

**Stormwater Drainage Master Plan Study  
in Northern Hong Kong Island**

**PROJECT PROFILE**

**DRAINAGE IMPROVEMENT  
IN NORTHERN HONG KONG ISLAND**

**HONG KONG WEST DRAINAGE TUNNEL**

## CONTENTS

<b>1.</b>	<b>BASIC INFORMATION.....</b>	<b>1</b>
1.1	PROJECT TITLE .....	1
1.2	PURPOSE AND NATURE OF PROJECT .....	1
1.3	NAME OF THE PROJECT PROPONENT.....	1
1.4	LOCATION AND SCALE OF PROJECT .....	1
1.5	NUMBER AND TYPES OF DESIGNATED PROJECTS TO BE COVERED BY THE PROJECT PROFILE .....	2
1.6	NAME AND TELEPHONE NUMBER OF CONTACT PERSON .....	2
<b>2.</b>	<b>OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME.....</b>	<b>2</b>
2.1	RESPONSIBILITY OF PARTIES.....	2
2.2	PROJECT TIME TABLE.....	3
<b>3.</b>	<b>POSSIBLE IMPACT ON THE ENVIRONMENT .....</b>	<b>3</b>
3.1	CONSTRUCTION PHASE.....	3
3.2	OPERATIONAL IMPACT .....	4
<b>4.</b>	<b>MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT.....</b>	<b>6</b>
4.1	LAND BASED RECEIVERS .....	6
4.2	MARINEWATER SENSITIVE USES .....	7
4.3	SITES OF CULTURAL HERITAGE .....	7
<b>5.</b>	<b>ENVIRONMENTAL PROTECTION MEASURES TO BE INCOPORATED IN THE DESIGN.....</b>	<b>8</b>
5.1	CONSTRUCTION STAGE.....	8
5.2	OPERATIONAL PHASE .....	9
5.3	RECOMMENDATION FOR FURTHER EIA STUDY .....	9
<b>6.</b>	<b>OTHER ENVIRONMENTAL EFFECT .....</b>	<b>9</b>
<b>7.</b>	<b>PREVIOUS PUBLIC CONSULTATION AND ENVIRONMENTAL REVIEW .....</b>	<b>10</b>

## **1. BASIC INFORMATION**

### **1.1 Project Title**

The title of the proposed project is “Drainage Improvement In Northern Hong Kong Island - Hong Kong West Drainage Tunnel”.

### **1.2 Purpose and Nature of Project**

The Stormwater Drainage Master Plan Study in Northern Hong Kong Island (NHKDMP Study) covers the flood prone areas from Kennedy Town in west to Chai Wan in east. The NHKDMP Study results reveal that potential flood risk exists within the study area due to the hydraulic deficiencies of the existing system.

Serious flooding was reported in the past in the northern Hong Kong Island during the rainy season. There were few storms that cause major flooding. During the severe rainstorm, it will cause not only potential risk to life and property damage but also traffic chaos and public inconvenience.

Various options have been considered. These include conventional drainage upgrading method, storm retention scheme and pumping scheme. In view of constraints such as existing system configuration, land requirements, existence of underground utilities and obstructions, traffic disruptions, environmental impacts and public nuisance, a drainage master planning strategy, namely, Hong Kong West Drainage Tunnel, is formulated in order to improve the hydraulic deficiency in the study area.

The main concept of the Hong Kong West Drainage Tunnel is to use drop shafts to collect and divert upland runoff to an east-west running stormwater tunnel. The diverted runoff will be conveyed to the sea via a tunnel portal without entering the downstream so that the hydraulic loading on flow deficiency pipes in the lower catchment is relieved.

Figure 1 illustrates the areas to be drained and protected by Hong Kong West Drainage Tunnel.

The tunnel diversion scheme is developed mainly in view of the tremendous difficulties associated with drainage improvement works in the heavily built-up and traffic congested lower catchments. The major drainage improvement works at the lower catchment especially trunk drains will be substantially reduced with the implementation of the tunnel scheme.

