be applied for drill rigs operating in Works Area E. A number of four air compressors will be used. Two at Works Area A and two at Works Area G. A number of three grouting machines will be used. One at Works Area A and two at Works Area G. A number of two generators will be used. One at Works Area A and one at Works Area G. A number of three concrete mixers will be used. One at Works Area A and two at Works Area G. Moveable Noise Barrier has to be applied for the concrete mixer operating in Works Area A. Noise Enclosures have to be applied for the air compressors, grouting machine and generator operating in Works Area A.	Contractor	Works Area	Construction Phase	EIAO-TM, NCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
Construction Air Quality Impact						
7.16		Good site practice • Covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines. • Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs. • Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations. • Use of vehicle wheel and body washing facilities at the exit points of the site. • Dusty activities should be re-scheduled if high-wind conditions are encountered. • Instigation of an environmental monitoring and auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise.	Contractor	Works Area	Construction Phase	EIAO-TM, APCO
Construction Water Quality Impact						
6.22		• Provision of perimeter drains to intercept storm-runoff from outside the works area. These shall be constructed in	Contractor	Works Area	Construction Phase	ProPECC PN 1/94 Construction

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		advance of site formation works and earthworks. Earth bunds or sand bag barriers should be provided on-site to direct storm water to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the Contractor prior to the commencement of construction. • Sand/silt removal facilities such as sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the Water Pollution Control Ordinance. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. The detailed design of the sand/silt traps will be undertaken by the Contractor prior to the commencement of construction. • Air would be used as the flushing medium of the drilling equipment to avoid the groundwater being affected by the flushing medium. In addition, permanent casing may be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer to minimize the impact to the groundwater table situated at the permeable				Site Drainage TM standard under the WPCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		soil stratum. • An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting. • All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times. • Exposed slope/soil surface should be covered by tarpaulin as soon as possible to reduce the potential of soil erosion. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94. • Open stockpiles of construction materials or construction wastes on-site of more than $50m^3$ should be covered with tarpaulin or similar fabric during rainstorms.				

