



**Hong Kong Resort Company Limited**

# **Discovery Bay Development**

**Master Plan 6.0(A)**

## **Environmental Impact Assessment**

### **Executive Summary**

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## 1. Introduction

### 1.1 Background

In August 1994, the Government agreed in principle to the addition of 210,000 m<sup>2</sup> residential Gross Building Area (GBA) to Discovery Bay which would raise the population to 25,000, and the provision of a tunnel link to Siu Ho Wan for road and utility connections. Hong Kong Resort Company Limited (HKR) prepared Master Plan 6.0 which was subsequently revised in response to comments from Government and renamed Master Plan 6.0(A).

The project involves an extension to the existing Discovery Bay development northwards into Yi Pak and is confined within the existing Discovery Bay lease boundary. This extension is referred to as Discovery Bay North (DBN). The study area is shown in Figure 1. The proposed Road and Tunnel Link (RTL) connecting Discovery Bay and North Lantau will be restricted to residential coaches, service vehicles and emergency vehicles.

### 1.2 Environmental Design and Assessment

Environmental issues were key considerations during the development of Master Plan 6.0(A) and the requirement for a high quality environment and minimal disruption to the existing community have been primary objectives. The development proposal has also taken opportunities to contribute positively to sub-regional plans for environmental improvement.

The design progressed through an iterative process whereby potential environmental issues were identified and addressed within the planning and engineering design. Guidelines and standards established in the Hong Kong Planning Standards and Guidelines (HKPSG) were applied throughout the design, and additional requirements to protect environmental quality have been adopted.

The EIA studies addressed the DBN and RTL components of Master Plan 6.0(A) separately in order to facilitate review of the project by the various Government departments. This Executive Summary includes the findings of the EIAs for both DBN and the RTL.

## 2. Discovery Bay North

### 2.1 Project Description

#### *Residential Accommodation*

DBN will provide 2230 residential units with a GBA of 185,000 m<sup>2</sup>. The layout is illustrated in Figure 2.

There will be 12 residential tower blocks (24 storeys), 3 medium rise residential blocks (13 storeys) and 67 low-rise blocks (6 storeys).

#### *Commercial Facilities and Hotel Development*

The commercial facilities consist of a 3-storey building adjacent to the ferry terminal, transport interchange and hotel. The proposed hotel has a GBA of 25,000 m<sup>2</sup> and will be a 19-storey building over a 4-storey podium with proper segregation from the residential areas.

#### *Transport Facilities*

The new ferry terminal proposed at DBN will supplement the existing Discovery Bay pier which will continue to operate. The ferry terminal will be served by a transport interchange containing a bus terminal. Buses will serve all parts of the new development and the existing ferry pier, and will provide links to Chek Lap Kok airport and the mainland via the tunnel.

No private cars will be allowed in the DBN development. Road traffic will be limited to buses, service vehicles and golf carts. The internal road network has been designed to minimise gradients and bus services have been planned to reduce uphill, and inherently noisier, bus movements.

#### *Community and Recreational Facilities*

A public primary school, an international school and a Neighbourhood Community Centre are included in the Master Plan 6.0(A) proposal. Three residents' clubs will service different residential clusters and phases of the development. Each club will be approximately 1000 to 2000 m<sup>2</sup> in area and will include sports and leisure facilities such as tennis and badminton courts and a swimming pool. A Type A Indoor Recreation Centre is also included and will be either adjacent to or in the same building as the Neighbourhood Community Centre.

#### *Utilities and Services*

The tunnel link will create an opportunity for the rationalisation of many existing services and utilities on North Lantau and, to a lesser extent, some of the Outlying Islands. Potable water will be supplied by the Siu Ho Wan Water Treatment Works replacing the existing potable water supply derived from the Discovery Bay reservoir. Flushing water will continue to be sourced from the existing impounding reservoir.

Sewerage connection through the tunnel will permit all sewage loads from Discovery Bay to be treated at the Siu Ho Wan Sewage Treatment Works. This link will also permit sewage from Peng Chau to be diverted to Siu Ho



Wan. Three local submersible type sewage pumping stations with screening facilities will be located within the DBN site.

A dangerous goods store is located adjacent to the roundabout on the tunnel approach road. This site will store LPG and has been located away from residential areas and the roundabout for safety reasons.

Solid waste will be gathered at a refuse collection point (RCP) which is also adjacent to the roundabout on the tunnel approach road. The waste will then be transported to the Siu Ho Wan Refuse Transfer Station via the RTL. This service will replace the existing marine collection service from Discovery Bay.

Telecommunication services may be diverted from the existing microwave links to landline connections through the tunnel if so desired by Hong Kong Telecom.

### Landscaping

The Landscape Master Plan (Figure 3) retains the open valley which is a feature of the current landform and includes the development of a range of formal and informal open spaces. From an environmental perspective, the main features of the plan include:

- creation of a stream course and fresh water pools and associated riparian vegetation along the southern edge of the development area;
- creation of an area of mudflats to the south-east of the site for relocation/planting of mangroves;
- provision of an integrated open space network within the valley floor; and
- extensive woodland creation on slopes within and around the margins of the development area.

### Drainage

The streams flowing through Yi Pak will be culverted or diverted to new channels. The major stream will flow through a series of pools and a reprovisioned channel before flowing over the restored mangrove mudflat. The stream banks will be planted with a range of species currently found on the site. Run-off from buildings, roads and the building platforms will be collected by a separate drainage system, and discharged directly at the sea wall.

### Construction Requirements

The major construction works for DBN include:

- formation of fourteen building platforms;
- formation of the internal road network;
- filling the Yi Pak valley to +6 mPD;
- construction of the seawall;

- reclamation and earth moving activities; and
- construction of the various residential blocks and other buildings.

The platforms and reclamation will be constructed over three to four years. The development will be phased in three stages, with work starting on the higher platform areas and progressing to the reclamation. The construction of residential and commercial buildings in each phase will last three to four years. The ferry terminal will be constructed during the first and second development phases.

Platform formation will require both blasting and excavation. The main platforms will be formed using fill removed from Yi Pak Hill and the existing formed roads within the site will be used as haul roads.

The reclamation will be to a level of +6 mPD. Marine mud (150,000 m<sup>3</sup>) will be dredged from the site of the seawall but will be left *in situ* in other parts of the reclamation site. Sampling of the marine muds has shown that the sediments are uncontaminated with respect to heavy metals. The dredged marine muds will not be suitable for site formation but can possibly be used for the mangrove mudflat and in landscaping works.

## 2.2 Existing Environment

The landscape of the study area is characterised by high and low-rise urban development set against the backdrop of the mountains of North Lantau. Two promontories enclose Yi Pak Wan and form a natural amphitheatre. The southern promontory forms part of the existing Discovery Bay development consisting of low-rise residences and is separated from the proposed site by the steep and well wooded slopes of the ridge. The ridge extends into a prominent knoll which is also developed. The northern promontory (Yi Pak Hill) is undeveloped and is prone to wildfire, but has an area of established woodland on its lower slopes.

The flat landscape of the Yi Pak valley is characterised by man-made influences with two minor paved roads crossing the site to access temporary platforms containing a spoil stockpile, a horticultural nursery and an abandoned agricultural area. The area of the valley plain that lies closer to the sea is composed of mangrove and estuarine areas surrounded by scrub/woodland vegetation.

Infrequent use of Sam Pak was recorded during winter 1994/95 and spring 1995. The Sam Pak Wan beach was used by only a few hikers and fishermen. Pleasure craft began using both Yi Pak Wan and Sam



Pak Wan in April 1995 for water sports.

The area is relatively quiet and noise levels are typical of low density urban conditions. Air quality compares favourably with urban areas of Hong Kong. The future air quality of Discovery Bay may deteriorate marginally as a result of the Lantau Port and Western Harbour (LAPH) development, probably with a slight elevation of dust levels from the extensive construction works.

Yi Pak Wan falls within the boundaries of Southern Water Control Zone (SWCZ). Tai Pak beach at Discovery Bay is not gazetted but is regularly used by both residents of Discovery Bay and visitors for recreation and water sports. The bathing water quality during 1993 was rated as 'fair' based on EPD monitoring data.

Presently, the marine waters of Discovery Bay are influenced by wastewater arising from the existing development (population approximately 11,000). The wastewaters are screened and disinfected before being discharged via an outfall off the peninsula to the south of Discovery Bay into the SWCZ. The sewage disinfection system was commissioned recently to upgrade the treatment level of the Discovery Bay sewage wastewater discharge in anticipation of the deterioration in water quality which may result from the partial embayment of Discovery Bay following construction of the Lantau Port.

As part of Master Plan 6.0(A), sewage from Discovery Bay (and Peng Chau) will be pumped via the tunnel link to the Siu Ho Wan Sewage Treatment Works and water quality in the area will improve as a result.

Five natural watercourses drain the hill slopes surrounding the Yi Pak site, with four draining into the Yi Pak estuary. The streams had continuous flows during autumn/winter 1994 and are generally clean and silt free, except in times of exceptional rainfall. The upper section of one stream is culverted.

The area contains ecological resources composed of marine, estuarine and fresh water habitats of importance on a local level. The mangrove communities in the estuarine area at Yi Pak Wan represent the habitat of greatest conservation value in the study area. Some mature upland woodland is also of conservation value.

The LAPH development will have a major effect on Discovery Bay. Later phases of the Port will be clearly visible and Discovery Bay will potentially be affected by minor noise and air pollution effects, although predicted to be within acceptable limits. The most important effect, however, will be the partial blockage of the seaward view and loss of the rural setting currently enjoyed by Discovery Bay residents.

## 2.3 Noise

### Construction

Noise sensitive receivers (NSRs) are the residential buildings on the northern fronts of the existing Discovery Bay development. Construction noise at selected NSRs was predicted based on the best estimates of construction phasing and equipment available at the time of the assessment. The predicted noise levels were compared with typical daytime guidelines and the standards detailed in the Technical Memoranda (TM) which support the Noise Control Ordinance (NCO).

Cumulative construction noise (not including percussive piling) was predicted to exceed daytime guidelines mainly due to platform formation works. Predicted noise levels from percussive piling were below the TM standard.

A construction noise mitigation plan was developed to control the noise impact of general construction works. The plan is based on a combination of noise source and path control measures. Source controls include the use of silenced plant and machinery noise enclosures, while path controls include noise barriers at the site or platform boundaries. The construction noise impact can be mitigated through source and path controls, and reduced further through construction programming and good site practice. A community liaison group will be established to respond to complaints of construction noise and noise levels will be closely monitored as part of the Environmental Monitoring & Audit (EM&A) programme.