### **1.3 Name of the Project Proponent**

The Project Proponent is Drainage Services Department (DSD)

### **1.4 Location and Scale of Project**

The currently selected tunnel alignment is an east-west running tunnel to intercept the upland runoff. It is approximately 10km in length passing through 14 catchments at a

minimum cover of 30m below ground level with inverts from 52mPD to 9.0mPD. It starts at Tai Hang Road in the east running westwards, passing through 17 stormwater shafts, 3 man access shafts and discharging to the sea at south of Sandy Bay via a multi-cell box culvert. The tunnel excavation will be done mainly using tunnel boring machines (TBMs) and majority of the construction work will be carried out underground.

A total of 20 shafts will be constructed. 17 shafts are flow intercepting points for which the runoff will be diverted vertically down through vortices, or through small diameter horizontal tunnels to the main tunnel. 3 man access shafts are provided as emergency entrance and exit points in case of emergency. All the shafts, except for three locations at fault zones, will be driven into rock using raise boring machines (RBM). The remaining three shafts will be constructed using the traditional hand dug method.

The tunnel will consist of 2 tunnel portals. The eastern portal is located at the stream course to Tiger Balm Garden at Tai Hang Road. The western portal, which is the outfall for stormwater discharges, is at the headland south of Sandy Bay. Major construction works including site formation for minor slope stabilization and handling excavated tunnel spoil will take place at this portal.

The alignment and shafts location of the proposed Hong Kong West Drainage Tunnel is shown in Figure 2.

### **1.5 Number and Types of Designated Projects to be covered by the Project Profile**

The Hong Kong West Drainage Tunnel is a designated project under Environmental Impact Assessment Ordinance (EIAO). Since a portion of the proposed tunnel route is encroaching into Pok Fu Lam Country Park, Special Area and Lung Fu Shan Country Park, the project will be classified under item Q.1 in Schedule 2 of the EIAO as designated project.

### **1.6 Name and Telephone Number of Contact Person**

All queries regarding the Project can be addressed to:

## **2. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME**

### **2.1 Responsibility of Parties**

DSD is the overall Project Proponent who oversees and manages the Project. The Project Proponent will commission consultants to conduct an Environmental Impact Assessment (EIA) in accordance with EIAO. The construction works will be carried out by the contractor at the subsequent stages.

## 2.2 Project Time Table

The planning, design, preparation of contract documents and tendering of the Project will be undertaken by consultants appointed by DSD. The construction works will be contracted out. Details of the tentative implementation programme are as follows:

Upgrading to Cat. B, partial upgrade to Cat A and Selection of Consultant	09/2000 – 12/2001
Site Investigation (SI), Environmental Impact Assessment (EIA), Traffic Impact Assessment (TIA), Detailed Design, Funding, Tendering, Legislation, and Site Work Area Possession	12/2001 – 03/2007
Construction	03/2007 – 09/2011

## 3. POSSIBLE IMPACT ON THE ENVIRONMENT

The environmental issues during the construction and operation phases of the proposed Hong Kong West Drainage Tunnel are identified based on all possible impacts on the environment as listed in Annexes 1 and 3 of the Technical Memorandum on EIA Process. These issues include dust, noise, water and solid waste management which are described as follows.

### 3.1 Construction Phase

**Dust:** Dust will be generated during the site preparation, ground excavation, material handling and traffic movement on unpaved site areas for delivery and transport of material at all work sites. Generally, the highest dust emission would occur at the tunnel portal sites due to the most intensive and prolonged construction activities. Dust impact at the shaft would be minimal. Dust emission would occur during the initial excavation. When the excavation reaches the rockhead, the excavation will be carried out underground using a raise boring machine. Furthermore, the excavated material from the shaft sites will be removed from the two portals. Thus, it is envisaged that on the whole, unacceptable dust impact due to the construction should not occur at these sites with adoption of mitigation measures. However, considering the scope of large and prolonged construction work at two tunnel portals, it is considered necessary to conduct dust impact assessment for these two sites to confirm the findings.

**Noise:** The portals represent the most intensive work sites. The noise impact could be of the most environmental concern, particularly at the eastern portal site due to its location in the urban area and close proximity to the noise sensitive receiver, Tiger Balm Garden. As excavated material will be transported to and removed from the western portal and disposed off site, noise will be generated from the use of powered mechanical equipment for site preparation and excavation of shafts using TBM.

