7 WATER QUALITY MONITORING

7.1 INTRODUCTION

As determined in the EIA, there is no requirement for the Contractor to undertake water quality monitoring during the construction and operational phases of the Project. However, in order to ensure the effective management and implementation of water pollution control mitigation measures developed and defined in the EIA, the Contractor and his ET shall be required to conduct regular site inspections of the construction work sites. The overall scope of the site inspections are defined in *Section 10*, however, relevant water quality issues are presented below.

7.2 OBJECTIVES OF THE WATER QUALITY AUDIT

The aims of the water quality audit will include, but are not limited to, the following:

- ensuring compliance with all relevant Contractual and legislative requirements, in particular, the *Water Pollution Control Ordinance* and its regulations;
- ensuring that the Contractor properly implements the appropriate environmental protection and water pollution control mitigation measures, as outlined in the IS (*Annex E*), to minimise and control the potential for water quality impacts; and
- ensuring the effective implementation of the Contractor's Environmental Management System (EMS).

7.2.1 *Methodology and Criteria*

As it is both a legal and contractual requirement for the Contractor to meet all of the relevant environmental protection and pollution control requirements, it will be necessary for the Contractor and his ET to regularly review the progress and programme of the works to check that relevant criteria can be, and are being, achieved. MTRC's environmental management procedures, and in particular those sections relating to water quality control, provide a strong framework for ensuring that the implementation of the proposed project can be undertaken in accordance with the required criteria. Nevertheless, the review will also have to consider the current status on licences/permit applications, ensuring that all of the requirements of the *WPCO* and various ordinances have been achieved.

- *Environmental Impact Assessment Ordinance (Cap. 499. S.16), and the Technical Memorandum on EIA Process (EIAO TM), especially Annexes 6 and*

- *Air Pollution Control Ordinance (Cap.311) (APCO); and*
- *Hong Kong Air Quality Objectives (AQOs)*

6 AIR QUALITY MONITORING

6.1 INTRODUCTION

The PBRL EIA concluded that it was not necessary from the Contractor to conduct air quality monitoring during the construction and operational phases of the project. However, in order to ensure that the effective management and implementation of air quality mitigation measures developed and defined in the EIA, the Contractor and his ET shall be required to conduct regular site inspections of the construction work sites. The overall scope of the site inspections is defined in *Section 10*, however, the relevant air quality issues are presented below.

6.2 OBJECTIVES OF THE AIR QUALITY AUDIT

The aims of the air quality audit will include, but are not limited to, the following:

- ensuring compliance with all relevant Contractual and legislative requirements, in particular, *the Air Pollution Control Ordinance (Cap. 311)* and associated regulations;
- ensuring that the Contractor properly implements the appropriate environmental protection and water pollution control mitigation measures, as outlined in the IS (*Annex E*) to minimise and control the potential dust impacts; and
- ensuring the effective implementation of the Contractor's Environmental Management System (EMS).

6.2.1 *Methodology and Criteria*

As the Contractor is contractually and legal required to meet all of the relevant environmental protection and pollution control requirements, it will be necessary for the Contractor and his ET to regularly review the progress and programme of the works to check that the relevant criteria can be, and are being, achieved. MTRC's environmental management procedures, and in particular those sections relating to air quality controls, provide a strong framework for ensuring that the implementation of the proposed project can be undertaken in accordance with the required criteria.

The Contractor will also have to ensure that notice is given to the EPD that "notifiable works" are to be carried out, and that the requirements of the *APCO* and its associated regulations are achieved.

- *Environmental Impact Assessment Ordinance (Cap.499.) and the Technical Memorandum on EIA Process (EIAO TM. Annex 16);*

Technical Memorandum on EIA Process (EIAO TM), especially Annexes 5 & 13;

- *Noise Control Ordinance, Cap. 400* (NCO);
- *Technical Memorandum on Noise from Percussive Piling* (PP-TM); and
- *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (GW-TM).

5 NOISE MONITORING

5.1 INTRODUCTION

As determined in the EIA, the Contractor is not required to carry out construction or operational noise monitoring, as it is not considered necessary due to the identified NSRs being remote from the works and consequently there being no predicted noise impacts associated with the construction activities. However, in order to ensure the effective management and implementation of noise control mitigation measures developed and defined in the EIA, the Contractor and his ET shall be required to conduct regular site inspections of the construction work sites. The overall scope of the site inspections are defined in *Section 10*, however, relevant noise issues are presented below.

5.2 OBJECTIVES OF THE NOISE AUDIT

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

- ensuring compliance with all relevant contractual and legislative requirements, in particular, the *Noise Control Ordinance* and its regulations;
- ensuring that the Contractor properly implements the appropriate environmental protection and noise mitigation measures, as outlined in the IS (*Annex E*), to minimise and control the potential for noise impacts; and
- ensuring the effective implementation of the Contractor's Environmental Management System (EMS).

5.2.1 *Methodology and Criteria*

As it is both a legal and contractual requirement for the Contractor to meet all of the relevant environmental protection and pollution control requirements, it will be necessary for the Contractor and his ET to regularly review the progress and programme of the works to check that relevant criteria can be, and are being, achieved. MTRC's environmental management procedures, and in particular those sections relating to noise control, provide a strong framework for ensuring that the implementation of the proposed project can be undertaken in accordance with the required noise criteria. Nevertheless, to ensure that all of the requirements of the various Ordinances have been achieved, the reviews will also have to consider the current status regarding licences and in particular, Construction Noise Permits(CNP) applications.

- *Environmental Impact Assessment Ordinance (Cap. 499. S.16), and the*

4.3.4 *Reporting*

Three monthly, annual and bi-annual reports shall be prepared by the Contractor and his Environmental Team. These shall be submitted to the Engineer and EPD. The three-monthly reports shall be prepared and submitted within 10 working days of the end of the appropriate calendar month. Additional details on reporting protocols are presented in *Section 11*.

The use of an EQPMS will be subject to agreement with MTRC, and it may obviate the need for the formal paper reporting outlined above.

4.3.5 *Cessation of EM&A*

The ET and the ENM shall continue to carry out site inspections until the completion of the major Civil works of the Project.

4.4 *OPERATIONAL PHASE EM&A*

No requirements for operational monitoring have been identified.

4.3.3 *Enquiries, Complaints and Requests for Information*

Enquiries, complaints and requests for information can be expected from a wide range of individuals and organisations including members of the public, Government departments, the press and television media and community groups. During the construction phase, the vast majority of such correspondence is likely to be received directly by the Engineer.

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

1) The Contractor's Environmental Team shall notify the Engineer of the nature of the enquiry.

2) An investigation shall be initiated to determine the validity of the complaint and to identify the source of the problem.

3) The Contractor shall undertake the following steps, as necessary:

- Investigate and identify the source of the problem;
- If considered necessary by the Engineer following consultation with the ENM, undertake monitoring to verify the existence and severity of the alleged complaint;
- Liaise with the ENM to identify remedial measures;
- Implement the agreed mitigation measures;
- If monitoring was conducted, repeat the monitoring to verify the effectiveness of the mitigation measures; and
- If the repeat monitoring results continuing to substantiate the complaint, repeat review procedures to identify further possible areas of improvement.

4) The outcome of the investigation and the action taken shall be documented on a complaints proforma as required by MTRC's internal procedures. A formal response to each complaint received shall be prepared, by the Contractor, within a maximum of five working days and submitted to the Engineer in order to notify the concerned person(s) that action has been taken.

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

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

During the construction phase landscape and visual impacts may be associated with the cut and cover, slope stabilisation works located at the northern and southern tunnel portals and at the temporary works area as identified in the Gazettal Plan. However, with the implementation of the recommended mitigation measures, relocation of the temporary works area and the minimisation of geotechnical slope stabilisation works, the residual impacts are anticipated to be only slightly significant.

During the operational phase, landscape and visual impacts may result from the southern tunnel portal and vent structure and associated geotechnical slope stabilisation works, and the at-grade section of railway that curves around the edge of the Water Recreation Centre. With regard to the portal and slope works, if the natural hill-slope is excavated to the full extent as indicated on the Gazettal Plan, then the substantial adverse landscape and visual impacts experienced during the construction phase will also be expected during the operational phase. However, with the implementation of the recommended construction phase mitigation measures, the residual adverse impacts would be reduced to 'slightly significant'.