### Operation

The key operational noise issues relate to road traffic noise and noise from the LAPH development. Road traffic noise is under planning control and was predicted using the *RoadNoise* model. No private cars or taxis will be allowed into the existing or new residential areas. Noise planning controls included building aspect and setback, road alignment and gradient, and bus routing. Road noise at all flats and both schools proposed under Master Plan 6.0(A) will be below the planning standards. Less than 1% of the flats in the existing blocks of Greenvale Village which overlook the Yi Pak site will be subject to a minor traffic noise impact of 1 dB(A) or less over the standard.

Detailed modelling was undertaken to determine the noise impact of Container Terminals 10, 11, 12 and 13 planned under the LAPH project. Noise levels were compared with the planning noise guideline and the NCO standard. The Master Plan 6.0(A) design avoids direct line of sight to the Port and incorporates screening for residential buildings as far as possible. 96.6% of the



proposed DBN development met the night-time planning guideline, and all predicted noise levels complied with the NCO enforcement standard.

Noise from the ferry terminal, aircraft/helicopters, the tunnel ventilation system and utility areas is under planning control and is predicted to be acceptable for the Master Plan 6.0(A) development.

## 2.4 Air Quality

### Construction

Air quality sensitive receivers (ASRs) are the existing tower blocks to the west of the site (Greenvale Village) and the housing on the promontory to the south. The main source of impact is dust from vehicle travel on unpaved roadways, site excavation, drilling and blasting, dry material stockpiles, material handling, general construction activity and wind erosion of open areas. The Air Quality Objectives (AQO) specify standards for dust levels.

Dust emissions were predicted using the Fugitive Dust Model and the best available site information and construction programme. The modelling results indicate that without mitigation, dust levels from general construction works could be high at the ASRs to the west and south-west of the DBN site. Should the blasting scenario be adopted as modelled, unmitigated dust levels at ASRs will exceed the AQO. In practice, however, blasting will only occur in localised areas and with the effective implementation of dust control measures for blasting and other construction activities, dust levels should be within the AQOs at the ASRs. Further dust modelling studies may be required for blasting works once further information on the site conditions and construction details are available and are reviewed with EPD. The amount of blasting should be minimised where possible.

### Operation

Operational sources of air quality impact include internal road traffic and odour from the proposed sewage pumping stations. The pumping stations will be operated in a similar manner to the existing facilities and should not cause any odour nuisance.

Levels of nitrogen dioxide (NO<sub>2</sub>) and respirable suspended particulates (RSP) from vehicles were predicted using the CALINE4 model and compared with the AQO for these parameters. The results showed that both RSP and NO<sub>2</sub> concentrations from vehicles in DBN will be well within the AQOs.

## 2.5 Landscape and Visual Quality

The DBN layout plan has attempted to maintain views over the sea and green areas, and to orient views of future residents away from the Lantau Port as far as possible. Attention has been given to maintaining the 'open' feel of the valley, providing effective buffers between the existing and new development areas and retention of the lower scrub-woodland covered slopes of Yi Pak Hill.

The development will fundamentally alter the open, rural character of the Yi Pak valley, resulting in a number of clearly identifiable landscape and visual impacts on sensitive receivers. Long-term landscape impacts include the loss of Sam Pak Wan Valley South natural landform and vegetation; lowering of Yi Pak Hill and cutting back of the Yi Pak Hill spur; the loss of the lower Yi Pak valley ecosystem; and the loss of natural coastal features in Yi Pak Wan and part of Sam Pak Wan.

Severe long-term visual impacts will remain for some existing residents as a consequence of their proximity and elevated views over the Yi Pak valley and the DBN development. The long-term visual impact for hikers and boat passengers (medium and low sensitivity receptor, respectively) will be low.

Specific landscape measures have been included to compensate for loss of existing habitat and a major revegetation plan is proposed both within and around the development area. The standard of the internal landscape will equal that in the existing Discovery Bay development. The overall landscape and visual impact of the development is considered to be acceptable.

## 2.6 Ecology

The DBN site contains a range of habitats and the area has been influenced by the proximity to the existing Discovery Bay development. Some areas are highly modified either through construction activity or fire; others retain an essentially natural character.

The site vegetation consists of shrub woodland, shrub grassland, grass/disturbed areas, mangroves and associated vegetation, and backshore vegetation. The habitats present include upland grass/scrub cover, woodland, freshwater streams, beach, sub- and inter-tidal areas, and the Yi Pak estuary.

No protected or endangered terrestrial plant species were recorded on the site. A major portion of the development will be constructed on shrubland and grassland and loss of these areas is not predicted to be significant. The greatest impact to birds will be habitat loss, particularly with the loss of a Black-eared Kite nest



site. Impacts on mammals will be loss of habitat for burrowing small mammals; no protected species were recorded on the site during recent surveys. With regard to reptiles and amphibians, only the common Asiatic Painted Frog was recorded on the site. The availability of suitable lowland habitats for reptiles and amphibians will decline upon completion of the development.

The DBN site does not encroach upon areas included in the proposed extension of the Lantau North Country Park.

The boulder shore and associated coastal vegetation between Yi Pak Wan and Sam Pak Wan will be lost with the development, but is common in Hong Kong and is not of conservation importance. Unavoidable adverse impacts on coastal areas include loss of natural sand beach at Yi Pak and part of Sam Pak; loss of beach-associated vegetation, an increasingly rare plant community in Hong Kong; loss of sand spits and lagoons on Yi Pak and Sam Pak beaches which provide shelter for juvenile marine fish; loss of tidal wetland at Yi Pak including 0.6 ha of mangroves; disruption of the main Yi Pak stream; and loss of 5 ha of seabed with possible impacts on local fisheries.

The primary impact would be loss of the estuary and mangrove stand at Yi Pak. Such coastal wetland habitats are an increasingly rare vegetation type in Hong Kong due to sustained development pressure.

Impact mitigation includes detailed revegetation and habitat enhancement plans to compensate for woodland and shrubland loss and loss of habitat for birds, reptiles, amphibians and mammals. In addition, the Black-eared Kite nest will be relocated to a suitable site in the adjacent Sam Pak valley.

Mitigation of mangrove habitat loss is proposed in the formation of a mangrove mudflat to the south-west of the development in Yi Pak Wan. The design of the replacement mangrove will aim for an area three times larger than the area of mangrove lost. Creation of a new mangrove area will not fully replace the form and function of the existing wetland, but will provide a comparable mangal habitat within a secure management situation.

The boulder shore will be recreated along the edge of the DBN seawall. Together with the mangrove recreation plan, these measures will help mitigate impact on local fish nurseries. In addition, artificial reefs and fish decoys will provide shelter and a source of food for juvenile and small fish.

The lower section of the main Yi Pak stream will be reprovioned and will flow over the mangrove stand.

The stream banks will be planted with native species, and aquatic plants and animals will be reintroduced if they do not recolonise on their own.

Residual impacts of the proposed development would be the loss of coastal, intertidal and estuarine habitats. Master Plan 6.0(A) includes compensation measures to maintain coastal ecological resources within the plans for development of the area. The loss of habitats is significant but the proposals provide maximum compensation and opportunities for the long-term protection of the compensating areas.

## 2.7 Water Quality

### *Construction*

Dredging of marine muds prior to reclamation work will increase suspended solid levels and reduce dissolved oxygen with potentially adverse effects on marine ecology. Analysis has shown that the marine sediments are not contaminated by heavy metals and will be suitable for reuse in the restored mangrove mudflat or in site formation works. Water quality impacts of dredging and spoil transport will be minimised through careful working practices, control of dredging rates, dredging under appropriate tidal conditions, and through the use of silt curtains as necessary, and will be monitored for compliance with the Trigger/Action/Target (TAT) levels agreed with EPD as part of the EM&A programme.

Other sources of marine and stream water quality impact include suspended solids in site runoff, chemicals/fuels used on site, and litter. The site drainage system will include controls to reduce suspended solid levels and intercept any oil from fuel storage areas. Stores of fine materials will be covered and bunded, and fuels/chemicals will be stored on bunded hard surfaced areas. Fuel/chemical spill control plans will be implemented. Stream culverting and diversion works will be carried out at an early stage of construction and during the dry season to minimise potential problems with temporary drainage and flood control.

### *Operation*

The impact on streams in Yi Pak will be severe with all the channels being culverted, with the exception of the lower portion of the main stream. This stream section will be diverted through the central landscape area to a new channel which will discharge to the restored mangrove mudflat. The Sam Pak stream will not be affected by the development. Stormwater flows will increase by 10% with the DBN development and can be easily accommodated within the site drainage system.



Stormwater runoff will be relatively clean and suitable controls will be included in the site drainage system and chemical/fuel storage areas to protect the quality of the drainage effluent. The impact of site drainage on water quality will be minimal.

The reclamation proposed in Master Plan 6.0(A) will have only a minor impact on water circulation patterns in the area. Recent improvements in sewage treatment and the Master Plan 6.0(A) proposal to export Discovery Bay's sewage to Siu Ho Wan will improve water quality in the bay, a significant environmental benefit of the project.

## 2.8 Sewage Disposal

Currently, sewage from Discovery Bay is screened and disposed of through a marine outfall. A Disinfection and Dechlorination Facility began full operation in October 1995 with the aim of improving the bacteriological and microbiological quality of the local waters. Sewage loads will increase with the DBN development and, following the recommendation of the Outlying Islands Sewerage Master Plan, Master Plan 6.0(A) proposes to export all sewage from Discovery Bay and Peng Chau to the Siu Ho Wan Sewage Treatment Works via the tunnel link. Previous laboratory trials and technical review have shown that the existing Disinfection Facility will be capable of disinfecting the additional flows from DBN to meet the relevant microbiological/bacteriological discharge standards.

The diversion of sewage to Siu Ho Wan will improve marine water quality in Discovery Bay and will help mitigate the potential water quality impacts caused by the embayment formed by the proposed Lantau Port. Connection to the Siu Ho Wan Sewage Treatment Works is technically feasible and the facility is capable of accommodating the additional flows under normal operating conditions. The export of Discovery Bay sewage to Siu Ho Wan is not anticipated to have any significant environmental impact upon the North Lantau marine waters.

The proposals for treatment of Discovery Bay sewage prior to connection to Siu Ho Wan will be reviewed at the end of 1996 in case of delays to the RTL construction programme.

## 2.9 Waste

### Construction

A construction waste minimisation and recovery plan has been prepared and includes controls for waste generation at source, efficient use of resources through construction phasing, reuse of wastes where possible,

and provision of staff responsible for waste minimisation and sorting on site. The majority of spoil generated from the DBN site will be clean material suitable for use in reclamation and platform creation. The marine muds to be dredged are not contaminated and will be used on site or disposed of at a suitable approved site. The impacts of spoil storage, handling and disposal relate to dust, noise and water quality, and with suitable controls, can be reduced to acceptable levels. The contractor should prepare a comprehensive on-site waste management plan. The EM&A team will monitor the storage, transport, collection and disposal of construction wastes to ensure good practice.