Noise impact at shaft sites may also be a concern because of their close proximity to the receivers.

However, the noise impact on the receivers would be of short duration and would occur during initial site clearance and excavation when the construction work is carried out above the ground. Overall, the degree of noise impact at individual site will depend on the intensity of construction work and the distance to the receivers.

**Water:** During the construction phase, potential impact would be associated with the discharge of wastewater into storm drains, which will include rainwater run-off from the construction site and maintenance pumping of groundwater from the excavated trenches for shafts during the site excavation.

The wastewater will generally contain high concentrations of suspended solids and/or silts. Discharge could cause the blockage/silting of drains and lead to elevation of turbidity in the receiving water bodies. The extent of these impacts will depend upon the solid concentrations. Mitigation measures must be provided on site.

**Solid Waste:** Spoil, including rock, vegetation and soil, will be generated at all work sites during initial site clearance and excavation. Since the excavated spoil will be transported to and removed from the portals. Thus, it is expected that a substantial volume of rock spoil will be handled at the portals. The re-use of spoil on-site or somewhere elsewhere should be examined in the subsequent study. This should include the arrangement for the sorting and process facilities. It is also recommended that spoil should be transferred off-site by sea to minimize traffic impact

**Ecology:** Construction of portal will require site clearance. This will involve the removal of a certain amount of vegetation on the slope which could result in the losses of habitat for fauna such as birds. However, these impacts would be short-term if compensatory planting is carried out. In addition, construction noise can also cause short-term disturbance to animals using the area.

In terms of impact on the marine biota, the site run-off can cause deterioration of water quality if it consists a high level of solids, which could affect the organisms inhabiting the water.

### 3.2 Operational Impact

**Water Quality:** A cooling water intake for Queen's Mary Hospital is located approximately 200m north from the proposed western portal. Since debris, sand, silts, tree branches and etc. can enter the tunnel in the event of heavy storms, discharge of the collected water can be a concern to the intake if an elevation of suspended solids in the receiving water occurs. Thus, mitigation should be adopted to prevent silt, debris and sand from entering the tunnel. There are two possible intakes close to the western portal (details refer to Section 4.2). Due to their large distances from the proposed discharge point, the impact should be minimal. However, it is considered necessary to assess the impact in the subsequent study to confirm the finding.

The stormwater shaft locations were carefully chosen. The shaft, with the use of overflow device, will only intercept the runoff and divert the flow to the drainage

tunnel during the severe rainstorm. Apart from that, they are designed to allow the passage of upland runoff directly to the downstream catchment under the normal conditions. The original flow regime will remain the same. As such, there will be no impacts on inland waters downstream of the interception points. In fact, there is a general improvement to the downstream catchment.

**Ecology:** The issue of major concern is the discharge of freshwater into the oceanic water which could cause a decrease in the salinity level in the receiving water, particularly in the mixing zone. Such change could have impact on the marine organisms, especially those that are sensitive to the salinity change. Consequently, it could cause mortality of sensitive organisms and change in species composition. However, the extent of the impact will depend on the types of organisms, the presence of sensitive organisms, the presence of important nursery/spawning ground for marine organisms, and the presence of fishing grounds. It is necessary to verify the issue during the subsequent study.

The proposed western portal is located on a rock cliff without any stream in the vicinity of the works area, no aquatic life inhabiting or terrestrial wildlife in the area will be affected.

**Cultural Heritage:** Three proposed tunnel shafts are in the vicinity of sites of cultural heritage as listed in Section 4.3. The construction activity may affect these historic structures. As a result, it is recommended that impact on the historic structures should be assessed in the subsequent study.

**Other Issues, Visual and Landscaping:** The proposed portal and energy dissipator structure will be built on an existing rock cliff in Sandy Bay Area. Currently, it is proposed that the portal exit point will be 8m in diameter at 6m mPD and the energy dissipator will be 30m in width and 40m in length built between 4-6m mPD. Their construction will require the removal of vegetation and cutting of slope. These activities can cause landscape and visual impact. However, the degree of visual and landscape impact should not be significant as explained below:

- There is an EMSD's concrete pump house and rock armour in the vicinity of the proposed portal site. The presence of these structures will make the portal less visually intrusive.
- The portal is shielded from highly sensitive viewers, comprising residential receivers in Pok Fo Lam Road and Wah Fu. The only viewers will be travelers from boats passing the site. These receivers are considered a low sensitivity group in terms of visual impact.