4.3 CONSTRUCTION PHASE EM&A

4.3.1 *General*

The environmental issues associated with the construction phase of the PBRL which were identified during the EIA process will be addressed through the site inspection process and controls specified in the EM&A Manual. The inspections will include, within their scope, mechanisms to review and assess the Contractor's environmental performance, ensuring that the recommended mitigation measures have been properly implemented, and that the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations of the EIA.

4.3.2 *Site Inspections*

The Contractor's Environmental Team shall undertake regular site inspections and audits of on-site practices and procedures. The primary objective of the inspection and audit programme will be to assess the effectiveness of the environmental controls established by the Contractor and the implementation of the environmental mitigation measures recommended in the EIA.

The findings of site inspections and audits shall be made known to the Contractor at the time of the inspection to enable the rapid resolution of identified problems.

Section 10 presents the scope and frequency of on-site inspections and defines the range of issues the audit protocols should be designed to address.

(Construction Dust) Regulations shall be followed to limit the dust emissions from the site.

Air quality impacts during the operational phase are not considered to be of concern as limited potential sources have been identified.

4.2.3 *Water Quality*

Water quality impacts during the construction and operational phases of the PBRL are not anticipated, therefore, water quality monitoring is not considered necessary for the Project during either stage.

During the construction phase, water quality impacts may be associated with discharges of surface waters and collected groundwater from the various construction sites, and sewage from construction workers. However, no unacceptable residual impacts to local water quality are anticipated

During the operational phase, water quality impacts may arise from the tunnel and at-grade track runoff drainage collection facilities. However, with the adoption of the proposed mitigation measures, as outlined in *Annex E*, no insurmountable water quality impacts are expected.

4.2.4 *Waste Management*

With the implementation of the recommended mitigation measures, the EIA concluded that the potential environmental impacts associated with the storage, handling, collection, transport, and disposal of wastes arising from the construction and operation of the PBRL would meet the criteria specified in the *EIAO TM* and as such, no unacceptable environmental impacts were envisaged.

The total quantity of excavated materials to be generated from the construction of the PBRL is expected to be small, however, the EIA recommends that the Contractor implements the recommended mitigation measures to ensure that adverse impacts are prevented and that the opportunities for waste minimisation and reuse are maximised.

The amount of general refuse arising from the operation of the PBRL is expected to be minimal, but all feasible measures should be taken to avoid, minimise and reuse wastes. Industrial and chemical wastes arising from maintenance activities will be low and limited to plant and equipment maintenance. It is envisaged that MTRC's current procedures should be sufficient to adequately control the predicted wastes.

4.2.5 *Landscape and Visual*

The EIA determined that with the implementation of the recommended mitigation measures, that the landscape and visual impact would be acceptable during the construction and operational phases of the Project.

4 EM&A GENERAL REQUIREMENTS

4.1 INTRODUCTION

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

4.2 SUMMARY OF THE ENVIRONMENTAL IMPACT ASSESSMENT

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

4.2.1 *Noise*

The PBRL concluded that environmental monitoring for noise was not necessary during the construction and operational phases of the Project.

Noise from the construction works was determined to be the main source of noise arising from the Project, with the primary source being the use of powered mechanical equipment on site. However, in view of the distances between the sensitive uses and the works sites, no insurmountable noise impacts were expected.

In view of the setback distance and the operational characteristics of the trains, no noise impacts are anticipated during the operational phase. Accordingly, no mitigation measures will be required and no cumulative impacts with existing sources of railway noise will arise. Fixed plant noise was considered to be an issue as the EIA TM noise limit can be satisfied provided that the recommended good engineering practice noise limit are implemented, as outlined in the IS (*Annex E*).

4.2.2 *Air Quality*

The EIA has demonstrated that adverse air quality impacts during the construction and operational phases are not anticipated, therefore, air quality monitoring is not considered necessary for the Project during either stage.

Construction dust has been identified as the main air quality issue arising during the construction phase. Handling of excavated materials and vehicle movements on haul roads are the main source of dust impact. However, in view of the buffer distances between the sensitive uses and the works, no air quality impacts are expected. To ensure the environmental performance of the works, environmental control measures stated in *the Air Pollution Control*

Annex E

Implementation Schedule

The Implementation Schedule has the following column headings:

- **EIA REF :**
  This denotes the section number or reference from the EIA Report Main text.

- **EM&A LOG REF:**
  This denotes the sequential number of each of the recommended mitigation measures specified in the Implementation Schedule.

- **ENVIRONMENTAL PROTECTION MEASURES:**
  This denotes the recommended mitigation measures, courses of action or subsequent deliverables that are to be adopted, undertaken or delivered to avoid, minimises or ameliorate predicted environmental impacts.

- **LOCATION/DURATION OF MEASURES/TIMING OF COMPLETION OF MEASURES:**
  This indicates the spatial area in which the recommended mitigation measures are to be implemented together with details of the programming or timing of their implementation.

- **IMPLEMENTATION AGENT:**
  This denotes where the responsibility lies for the implementation of the recommended mitigation measures.

- **IMPLEMENTATION STAGE:**
  This denotes the stage at which the recommended mitigation measures are to be implemented; either during the Design, Construction, Operation or Decommissioning.

- **RELEVANT LEGISLATION & GUIDELINES:**
  This section defines the controlling legislation or guidelines that are either required to be complied with, or should be complied with as good practice

Table 1.1 Recommended Mitigation Measures and their Implementation

EIA* Ref	EM&A Log Ref	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		NOISE							
		Construction Phase Standard Mitigation Measures							
		The following measures should be incorporated into contract documents and adopted as part of good site practices to minimise potential noise impacts:							
3.4.3	1	only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Noise Control Ordinance (Cap400) and Annex 5 of EIA TM.*
3.4.3	2	machines and plant that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Noise Control Ordinance (Cap400) and Annex 5 of EIA TM.*
3.4.3	3	silencers or mufflers on construction equipment should be utilised and be properly maintained during the construction works;	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Noise Control Ordinance (Cap400) and Annex 5 of EIA TM.*
		Operational Noise Suppression Measures for Fixed Plant							
3.5.3	4	It is recommended that the sound pressure level measured at a distance 1 m from any louvers, exhaust outlets and vent shafts should be controlled to within80 dB(A), as a good engineering practice to reduce the potential noise nuisance to the surrounding environment.	Site-wide and during the operation phase of the railway.	To be implemented by MTRC			√		Noise Control Ordinance (Cap 400) and Annex 5 of EIA TM.
3.5.3	5	Maintain PBRL rolling stock not to exceed a reference noise level of L_{max} 91dB(A) at 25 m at 130 kph on ballasted track bed supporting continuously welded rail.	Site-wide and during the operation phase of the railway.	To be implemented by MTRC			√		Noise Control Ordinance (Cap 400) and Annex 5 of EIA TM.

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
4.4.3	6	**Air Quality** In addition to complying with the requirements of the *Air Pollution Control (Construction Dust) Regulations*, the Contractor shall comply with thefollowing:							
		• the loading, unloading, handling, transfer or storage of cement, pulverised fuel ash or other equally dusty materials should be carried out in an enclosed system;	At all times during the operation of the batching plant.	To be implemented by the Contractor(s) and enforced by Engineer/ENM					EPD's Best Practicable Means Requirements for Cement Works (Concrete Batching Plant)
		• all dust-laden air or waste gas generated by the process operations should be properly extracted and vented to fabric filtering system;	At all times during the operation of the batching plant.	To be implemented by the Contractor(s) and enforced by Engineer/ENM					EPD's Best Practicable Means Requirements for Cement Works (Concrete Batching Plant)
		• cement, pulverised fuel ash or other equally dusty materials should be stored in storage silo fitted with audible high-level alarms to warn of over-filling, the high-level alarm indicators should be interlocked with the material filling line;	At all times during the operation of the batching plant.	To be implemented by the Contractor(s) and enforced by Engineer/ENM					EPD's Best Practicable Means Requirements for Cement Works (Concrete Batching Plant)
		• vents of all silos and weighing scale should be fitted with fabric filtering system; and	At all times during the operation of the batching plant.	To be implemented by the Contractor(s) and enforced by Engineer/ENM					EPD's Best Practicable Means Requirements for Cement Works (Concrete Batching Plant)
		• seating of pressure relief valves of all silos should be checked, and the valvesreseated if necessary, before each delivery.	At all times during the operation of the batching plant.	To be implemented by the Contractor(s) and enforced by Engineer/ENM					EPD's Best Practicable Means Requirements for Cement Works (Concrete Batching Plant)
		WATER QUALITY- Construction Phase The following measures should be incorporated into contract documents and adopted as part of good site practices to minimise potential water quality impacts:							

