


ROUTE 3 CONTRACTORS CONSORTIUM

ROUTE 3 TAI LAM TUNNEL & YUEN LONG
APPROACH - SOUTHERN SECTION

FINAL DETAILED ENVIRONMENTAL
IMPACT ASSESSMENT

Executive Summary

August 1995

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BACKGROUND

BACKGROUND

1 INTRODUCTION

Route 3 Tai Lam Tunnel and Yuen Long Approach (R3 TLT & YLA) is an integral part of a transport network to serve the new airport at Chek Lap Kok and the proposed container terminals 10 and 11 on Lantau Island. An Environmental Assessment study for the R3 TLT & YLA (including the conveyor system under a separate cover, the EACS) Preliminary Design Stage 2 was completed in March 1994, hereafter referred to as the PDS2EA. The study was conditionally recommended for endorsement by the Advisory Council on the Environment (ACE) EIA Subcommittee on 5 July 1994 and was subsequently endorsed by the full ACE, subject to conditions given in the table below.

The Hong Kong Government has awarded this project to a franchisee, Route 3 (CPS) Company Limited, that has delegated responsibilities for design and construction to Route 3 Contractors Consortium (R3CC). Appendix 5 Part 1 of the Project Agreement gives Construction Requirements containing specifications on environmental matters. These include commitments for R3CC to:

- 1) reinstate portions of fishponds remaining within the construction boundaries to their original condition including water quality and suitable enhancements to improve their ecological value;
- 2) prepare a Detailed Environmental Impact Assessment (DEIA) report to verify the findings of the PDS2EA and detail the environmental impacts of the Construction Proposal;
- 3) complete the four-season ecological survey as required by the ACE;
- 4) address key environmental issues described in Clause 10.2 of the Construction Requirements;
- 5) carry out off-site compensatory planting of native woodlands affected by the works;
- 6) develop and implement a comprehensive Environmental Monitoring and Audit programme to quantify the impact predictions in the DEIA and, if required, act to remedy any non-conformances with relevant environmental standards.

Recommendation	Commentary
Temporary access to avoid wetland habitats and SSSI at Ho Pui. Provision of wildlife corridors	R3CC will take note of this recommendation in proposing temporary access.
Additional ecological survey before commencement of work.	Supplementary surveys were carried out from late August 1994 through January 1995 by Highways Department. R3CC will undertake the continuation of this survey and complete it in June 1995 with reporting at the end.
Off-site compensatory planting at a ratio of no less than 3:1	R3CC will undertake the compensatory planting.
The final EIA to be submitted to ACE for consultation.	R3CC will submit the Detailed EIA to ACE for consultation.
Off-site restoration of wetland.	Highways believe that off-site restoration of wetland is not viable in this project. R3CC will however reinstate areas of ponds within the work site which are not required as part of construction, operation and maintenance of the permanent works.

Two Information Papers, one on the environmental impacts of the preliminary works during the first 6 months of the project and the other on the environmental impacts of the Conveyor System, have been presented to ACE by R3CC. Both have been endorsed by ACE with the following conditions on the Conveyor System Information Paper:

- 1) all mitigation measures listed on page 14 of the Information Paper be adopted with the exception of enclosing the discharge points and the stockpile;
- 2) additional quietened equipment be deployed during construction and/or noise barriers be used where necessary to ensure daytime criterion of 75 dB(A) is met;
- 3) extremely loud equipment should not be used in the evening or night hours;
- 4) noise reduction measures for tugboats or strict controls on their use be applied;
- 5) litter and debris arising from the project be cleared frequently and the jetty reinstated as soon as possible; and
- 6) a summary of the habitat loss mitigation proposals for the project be included in the Southern Section DEIA to be submitted to ACE.

2 OBJECTIVES

This Executive Summary highlights the findings and recommendations of the DEIA for the Southern Section of R3 TLT & YLA and describes the Environmental Monitoring and Audit (EM&A) programme. The DEIA consists of 3 volumes and the readers should refer to them for technical details:

- Volume 1: The Main Line
- Volume 2: The Conveyor System
- Volume 3: Environmental Monitoring and Audit Manual

As specified in the Construction Requirements, the objectives of the DEIA are:

- to verify the findings of the PDS2EA;
- to assess in detail the environmental impacts of the Construction Proposals;

- to address any outstanding issues from the PDS2EA related to the refinement of impact mitigation measures; and
- to assess the environmental impacts of any changes between the current Construction Proposals and the project design used as a basis for the PDS2EA.