### Operation

The management of domestic waste from the whole of Discovery Bay will be improved and simplified as a result of the Master Plan 6.0(A) project. Waste from DBN will be collected at a new RCP and together with other waste from Discovery Bay, will be exported via the tunnel to the Siu Ho Wan Refuse Transfer Station in accordance with the waste disposal strategy for Lantau. With the inclusion of appropriate controls and mitigation measures, the new RCP is not anticipated to result in adverse environmental impacts.

## 3. Road and Tunnel Link

### 3.1 Project Description

Environmental issues were a key consideration in the development of the RTL alignment options. The RTL will provide a two lane single carriageway road running from the proposed ferry terminal at DBN to the utility services road adjacent to the North Lantau Expressway (NLE). Five alignments, Options A1, A2, A3, B and C, were considered initially (Figure 4), but Option C was subsequently not deemed feasible due to conflicting land use requirements with the Siu Ho Wan water and sewage treatment works projects which are currently under construction.

The RTL will be restricted to residential coaches, service vehicles and emergency vehicles only. No private cars, taxis or golf carts will be permitted. The tunnel will also provide utility connections between Discovery Bay and North Lantau. The sewerage and water pipelines will follow the RTL alignment and construction works for these pipelines will have negligible impacts.

The RTL will be built and operated by HKR to standards approved by the Government. There will be a payment system for uses (e.g. tolls) to offset operational



and maintenance costs. The operation of the RTL will be controlled under the Discovery Bay Road Tunnel Bill which is currently being drafted for submission to LEGCO.

#### *Construction Requirements*

Construction of the RTL will take up to three years. The tunnel will be excavated using a drill and blast method. Blasting may also be required for sections of the Siu Ho Wan link road, lengths of which may be elevated. A temporary access track will be required along the alignment for the movement of equipment and materials, and should be within the operational boundary of the RTL.

### **3.2 Existing Environment**

The landscape of North Lantau is characterised by a mountainous barren terrain with peaks of up to +465 mPD which fall steeply to the coast. Chek Lap Kok and associated projects have fundamentally altered the rural character of the island. The reclamation and works for the sewage and water treatment plants at Siu Ho Wan, a microwave link relay station at Tai Che Tung, and the NLE are features of the RTL study area. All surrounding land uses are non-residential.

A stream course and tributaries run through the Siu Ho valley, and several small streams flow down steep courses along the Lau Fa Tung foothills. Habitats in the study area comprise hillside shrub woodland of relatively high conservation value on the Lau Fa Tung foothills, and shrub grassland which is subject to wildfire. The study area has been extensively disturbed by ongoing construction projects which have degraded the quality of the remaining habitat for fauna.

Noise is dominated by construction works for the Siu Ho Wan Sewage and Water Treatment Works, and the NLE, and in the future, the dominant noise sources will be NLE traffic and aircraft at Chek Lap Kok. Air quality on North Lantau compares favourably with the urban areas of Hong Kong. Construction works for the airport and related projects have resulted in increased dust levels, and may be similarly affected by works for the LAPH developments in the future.

### **3.3 Noise**

#### *Construction*

The NSR for the Discovery Bay tunnel portal is Greenbelt Court, the closest residential building of the existing Discovery Bay development. There are no NSRs near the Siu Ho Wan tunnel portal and construction noise is not an issue in this location. The predicted noise levels for tunnelling and portal formation

works at the Discovery Bay portal were compared with typical daytime guidelines and the standards detailed in the TM which support the NCO.

Cumulative unmitigated construction noise levels were predicted to exceed daytime guidelines and a construction noise mitigation plan was developed to control construction noise and minimise nuisance to NSRs. The plan includes source and path controls, construction and equipment use phasing, and recommendations for good site practice. Construction noise will be closely monitored by the EM&A team and close liaison will be maintained with nearby NSRs.

#### *Operation*

Sources of noise during the operation of the RTL are limited to the tunnel ventilation system and road traffic on NSRs in the DBN site. These issues are addressed in Section 2.3.

### **3.4 Air Quality**

#### *Construction*

Dust from construction works is the key air quality issue during construction of the RTL. Dust emissions from works at the Discovery Bay portal were considered as part of the DBN air quality assessment (Section 2.4).

The ASRs for the Siu Ho Wan link road and tunnel portal are the Siu Ho Wan Sewage and Water Treatment Works. Blasting works will be the main dust source, and dust emissions were calculated for heavy construction operations for road construction, and secondly for dust emitted during blasting at the Siu Ho Wan tunnel portal. Dust emissions were predicted using the Fugitive Dust Model for Option A3, the road alignment which is closest to the ASRs.

Predicted dust levels at ASRs for road construction were well below the EPD 1 hour guideline and the AQO standards. Unmitigated dust levels from blasting were predicted to exceed the EPD 1 hour guideline in the short term at the eastern end of the water treatment works site. The extent of blasting should be minimised and careful working practices followed to achieve compliance with the EPD guideline. Further dust modelling studies may be required for blasting works once more site information and construction details are available and have been reviewed with EPD.

#### *Operation*

Air quality issues during the operation of the RTL relate to vehicle emissions and sewage odour. The tunnel will be ventilated by jet fans drawing air from the Discovery Bay portal and exhausting to the Siu Ho Wan



portal. Vehicle usage of the tunnel will be light compared with other tunnels in Hong Kong, and the fans will effectively extract and discharge air pollutants emitted inside the tunnel. The portal emissions were predicted using the ISCST2 model and vehicle emissions on the open road calculated using the CALINE4 model.

Predicted levels of NO<sub>2</sub> and carbon monoxide were both below the standards in the AQOs and will not result in adverse air quality impacts at the Sewage or Water Treatment Works.

Sewage odour within the tunnel will be controlled through both the design of the sewerage pumping system and the tunnel ventilation system. The EM&A programme will include checks to ensure that sewage odour is not detectable, and odour controls could be added to vents if necessary. The potential impact of odour from the Siu Ho Wan Sewage Treatment Works should be insignificant for users of the RTL.

Sewage can generate methane and hydrogen sulphide, but the tunnel ventilation system will prevent the build up of these gases inside the tunnel.

### 3.5 Landscape and Visual Quality

The landscape of North Lantau is undergoing a period of considerable change. The recent reclamation and development along the north coast has fundamentally altered the island's rural landscape setting. Features of the study area include the Siu Ho valley and stream; foothills of the Lau Fa Tung range; the Siu Ho headland which is the site of extensive earthworks; and the Siu Ho Wan reclamation.

Option C is strongly preferred on landscape and visual impact grounds, but is not feasible due to land use conflicts with the Siu Ho Wan Sewage and Water Treatment Works. The remaining options will have more significant landscape and visual impacts, with Options A1/A2 being preferred in terms of landscape impact, and Option B preferred in terms of visual impact. The final alignment should be based on a combination of these options to minimise landscape and visual impacts, and as such, Option A3 is the most appropriate.

The major impact of concern is the effect on views of travellers on the NLE, either approaching or leaving Hong Kong via Chek Lap Kok airport. Extensive planting of the cut slopes and areas along the alignment will contribute to the long-term mitigation of visual impacts, and a revegetation plan has been prepared.

### 3.6 Ecology

The study area has been disturbed by ongoing construction works for the NLE and the Siu Ho Wan

Sewage and Water Treatment Works, and also by hill fires. Hillside shrub woodland on the coastal foothills is of relatively high conservation value, while the shrub grassland which covers the majority of the site is of low conservation value. No protected or endangered plant species were recorded.

Faunal use of the site appears limited to birds which were observed mainly in the shrub woodland habitat. Aquatic animals, reptiles and amphibians, and mammals were not recorded during surveys, although the shrub woodland could provide habitat for some burrowing mammals.

Options A1, A2, A3 and B will result in greater ecological impacts than Option C. Selection of Option C would reduce impacts to flora and fauna as the road would be constructed on previously disturbed sites. However, this alignment is not feasible due to land use conflicts with the sewage and water treatment works sites. Mitigation measures for Options A1, A2, A3 and B include habitat restoration through revegetation of disturbed areas, and erosion control measures.

### 3.7 Water Quality

#### *Construction*

Construction wastes with potential water quality impacts include sewage, canteen and washing facility discharges, and site litter. Self-contained chemical toilets should be provided and the sewage arisings disposed off-site at a suitable facility by a licensed contractor. Canteen and washing facility effluents should be combined and discharged into a settlement tank/grease trap and soakaway pit at a suitable distance from streams and the coast. Site litter can be controlled through the provision of convenient disposal points and regular litter patrols.

Other sources of stream water quality impact include suspended solids in site runoff, spilt chemicals and engine oils/fuels, and suspended solids in groundwater seepage during tunneling works. The potential water quality impact can be mitigated through the use of drainage controls, settlement ponds, construction programming and good site practice. Water quality will be closely monitored by the EM&A team during the construction period.

#### *Operation*

Rainfall runoff from the Siu Ho Wan section of road will be relatively clean and will be discharged to an existing drainage channel on the Siu Ho Wan reclamation or to the NLE drainage system. Suitable controls will be included in the RTL drainage system to



protect the quality of the effluent. Accidental spills of material on the road could potentially be washed into the drainage system by rain. Vehicles carrying dangerous goods will not be permitted to use the RTL.

The RTL crosses several stream courses, some of which may be culverted or diverted. Where practical, the road will cross streams on structure to minimise stream bed and vegetation loss.

### 3.8 Waste

A construction waste minimisation and recovery plan has been prepared for the RTL. The largest volume of waste will be rocky spoil from road and tunnelling works and will be minimised through a balance of cut and fill. Suitable spoil will be used as fill material either on site or by other construction projects, or in shore revetment works in Discovery Bay. Spoil will be transported along a haul road within the operational boundary of the RTL. The contractor should prepare a comprehensive on-site waste management plan, and the EM&A team will monitor the storage, handling and disposal of construction wastes to ensure good practice.

### 3.9 Lantau North Country Park

The RTL options are outside the existing boundary of the Lantau North Country Park, but all would affect the proposed country park extension. The tunnel section of all options would pass under the future country park area with no intrusion above ground. The Siu Ho Wan tunnel portal will be within the future country park boundary for all options. The length of road that would lie within the Lantau North Country Park extension would be small (225m for Options A1/A2 and 110m for Options A3/B). Option C was not considered as this alignment is not feasible due to land use conflicts. Relocation of the tunnel portal outside the country park boundary is not preferred in terms of portal location, engineering and tunnel ventilation considerations. The impact of the road can be reduced through detailed design, landscaping and revegetation.