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		Construction Runoff and Drainage (Erosion Control Plan)							
5.6.4	7	• Sediment traps, of sufficient capacity,shall be used for settling surface runoff prior to discharge to storm drains/culverts or discharge to marine waters. The system capacity should be flexible and able to handle multiple inputs from a variety of sources.	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94) *Water Pollution Control Ordinance* (WPCO)
5.6.4	8	• Adequate maintenance of drainage systems to prevent flooding and overflow.	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94) *Water Pollution Control Ordinance* (WPCO)
5.6.4	9	• The boundaries of large areas of exposed earthworks should be provided with flood protection measures, which could includetemporary ditches to facilitate runoff discharge into the drainage system via a sedimentation trap.	Site-wide prior to earthworks/excavation and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94) *Water Pollution Control Ordinance* (WPCO)
5.6.4	10	• Permanent drainage channels should incorporate sediment basins or traps and baffles to enhance deposition rates. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94.	To be incorporated into the design during the detailed design phase, and to be implemented site-wide throughout the full duration of construction contract(s).	Design Engineers to address at detailed design stage, and Contractor(s) to implement during construction.	√	√			Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94) *Water Pollution Control Ordinance* (WPCO)
5.6.4	11	• All exposed earth areas should be protected as soon as possible after earthworks have been completed, or alternatively, within4 weeks of the cessation of earthworks where practicable.	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.6.4	12	• Open stockpiles of construction materials (e.g. aggregates, sand and fill material) of more than 50m̂ should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)
5.6.4	13	• Manholes (including newly constructed ones) shall always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and storm runoff being directed into foul sewers.	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)
		General Construction Activities							
5.6.4	14	• The Contractor shall comply with the requirements of the WCPO, and any licenses issued under the Ordinance, to ensure the mitigation of potential water quality impacts during construction	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)
5.6.4	15	• Standard good housekeeping practises shall be employed by the Contractor (s) to ensure the control of activities that may have implications for water quality This shall include:	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.6.4	16	• debris and rubbish on-site shall be collected, handled and disposed of properly to avoid entering the water column to cause water quality impacts; • all fuel tanks and storage areas shall be provided with locks and located in sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank, to prevent spilled fuel oils from reaching the coastal waters of Yam O Wan or Penny's Bay.	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENMIEC		√			*Water Pollution Control Ordinance* (WPCO)
		Sewage Effluent							
5.6.4	17	• If possible, all the sewerage effluent from the construction workers at Yam Oshould be diverted to the foul sewer for treatment at Siu Ho Wan Sewerage Treatment Works. If no connection can be made to the foul sewer at Yam O then the workforce shall use portable chemical toilets. Prior to the commissioning of the sewerage system at Penny's Bay, the construction work force shall use portable chemical toiletsalong the rail alignment at Penny's Bay.	Site-wide and throughout full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)
		Runoff from Temporary Depot							
5.6.4	18	• hard standing surfaces shall be provided for areas which may potentially give rise to contamination of storm water by oil and grease. Runoff and spillage prevention measures shall conform with relevant engineering and design standards;	Specific to the temporary depot and for the full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.6.4	19	• on-site drainage must focus on the areas where contaminated effluent may be generated and provide a clear segregation of clean and contaminated effluents;	Specific to the temporary depot and for the full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)
5.6.4	20	• all plant maintenance areas shall be bunded and constructed on a hard standing, and provided with sediment traps and petrol interceptors. Traps and interceptors shall be regularly cleaned and maintained, especially after any accidental spillages. Each petrol interceptor shall have a bypass to prevent flushing during periods of heavy rains. Layers of sawdust, sand or equivalent material shall beavailable to be laid underneath and around any plant and equipment that may possibly leak oil to prevent transport of oil to stormdrains and marine waters during rainstorms	Specific to the temporary depot and for the full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Water Pollution Control Ordinance* (WPCO)
5.6.4	21	• measures shall be developed for the temporary depot to ensure that any accidental spillage event is treated immediately and does not impact on any water bodies;	Specific to the temporary depot and for the full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM	√				*Water Pollution Control Ordinance* (WPCO)
5.6.4	22	• the disposal of waste oil and other chemicals at the Government Chemical Waste Treatment Centre at Tsing Yi; and	Specific to the temporary depot and for the full duration of construction contract(s)	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Waste Disposal (Chemical Waste) (General) Regulation (Cap 354).*
5.6.4	23	• drainage and effluent collection and treatment systems shall be specified to meet the discharge limits at the detailed design stage.	To be incorporated into the detailed design of the temporary depot	Design Engineers to address at detailed design stage	√	√			*Technical Memorandum of Standards for Effluents into Drainage and Coastal Waters*
		Water Quality -Operational Phase							

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		The following measures shall be incorporated into the operation of the PBRL:							
5.7.2	24	• a surface water drainage system shall be provided to collect operational tunnel seepage. Where oils and lubricating fluids could be spilt facilities shall be provided to remove the oil / greasebefore being pumped to the public stormwater drainage system It is envisaged that the operational tunnel dischargeand track runoff will pass through the oil and grit / silt interceptors / chambers to remove oil, grease and sediment, however, other suitable alternative methods may be used	To be incorporated into the detailed design and to be implemented before the operation of the PBRL.	Design Engineers to address at detailed design stage	√	√			*Water Pollution Control Ordinance* (WPCO)
5.7.2	25	• sewage effluents generated at the station are required to meet the TM standards prior to discharge. Sewage shall be directed to the public foul sewerage system and/or on-site sewage treatment facility for treatment prior to discharge to the public foul sewerage system	To be incorporated into the detailed design and to be implemented before the operation of the PBRL.	Design Engineers to address at detailed design stage	√	√			*Water Pollution Control Ordinance* (WPCO)
5.7.2	26	• the efficiency of silt traps and oil interceptors is dependent on regular cleaning and maintenance. These installations shall be regularly cleaned and maintained in good working condition; and this shall be incorporated into operational procedures;	Site-wide and throughout the operation of the PBRL	To be undertaken by MTRC during the operation of the PBRL.			√		*Water Pollution Control Ordinance* (WPCO)
5.7.2	27	• oily contents of the oil interceptors shall be collected for reuse, or transferred to a disposal facility;	Site-wide and throughout the operation of the PBRL	To be undertaken by MTRC during the operation of the PBRL.			√		*Water Pollution Control Ordinance* (WPCO)

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.7.2	28	• the design of the sanitary fitments and drainage works shall take into account the guidelines published in Drainage Plans subject to Comment by the EPD and	To be incorporated into the detailed design and to be implemented before the operation of the PBRL.	Design Engineers to address at detailed design stage	√	√			*Practice Note for Professional Persons, Environmental Protection Department* (ProPECC PN 5/93).
5.7.2	29	• a small waste water treatment plant(or other suitable alternative method) should be provided to remove detergents from the waste waters arising from the train washing facilities prior todischarging to the foul sewers.	To be incorporated into the detailed design and to be implemented before the operation of the PBRL.	Design Engineers to address at detailed design stage	√	√			
		Waste Management The following measures should be incorporated into contract documents and adopted as part of good site practices to minimise potential waste management concerns:							*Waste Disposal Ordinance and subsidiary legislation*
6.3.3	30	• Submission of a Waste Management Plan for the Construction Phase which shall take into account the recommendations of the EIA study.	1 month prior to the commencement of construction work on site	To be produced and submitted by the Contractor(s) and for review by the Engineer/ENM	√				
6.3.3	31	• Training and instructions shall be given to the construction staff to increase the awareness and draw attention to waste management issues and the need to minimise waste generation.	All construction staff at the commencement of the construction contracts and thereafter on a yearly basis.	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
6.3.3	32	• Obtain the necessary waste disposal permits from the appropriate authorities, if they are required, in accordance with the relevant legislation.	Site-wide and prior to the commencement of the construction contracts and thereafter as required.	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			*Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste)(General) Regulation (Cap 354), the Crown Land Ordinance (Cap 28), Dumping at Sea Ordinance(Cap 466) and Works Branch Technical Circular No22/92, Marine Disposal of Dredged Mud.*
6.3.3	33	• Proper segregation of C&D wastes, public fill and recyclable materials into different transit skips/containers.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			
6.3.3	34	• Storage of general refuse in enclosed bins or compaction units.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			
6.3.3	35	• Waste Storage areas shall be maintained, cleaned or washed regularly.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			
6.3.3	36	• All loads of public fill or C&D waste shall be properly covered with tarpaulin before leaving the site.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			
6.3.3	37	• Chemical waste shall be stored, handled, transported and disposed of in accordance with the*Code of Practice on the Packaging, Handling and storage of Chemical Waste.*	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			
6.3.3	38	• Burning of waste is strictly prohibited.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by the Contractor(s) and enforced by Engineer/ENM		√			