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
Waste Management						
8.19, 8.20		Good site practice • Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site. • Training of site personnel in proper waste management and chemical waste handling procedures. • Provision of sufficient waste disposal points and regular collection for disposal. • Appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers. • Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors. Waste Reduction • Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal. • Encourage collection of aluminium cans, PET bottles and	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		paper by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the work force. • Any unused chemicals or those with remaining functional capacity shall be recycled. • Proper storage and site practices to minimize the potential for damage or contamination of construction materials. • Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste.				
Ecological Impact						
3.110		The location of the soil nail installation should be carefully selected and adjusted on-site to avoid/minimize the damage of root system to the existing plants on slope surface. No tree felling is required.	Contractor	Works Area	Construction Phase	
3.111		Fences should be erected and installed along the boundary of the proposed works area before the commencement of works in order to minimize the disturbance to the natural woodland and shrubland habitats by preventing tipping, vehicle movements and encroachment of personnel onto the adjacent areas.	Contractor	Works Area	Construction Phase	
3.112		Specific mitigation measures for the two plant species of	Project	Works Area	Construction	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		conservation interest • A detailed vegetation survey of the affected species of conservation interest should be conducted by a suitably qualified botanist/ecologist with over 7 years relevant experience to identify the affected individuals of the floral species of conservation concern, including but not limited to Small Persimmon, Common Tutcheria, Bird-nest Fern and Chinese Pholidota. • These species should be labeled on site prior to the commencement of works for better protection.	Proponent		Phase	
3.113 & 3.114		To minimize the indirect impacts to the nearby stream course and drainage culvert. Site runoff control measures mentioned in Section of Construction Water Quality Impact should be implemented. There should be no site runoff and discharge to the nearby stream course and drainage culvert.	Contractor	Works Area	Construction Phase	
3.115		Noise mitigation measures: • Mitigation measures listed in the section Construction Noise Impact should be implemented. • Noise generating construction works should be implemented at daytime only.	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		• Measures such as noise barriers should be used to minimize disturbance to the bat roost identified close to the western side of the works area.				
3.116		To minimize the construction dust impact to the vegetation within and in vicinity of the proposed works area, the mitigation measures listed in the section Construction Air Quality Impact should be implemented.	Contractor	Works Area	Construction Phase	
3.117		Good site practice: • Placement of equipment in designated works areas and access routes selected on existing disturbed land to minimize disturbance to natural woodland habitat. • Construction activities would be restricted to the proposed works area that would be clearly demarcated. • The proposed works area would be reinstated immediately after completion of the works. • Open burning on proposed works sites is illegal, and will be strictly enforced. • Waste skips would be provided to collect general refuse and construction wastes. The wastes would be disposed of timely and properly off-site.	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		• Any soil contamination with fuel leaked from construction plants should be removed off-site. • Disturbance to existing vegetation should be minimized wherever possible. In particular, adequate protection should be provided for mature trees located within or adjacent to the proposed works area.				
3.118		Compensatory planting due to the loss of trees and vegetations: • Planting of suitable shrubs/herbs, including the Small Persimmon, should be provided within the project area to compensate for the understorey vegetation of the woodland habitats affected by the landslide preventive works. • Chinese Fan-palm (*Livistona chinensis*) should be planted near the existing bat roost in the project area to provide suitable habitat for the Short-nosed Fruit Bat after completion of landslide preventive works.	Contractor	Works Area	Construction Phase	
3.121		Monitoring programme: • For the plant individuals of conservation interest identified within the proposed works area, a specific monitoring programme of the plant individuals of conservation interest identified within the proposed works area during the detailed	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		vegetation survey should be carried out by a suitably qualified local ecologist(s) with over 7 years relevant ecological experience. • Regular monitoring of the trees, shrubs and herbs should be conducted to check on the health and condition of the plants. • Monitoring should be conducted twice a month covering the whole construction period.				
Landscape and visual Impact						
Table 4.5		Due consideration on existing surrounding vegetation during construction: • Designate 'no-intrusion zones' • Dust and erosion control for exposed soil • All retained trees should be record photographically at the commencement of Contract, and carefully protected during the construction period. • Allowance for adjustment of soil nails on site for the avoidance of tree trunks and tree roots Appearance and view consideration:	Contractor	Works Area	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		• Temporary hoarding barriers shall be sensitively designed, subtle, camouflaged and more 'permeable' so that they fit into the existing country park character • Careful selection of security floodlights to avoid light pollution				
Table 4.6		• Existing topsoil shall be re-used where possible for new planting areas within the project • 12 month establishment period for the soft landscape works shall be allowed in the main contract. • All excavated area and disturbed area for utilities diversion, temporary road diversion, and pipeline works shall be reinstated to former conditions. • Woodland mix is proposed to screen sensitive views, to match surrounding vegetation, and to provide greenery to the surrounding area.	Contractor	Works Area	Operation Phase	EIAO-TM

Appendix C Sample Data Sheets for Air Quality and Noise Monitoring

APPENDIX C1 Data Sheet for TSP Monitoring

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial Flow Rate, Qsi	Pi (mmHg)	
	Ti (°C)	
	Hi (in.)	
	Qsi (Std. m^3)	
Final Flow Rate, Qsf	Pf (mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std. m^3)	
Average Flow Rate (Std. m^3)		
Total Volume (Std. m^3)		
Filter Identification No.		
Initial Wt. of Filter (g)		
Final Wt. of Filter (g)		
Measured TSP Level ($\mu g/m^3$)		

Name & Designation Signature Date

Field Operator:

Laboratory Staff:

Checked by:

APPENDIX C2 Noise Monitoring Field Record Sheet

Equipment	Model	Equipment No.	Last Calibration/Due Date
Sound Level Meter			/
Sound Pressure Calibrator			/

Calibration before measurement (dB(A))	
Calibration after measurement (dB(A))	

Monitoring Location							
Description of Location							
Date of Monitoring							
Weather Condition		Sunny / Cloudy / Rainy					
Measurement Start Time (hh:mm)							
Measurement Time Length (min/hr)							
Measurement Results	L90 (dB(A))						
	L10 (dB(A))						
	Leq (dB(A))						
Major Construction Noise Source(s) During Measurement		Excavator / backhoe			Bulldozer		
		Dump truck / lorry			Jack Hammering		
		Others, pls specify					
Other Noise Source(s) During Measurement		Road traffic noise			Air traffic noise		
		Construction noise from other sites (e.g. piling) pls specify:					
		Village activities or animal noise (e.g. dog barking) pls specify:					
Remarks							

	Name	Signature	Date
Recorded By			
Checked By			

Appendix D Sample Template for the Interim Notification

Appendix D Sample Template for the Interim Notification

Incident Report on Action Level or Limit Level Non-compliance

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

Prepared by: _____

Designation: _____

Signature: _____

Date: _____