3 THE PROJECT

3.1 The Main Line

The R3 TLT & YLA comprises the northern section of Route 3 from Tuen Mun Road in the south to Au Tau (near Yuen Long) in the north. The south interchange will connect to the northern end of the Ting Kau Bridge and Tuen Mun Road. The north interchange will connect to the New Territories Circular Road and the Yuen Long Southern Bypass.

The road will be a 12 km long fully graded divided dual 3-lane highway providing a direct link from the North West New Territories and the border crossing at Lok Ma Chau through to Tsuen Wan, Kwai Chung, Lantau, the West Kowloon Corridor and Hong Kong Island. It will include a 6.3 km stretch of the elevated Yuen Long Approach Road and a 3.8 km Tai Lam Tunnel. The Tai Lam Tunnel will consist of two separate 3-lane road tunnels and ventilation tunnels from the portals to the quarter points of the road tunnels. Ventilation plant buildings will be located at both portal areas.

Situated 1.5 km north of the Tai Lam Tunnel northern portal, there will be a 22-lane Toll Plaza and an Administration Building to accommodate the Central Monitoring and (Traffic) Control System. At the Toll Plaza, sliproads will connect the main roadway to Kam Sheung Road to the east.

3.2 The Conveyor System

The preliminary design identified the need to remove approximately 6 Mm³ of excavated spoil material when constructing the Tai Lam Tunnel and the Tin Kau Interchange. A conveyor system was deemed to be the most practical and environmentally acceptable method for transporting the material to a barge loading area. The amended design proposed by R3CC has reduced the estimated quantity to 4.5 Mm³.

The conveyor system will be installed along the hillsides and coastal area. Spoil will be transported via this system from the Tai Lam Tunnel portal area

to a barge loading jetty located at Gemini Beaches. Barges will be used to transport this material for disposal. The entire length of the conveyor system is approximately 960 m.

3.3 Design

An implicit component of the DEIA is to establish the Franchisee's design changes compared with the preliminary design. These are summarised as follows:

Environmental assumptions: No change to these has been made.

Engineering assumptions: Figure 1 shows the refinements made to the design of the road. These can briefly be summarised as follows:

- The road alignment at the Tai Lam Tunnel South Portal has been elevated by 18 m. This will reduce the amount of material to be excavated from the southern cutting and tree loss. More fill material will be required to construct the embankment crossing the stream channel in the Southern Valley.
- Ramp C to the Ting Kau Interchange will be constructed with reinforced earth instead of the initial bridge design which will require more fill for embankment construction.
- There is a marginal difference in the tunnel alignment.
- The Ventilation Buildings at both the North and South Portals have been relocated and combined with the respective Portal Buildings. This relocation will result in less cut and less land take.
- The Toll Plaza layout has been modified to move the toll booths slightly south. This will require less fill than the preliminary design.

Traffic assumptions: The traffic load has been modified. There is a 3.3% reduction in total tunnel flow and a 23% reduction in heavy vehicles.

Identification of sensitive receivers: A detailed survey to identify all potential air and noise sensitive receivers for this assessment has been carried out as part of this DEIA to fulfill ACE EIA Subcommittee requirements and PDS2EA recommendations.

4 THE DEIA STUDY AREA

To address environmental matters associated with the R3 TLT & YLA, the project is divided into a Southern Section and a Northern Section. The former comprises the Ting Kau Area, the Conveyor System, the South Portal, the Tai Lam Tunnel, the North Portal and the Yuen Long Approach up to and including the Kam Sheung Access Road. The latter comprises the remaining portion north of Kam Sheung Access Road.

This DEIA is for the Southern Section and the study area is shown in Figure 2. The Northern Section will be covered by the Northern Section DEIA under separate cover.

5 KEY ISSUES

The following key issues were depicted in the Construction Requirements.

Issues related to monitoring and/or mitigating environmental impacts (Clause 10.2):

- associated fixed noise sources of constructed facilities;
- traffic noise;
- effect on air quality, particularly along the Yuen Long Approach, at the portals and ventilation exhaust points of Tai Lam Tunnel and inside the tunnel;
- visual impact, and landscaping and environmental re-provisioning;
- ecological and heritage impact;
- water quality impact;
- disposal of soil, construction waste and unsuitable material;
- traffic impact to existing roads during construction;
- construction noise, dust and vibration..

Issues related to ecology:

- determine the area, species and precise location of woodlands affected by the execution of works (Clause 10.3.2)
- complete the four seasons ecological survey already partially completed by Government and prepare a report identifying the need and measures to be taken to mitigate the impacts of the constructed facilities on the ecology (Clause 10.1.6);
- for fish ponds affected by the temporary works but not required in the long term, determine suitable enhancements to improve their ecological value (Clause 9.3.3).