In order to minimise the visual intrusion and as the portal will be viewed against the backdrop of a hill site, it is recommended that landscaping work should be incorporated in the design of the portal. Since the stormwater will be conveyed and discharge via box culverts, it would not affect inter-tidal and subtidal areas.

#### 4. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

##### 4.1 Land Based Receivers

The proposed tunnel alignment is running in the east-west direction with mountain ridge shirts along the southern Study Boundary. The proposed shaft sites are generally located in the urban. A description of sensitive receivers at each shaft site is summarised in the following Table 1.

**Table 1: Location of Land Based Sensitive Receivers**

Shaft No.	Shaft Location	Sensitive Receiver	Distance to Receiver
E4	Streamcourse next to Tiger Balm Garden at Tai Hang Road	Tiger Balm Garden	50m
E5	Tai Hang Road between Wesley Village and Block 10	Block 10	25m
E7	Blue Pool Road next to Mary Mount Secondary School	Marymount Secondary School Greenside Villa	10m
MA1	Blue Pool Road and Tai Hang Road	Green Lane Roll Wendy Apartment	45m
E8	Stubbs Road near Evergreen Villa	Evergreen Villa	35m
W0	Stubbs Road opposite Lingnan College	Lingnan College, Goodview Garden,	35m
W1	Western Tunnel Section, parallel with Wan Chai Gap Road, between Kennedy Road and Bowen Road	Residential Blocks	15-20 m
W2	52-54 Kennedy Road	Ewan Court, Man Yuan Garden	10-25 m
MA2	52-54 Kennedy Road	Ewan Court, Man Yuan Garden	10-25 m
W3	Justice Road near EMSD HK depot	-	-
W4	Playground at the junction between Garden Road and Cotton Tree Drive	YWCA	30 m
W5	At Glenealy close to Pine Court	Pine Court	20 m
W6	Near 19 Mosque Street	Residential Blocks	10 m
MA3	Robinson Road	Residential Blocks	10m
W7	Garden between Caine Road and Seymour Road	Residential Blocks	45m
W8	At Breezy Path	Bonham Court	15m
W9	At Po Shan Road, opposite Medallion Heights	Residential Blocks	20m



<b>Shaft No.</b>	<b>Shaft Location</b>	<b>Sensitive Receiver</b>	<b>Distance to Receiver</b>
W10	At Kotewall Road, opposite tennis court of Wisdom Court	HK University lodge	50m
W11	Po Shan Road opposite Kotwall Fire Station	Hatton Place	70m
W12	Pok Fu Lam Road opposite Pokfulam Mansion	Pokfulam Mansion, La Clare Mansion	45m
Western Portal	South of Sandy Bay	Magnolia Villas	--

#### 4.2 Marinewater Sensitive Uses

The proposed portal site is in Sandy Bay, west of Hong Kong Island. The surrounding water body is within the designated Western Buffer Zone. There is no maricultural zone in the immediate vicinity. The closest fish mariculture zones, Sok Kwu Wan and Lo Tik Wan around the Lamma Island, lie to the South of the Sandy Bay area.

There are two existing the water intakes in the vicinity of the proposed western portal. One is the EMSD's seawater intake for cooling water for Queen's Mary Hospital, approximately 200m from the discharge point and other is Sandy Bay water intake, approximately 1050 m away. In addition, there is a proposed water intake located in about 500m south to the site at Telegraphy Bay.