### 3.10 The Booster Water Pumping Station & Access Road

The booster pumping station will pump potable water from the Siu Ho Wan Water Treatment Works to Discovery Bay via the RTL. The single storey pumping station building will be located to the south of the water treatment works site and will be accessed by a 245m length of road branching from the RTL. Potential impacts considered include water quality, stream disruption, landscape/visual quality and ecology.

Construction and operational phase water quality impacts will be minor and can be mitigated effectively through the use of proper controls. Impacts on stream courses have been reduced through careful siting of the pumping station and the design of the access road. The road will cross one stream on structure to minimise the impact on the stream bed and vegetation. The pumping station and access road will add to the landscape and visual impact of this section of the RTL and will increase the area of shrub woodland loss. Both ecological and landscape/visual impacts can be reduced through revegetation of disturbed areas.

### 3.11 The Road and Tunnel Link Toll Plaza

The Toll Plaza will control vehicular use of the RTL and prevent access by unauthorised vehicles. The facility will have a small control building and a barrier gate. The proposed location is an area on the new reclamation adjacent to the junction of the RTL and the NLE utility services road. No adverse ecological impacts would result at this location and the landscape/visual impact would be minimal. The Toll Plaza could be landscaped to extend the area of shrub woodland vegetation on the coastal foothills.

## 4. Environmental Monitoring & Audit

EM&A procedures are essential in order to:

- ensure that any environmental impacts resulting from the construction and operation of DBN and the RTL are minimised or kept to acceptable levels;
- establish procedures for checking that mitigation measures have been applied and are effective, and that the appropriate corrective actions are undertaken, if and when required; and
- provide a means of checking compliance with environmental objectives, recording anomalies and documenting corrective action.

The EM&A requirements for DBN and the RTL relate to noise, air quality, landscape and visual quality, ecology, water quality and waste impact mitigation management. The EM&A schedules detail monitoring requirements for selected environmental parameters and action plans outline the action to be taken if certain pollution levels are reached. An audit system is also proposed for both construction and operational phases of the project. The EM&A requirements are included in an EM&A Manual and will be incorporated into the construction contract(s) in the form of environmental clauses.