Issues related to environmental monitoring and audit:

- detailed requirements for EM&A (Clauses 10.4 - 10.10)

The above issues are covered by this DEIA except traffic impact, air quality in the tunnel and the four seasons ecological survey. Traffic impact is not an environmental issue and is being covered by the traffic consultant. Air quality in the tunnel is being covered by the ventilation engineers. The four seasons ecological survey will be presented in a separate report.

DESIGN REFINEMENTS:

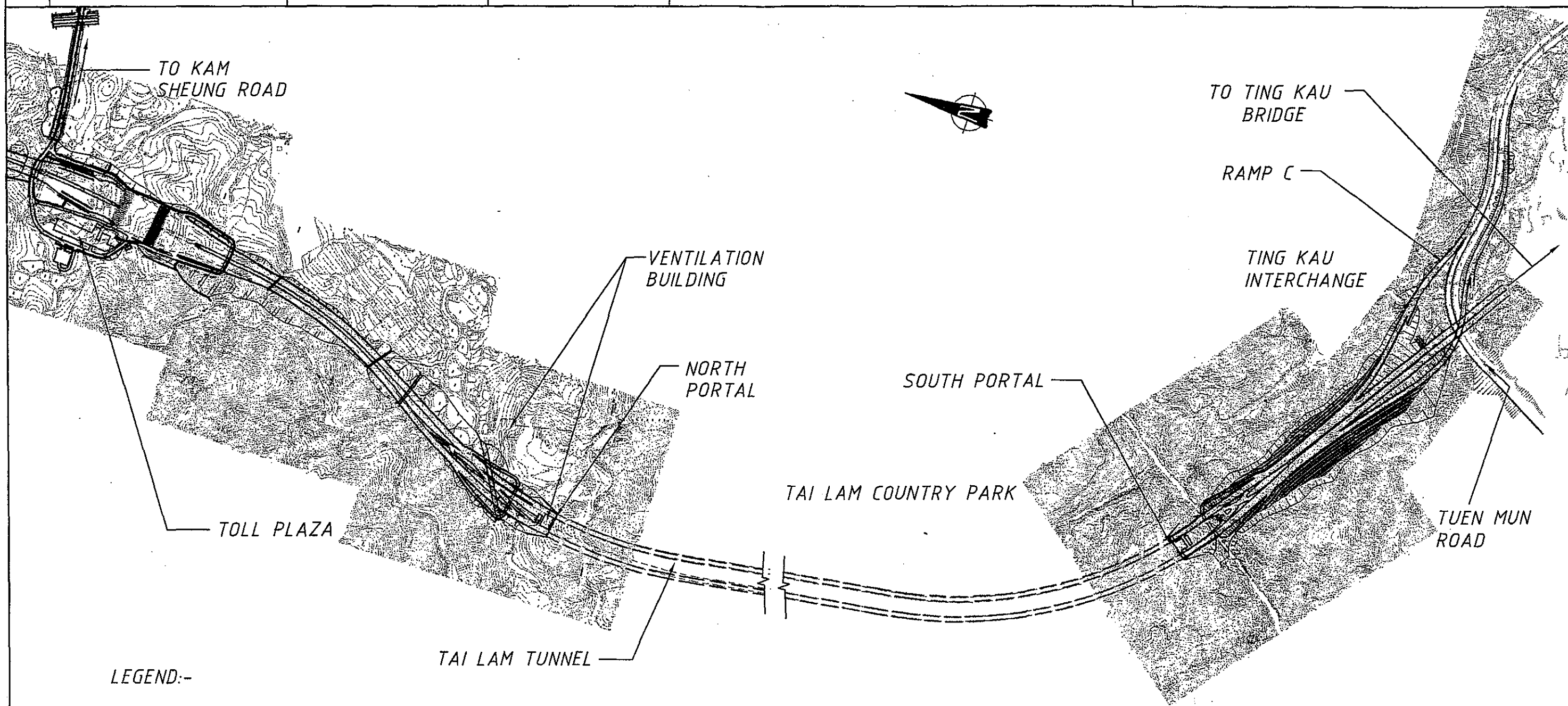
NEW
TOLL PLAZA LAYOUT
LESS FILL

NO DIFFERENCES

VENTILATION
BUILDING
COMBINED WITH
PORTAL BUILDING
LESS LANDTAKE
LESS CUT

MARGINAL DIFFERENCE IN
TUNNEL SEPARATION

VENTILATION BUILDING COMBINED
WITH PORTAL BUILDING,
ROAD LEVEL RAISED BY 18m
AT PORTAL, SIGNIFICANT LESS CUT,
SLIGHTLY MORE FILL OVER STREAM
COURSE.
RAMP C BY REINFORCED EARTH,
INSTEAD OF ON STRUCTURE
MORE PLEASANT AESTHETICALLY