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		LANDSCAPE AND VISUAL Recommended landscape and visual mitigation measures for impacts caused during the construction process are described below:							
		Landscape Mitigation Measures - Construction Phase							
	39	• Limitation of the Contractor's works area at the south portal to the areas of flat land atthe base of the natural slope.	To be incorporated into the detailed design and enforced throughout the construction phase of the PBRL.	MTRC's Design Engineers to address at detailed design stage, and to be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.	√	√			*EIAO TM*
	40	• Minimisation of cut into theexisting slopes for the construction of the north and southportals.	To be incorporated into the detailed design and enforced throughout the construction phase of the PBRL.	MTRC's Design Engineers to address at detailed design stage, and to be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.	√	√			*EIAO TM; WBTC 25/93 Control of Visual Impact of Slopes*
	41	• Excavated material to be used for Penny's Bay reclamation so as to minimise haulage, if possible.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.		√			*EIAO TM*
	42	• Regular checks of work site boundaries.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.		√			*EIAO TM*
	43	• Topsoil stripped and stored for re-use, where practical.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.		√			*EIAO TM*
	44	• Minimisation of soil erosion.	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.		√			*EIAO TM*

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
	45	• Control of waste disposal, oil spillage etc on site	Site-wide and throughout the full duration of the construction contract(s).	To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.		√			*EIAO TM, Waste Disposal Ordinance and subsidiary legislation*
	46	• Control of night-time lighting.	Site-wide	To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.		√			*EIAO TM*
	47	• Decorative hoarding on the northern section of works area.	Specific to the northern section and throughout the full duration of the construction contract(s).	To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.		√			*EIAO TM*
		Landscape Mitigation Measures - Operation Phase Landscape impact mitigation measures which should be incorporated within the permanent landscape design include the following:							
	48	• The northern vent building should be located to avoid excavation into the existing hill-slope.	To be incorporated into the detailed design and implemented before the operation of the PBRL.	MTRC's Design Engineers to address at detailed design stage and to be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.			√		*EIAO TM; WBTC 25/93 Control of Visual Impact of Slopes*
	49	• Design of the southern portal (as associated works area) should avoid unnecessary cutting of the natural hill-slope.	To be incorporated into the detailed design and implemented before the operation of the PBRL.	MTRC's Design Engineers to address at detailed design stage, and to be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.	√		√		*EIAO TM; WBTC 25/93 Control of Visual Impact of Slopes*
	50	• The vent structure at the southern portal should be built without causing any excavation into the existing hillside.	To be incorporated into the detailed design implemented before the operation of the PBRL.	MTRC's Design Engineers to address at detailed design stage, and to be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.	√		√		*EIAO TM; WBTC 25/93 Control of Visual Impact of Slopes*

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
	51	• The vent structures should receive sensitive architectural and chromatic treatment	To be incorporated into the detailed design and implemented for the full duration of construction contract(s).	MTRC's Design Engineers to address at detailed design stage, and to be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.	√				*EIAO TM*
	52	• Woodland tree and shrub planting should be undertaken around the northern tunnel portal and cut and cover tunnel so as to compensate forvegetation loss during construction. Any affected slope areas should be hydroseeded and planted with woodland species, not shotcreted.	To be implemented before completion of the construction works.	MTRC's Design Engineers to address at detailed design stage, and to be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM.			√		*EIAO TM; WBTC 25/93 Control of Visual Impact of Slopes*
	53	• Native shrub planting should be undertaken to blend the southern tunnel portal into the landscape. Any affected slope areas should be hydroseeded and planted with woodland species, not shotcreted.	To be implemented before completion of the construction works.	MTRC's Design Consultants to address at detailed design stage. To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM			√		*EIAO TM; WBTC 25/93 Control of Visual Impact of Slopes*
	54	• High landscape berms should formed along the south side of the railway adjacent to the Theme Park, with lower berms along the north side.	Prior to the completion of construction contract(s).	HKITH's Design Consultants to address at detailed design stage. To be implemented by the Theme Park Operator's Contractor(s) and enforced by Theme Park Operator's Engineer/ENM		√			*EIAO TM*
	55	• Tree and shrub planting should be implemented alongside the railway reserve to screen the railway and provide an attractive green outlook for railway passengers. However, tree planting must not comprise railway safety.	Prior to the completion of construction contract(s).	MTRC's Design Consultants to address at detailed design stage. To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM. MTRC on MTRC land, HKITP on Theme Park, CED on Government Land.		√			*EIAO TM*

EIA* Ref	EM&A Log *Ref*	Environmental Protection Measures*	Location /Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
	56	• The external appearance of rail-related structures should be carefully detailed in terms of form and colour such that they are visually integrated as much as possible into the surrounding landscape	To be incorporated into the detailed design and implemented before the operation of the PBRL.	MTRC's Design Engineers to address at detailed design stage.	√				*EIAO TM*
	57	• Trees in paving should be planted either side of the Disneyland Station to provide shade for pedestrians and soften the appearance of the station.	To be incorporated into the detailed design and implemented before the operation of the PBRL.	MTRC's Design Consultants to address at detailed design stage. To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM			√		*EIAO TM*
	58	• Trees in paving should be planted on the west side of the footbridge leading from the PTI to Yam O Station to provide shade for pedestrians and soften the appearance of the station.	To be incorporated into the detailed design and implemented before the operation of the PBRL.	MTRC's Design Consultants to address at detailed design stage. To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM			√		*EIAO TM*
	59	• A wide landscape buffer comprisingberm and tree planting should be provided to screen Yam O Station and the transport corridor from the Theme Park Gateway.	To be incorporated into the detailed design and implemented before the operation of the PBRL.	MTRC's Design Consultants to address at detailed design stage. To be implemented by MTRC's Contractor(s) and enforced by MTRC's Engineer/ENM			√		*EIAO TM*

* All recommendations and requirements resulted during the course of the EIA/EA Process, including ACE and /or accepted public comment to the proposed project

** Des =Design, C =Construction, O =Operation, Dec =Decommissioning.

Penny's Bay Rail Link Environmental Impact Assessment

Executive Summary

Mass Transit Railway Corporation

Penny's Bay Rail Link:
Executive Summary

February 2000

Environmental Resources Management
6/F Hecny Tower
9 Chatham Road, Tsimshatsui
Kowloon, Hong Kong
Telephone: 2271 3000
Facsimile: 2723 5660

Mass Transit Railway Corporation

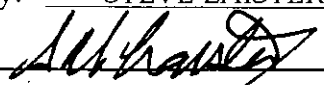
Penny's Bay Rail Link:
Executive Summary

February 2000

Reference C1937

For and on behalf of
Environmental Resources Management

Approved by: STEVE LAISTER

Signed: 

Position: EXECUTIVE DIRECTOR

Date: 25 February 2000

CONTENTS

1 INTRODUCTION

This executive summary presents the key findings resulting from the Environmental Impact Assessment (EIA) of the proposed Penny's Bay Rail Link (PBRL). The EIA has considered the impacts associated with the construction and operation of the railway, and the principal findings are set out below.

1.1 SCOPE OF THE STUDY

ERM-Hong Kong Ltd. has been commissioned to undertake an Environmental Impact Assessment (EIA) of the *Penny's Bay Rail Link* (PBRL) for the Mass Transit Railway Corporation (MTRC) in accordance with the requirements of the *Environmental Impact Assessment Study Brief No. ESB - 043/1999 for Construction of An International Theme Park in Penny's Bay of North Lantau and Its Essential Associated Infrastructures.* ERM-Hong Kong Ltd. is supported by Urbis Limited in undertaking specialist study of landscape and visual impacts.

The PBRL EIA forms part of a wider EIA for the theme park, essential infrastructures including road works, water supplies, stormwater drains, a multi-purpose lake and various other utilities being developed by Civil Engineering Department (CED). The assessment of PBRL is part of this wider study but, as required by the EIA applicant, CED, is provided by MTRC as a standalone EIA to be included as an Appendix to CED's submission under the EIA Study Brief and in accordance with the *Technical Memorandum on the Environmental Impact Assessment Ordinance* (EIAO).