#### 4.3 Sites of Cultural Heritage

There are a number of historic structures in the vicinity of the proposed tunnel shafts and tunnel alignment as summarized below:

<u>Name</u>	<u>Shaft No.</u>
Tiger Balm Garden	E4
Old Ammunition Depot	W3
Hot Yat Church	W7
Pinewood Battery	-
Mount Davies Battery	-

## 5. ENVIRONMENTAL PROTECTION MEASURES TO BE INCOPORATED IN THE DESIGN

Considering the findings of above assessment, it is recommended that the following mitigation measures should be considered in the subsequent design. However, it should be noted that the mitigation measures to be considered in the subsequent study should not be limited by these identified below. Any other measures should be explored and included if practicable.

### 5.1 Construction Stage

**Dust:** Mitigation measures such as the use of covers for stockpiled excavated materials and the construction areas may be required. This will especially be the case during the dry season and in those areas where may exacerbate the dust problem. The contractor should regularly water and damp construction sites. The standard dust control clauses should be included in all works contracts.

**Noise:** The mitigation measures, but not limited to the following, should be considered in detail during the subsequent study:

- acoustic screening of receivers from direct line of site from construction activities
- use of acoustic barriers/shields to enclose or partially enclose noisy activities
- use of silenced equipment
- proper planning of the construction programme
- using a common sense approach: the placing of noisy equipment and the conducting of activities as far from receivers as is practical. The turning off of idle equipment. Proper plant and equipment maintenance.

Standard contract clauses for noise control should be included in contract documentation.

**Water:** Silt traps and sedimentation tanks should be provided on the construction sites. Wastewater should be channeled to sedimentation tanks prior to discharges in order to avoid blockage of drains. Regular maintenance of the sediment traps should be carried out. In addition, measures should be taken to avoid any disturbance to natural watercourse as far as practicable.

Direct discharge of sewage into the surface drainage system without any treatment should be prohibited. Sewage from construction sites and waste from canteen areas (if any) should be collected and treated prior to discharge.

All discharges should be complied with the relevant standards specified in the Technical Memorandum on '*Standards for Effluents Discharged into Drainage and Sewerage System, Inland and Coastal Waters*'.

**Waste Management:** Different categories of wastes should be segregated and disposed off separately in accordance with EPD's required procedures. The re-use of rock spoil generated from the tunnel excavation should be investigated. It may be possible to use part of the spoil for the land formation and the rest could be used for other projects as fill material.

Refuse containers, such as open skips should be provided at every work site for use by the workforce.

## 5.2 Operational Phase

**Water:** It is recommended that at the tunnel entry points, specially designed sand/debris trap, specially grating (grills) should be installed. Self-cleansing velocities should be maintained at full flow conditions and also at flow conditions within the tunnel in case that silt is carried into the tunnel. Consideration should also be given to protect all the existing and planned seawater intake points.

**Visual and Landscaping:** Landscaping should be considered in the design of both the eastern and western tunnel portal to minimise visual impact.

## 5.3 Recommendation for Further EIA Study

As the Project is a “designated project” under the EIAO, an EIA following the EIAO shall be undertaken. The key issues to be examined include, inter alia, the following:

### Construction Phase:

- Dust impact on receivers at the tunnel portal area.
- Noise impact on receivers.
- Water quality impact caused by discharge of construction wastewater.
- Excavated spoil handling, including opportunity for re-use on-site or off-site transportation method for off-site disposal, as well as the sorting and processing facilities.
- Ecological impact at stream course, portal and shaft sites, Country Parks and Special Area caused by the construction activities.
- Impacts on sites of cultural heritage and other unknown sites in the vicinity of the tunnel alignment and dropshafts.
- Environmental monitoring and audit requirements.

### Operational Phase:

- Marine water quality impact and impact on water intakes.
- Ecological impact due to discharge of fresh water to the marine water which could change the salinity of the receiving marine water, hence affecting marine organisms.

In addition, the site and alignment of the Hong Kong West Drainage Tunnel, such as the tunnel routing and the site and design of stormwater drain outfall, should be assessed, so as to avoid any adverse environmental impacts and to control the potential impacts to minimal.