LEGEND:-

————— CURRENT PROPOSAL

- - - - - PREVIOUS PROPOSAL
(FOR PRELIMINARY DESIGN
STAGE 2 - EIA)

CONTRACTOR
ROUTE 3 CONTRACTORS CONSORTIUM

DEIA
SOUTHERN SECTION

DESIGN REFINEMENTS
FROM STAGE 2 EIA

FIGURE
1

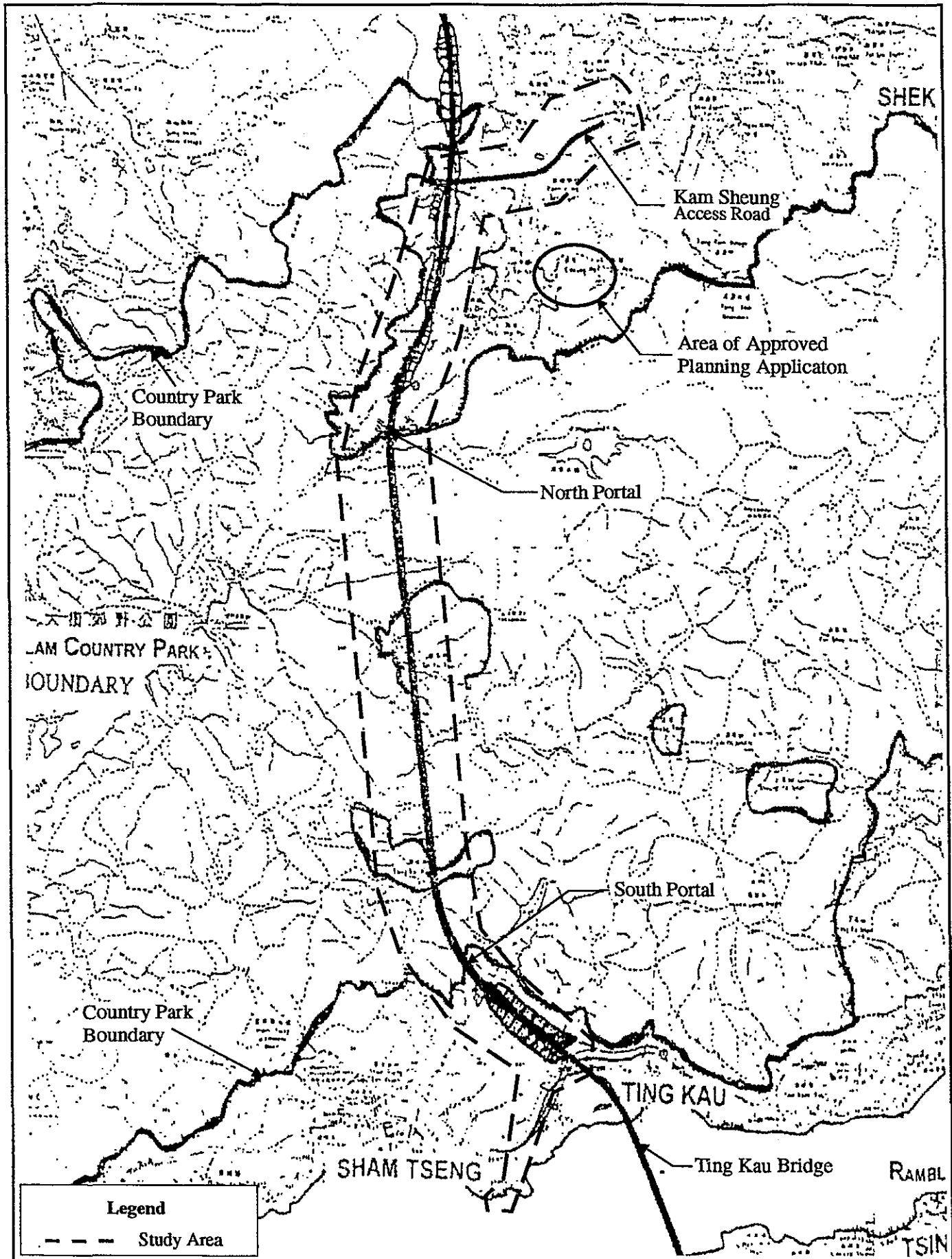



Figure 2 TLT & YLA (South) Study Area


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THE MAIN LINE

THE MAIN LINE

6 NOISE

Construction noise was predicted to comply with the daytime criterion of 75 dB(A) at sensitive receivers along the alignment and Kam Sheung Access Road with the implementation of the following mitigation measures:

- Acoustic screening is provided for stationary plant items.
- For mobile plant items where acoustic screening is not feasible, the working time within each 30-minute period is reduced.
- At certain locations close to noise sensitive receivers, each PME item is separated spatially along the alignment.
- Where indicated in the Main Report, quieter 24 tonne dump trucks will be utilised.

Construction during restricted hours requires a Construction Noise Permit (CNP). The contractor will comply with CNP conditions.

Traffic noise during the operational phase was predicted to meet the HKPSG guideline of 70 dB(A), with the implementation of a friction course road surface and the use of 0.8 m high concrete profile barriers, at all the sensitive receivers along the route with the exception of two. Traffic noise at these two receivers are predominantly from Tuen Mun Road. Route 3's contributions were predicted to be 0.1 dB(A) (out of 75.3 dB(A)) at one receiver and 2.2 dB(A) (out of 80.4 dB(A)) at the other (R70 overlooking Ramp C). For R70 all possible direct mitigation measures, including barriers and enclosures, were examined and were found to be ineffective in mitigating the overall noise level at this receiver. Acoustic insulation at the receiver to mitigate against traffic noise from all sources is more appropriate and is recommended, which is in keeping with that of the PDS2EA.

7 AIR QUALITY

R3CC has committed to the following dust mitigation measures during construction:

- Exercise good site practices such as speed control and wheel wash facilities that are normally included in construction contract clauses.

- Undertake steps to minimise dust during blasting such as wetting the blast face and blasting with an 'open face' to reduce dust dispersion vertically.
- Control dust emissions from concrete batching and crushing activities by installing fabric filters and operating water sprays at all crushers.

With these commitments taken into account in dispersion modelling, dust levels (in terms of total suspended particulates (TSP) were predicted to comply with the 1-hr average TSP guideline as well as the Air Quality Objectives (AQO) for 24-hr and annual average TSP at all sensitive receivers. The dust levels will be monitored through the EM&A programme during construction and additional mitigation will be taken if needed.

During operation, nitrogen dioxide (NO₂) levels from traffic emissions and ventilation exhaust were predicted to meet AQO requirements at the sensitive receivers. Future sensitive uses should be located at least 350 m and 300 m from the ventilation shafts of the northern and southern ventilation buildings respectively. Air quality with respect to tunnel ventilation will be addressed by the ventilation engineer in a separate report. The ventilation system will be designed to meet the tunnel air quality guideline.

8 WATER QUALITY

Water quality impacts discussed in the PDS2EA remain valid, but changes have been made in this detailed design resulting in less cut and fill activities. This will lessen water quality impact on nearby streams during the construction phase. Construction activities are mainly below the WSD catchwaters and should not affect water quality in the catchwater. Production water generated during tunnelling will be recycled and used for dust suppression where possible.

Site run-off and the draining of fish pond water are two key issues during construction. The former will be controlled by installing sedimentation tanks at appropriate locations. These tanks will be cleaned regularly to ensure effective performance. When construction works are completed at exposed slopes with soft material, R3CC will hydroseed as soon as possible. R3CC has obtained the consent to discharge the pond water from EPD. Bottom slurry will be pumped to sedimentation basins for settling and will not be discharged into streams.

During operation, water quality impacts may arise from road and tunnel run-off as well as sewage from the employees working in Administrative Building. The drainage design of Route 3 has incorporated silt traps, oil interceptors and "close-off" valves as suggested by the PDS2EA at strategic points along the alignment to mitigate against storm run-off and accidental spills. Septic tanks with soakaways will be installed as an interim measure for treating the sewage from the Administration Building, until year 2005 when sewerage will be provided for this area.

9 ECOLOGY

The following table compares habitat loss in the Southern Section between the preliminary design and the present design assuming that all vegetation within the construction boundary would be removed. The apparent increase in habitat loss with the present design may not reflect real differences as much as greater detail and refinement of construction boundaries, which were not specified during the preliminary design stage.