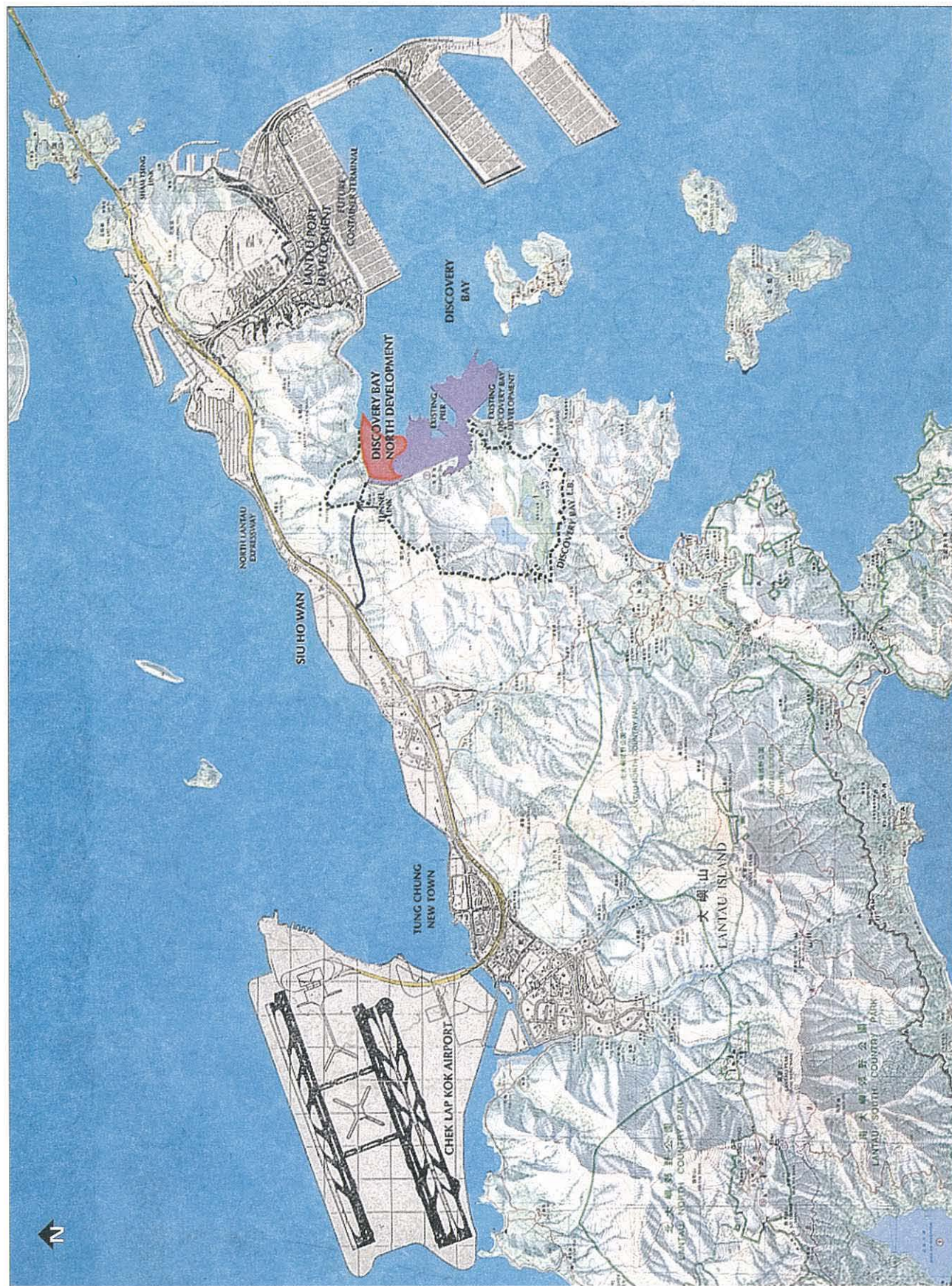


Figure 1 圖例1  
Study Area 研究區域



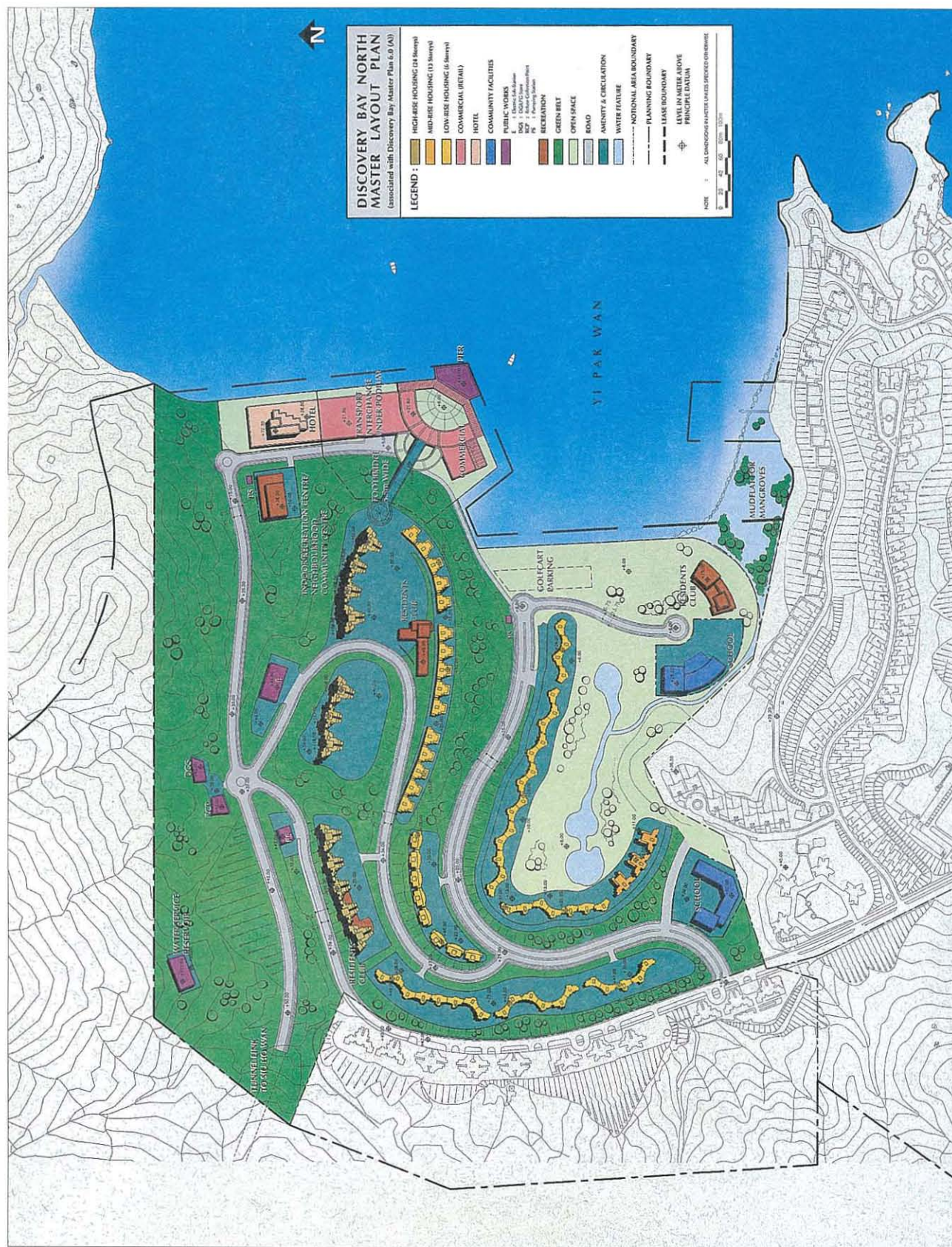


Figure 2  
Discovery Bay North Master Layout Plan

圖例2  
北愉景灣總綱發展藍圖



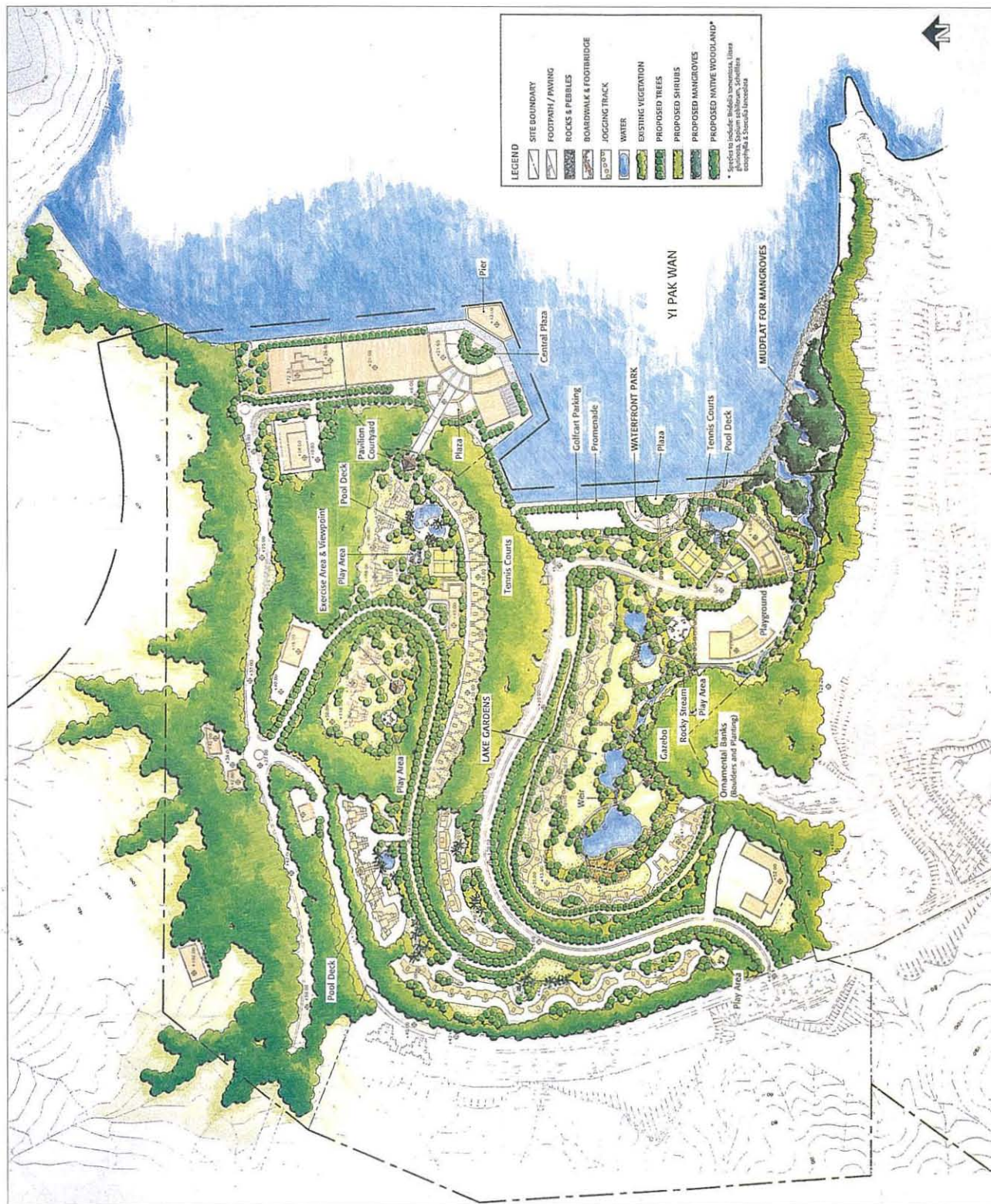
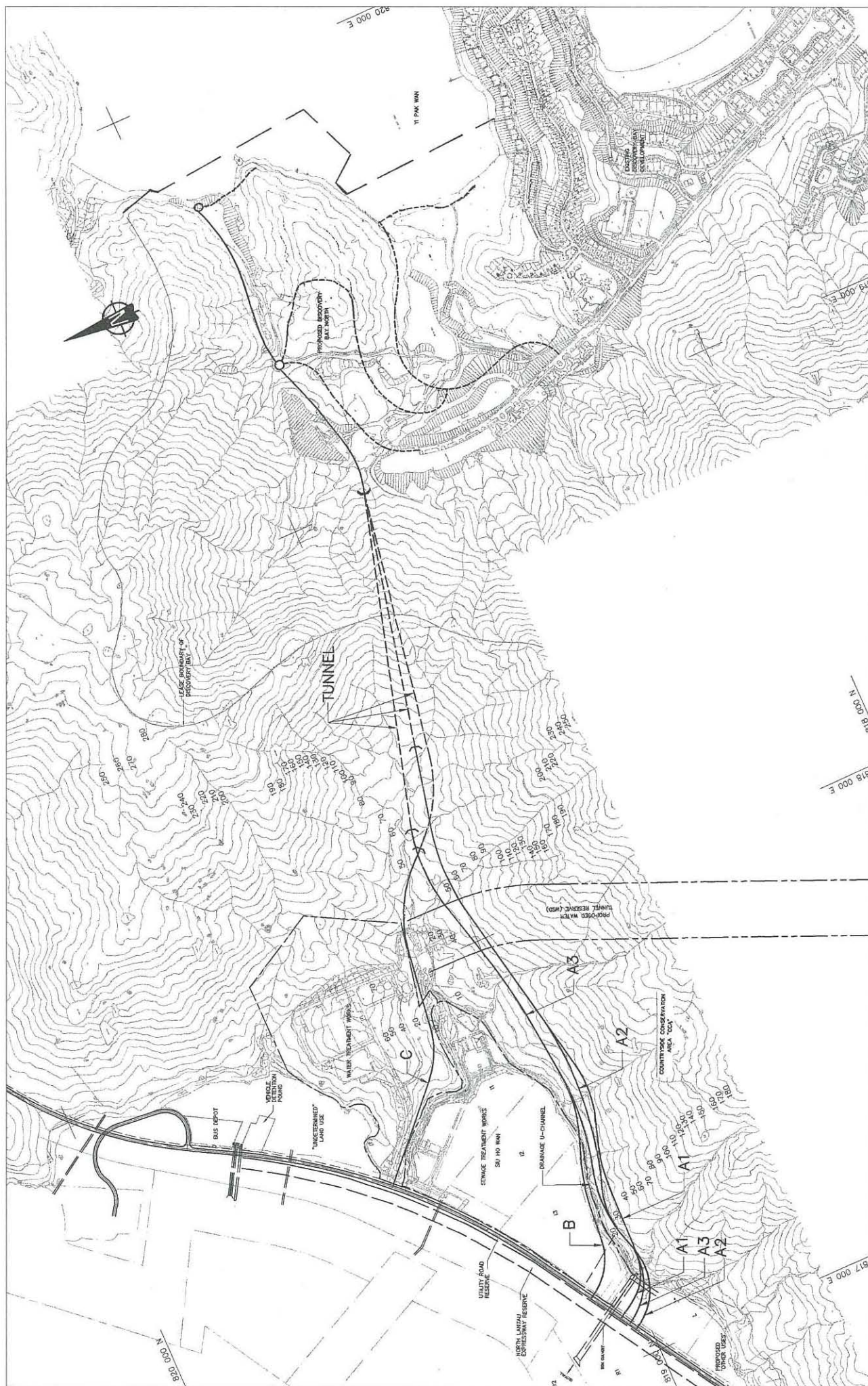


Figure 3  
Discovery Bay North Landscape Master Plan

圖例3  
北愉景灣綠化總綱藍圖





NOTE:

LAND USES INDICATED ARE BASED ON PLANNING DEPT.  
PLAN NO. L/I-SHW/C OF 31-7-93.



Figure 4

# Road and Tunnel Link Options

圖例4

# 道路及接駁隧道方案



## 運作

小濠灣一段道路的雨水逕流將為相當清潔，並將排放至小濠灣填海區的現有排水溝道，或排放至北大嶼山高速公路的排水系統。道路及接駁隧道的排水系統將實施適當控制，以確保污水的質素。道路上意外流出的源料可會被雨水沖往排水系統。載有危險物品的車輛將不可使用道路及接駁隧道。

道路及接駁隧道橫跨多條河道，其中某些更可能會進行河溝建設或改道。在可能的情況下，道路可在結構上橫跨河流以盡量減低對河床及植物的損害。

### 3.8 廢物

現已就道路及接駁隧道編製出一份減少建築廢物及再用計劃。最大的廢物量將為道路及隧道工程中產生的石塊。廢物量可透過均衡的移山填海而得以減少。合適的廢物可用作地盤或其他建築項目或愉景灣海岸護土牆工程的填土物料。廢物亦可在道路及接駁隧道的營運邊界內經運輸道路運往其他地方。承建商應制訂一份地盤內廢物管理的綜合計劃，而環境監察及查核隊將對存放、處理以及處置建築廢物進行監察，以確保地盤運作妥善。

### 3.9 北大嶼山郊野公園

道路及接駁隧道的方案在現有北大嶼山郊野公園範圍之外，但該等方案將影響建議中的郊野公園擴展計劃。各項方案的隧道部份將經過日後郊野公園地底。各項方案的小濠灣隧道入口將在日後的郊野公園範圍之內。在北大嶼山郊野公園擴展範圍內的道路頗短 (方案 A1/A2 為 225 米，方案 A3/B 則為 110 米)。基於土地使用抵觸問題，方案 C 乃屬不可行而不獲考慮。就隧道入口位置、工程及隧道通風等方面而言，將隧道入口移離郊野公園範圍並不合適。詳細的設計、綠化設計及再種植可減低道路的影響。

### 3.10 增壓抽水站及通道

增壓抽水站將小濠灣水質處理廠的食水經道路及接駁隧道泵往愉景灣。單層抽水站將位於水質處理廠以西，一條長 245 米的道路及接駁隧道支路可通往

該抽水站。預計該抽水站對水質，河流影響、景觀／視覺質素以及生態有潛在的影響。

建築及營運階段的水質影響將屬輕微，可透過使用適當的管制，將影響減低。透過抽水站的謹慎選址以及通道的設計，河道的影響得以減低。該道路將在結構上橫跨一條河流，以盡量減低對河床及植物的影響。抽水站及通道將對道路及接駁隧道一節的景觀及視覺造成影響，並將擴大灌木木林受損的面積。生態及景觀／視覺影響可透過在曾受影響的地方再種植而得以減低。

### 3.11 道路及接駁隧道繳費站

繳費站可控制車輛使用道路及接駁隧道，並阻止未經許可的車輛進入。該設施包括一控制中心及柵欄。建議的位置為道路及接駁隧道與北大嶼山高速公路公用設施服務道路交匯點毗鄰的新填海土地。該項計劃對該處的生態不會造成不良影響，而對景觀／視覺的影響亦屬輕微。沿岸山麓上灌木木林的種植範圍將伸延至繳費站。

## 4. 環境監察及查核

環境監察及查核程序極為重要，其旨在：

- 確保北愉景灣及道路與接駁隧道的興建及運作所產生任何環境影響已盡量減低或已保持於可接受的水平；
- 訂下程序，以考察緩和措施是否已有效施行，並考查在需要的情況下是否已採取適當的矯正行動。
- 提供方法，以核實是否已達到環境目標，記錄反常事故以及將矯正行動存檔。