The EIA Report includes a detailed assessment of the environmental impacts arising from the construction and operation of the PBRL and identifies potential impacts relating to air quality, noise, water quality, waste management, and landscape and visual resources.

1.2 PROJECT DESCRIPTION

The proposed Penny's Bay Rail Link(PBRL) comprises a new 3.6 km link from the existing Tung Chung Line at Yam O to the Penny's Bay site of the proposed new Disney Theme Park as shown by *Figure 1.2a.*

A new Yam O Station will be constructed along the existing Tung Chung Line and will have two platforms, for the Tung Chung Line services between Hong Kong and Tung Chung, and an additional, third platform dedicated to the PBRL service. Concourses will be constructed above the three platforms and connected by overhead link bridges.

The PBRL will comprise a single track which will run parallel to the Tung Chung line before passing under the existing Tung Chung and Airport Express formation and the North Lantau Highway and into a 100 m length of cut and cover tunnel. The PBRL then enters the 750 m single cell horse-shoe tunnel to pass below the central hills of North Lantau to emerge to the north of Penny's Bay. A passing loop will be constructed to the south of the portal before the PBRL enters the new Disneyland Station. This station will be built on Penny's Bay Reclamation and will comprise a single platform.

Much of the PBRL is to be constructed at grade. However, portions of the track will be in cutting in the vicinity of Yam O Station, so as to gain sufficient headroom to pass underneath the existing viaducts of the North Lantau Highway, and on the approaches to the Disneyland Station will remain in cutting to minimise visual impacts.

1.3 *CONSIDERATION OF ALTERNATIVES AND "DO NOTHING" SCENARIO*

Within the Yam O site, the alignment is constrained by the existing and proposed highways, the existing Lantau Airport Railway (LAR), an existing MTR traction substation and the close proximity of the sea wall. Together with the need for the PBRL platform to be parallel with the existing LAR lines, the alignment is essentially predetermined to fit the existing infrastructure. Other options have been examined but these involve only minor deviation in the vicinity of Yam O Station according to platform and connection details.

These constraints determine the alignment to the east and then south, in tunnel through the hill to Penny's Bay, continuing towards the Theme Park site on land to be reclaimed by CED. The layout within the Penny's Bay reclamation is determined by the planning layout of the intended landuses for the platform. Given the proposed arrangement of the landuse in Penny's Bay, there are no other conceivable and practical alignments between Yam O Station and Disneyland Station that would ameliorate environmental impacts, including noise and those to landscape and visual resources.

The existing LAR tracks at Yam O are at approximately +6.2 mPD and the PBRL will be at the same level with a horizontal profile extending from the LAR tracks to the tunnel portal. Throughout the tunnel section, the vertical alignment follows a slight up gradient towards the Penny's Bay reclamation, designed to match with the Government's highway proposals at that portal, then trending downwards to Disneyland Station, where it is at a level of approximately +2.0mPD, which in conjunction with earth bunds, serves to mask train operations from the Theme Park.

While the above constraints allow no alternative alignment, a "Do Nothing" scenario is considered briefly here. The PBRL is proposed in order to improve transport communications for the users of the Theme Park and other new sites proposed on the Penny's Bay reclamation and Northshore Lantau Development. In environmental terms, the projected ridership levels indicate

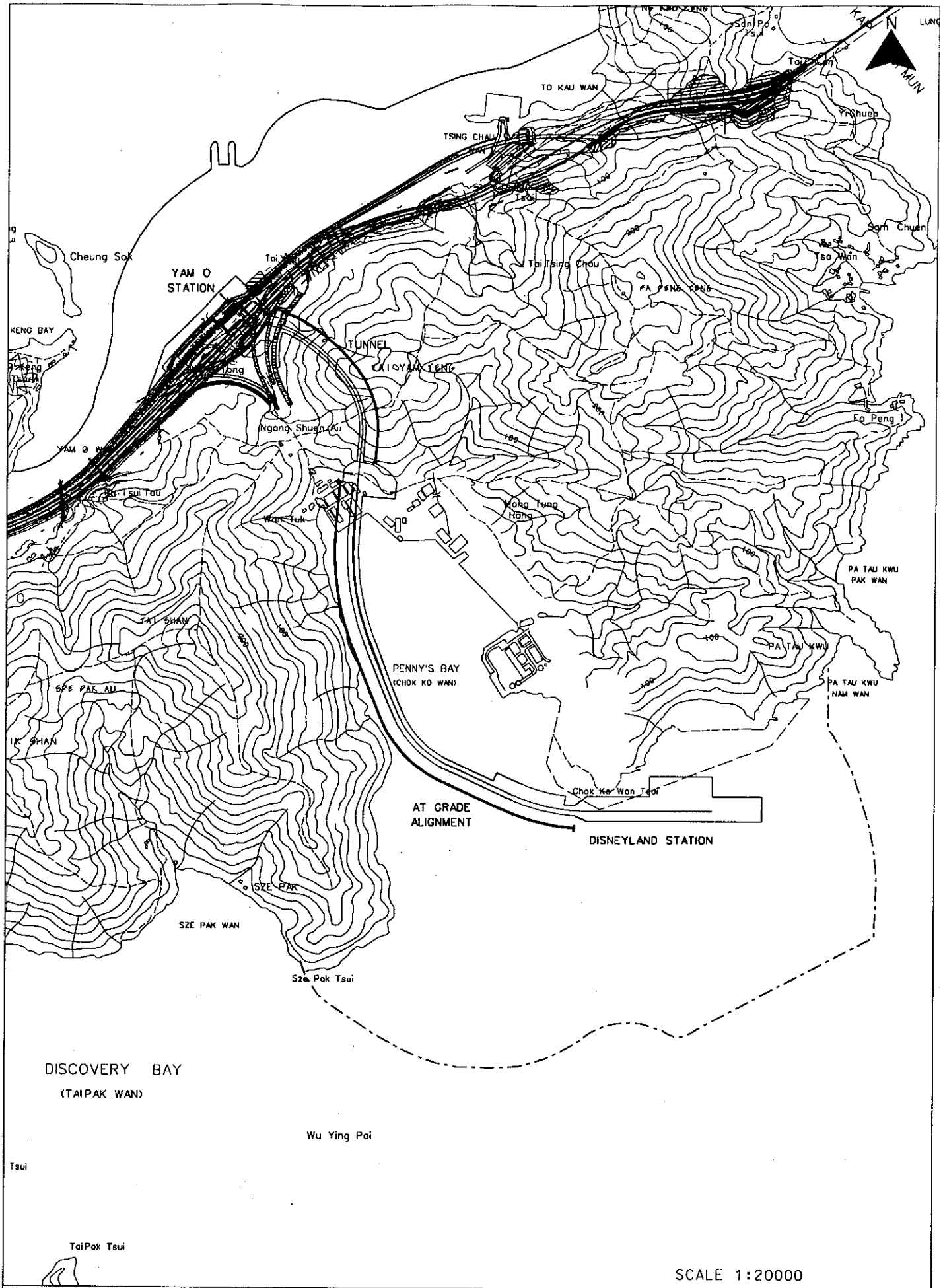


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FIGURE 1.2a

PROJECT AREA & ROUTE OF PBRL

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DATE: 19/01/00

Environmental Resources Management

ERM

that the proposed railway will carry up to 30,000 passengers per hour. If the PBRL was not constructed, the travellers to the proposed new land uses would need to find alternative means of transport. It is most likely that the alternative transport options would comprise car and bus journeys. As a consequence, there would be an increased level of vehicles on the road networks in the surrounding areas which would give rise to increased levels of vehicular air pollutants and noise.

1.4 *CUMULATIVE IMPACTS*

The potential for cumulative impacts will be fully considered by the Theme Park EIA based upon the impact assessment information provided by the PBRL EIA as, for the exception of the rail noise, common environmental issues are assessed in the wider context of the Theme Park EIA Study's assessment area.

For the assessment of cumulative railway noise, the PBRL EIA assesses the cumulative impact of the Lantau Airport Railway (both Tung Chung Line and Airport Express Services) and PBRL noise.

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2.1.1 *Introduction*

A number of key impacts and issues were identified during the course of the EIA Study. These included impacts that were significant because of their nature or scale. The findings of the EIA in relation to these issues are summarised below.

2.2 *NOISE ISSUES*

2.2.1 *Baseline Conditions*

The existing ambient noise levels are mainly affected by the traffic on North Lantau Highway and railway noise from Airport Express Line and Tung Chung Line. Noise emission from the nearby Penny's Bay Power Station also contributes to the background noise level of the area. In the future, the planned Chok Ko Wan Link Road and Route 10 will be new sources of noise directly affecting the area.