Works near the two ardeid (egret and heron) nesting sites at the Ho Pui Egretty may have negative impact on the egretty, especially during the breeding season. To mitigate, a pond partially lost to the project has been identified for conservation management. Implementation of conservation measures could improve the conservation potential of this site, thereby increasing the carrying capacity of the pond.

Potential locations for off-site compensation planting have been identified. These include the hill north of Sham Tseng along the west side of the conveyor and the hill slope west of Ma On Kong between the Route 3 alignment and the boundary of the Tai Lam Country Park.

No other unexpected finding has emerged from the surveys and assessments conducted to date. The conclusion and recommendations of the PDS2EA remain valid.

R3CC is committed to the following impact avoidance and habitat loss mitigation measures:

- Carry out 3:1 compensation planting of native woodlands permanently lost by the works through off-site planting.
- Revegetate temporary construction areas within the works boundary.
- Where practicable transplant seedlings of the protected species *Enkianthus quinqueflorus* (New Year Flower) and *Arundina chinensis* (Bamboo orchid).
- Minimise incursion into areas within the works limit that are not directly required for either temporary or permanent works.
- Establish conservation management regimes in a pond partially lost to the highways projects.
- Restore additional ponds lost during temporary works to commercial fish production, thereby restoring the pre-disturbance function.
- Monitor the egretty and restoration of the areas within the works limits and adjacent to the egretty following construction, to encourage wildlife utilisation.
- Where practical, excavate by hand, any burrow systems encountered during construction and release captured animals unharmed in undisturbed areas.

	Preliminary design (excluding temporary works)	Finalized Design (excluding temporary works)	Finalized design (including temporary works)
Woodland	6.3 ha	7.4 ha	9.1 ha
Shrubland	20.9 ha	Not Estimated	28.3 ha
Grassland	0.8 ha	Not Estimated	4.1 ha
Agriculture/Disturbance	4.6 ha	Not Estimated	7.4 ha
Fish Ponds	3.7 ha	Not Estimated	3.9 ha
Marsh	-	Not Estimated	3.9 ha

10 VISUAL AND LANDSCAPE

Visual and landscape impacts and mitigation recommendations described in the PDS2EA remain valid since design revisions during construction and operation are minimal.

11 WASTE MANAGEMENT

At the South Portal, approximately 500,000 m³ of spoil will be generated from tunnelling and 4 Mm³ from the main cut. Approximately 5% of the crushed rock will be used as aggregate. The remaining 4.5 Mm³ will be transported via the Conveyor System to the jetty for disposal via barges. Re-use of such spoil is currently under investigation.

At the North Portal, tunnelling and construction of the North Portal and the Toll Plaza will generate approximately 682,000 m³ of soft spoil, 635,500 m³ of rock and 22,000 m³ of pond mud. All the materials will be re-used on site.

Construction wastes other than spoil, general refuse and chemical wastes such as waste oil, grease, lubricants, cleaning solvents/absorbents, etc during construction and operation are not expected to be large in quantity. Their disposal should comply with the existing environmental legislation.

THE CONVEYOR SYSTEM

THE CONVEYOR SYSTEM

12 DESIGN FEATURES

The current design differs from the preliminary design contained in the PDS2 as follows:

- The alignment is amended north of the Tuen Mun Road
- The conveyor is continuous thus eliminating the need for transfer points on the route
- The new alignment will require cutting and covering for sections passing through ridges or hills
- The conveyor will be erected on steel trusses where it traverses valleys, rather than on earthen fills
- There will be no surge bins/stockpiles along the conveyor route
- The amount of spoil to be moved is 4.5 Mm³, 25% less than the PDS2 design
- The jetty will be on fill rather than piles, thus site formation will be required
- The spoil will be rehandled at the jetty, stockpile size will be 30,000 m³
- The conveyor system service road will not follow the conveyor system alignment, because the gradients are too steep

These changes have the following advantages:

- Less maintenance for one continuous conveyor than for discontinuous conveyors
- No stockpiling along the alignment due to elimination of transfer points, stockpiling at the head of the conveyor only
- Dust, noise and water quality impacts along the alignment reduced due to elimination of transfer points
- No fill material needed as a result of the use of steel trusses
- The steel trusses are easier to erect and disassemble than the earthen fill, thus easier to reinstate lost habitats
- Stream flows in the valleys can be maintained more readily as a result of the trusses

13 OPERATIONAL DATA

The main conveyor will be operated continuously at a speed of 3.5 m/s for 16 hours a day at a maximum rate of 3,000 tonnes per hour for 2 years. To accommodate a continuous conveyor system and a discontinuous barge loading operation, a stockpile of

maximum 30,000 m³ will be created in the jetty area. The material will then be moved from the stockpile to barges by two underground conveyors. Barge loading will operate 16 hr per day with an approximate loading rate of 5,000 tonnes per hour.