北愉景灣及道路及接駁隧道的環境監察及查核要求涉及噪音質素、空氣質素、景觀及視覺質素、生態、水質以及有關減低廢物影響的管理。有關環境監察及查核的附錄詳述對指定環境特點的監察要求，而行動計劃則概述達到一定的污染水平後將採取的行動。查核系統亦有對該項目的建築及運作階段作出建議。

環境監察及查核要求載列於環境監察及查核手冊內，並將以環境條款的形式轉載於建築合約內。



對爆破工程作出更深入的埃塵模擬研究。

## 運作

營運道路及接駁隧道造成的空氣質素問題，與車輛排出廢氣，以及污水發出的臭氣有關。隧道將採用噴氣式風扇，由愉景灣入口將空氣抽入，並放送至小濠灣入口。由於該隧道的車輛流量將較香港其他隧道的車輛為少，故該風扇可有效排出隧道內的空氣污染物。有關隧道口排出塵埃的預測乃採用 ISCST2 模型而作出，而露天道路上車輛排出塵埃的預測乃採用 CALINEG 模型計算得來。

預測二氧化氮及一氧化碳的水平均低於空氣質素控制條例的規範，故不會對污水處理及濾水工程造成不良的空氣質素影響。

隧道內的污水臭氣將透過污水抽水系統及隧道通風系統設計，加以控制。環境監察及查核計劃將包括检查工作，以確保污水臭氣已不可察覺。如有需要，臭氣管制可應用於通風口。小濠灣污水處理廠發出的臭氣對道路及接駁隧道使用者應不會造成嚴重的潛在影響。

污水可產生沼氣及硫化氫，但隧道通風系統可防止該等氣體於隧道內累積。

## 3.5 景觀及視覺質素

北大嶼山的景觀正進入重大的改變階段。近期沿北岸一帶正進行中的填海及發展已基本上改變了該島的鄉村風貌。該研究區域的特點包括有小濠谷及河流、流花洞山脈的山麓、為大型泥土工程地盤的小濠山岬以及小濠灣填海工程。

方案C在景觀及視覺影響等方面非常佔優，但因與小濠灣污水及水質處理廠的土地使用相抵觸而被視為不可行。餘下的方案對景觀及視覺有比較大的影響，其中方案A1/A2在景觀影響方面較少，而方案B則在視覺影響方面較少。最終的安排應集合各方案之特點制訂出來，以盡量減低景觀及視覺影響，就此，方案A3則屬最合適。

其中最受關注的影響在於使用北大嶼山高速公路經赤鱗角機場往返香港人士所目睹的景色。沿該高

速公路一帶經批削的斜坡及地方上進行的廣泛種植，將有助長期減低視覺影響，而再種植計劃亦已編製完成。

## 3.6 生態

該研究區域受到現正進行的北大嶼山高速公路建築工程、小濠灣污水處理廠及濾水廠以及山火的影響。近岸山麓的山邊灌木木林有相當高的保留價值，而至於覆蓋大部份發展地區的灌木草原，保留價值則不高。該處並無受保護或臨危的植物。

該地區的動物似乎限於主要可於灌木木林棲所看到的鳥類，雖然灌木木林可為若干需要挖洞居住的哺乳類動物提供棲息地方，但調查顯示該處並無水生動物、爬虫類動物以及兩棲類動物。

除方案C外，方案A1，A2，A3及B會導致比較大的生態影響。採納方案C將可減低對動物及植物的影響，因該道路乃於曾受影響的地方興建。然而方案C因與污水處理的及濾水廠地盤的土地使用相抵觸而不能獲採納。方案A1，A2，A3及B的補償措施包括在受影響的地方進行再種植，以重修動物的棲息處，以及風雨侵蝕控制措施。

## 3.7 水質

### 建築

對水質有潛在影響的建築廢物包括污水、飯堂及清潔設施排放的污水，以及地盤垃圾。承建商應提供配套式化學處理廁所，以及採用適當的設施將污水排出地盤。飯堂及清潔設施排出的污水應混合後排放到與河流及海岸有適當距離的沉澱池／油脂分離器及滲水坑。至於地盤垃圾管制方面，應提供就近的垃圾站，並定期巡視。

對河流水質具影響的其他來源包括地盤逕流內的浮懸固體，溢出的化學品及機油／燃油以及進行隧道工程時地下滲水的浮懸固體。潛在的水質影響可透過排水管制、沉澱池、建築計劃以及妥善的地盤運作等方法予以減低。在施工期間，環境監察及查核隊將密切監察水質。



道路及接駁隧道之營運將受到愉景灣道路隧道法 (Discovery Bay Road Tunnel Bill) 所管制。該法例目前仍在草擬中，以呈交立法局。

### 建築要求

興建道路及接駁隧道需時達三年。隧道將透過鑽探及爆破之方法建造。若干段小濠灣的接駁道路亦可能需要進行爆破工程，其中的部份可能為高架公路。為方便運送機器及材料，將須沿路興建一條臨時通道，該通道應在道路及接駁隧道的營運界線之內。

### 3.2 環境現況

北大嶼山既多山又荒蕪，山峰高達 +465mPD，山峰與海岸一段極為陡峭。赤鱸角及有關的項目已改變該島的原本鄉村特色。道路及接駁隧道的研究範圍內的重點地方包括小濠灣的填海以及污水及水質處理廠工程、大輦洞的微波接駁發播站，以及北大嶼山高速公路等工程。當中四周的土地使用均為非住宅用途。

流經小濠灣的河道及支流以及數條小河流均流往沿流花洞山麓的陡峭河道。該研究範圍內的動物棲所包括有甚具保留價值的山邊灌木林以及蔓延廣遠但易招山火的灌木草原。該研究範圍亦廣泛受到進行中的建築項目影響，使餘下的動物棲所質素下降。

噪音主要源於小濠灣污水及水質處理廠以及北大嶼山高速公路的建築工程。將來，主要的噪音來源將為北大嶼山高速公路的交通以及升降赤鱸角的飛機。北大嶼山的空氣質素較香港的市區為佳。機場及有關項目的建築工程已導致塵埃水平上升，日後同樣可能會受到大嶼山及西海港發展的工程影響。

### 3.3 噪音

#### 建築

愉景灣隧道入口的噪音靈敏接收地點為濤山閣，此為最鄰近現時愉景灣發展的一幢住宅大廈，而小濠灣隧道入口附近並無噪音靈敏接收地點，因建築噪音對該處並不構成問題。於愉景灣方面進行的隧道

及隧道口興建所得的預測噪音水平會與一般日間指引及詳載於技術備忘錄，且附合噪音管制條例的標準作比較。

累積未經減低的建築噪音水平預測將超越日間指引，減低建築噪音計劃亦已制定，以控制建築噪音以及盡量減低對噪音靈敏接收地點造成的滋擾。該項計劃包括噪音來源及途徑管制、分階段進行建築及使用機器，以及提倡妥善的地盤運作。環境監察及查核隊將密切監察建築噪音，並與鄰近的噪音靈敏接收地點保持緊密的聯繫。

#### 運作

營運道路及接駁隧道的噪音來源限於隧道的通風系統，以及北愉景灣地區噪音靈敏接收地區的陸上交通。該等問題詳述於第 2.3 節。

### 3.4 空氣質素

#### 建築

建築工程產生的塵埃為興建道路及接駁隧道時主要的空氣質素問題。於愉景灣隧道口進行的工程所排出的塵埃已被用作評估北愉景灣空氣質素的一部份 (第 2.4 節)。

小濠灣接駁道路及隧道口的空氣質素靈敏地點為小濠灣的污水及水質處理廠。爆破工程將為主要的塵埃來源，而噴出的塵埃相信來自築路時進行的重型建築運作，其次則來自小濠灣隧道進行的爆破。就 A3 (即最接近空氣質素靈敏接收地點的道路路線) 的塵埃排放進行的預測是採用塵埃播散模型 (Fugitive Dust Model) 而作出。

於空氣質素靈敏接收地點進行築路工程所得的預測塵埃水平正好低於環保處一小時指引以及空氣質素控制條例的標準。在短期內，於水質處理廠地盤最東一端進行爆破所得的未經減低塵埃水平預測將超逾環保處一小時指引。進行爆破的範圍應減至最細，並應作出謹慎施工安排，以達至合乎環保處的指引。倘更多地盤資料及建築詳情得以提供，並已獲環保處審核後，則可能須



發展的主要部份將建於灌木林及草原上，預料該地的損失並不嚴重。對鳥類最大的影響將為其棲息地受損，尤其是黑耳鷺 (Black-eared Kite) 築巢的地方將受損，而哺乳類動物則因幼哺乳類動物棲息的地方受損而受到影響，但事實上，據最近的調查顯示，該地區並無受保護的動物品種。至於爬虫類動物及兩棲動物方面，調查顯示該處只有普通的亞洲有色蛙 (Asiatic Painted Frog)。於該項發展完成後，該處適合爬虫類動物及兩棲動物棲息的低地將漸漸減少。

北愉景灣地區並不會延展至建議中北大嶼山郊野公園擴展範圍。

該項發展將導致二白灣及三白灘之間的礫石海灘及生長於海岸的植物受損，但由於該海灘及植物在香港甚為普遍，故保留價值不高。部份對海岸產生的不良影響實無可避免，包括各種不同生態的流失，如二白及部份三白的天然沙灘、生長於海灘的植物、二白灘及三白灘上可庇護幼魚類的沙角及礁湖、位於二白包括一片 0.6 畝廣紅樹林的潮水濕地，以及 5 畝廣的海床受損對當地魚場可能帶來的影響。

最主要的影響將為二白河口紅樹林受損。這些沿岸濕地棲息的植物因此漸漸成為香港罕少的植物品種。

減低影響的方法包括密集或再種植及改善動物棲息處計劃，以彌補灌木林及灌木林的損失，以及鳥類、爬虫類、兩棲類及哺乳類動物棲所的損失。此外，黑耳鷺 (Black-eared Kite) 的雀巢亦將會遷往鄰近三白谷的合適地點。

為減低對紅樹生長地的損害，現擬於二白灣發展區西南部建造一片紅樹泥灘。該項紅樹的替代設計旨在建造一片比受損的紅樹生長地大三倍的新生長地。建造新的紅樹生長地並不能完全替代現有濕地的形式及功用，但將可在安全受管理的情況下提供相當大的紅樹生長地。