The nearest potential sensitive receivers are village type developments located in Luk Keng Tsuen, while the nearest densely populated areas are Discovery Bay and Peng Chau which are more distant from the site. As all the sensitive uses are over 300 m away from PBRL, noise impacts on these NSRs are not expected.

2.2.2 *Construction Noise Impacts*

The source of noise during each construction stage of the Project is mainly from the use of PME on site. The works will require a number of noisy activities including the use of heavy plant for excavation, filling, concreting, tunnelling and station construction.

As the nearest NSR is more than 300 m away from construction site boundaries, noise impacts associated with the construction activities during daytime are not expected. Noise nuisance from site traffic would also be unlikely given the limited traffic on site. Specific noise mitigation measures are therefore not required. However, the Contractor will be responsible for adopting good site practice and maintaining proper on-site management in order to ensure the environmental performance of the works.

2.2.3 *Operational Noise Impacts*

In view of the setback distance and the operational characteristics of the trains, no noise impacts are anticipated during the operational phase. Accordingly, no mitigation measures will be required and no cumulative impacts with existing sources of railway noise will arise. Fixed plant noise is

also not an issue and can satisfy the EIAO noise limit provided that the recommended good engineering practice noise limit is implemented.

2.3 AIR QUALITY

2.3.1 *Baseline Conditions*

The main sources of air pollution in Penny's Bay is from vehicle emissions arising from the North Lantau Highway and air emissions from the China Light & Power Ltd (CLP) Penny's Bay Gas Turbine Power Station. Air quality monitoring data provided by CLP indicates that the background pollutant levels for the area are low, with EPD having classified the study area as being rural in character, with the ambient air quality being generally good with low pollutant levels.

The nearest potential sensitive receivers are the village type developments located close to the shore line, Luk Keng Tsuen. Although Penny's Bay Gas Turbine Power Station itself is a pollution source, offices and accommodations within the station are potential sensitive receivers.

2.3.2 *Construction Air Quality*

The potential air quality impacts arising from the construction of PBRL are likely to be fugitive dust emissions and gaseous emissions from construction plant, construction activities and vehicle movements within the site. These activities are not expected to cause any exceedance of *Air Quality Objectives* due to given the limited number of plant, vehicle movements and the buffer distance from the ASRs. However, it is the responsibility of the Contractor to implement appropriate site management practices and those measures detailed in *Air Pollution Control (Construction Dust) Regulations* in order to ensure the environmental performance of the works.

For the blasting works within the rock tunnel between Yam O and Penny's Bay and the hydraulic breaking activities required inside the cut and cover tunnel at Yam O, the Contractor will be required to adopt the best practical means and measures in undertaking these kinds of works, such as the measures required by the Mines & Quarries Division of the Civil Engineering Department. The outbreak of dust from these activities will be carefully controlled and will not cause dust impacts on the ASRs.

2.3.3 *Operational Air Quality*

Potential air quality impacts during the operation of PBRL will be limited since electric trains will be used and no air emissions will be produced. However, low levels of dust may be generated by the abrasion and wear of track, electrical pick-up gear and rolling stock during normal operation and from maintenance activities. Ozone will also be generated due to arcing between the power rail and train pick-ups. The amount of air pollutant

generated from such activities will be limited and will have a negligible impact on the ASRs.

2.4 WATER QUALITY ISSUES

2.4.1 *Baseline Conditions*

The Study Area covers the north-eastern part of Lantau Island which is directly influenced by the main channel flows passing around Ma Wan Island, into and out of the Western Harbour and Victoria Harbour. Any impacts from the construction and operation of the PBRL will occur within two *Water Control Zones*, the North Western and Southern. In 1997, the water quality in the vicinity of the Study Area is generally good, achieving compliance with all *Water Quality Objectives*, except Total Inorganic Nitrogen (TIN), with the data showing that the study area is somewhat influenced by sewage discharges. The influence of sewage discharges in the North Lantau area likely to increase in the future due to increasing flows through the Siu Ho Wan outfall.

2.4.2 *Water Quality Impacts*

Water quality impacts during the construction of PBRL may be associated with discharges of surface waters and collected groundwater from the various construction sites, and sewage from construction workers. However, it is anticipated that there will be no insurmountable residual impacts on water quality, provided that the recommended mitigation measures are effectively implemented and so all the construction site/works area discharges will comply with effluent discharge standards.

With the implementation of all the proposed mitigation measures, there are not predicted to be any potential water quality impacts arising from the operation of the proposed rail development.

2.5 WASTE MANAGEMENT ISSUES

The construction activities will result in the generation of a variety of wastes including excavated material, construction and demolition waste, chemical waste and general refuse. Adherence to the recommended mitigation measures relating to good practice will ensure that adverse impacts are prevented and that the opportunities for waste minimisation and reuse are taken.

The amount of general refuse, industrial and chemical wastes arising from the operation of the PBRL is expected to be small.

The implementation of appropriate mitigation measures will reduce the potential environmental impacts associated with the storage, handling, collection, transport, and disposal of wastes arising from the construction and

operation of the PBRL will meet the criteria specified in the *EIAO* and no unacceptable environmental impacts are anticipated.

2.6 LANDSCAPE AND VISUAL ISSUES

2.6.1 *Baseline Conditions*

The existing environment is rural in nature, with Penny's Bay located between two upland areas of Fa Peng Teng and Tai Shan and the low-lying saddle at Ta Shui Wan. The landscape comprises of smooth undulating hillsides with small areas of shrub and woodland on the lower slopes.

The views from the study area are restricted by the eastern and western hillsides, with views on a clear day to the south showing Peng Chau, Siu Kau Yi Chau and Kau Yi Chau and in the far distance Lamma Island and Hong Kong Island. Within Penny's Bay, extensive rock-cut slopes have been formed behind, to the south of Penny's Bay Power Station and Cheoy Lee Shipyard, and these create an unattractive visual impact on the surrounding areas.

2.6.2 *Landscape and Visual Impacts*

The assessment has indicated that the most significant impacts during the construction phase would be visual impacts caused by the construction of the cut and cover tunnel and slope stabilisation works at the north portal and the temporary works area and slope stabilisation works at the south portal. However, with the implementation of the proposed mitigation works, it is anticipated that the residual impacts would be reduced to slight significance.

During the operational phase, the most significant impacts would be the landscape and visual impacts associated with the southern tunnel portal and vent structure and associated geotechnical slope stabilisation works, and the section of the at-grade railway that curves around the edge of the Water Recreation Centre. However, if the proposed mitigation measures are adopted, the residual impacts would be reduced to slight significance. With regard to the Water Recreation Centre, the railway would be clearly visible to users of the Centre who would subsequently suffer residual adverse impacts of moderate significance. However, it would be quite possible for the designers of the Centre (which will be built concurrently with the railway) to provide berming and screening with the Centre to screen the railway if so desired.

Overall, it is considered that, the landscape and visual impacts are acceptable with the implementation of the recommended mitigation measures.

3 FUTURE REQUIREMENTS

3.1 ENVIRONMENTAL MONITORING AND AUDIT

To ensure that the mitigation measures recommended within the EIA Report are carried forward and implemented at the appropriate stage of the project, an Implementation Schedule has been produced. For each of the mitigation measures the Implementation Schedule defines the stage and location at which the measure should be implemented together with the responsible agent. An Environmental Management System has also been proposed as a means of ensuring the full implementation of the mitigation measures.

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The implementation of the recommended mitigation measures will ensure that there are no residual environmental impacts from the construction or operation of the PBRL.

The mitigation measures recommended in the EIA represent accepted measures which may be employed to ensure compliance with statutory requirements, Government guidelines and other environmental standards agreed with the EPD. The Environmental Monitoring and Audit programme which will be adopted during the construction of the PBRL will also help ensure compliance with statutory and recommended criteria.