14 AIR QUALITY

R3CC has committed to the following dust suppression measures to minimise dust nuisance:

- Cover the main conveyor with a steel roof and canvas sides.
- Install a spray curtain of water/surfactant at the drop point from the conveyor to the stockpile.
- Minimise the drop heights from the conveyor to the stockpile and from the stockpile to the barges.
- Use water spray curtains at the drop point from the loading conveyors to the barges.
- Exercise good site practice such as water site roads and open areas regularly and install a vehicle wash facility.

Dust levels at sensitive receivers (including Pink/Golden Villas) during the construction and operation of the conveyor system were predicted to comply with the 1-hr average TSP guideline and the 24-hr average AQO limit with the implementation of the above measures.

The following additional mitigation measures would be implemented if air quality monitoring determines that they are necessary:

- Wet exposed stockpile areas with water spray.
- Install side enclosure and cover aggregate or dusty material storage piles
- Restrict the conveyor system access road to service traffic only and locate site exit points away from sensitive receivers.

15 NOISE

Both the construction and operation of the conveyor system must comply with guideline and statutory limits for construction because it is deemed as part of the construction activities of Route 3. Construction of the conveyor system will entail the formation of a maintenance/access track, construction of foundations, erection of structural supports, installation of conveyor components, site formation at the barge point, and decommissioning of the conveyor and the barge point. During operation, noise may arise from the conveyor line as well as from barges and tug boats.

Noise levels at the sensitive receivers were predicted to comply with construction noise criteria with the implementation of the following mitigation measures:

- Use only 20-tonne to 24-tonne dump trucks during site clearance for the formation of the maintenance/access track and the foundation for the conveyor system, and during platform filling and backfill removal (decommissioning) at the barge point.
- Avoid concurrent use of power mechanical equipment.
- Install a temporary bund adjacent to the works near the isolated noise sensitive receiver.
- Restrict the use of rock drills during evening hours.
- Restrict the number of dumptrucks at the barge loading area to 2 during evening hours.
- Control operational times of powered mechanical equipment to meet statutory and non-statutory requirements.
- Acoustic baffling, where required, of tug boat engines and exhausts.

16 WATER QUALITY

A seawall and embankment slopes for the jetty will be constructed over a six week period. Site formation will take place behind the seawall with 50,000 m³ of fill over a two month period. During construction, the majority of the fill materials will be confined and cannot escape into the surrounding marine environment and therefore only a localised, slight increase in suspended solids is expected. There will be no dredging since the seabed is mainly rock.

Site formation will take place behind the seawall with 50,000 m³ of fill over a two month period. There will be no dredging since the seabed is mainly rock.

Impacts during the operation of the conveyor system include drainage from the stockpile area and the effect of the jetty (a reclaimed headland into the sea) on the flushing capacity of the Gemini Beaches to the east.

Mitigation measures for marine and fresh water quality are as follows:

- Build the jetty using the best practical filling technology, the seawall will be constructed first and filling will occur behind the seawall.
- Install a drainage channel around the spoil handling platform and sediment traps will be

provided on site. The drainage scheme is designed to contain run-off from 1 in 10 year storm events.

- Install a 1 m filter layer comprising of river sand, granular material or similar material will be installed on one side of the sea wall prior to placement of other fill materials to provide a barrier for any potential spills entering the water.
- Hydroseed and revegetate exposed slopes as soon as practical once major earthworks have been completed.
- Control stream sedimentation during construction using erosion control mats as required on exposed cut and fill slopes.
- Construct earthen berms to intercept and divert overland flows from construction disturbance areas and prevent their contamination of stream courses.
- Divert existing stream (and thus *E. coli* in stream water) flowing into West Gemini Beach to west of the jetty area and away from the Gemini Beaches.

17 LANDSCAPE AND VISUAL IMPACT

Potential landscape and visual impacts include temporary bridging structures over the existing roads, barge loading jetty off the Gemini Beaches promontory, and stockpile located on the loading jetty. The majority of the activity will be localised, contained within the conveyor belt corridor and of the barge loading jetty.

General mitigation measures recommended in the EACS for both the construction and operation phases remain valid for the new alignment.