在北愉景灣的防波堤沿岸將重建一個礫石海灘。連同紅樹重建計劃，該等措施將有助減低對本地

魚苗育場的影響。此外，人工礁及魚餌將為幼魚及細魚提供藏身處及食物來源。

二白河流下游將進行重整並將會流經紅樹林。河堤將種植源於該處的品種，而倘若水生植物及動物未能自行殖居，則會重新引入該等植物及動物。

該項建議中的發展項目產生的餘下影響為海岸、潮間及河口的動物棲息地受損。總規劃圖 6.0 (A) 包括補償措施，以保留該地區發展計劃內的海岸生態資源。雖然動物棲息處將受到一定程度的破壞，但該等建議將給予最大的補償，並提供機會，以長期保護需受補償的區域。

## 2.7 水質

### 建築

填海工程前所進行的海泥挖掘將增加浮懸固體水平，並減少溶於水中的氧氣，此對海洋生態構成潛在的不良影響。分析顯示，該處的沉澱物並無受重金屬污染，故適合在重建的紅樹泥灘以及地盤平整工程中再用。透過謹慎工作程序，控制挖掘的比率、在適當的潮汐情況下進行挖泥，並在需要時使用沙幕，則因挖泥及運送泥頭所造成的水質影響將可減至最低。此外，更會根據環境監察及查核計劃內經環保處同意的引發／行動／目標水平對該等水質影響進行監察。

造成海洋及河水水質影響的其他來源包括地盤逕流的浮懸固體。地盤內使用的化學品／燃料及垃圾。地盤排水系統將包括對浮懸固體水平的控制以及阻截燃料儲存處流出燃油。儲存微細物料時將會加以掩蓋及封好，燃料／化學品亦會儲存於封蓋妥善的地方。管制洩漏燃料／化學品計劃將予以施行。建造河溝及河流改道工程將於建築工程最初階段及於乾燥季節內進行，以盡量減少有關臨時排水及洪水控制潛在的問題。

### 運作

除二白主流的下流外，二白的所有河道進行河溝建造後將對其河流造成嚴重的影響。該河流部份將



改道經中央綠化區，通往經重建紅樹泥灘的新河道。三白河將不會受該項發展影響。雨水流量將隨著北愉景灣發展而增加 10%，並易於為地盤的排水系統所容納。雨水逕流相當清潔，而地盤排水系統及化學品／燃料儲存區內將採取適當的管制，以保障所排放的水質。地盤排水對水質的影響亦將減至最低。

總規劃圖 6.0 (A) 建議的填海工程將僅對該處的水流循環模式產生輕微影響。近期經改良的污水處理以及總規劃圖 6.0 (A) 中有關排送愉景灣的污水往小濠灣的建議，將可改善海灣的水質，並對環境有著重大裨益。

## 2.8 污水排放

目前，愉景灣的污水經過隔濾，消毒及脫氯設施 (Disinfection and Dechlorination Facility) 已於一九九五年十月全面投入運作，以改善附近水域的細菌及微生物含量。污水量將隨著北愉景灣發展而增加，緊隨離島污水總體計劃 (Outlying Islands Sewerage Master Plan) 提出後，總規劃圖 6.0 (A) 亦建議將所有愉景灣及坪洲的污水，經接駁隧道排放往小濠灣污水處理廠。過往的實驗性試驗及技術檢討顯示，現有的消毒設施能將北愉景灣的額外污水消毒，以達到有關污水內微生物及細菌的標準。

污水改道往小濠灣將可改善愉景灣的水質量，並有助減低因大嶼山港口建議建造海灣所引致的潛在水質影響。連接小濠灣污水處理廠在技術上為可行，該設施在正常運作情況下足以容納額外的污水。將愉景灣的污水排放往小濠灣預料將不會對北大嶼山的海洋水域造成任何重大的環境影響。

有關愉景灣污水於排送往小濠灣前預先進行處理的建議倘因道路及接駁隧道建計劃而有所延誤，則將於一九九六年尾進行檢討。

## 2.9 廢物

### 建築

建築廢物之減少及再用計劃現已製訂完成，其中包括控制廢物產生，透過分階段建築以有效利用資

源，在可能的情況下將廢物再用，以及提供人手，負責減省廢物，及於地盤內將廢物分類。大部份在北愉景灣產生的廢物均為清潔，可用作填海及建造平台。挖出的海泥預期並未受污染，可於地盤內使用，或堆置於合適的認可地盤內。透過適當的控制，可將存放廢物，處理及處置塵埃、噪音及水質的影響減至可接受的情況。承建商應準備一份有關地盤內廢物管理的綜合計劃，而環境監察及查核隊將監察建築廢物的存放、輸送、收集及處置等，以確保處理的手法妥善。

### 運作

推行總規劃圖 6.0 (A) 項目後，整個愉景灣的家庭廢物處理將獲得改善及簡化。根據大嶼山的廢物處置策略，北愉景灣的廢物將收集於新垃圾收集站內，並連同愉景灣其他廢物，經隧道送往小濠灣垃圾轉運站 (Siu Ho Wan Refuse Transfer Station)。透過兼行適當的管制及處理措施，新垃圾收集站預期並不會對環境造成不良影響。

## 3. 道路及接駁隧道

### 3.1 發展項目概述

環境問題為發展道路及接駁隧道方案選擇中一項主要的考慮。道路及接駁隧道將提供一條雙線單程行車路，該車路由北愉景灣的建議中渡輪碼頭通往北大嶼山高速公路毗鄰的公用設施道路。五項路線，即方案 A1、A2、A3、B 及 C 最初均獲考慮 (圖四)，但最後方案 C 因與目前動工興建中的小濠灣水質及污水處理廠項目的土地使用相抵觸而被視作不可行。

道路及接駁隧道將只供住客接駁巴士、服務車輛以及緊急車輛使用。私家車、的士或高爾夫車將不准駛入。隧道亦只提供愉景灣及北大嶼山之間的公用設施接駁。污水管及水管將跟隨道路及接駁隧道的路線及建築工程而鋪設。該等水管的建造工程只會造成輕微的影響。

道路及接駁隧道將由香港興業有限公司建造及營運，並將可達到政府認可的標準。一套用者自付制度 (如隧道費) 將予以設立以抵消營運及維修成本。



制條例的執行標準。

總規劃圖 6.0 (A) 發展中的渡輪碼頭、飛機/直升機、隧道通風系統及公用設施方面造成的噪音現受到規劃管制，並預期為可接受水平。

## 2.4 空氣質素

### 建築

空氣質素靈敏接收範圍 (Air Quality Sensitive Receivers) 即發展區以西 (頤峰) 的現有高樓區以及山岬以西的房屋。其影響主要源於車輛行駛未經鋪設車道時噴出的塵埃、地盤挖掘、鑽探及爆破、乾料貯存、物料處理、一般建築活動以及受風侵蝕空地等產生的塵埃。空氣質素目標 (Air Quality Objectives) 指明塵埃水平的標準。

塵埃排放乃採用塵埃播散模型 (Fugitive Dust Model) 以及現有最佳的地盤資料及建築計劃而作出預測。模擬結果指出，若不進行管制工作，於北愉景灣地盤以西及西南部空氣質素靈敏接收範圍所進行的一般建築工程所錄得的塵埃水平將會頗高。倘按計劃採納爆破方案，空氣質素靈敏接收範圍之未經管制塵埃水平將高於空氣質素目標 (Air Quality Objectives)，但事實上，爆破將只在限定的區域內進行，而只要對爆破及其他建築活動採取有效的塵埃管制措施，空氣質素靈敏接收範圍的塵埃水平應能達到空氣質素目標。倘有關地盤情況及建築詳情的進一步資料得以提供並獲環保處審核後，則可能需要對爆破工程作出更深入的塵埃模擬研究。在可能的情況下，應將爆破的次數減至最低。

### 運作

影響空氣質素的運作性來源包括對內道路交通以及建議興建的污水抽水站發出的臭氣。抽水站的運作方式將與現有設施的運作方式相似，而抽水站應該不會造成任何臭氣滋擾。

車輛排出的二氧化氮水平以及可吸入浮懸微粒的水平乃採用 CALINE 4 模型作出預測，並就其特

點，與空氣質素目標作比較。結果顯示，北愉景灣內車輛排出的可吸入浮懸微粒濃度及二氧化氮濃度正好達到空氣質素目標。

## 2.5 景觀及視覺質素

北愉景灣發展藍圖已盡量保留海景及綠化區的景色，並旨在令將來的居民盡量遠離大嶼山港口。此外，該計劃亦務求保留山谷的“空曠”感覺，為現有及新興的發展區提供有效的緩衝區，並保留二白山長滿灌木木林的低層山坡。

該項發展將對二白谷空曠、天然的特色起基本的改變，以致靈敏接收地區產生多項可清楚確認的景觀及視覺影響。對景觀的長期影響包括南三白灣山谷失去天然的地貌及植物、二白山被削低以及二白山山脈被削短、下二白谷的生態系統受損以及二白灣及部份三白灣失去天然的海岸特點。

由於現時若干的居民鄰近並能飽覽二白谷及北愉景灣發展項目，該項發展將對他們起著嚴重的長期視覺影響，但對遠足人士及船客（其分別為中等及低等靈敏度接收者）並不會產生嚴重的長期影響。

特設的綠化措施乃為現在動物棲息地的損失作出補償，並建議於發展區內及四周進行大規模的再種植計劃。內部地形的標準將與現時愉景灣發展項目的標準相同，而相信該項發展所產生的整體景觀及視覺影響將仍可接受。

## 2.6 生態

北愉景灣發展區內有多種不同類形的動物棲息地，而該區因臨近現時的愉景灣發展項目而受到影響。部份地方更因建築活動或火災而大受改變，其他則仍可保留主要的天然特點。

該地區的植物有灌木林、灌木草原、草地、紅樹及類似的植物，以及後灘的植物。目前，動物棲息地包括長滿草灌木的高地、木林、淡水溪間、海灘、潮間區以及二白河口。

該地區並無保護或臨危的陸上植物品種。該項



該區相當優靜，噪音水平為低密度市區的典型，空氣質素亦較香港的市區為佳。將來，愉景灣空氣質素可能因大嶼山港口及西海港發展而輕微轉壞，塵埃水平亦可能因大型的建築工程而微升。

二白灣位於南水質控制區 (Southern Water Control Zone) 內。愉景灣的大白灣雖然仍未刊於憲報上，但已經常有愉景灣的居民及遊人到此休憩及作水上活動。根據環保處的監測數據顯示，於一九九三年，二白灣的水質被評為“尚好”。

目前，愉景灣的海水受現時發展（人口約 11,000）所產生的污水所影響。污水於消毒及隔篩後經管道排離愉景灣以南之半島，再流至南水質控制區。近期已啟用污水消毒系統，藉以提高對愉景灣排出污水之處理水平，並防止興建大嶼山港口後，愉景灣部份海灣之水質預期會有下降的情況出現。