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地鐵公司

竹篙灣鐵路環境影響評估：

行政摘要

二零零零年二月二十五日

香港環境資源管理顧問公司
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電話：（八五二）二二七一　三零零零

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地鐵公司

竹篙灣鐵路環境影響評估：

行政摘要

二零零零年二月二十五日

香港環境資源管理顧問有限公司

批核 ： 張振明

（張振明）

職位 ： 副董事總經理

日期 ： 二零零零年二月二十五日

目錄

1 序言

本行政撮要總結竹篙灣鐵路環境影響評估(環評)的主要結論。此環評研究考慮的範圍，包括鐵路於興建時及日後運作對環境的影響，主要研究結果簡述於下。

1.1 研究範圍

香港環境資源管理顧問有限公司受香港地下鐵路公司委託，根據《環境影響評估研究概要(ESB - 043/1999)：北大嶼山竹篙灣國際主題公園及有關重要基礎設施建設工程》的規定，為竹篙灣鐵路作出環境影響研究，同時獲得雅邦規劃設計有限公司協助專門研究鐵路對景觀及視覺兩方面的影響。

「竹篙灣鐵路環境影響研究」是土木工程署為主題公園所作的環境影響研究的一部分。土木工程署的研究範圍，涵蓋各項基本設施，包括道路工程、供水、雨水渠、多用途湖泊及該署將要鋪設的多項公用設施。對竹篙灣鐵路的研究，是該廣泛研究的一部分，並由香港地下鐵路公司應土木工程署之邀，根據《環境影響評估條例技術備忘錄》作獨立研究，研究報告將會被列入土木工程署的《環境影響評估研究概要》的附錄中。

本環境影響研究報告書會詳細列出竹篙灣鐵路於建造及運作時對環境的影響，同時指出該鐵路對空氣質素、噪音、水質、廢物管理、景觀與視覺資源的潛在影響。

1.2 項目簡述

建議興建的竹篙灣鐵路包括一條長3.6公里的的新鐵路，由現有的東涌線從陰澳連至迪士尼主題公園位於竹篙灣的新址，如圖1.2a所示。

鐵路公司將會在現有的東涌沿線興建新的陰澳站。站上有兩個月台，供東涌線鐵路使用，來往香港與東涌。另外會興建第三個月台，專供竹篙灣鐵路之用。在三個月台之上將會興建車站大堂，以天橋連接。

竹篙灣鐵路只有一條路軌，最初與東涌線鐵路的路軌平行，其後會從下面穿過現有東涌線與機場快線路軌和北大嶼山公路，轉入一條長100米的有蓋隧道。之後鐵路會穿過北大嶼山北部的山腹，進入一條長750米的單洞馬蹄形隧道，於竹篙灣的北部離開山腹。該處將會興建一條繞行道，由隧道口的南面出口直連至新的迪士尼站。迪士尼站將建在竹篙灣的填土區，只設一個月台。

竹篙灣鐵路大部分會在地面興建。不過，部分路軌將會低於陰澳站附近的地面，以便取得更大的頂部空間，穿過北大嶼山高速公路的現有高架橋。另外，在迪士尼站不遠處，路軌也會低於地面，以盡量減少對視覺的影響。

1.3 *其他選擇方案及"沒有鐵路"方案*

由於現有及建議興建的高速公路、現有的大嶼山機場鐵路、現有的地下鐵路牽引變電站與海堤接近，帶來鐵路線在陰澳工地內不同的限制。加上竹篙灣鐵路的月台必須與現有的機場快線平行，因此，基本上已決定了可行線路的範圍。至於曾考慮過的其他選擇，由於月台與其他連接細節所限，也只能在陰澳站附近作輕微改動。

建議的線路最後只有一條從陰澳站出發，先向東然後轉向南，穿過山腹到達竹篙灣，再伸至土木工程署填海後平整的主題公園園址。竹篙灣填海區內的布局，會依照月台預定土地使用的布局方案執行。在陰澳和迪士尼站之間，沒有其他可想到及可行的鐵路線比現有在竹篙灣提出的用地安排更加完善，這包括噪音、景觀及視覺的環境影響。

現時機場鐵路在陰澳的軌道位於水平基準面6.2米以上，竹篙灣鐵路由機場鐵路軌道伸展至隧道入口的一段將會位於同一水平高度，隧道段的縱坡設計線將稍作調校，略向竹篙灣填海區傾斜，同時配合政府所建議在隧道口附近高速公路的規劃，及朝向迪士尼站一段位於約水平基準面2.0米，在加上土堤後，可遮蔽主題公園鐵路的運作。

當上述的限制並不能提供其他可選擇路線，"沒有鐵路"方案便需要考慮。竹篙灣鐵路線的目的是為了方便使用主題公園，新竹篙灣填海土地運用及北大嶼山發展的交通需求。在環境方面來看，建議的鐵路預計能容納每小時三萬乘客。如果不興建竹篙灣鐵路，前往上述地點的旅遊人仕便要選擇其他交通工具。最有可能是選用私家車或巴士(包括旅遊巴士)。最終會導致使用周圍的公路網車輛數目上升，增加車輛所排出的空氣污染物及噪音影響。

1.4 *累積影響*

除鐵路噪音外，所有情況結合起來所產生的影響，將由主題公園環境影響研究根據竹篙灣鐵路環境影響研究所提供的資料作全面考慮。至於一般環境問題，會放在主題公園環境影響研究的廣泛範圍中評估。

至於對鐵路綜合噪音的評估，本研究會評估大嶼山機場鐵路(包括東涌線和機場快線)和竹篙灣鐵路的累積影響。

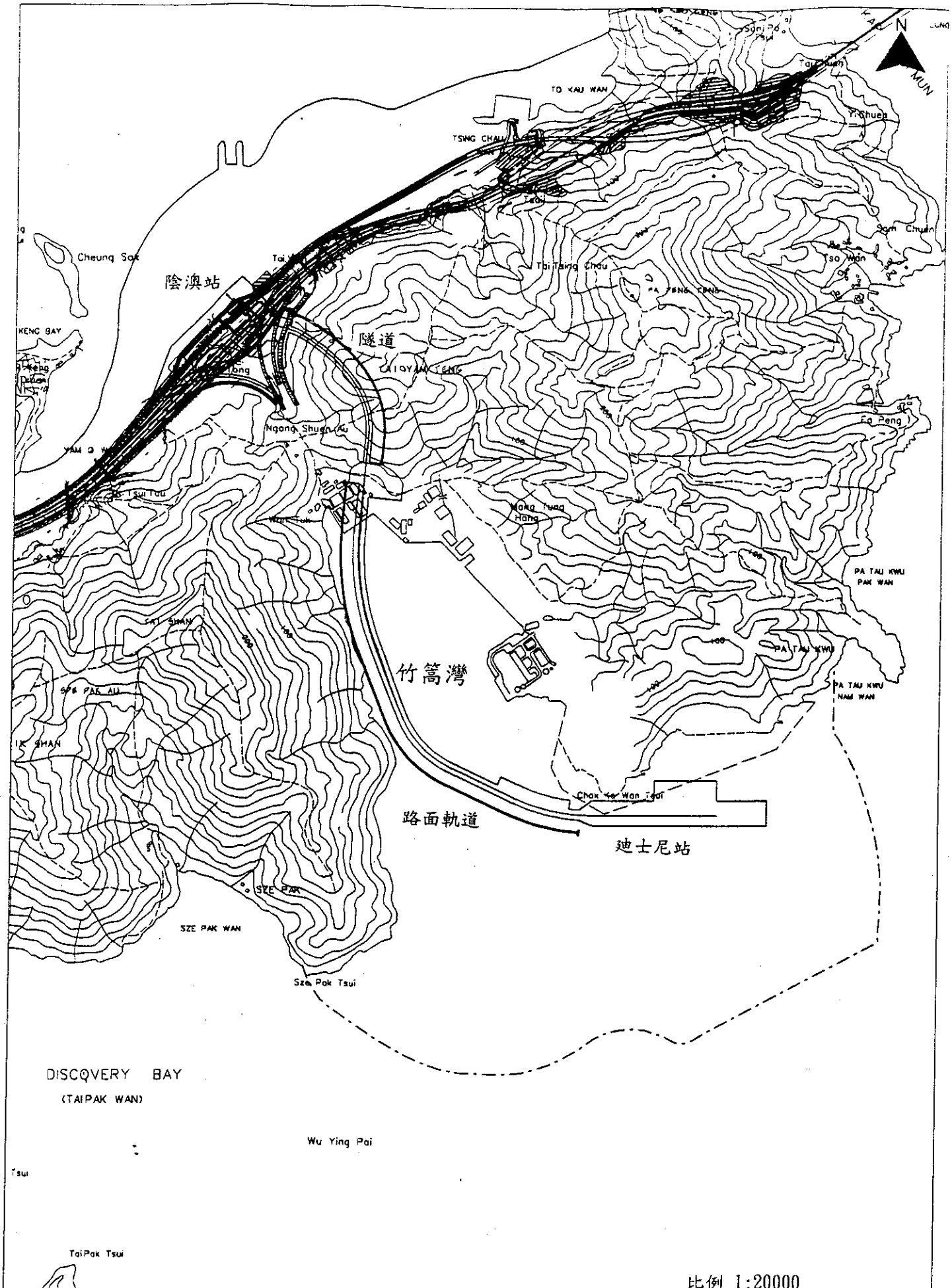

圖 1.2a

項目研究範圍及竹篙灣鐵路線

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Environmental Resources Management