18 ECOLOGY

The construction of the conveyor system would lead to an estimated total loss of 1.0 ha of plantations and 0.5 ha of ravine secondary forest; 8.4 ha of shrub-woodland; 1.6 ha of shrub-grassland; and 0.3 ha of eroded area. The most severe impact would be loss of 0.5 ha of the floristically diverse ravine woodland dominated by *Lithocarpus glaber* and its associated riparian habitat.

Two protected plant species were identified in the study area, *Enkianthus quinqueflorus* (New Year

Flower) and *Rhododendron simsii* (Red Azalea). Potential impacts on these species will include loss of individual plants and destruction of their habitats.

The selected conveyor alignment is appropriately located along the ridgeline where possible. Earthen fills have been eliminated where possible in favour of steel structural supports. These design features will largely avoid impacts to birds due to loss of important ravine habitats. The primary impact on birds will result from losses of ravine vegetation in the East Stream ravine near Tuen Mun Road.

Mitigation measures to be implemented are listed below together with a timetable for implementation.

Mitigation Measure	Implementation Schedule
Freshwater Habitat Protection <ul style="list-style-type: none"> hydroseeding & revegetation installation of erosion control measures construction of earthen berms 	<ul style="list-style-type: none"> upon completion of earthworks as needed
Vegetation Impact Mitigation <ul style="list-style-type: none"> cut-fill slope revegetation off-site planting site demarcation for protected species transplantation of <i>E. quinqueflorus</i> and <i>R. simsii</i> 	<ul style="list-style-type: none"> upon completion of earth works at outset of construction works during site investigation works following initial site survey, prior to earthwork
Avifauna Impact Mitigation <ul style="list-style-type: none"> demarcation of protection areas 	<ul style="list-style-type: none"> following initial site survey, prior to earthwork
Mammal Impact Mitigation <ul style="list-style-type: none"> burrow survey burrow excavation 	<ul style="list-style-type: none"> during site investigation surveys prior to start of earthworks

ENVIRONMENTAL MONITORING
AND AUDIT

ENVIRONMENTAL MONITORING AND AUDIT

19 ORGANISATION

An Environmental Team (ET) has been organised for carrying out environmental monitoring and audit during the construction phase. The construction programme will last 38 months.

20 TRIGGER, ACTION AND TARGET LEVELS

It is an accepted practice to apply a preset range of *trigger, action and target* (TAT) levels to the parameters monitored as a framework for interpreting and auditing monitoring results. Action plans are developed for each level of exceedance which describes actions to be taken by the ET, the Contractor and other related parties to mitigate against pollution.

21 ENVIRONMENTAL MONITORING AND AUDIT

A comprehensive programme for monitoring of air quality, noise, and freshwater and marine water quality before (baseline), during (compliance) and after (operational) the construction of R3 will be carried out.

Ecological monitoring during construction includes the translocation of native and protected species, marking of special areas and areas of vegetation to be avoided by personnel and equipment, ardeid use at the 2 sites in the Ho Pui Egretty, and design and conservation management of fish ponds. During the operational phase, ecological monitoring will be performed to assess the success of revegetation measures, restoration of wildlife in revegetated areas, ardeid use of the above egretty, and ardeid use of fish ponds managed for conservation.

22 POLLUTION CONTROL REQUIREMENTS

During on-site environmental monitoring, the ET will observe and record the effectiveness of mitigation measures, working practices, and site and equipment maintenance conditions. Site inspection checklists for air quality, noise, water and waste management will be used to facilitate the observation and recording of site conditions.

23 IMPACT PREDICTION REVIEW

The Environmental Manager of the ET will review the works programme each month to predict potential impacts and impacted areas and duration due to works activities in the following month. If necessary, the EM&A programme for the following month will be modified to take account of such predictions.

24 REPORTING

A Monitoring and Audit Report will be prepared and submitted each month. The report will include descriptions on monitoring methodology, monitoring and audit results, site inspection report, complaints received, impact prediction review, and the programme for works activities and monitoring schedule for the upcoming month.

25 ENVIRONMENTAL COMPLAINTS RESPONSE

Procedures to log, investigate, validate and respond to complaints received through EPD hotline or other direct enquiries have been established. A complaint response action plan will be set in motion when complaints are received.

26 ENVIRONMENTAL COMMITMENT OF THE CONTRACTOR

R3CC have made a commitment to implement the mitigation measures indicated in the DEIA and to ensure that the mitigation measures which relate to the construction practices, indicated in the Environmental Monitoring and Audit report, are adhered to. This commitment should ensure that any operational and construction impacts will comply with the established criteria and contract conditions.