根據總規劃圖 6.0 (A) 愉景灣（及坪洲）的污水將被引經隧道，泵往小濠灣污水處理廠。該處的水質會從而得以改善。

五條天然水道流經二白區的山坡當中，四條則流往二白河口。於一九九四年秋季／冬季，該處河流流水不斷，除偶爾有大雨外，河水大致清澈，不帶有淤泥。其中一條河流上游已建造河溝。

該區儲藏生態資源，包括重要的海洋、河口及淡水動物棲所。二白灣河口區的紅樹叢乃本研究範圍內最具保留價值的生態所在。若干茂密的高地木林亦具保留價值。

大嶼山港口及西海港發展將對愉景灣有最大影響。港口的後期工程快可目睹，而愉景灣將受到噪音及空氣的輕微潛伏影響，但預期仍可接受。然而，最主要的影響將為目前愉景灣居民享有的海景將部份被阻隔，天然景色亦將會受損。

## 2.3 噪音

### 建築

噪音靈敏接收範圍 (Noise Sensitive

Receivers) 為現時愉景灣發展以北前方的住宅單位。於指定噪音靈敏接收範圍內，建築噪音乃按建築階段及機器的最佳估計。預測的噪音水平與一般日間指引及詳載於技術備忘錄 (Technical Memoranda) 內符合噪音管制條例的標準作比較。

累積建築噪音（不包括撞擊式打樁）預測超越日間指引，主要歸因於地盤平整的平台建築工程。撞擊式打樁的預測噪音水平則低於標準。

為控制一般建築工程所產生的噪音影響，現已制定一項減低建築噪音的計劃。該項計劃乃以控制噪音來源及途徑為基礎編製而成。噪音來源控制包括使用隔聲機械及噪音罩，至於噪音途徑控制則包括在地盤及平台邊設置噪音隔聲板。建築噪音的影響除可透過噪音來源及途徑控制外，同時亦可進一步透過建築管理及妥善的地盤運作來減至最低。社區聯絡小組將予組成，以回應有關建築噪音的投訴，而噪音水平亦會受到嚴密的監察，此皆為環境監察及查核 (Environmental Monitoring & Audit) 計劃的一部份。

### 運作

主要的運作噪音問題仍源於陸路交通及大嶼山港口及西海港發展。道路交通噪音現受到規劃管制，並曾透過道路噪音模擬作出預測。現有或新興的住宅區將不許私家車或的士駛入。噪音規劃管制包括樓宇的方位，道路安排及斜度，以及巴士路線。在所有住宅單位以及總規劃圖 6.0 (A) 建議興建的學校附近道路的噪音將低於計劃的規範。現時能俯瞰二白地盤的頤峰大廈中將只有少於 1% 的單位受到高於規範一分貝或以下的輕微的交通噪音影響。

詳細的噪音模擬現已完成，以確定大嶼山及西海港發展項目擬興建的 10 號、11 號、12 號及 13 號貨櫃碼頭造成的噪音影響。噪音水平乃與計劃的噪音指引及噪音管制條例標準作比較。總規劃圖 6.0 (A) 設計盡量隔離住宅大廈及港口，以免住宅大廈直接面向港口。北愉景灣發展的建議當中，有 96.6% 已附合晚間規劃指引，所有的預測噪音水平更已達到噪音管



的污水轉流往小濠灣。三個設有過濾設備的污水抽水站將設於北愉景灣範圍內。

危險品倉庫設於隧道入口道路迴旋處側。該倉庫將儲存石油氣，由於該處遠離住宅區及迴旋處，安全將受保障。

固體廢物將收集於垃圾收集站內，其亦位於隧道入口道路迴旋處的毗鄰。廢物將經道路及接駁隧道被運往小濠灣垃圾轉運站 (Siu Ho Wan Refuse Transfer Station)。該項服務將取代現時由愉景灣海路收集的服務。

現時的電訊服務倚賴微波接駁，但香港電訊亦可轉而通過隧道使用陸上路線連接。

### 綠化設施

綠化總綱藍圖 (看圖三) 保留了空曠的山谷 (其為現時地貌的特點)。該藍圖包括井然有序及自然風格的休憩空間。從環境角度而言，該項藍圖的要點包括：

- 建設河道及淡水池，以及沿著發展區的南邊河岸綠化；
- 於地盤東南面建設泥灘，以移植 / 種植紅樹；
- 於山谷底提供綜合休憩用地；
- 於發展區內及環繞發展區邊沿的斜坡大規模種植木林。

### 排水系統

流經二白的河流將改道流往新水道。主要河流將流經一系列淡水池以及新設水道，最後流往經重建的紅樹泥灘。河堤將種植一系列目前生長在區內的植物品種。大廈、道路及大廈平台的排水將由獨立系統收集，直接排出防波堤。

### 建築要求

北愉景灣的主要建築工程包括：

- 建造十四個建築平台；

- 建造對內道路網絡；
- 將二白谷填土至 +6mPD；
- 興建防波堤；
- 填海及移土工程；及
- 興建各類住宅大廈及其他建築物

興建平台及填海需時三至四年，該項發展將分三期進行，首先動工興建各高地平台，繼而進行填海。住宅及商業大樓的各期建設需時三至四年。渡輪碼頭則將於第一及第二期發展展開時動工興建。

建造平台須進行爆破及挖掘。主平台將使用二白山移山所得的土壤造成，而現時區內已平整的道路將用作施工道路。

填海工程將以 +6mPD 的水平為限。150,000 立方米的海泥將於防波堤的地盤內挖出，但海泥將仍留於填海地盤的其他位置。海泥的樣本顯示，沉澱物未受重金屬污染。挖出的海泥將不宜用於地盤平整，但或可用於紅樹泥灘及用於綠化工程。

## 2.2 環境現況

研究區域的地形最大的特色在於樓宇分佈高低錯落有置，更有北大嶼山的群山為襯托。二白灣為兩個山岬所包圍，像天然的半圓形階梯式劇場。南面的山岬形成現時由低層住宅組成的愉景灣發展的部份，建議中的發展並以木林茂盛的山坡相隔。北面的山岬 (二白山) 雖仍未發展，且易於發生山火，但於斜坡下有一大片木林。

二白谷平坦的地形上築有兩條經修築的小路，並穿過發展區通往堆土存放區，園藝圃以及一片荒廢的耕地組成的臨時平台。近海的一片山谷平原由四周為灌木 / 木林包圍的紅樹以及河口組成。

據一九九四 / 九五年冬季及一九九五年時調查，三白的使用率不高。三白灣海灘僅有少數遠足人士及漁民使用。一九九五年四月才開始有游艇在二白灣及三白灣進行水上運動。



## 1. 緒言

### 1.1 背景

於一九九四年八月，港府原則上同意在愉景灣增加 210,000 平方米的住宅總建築面積（Gross Building Area），此將增加愉景灣的人口至 25,000 人，並同時為道路及公用設施的接駁提供一條連接小濠灣的隧道，香港興業有限公司 (HKR) 已製訂一項發展計劃，名為總規劃圖 6.0 (Master Plan 6.0)，該圖其後就回應政府之意見作出修改，並改名為總規劃圖 6.0 (A) (Master Plan 6.0 (A))。

該項目包括將目前愉景灣的發展向北擴展至二白，並以目前愉景灣地界內為限。該項擴展簡稱北愉景灣 (DBN)。研究區域載列於圖一。建議中連接愉景灣及北大嶼山的道路及接駁隧道 (RTL) 將僅限於住客接駁巴士、服務車輛及緊急車輛使用。

### 1.2 環境設計及評估

環境問題為發展總規劃圖 6.0 (A) 時主要的考慮項目。要求保持高質素的環境以及盡量減輕對現有社區構成滋擾更是該項計劃的主要目的。該項發展建議亦已藉此機會，就分區計劃改善環境方面積極作出貢獻。

該項計劃經過反復思索而成，透過該項計劃，潛在的環境問題在計劃及工程設計中得以確認。整項設計更應用（香港規劃標準及指引 (Hong Kong Planning Standards and Guidelines)）中訂立之指引及標準，並為保護環境質素訂下額外要求。

環境影響評估研究 (EIA) 將總規劃圖 6.0 (A) 分為北愉景灣及道路與接駁隧道兩個部份，以便各政府部門對該項目進行檢討。本執行概要包括北愉景灣及道路及接駁隧道之環境影響評估報告調查結果。

## 2. 北愉景灣

### 2.1 發展項目概述

#### 住宅發展

北愉景灣住宅發展將提供總建築面積達

185,000 平方米共 2230 個住宅單位。發展藍圖則載列於圖二。該處將建有 12 幢 24 層住宅大廈，3 幢 13 層中層住宅大廈及 67 幢 6 層低層大廈。

#### 商業設施及酒店發展

商業設施由一幢鄰近渡輪碼頭的三層高樓宇、交通轉駁處以及酒店組成。建議興建的酒店總建築面積為 25,000 平方米，樓高 19 層，建於一個 4 層高的平台上，並與住宅區保持適當的距離。

#### 交通設施

建議於北愉景灣興建的新渡輪碼頭將彌補現有的愉景灣碼頭之不足，而新渡輪碼頭落成後，現有的愉景灣碼頭將繼續運作。設有巴士總站的交通轉駁處將為渡輪碼頭提供交通轉駁服務，而巴士則將為該新發展及現有的渡輪碼頭提供服務，並行經隧道，連接赤鱗角機場及香港各地。

北愉景灣發展將禁止私家車輛駛入，道路交通將只限於巴士、服務車輛及高爾夫車。對內道路網絡斜度經刻意減低，至於巴士路線，則減少上斜，藉以減低巴士本身發出的噪音。

#### 社區及康樂設施

公立小學、國際學校及街坊社區中心均列入總規劃圖 6.0 (A) 建議書內。三所住客俱樂部將為各區住宅及各期發展提供服務。各所俱樂部面積約 1000 平方米至 2000 平方米，設有運動及休憩設施，如網球及羽毛球場以及泳池。當中更設有甲級室內康樂中心，該康樂中心將設於街坊社區中心毗鄰或與街坊社區中心設於同一幢建築物內。

#### 公用設施及服務

建議中的接駁隧道將使北大嶼山及若干離島的多項現有服務及公用設施更合理化。小濠灣水質處理廠將取代愉景灣水庫，為該區提供食水，而廁所用水將繼續由現有的儲水庫提供。

經該隧道的污水連接系統可讓愉景灣的所有污水於小濠灣污水處理廠進行處理。該接駁亦可讓坪洲



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香港興業有限公司

# 愉 景 灣

總規劃圖6.0(A)

## 環 境 影 響 評 估

執 行 概 要 報 告

1996年 3月



**AXIS**

Environmental

匯亞環保顧問有限公司