ERM

2 主要環境問題

2.1 序言

在本環境影響評估研究中，發現了數項主要的環境影響和問題。有的影響因其本質及規模而較為突出。有關的研究結果簡述於下。

2.2 噪音問題

2.2.1 基線情況

在研究範圍內，現有的環境噪聲主要來自北大嶼山高速公路的交通，以及機場快線和東涌線的鐵路噪音。由鄰近竹篙灣發電站所發出的噪音，也是該區背景噪聲級的來源。日後建議興建的竹篙灣連接路和十號幹線，將會是另一個帶來直接噪音影響的來源。

最可能也最接近這些噪音的地方，應是位於鹿頸村的村屋，至於最近的人口聚居地則是愉景灣及坪洲，但這些地方距離竹篙灣鐵路較遠。當地噪音感應強的地方已根據《環境影響評估條例技術備忘錄》「附件十三」和「噪音管制條例」找出。由於這些地方均距離竹篙灣鐵路超過三百米，因此鐵路對這些噪音感應強的地方應無任何影響。

2.2.2 施工噪音影響

鐵路建築所發出的噪音主要來自不同施工階段所需的機動設備。各項工程均會有發出噪音的工序，包括使用重型機器挖掘、填土、混凝土澆築、掘隧道和建造火車站。

由於最近的噪音感應強的地方在施工場地三百米以外，日間施工所發出的噪音將不會帶來任何噪音影響。同時，地盤的交通流量不大，由地盤交通工具發出的噪音應不會帶來滋擾，因此無須實施特別的噪音消減措施。不過，承建商均須採用良好的工場守則，保持適當的工地管理，以確保工程對環境沒有帶來不良的影響。

2.2.3 運作噪音影響

由於地方偏遠，加上火車的操作特性，預計在運作階段不會產生噪音影響，因此無須採取噪音消減措施，而鐵路現有的各項噪音來源均不會造成累積影響。另外，固定設備的噪音也不會成為問題，只須遵守建議的良好工程噪音標準，便可達到《環境影響評估條例技術備忘錄》的噪音限制規定。

2.3 空氣質素

2.3.1 基線情況

竹篙灣主要的空氣污染來源，是北大嶼山高速公路汽車噴出的廢氣，以及中華電力有限公司(中電)竹篙灣燃氣輪機發電站所排出的廢氣。根據中電提供的空氣質素監察資料顯示，該區的背景污染物水平偏低，而環境保護署也將該研究區域列為郊區，空氣質素大致良好，污染物水平低。

位置最接近而最有可能受到污染影響的地方，是位於沿岸一帶鹿頸村的村屋。雖然竹篙灣發電站本身是污染物的來源，但站內的辦公室與住所，也是有可能受影響的地方。

2.3.2 施工時空氣質素

竹篙灣鐵路施工時產生可能影響空氣質素的物質，主要是地盤內施工與汽車往來時機器噴出的浮游塵埃和氣體。但由於施工設備不算多，交通工具的來往不算頻繁，加上與空氣質素敏感的地方有足夠的緩衝距離，這些活動所製造的污染物應不會超過空氣質素指標。不過，承建商應實施適當的管理守則，並執行各項已詳列於「空氣污染管制(施工塵埃)規例」中的措施，以確保工程對環境不會帶來不良影響。

至於在陰澳與竹篙灣之間的隧道爆石工程，及在陰澳的挖坑回填隧道內的油壓式破碎工程，承建商均應採用如土木工程署鑛務及石礦部所規定的最佳可行措施，來紓緩這些工程所帶來的塵埃影響。

2.3.3 鐵路運作時的空氣質素

由於行走在鐵路上的是電動火車，不會排出任何污染物，因此竹篙灣鐵路運行時對空氣質素帶來的影響十分有限。不過，路軌受到磨擦與磨損、電動鉤取裝置與鐵道車輛於正常操作和維修時，均會發出少量的塵埃。另外，路軌與列車加速器接觸發弧時也會製造臭氧。由這些活動所產生的空氣污染物很有限，對空氣質素敏感的地方的影響只是微不足道。

2.4 水質問題

2.4.1 基線情況

本研究區域涵蓋大嶼山的東北部，直接受到馬灣島、西區海港與維多利亞港各主要海峽水流的影響。竹篙灣鐵路的施工與運作均只會影響西北部與南部的兩個水質管制區。一九九七年，本研究區域附近的水質均屬良好，大致上全部符合水質指標，只有無機氮總量一項除外，表示該區

某程度上受到污水排放物的影響。日後小蠔灣的排放口流量增加，北大嶼山受污水排放的影響也會增加。

2.4.2 *水質影響*

竹篙灣鐵路施工期間對水質的影響，主要是地面水的排放、從不同施工地盤收集到的地下水，以及工人排出的污水。不過，只要有效實施本報告書所建議的緩解措施，施工地盤/工作區的污水排放將會符合污水排放標準，預計水質不會受到無可克服的殘餘影響。

若實施了本報告所有建議的緩解措施，建議中的鐵路開發計劃於運作時，應對水質不會產生任何潛在的不良影響。

2.5 *廢物管理問題*

施工會製造大量廢物，包括從地面挖掘出的泥土、建築與拆卸廢物、化學廢物和一般的垃圾。但若實行本報告書建議的緩解措施，遵行良好的施工守則，則可確保不會對環境形成不良影響。同時爭取減少廢物的機會，並將物料循環再用。

預期竹篙灣鐵路運作後，一般垃圾、工業與化學廢物都會甚少。

實施適當的緩解措施，可減少竹篙灣鐵路在建造與運作時儲存、處理、收集、運輸和棄置廢物對環境造成的影響，同時能符合《環境影響評估條例備忘錄》列明的準則，不會對環境造成難以令人接受的不良影響。

2.6 *景觀與視覺問題*

2.6.1 *基線情況*

竹篙灣現時是一片鄉郊景色，位於兩塊高地花坪頂和大山之間，旁為中間低陷的打水灣。四週是一片平緩起伏的丘陵，低坡上有片片小面積的灌木叢和林地。

研究區域的東西視野均為山丘所阻，但在天朗氣清的日子，向南望可以見到坪洲、小交椅洲、交椅洲，再遠處則是南丫島和香港島。竹篙灣背靠一大片岩坡，前面南方是竹篙灣發電站及財利船廠，未能與四週的自然地貌協調。

2.6.2 *景觀與視覺影響*

本研究指出，在施工期間對這兩方面最明顯的影響，來自建造有蓋隧道，和在北面入口的斜坡整固工程，以及南面入口的臨時施工區和斜坡

整固工程。不過，若實施本研究建議的緩解措施，預期其餘的影響會降至微不足道。

在鐵路運作階段，對景觀和視覺最明顯的影響，是來自隧道南面入口和通風結構，以及相關的土力斜坡整固工程。另外，由於水上活動中心與其中一段鐵路處於同一水平。遊客於該中心遊玩時，定會清楚見到鐵路，難免會受到影響。不過，水上活動中心是遲於鐵路興建，設計者若感到有需要，可為鐵路提供土坡道和屏障，將火車和路軌遮蓋。

整體來說，只要實施本研究建議的緩解措施，鐵路對景觀和視覺的影響仍屬於可接受。

3 日後需求

3.1 對環境的監察與查核

本報告書同時列出一份實施時間表，確保本研究報告所建議的各種紓緩措施能夠在鐵路工程的適當階段實施。每個緩解措施均有一個實施進程表，訂明實施的階段和地點，以及負責實施的機關。本報告書同時建議推行一個環境管理制度，以確保全面實施這些緩解措施。

此頁留空

4 總結

實施本報告書所建議的緩解措施，可確保於竹篙灣鐵路興建與運作期間不會對環境帶來不良影響。

環境影響研究所建議的緩解措施，是一般已為人接受的措施，採用後可確保符合法例規定、政府所頒的指引及環保署所同意的其他環保標準。於興建竹篙灣鐵路時所須執行的環境監察與審核計劃，更可確保與法定準則及本研究報告所推薦的準則相符。

此頁留空