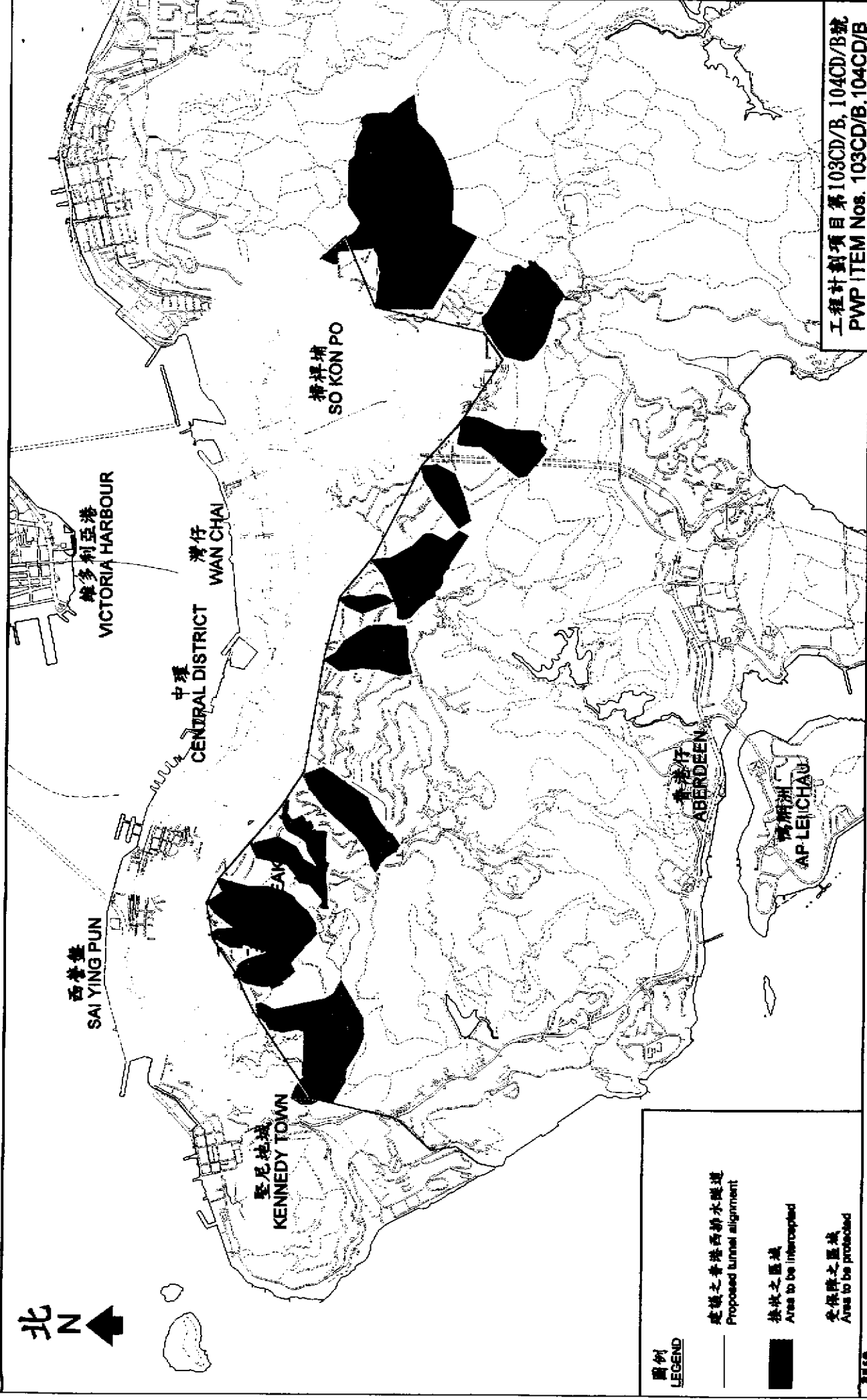
## 6. OTHER ENVIRONMENTAL EFFECT

Overall, after construction, there will be a general improvement in environmental quality due to the improvement of the drainage system.

## **7. PREVIOUS PUBLIC CONSULTATION AND ENVIRONMENTAL REVIEW**

An Environmental Review for the proposed scheme was undertaken during the feasibility study. Detail of the environmental review is included in the Working Paper WP12 Strategy Development of NHKDMP study. A Preliminary Environmental Review has also been included in the Preliminary Project Feasibility Study (PPFS) of the Project.

*- End of Project Profile -*

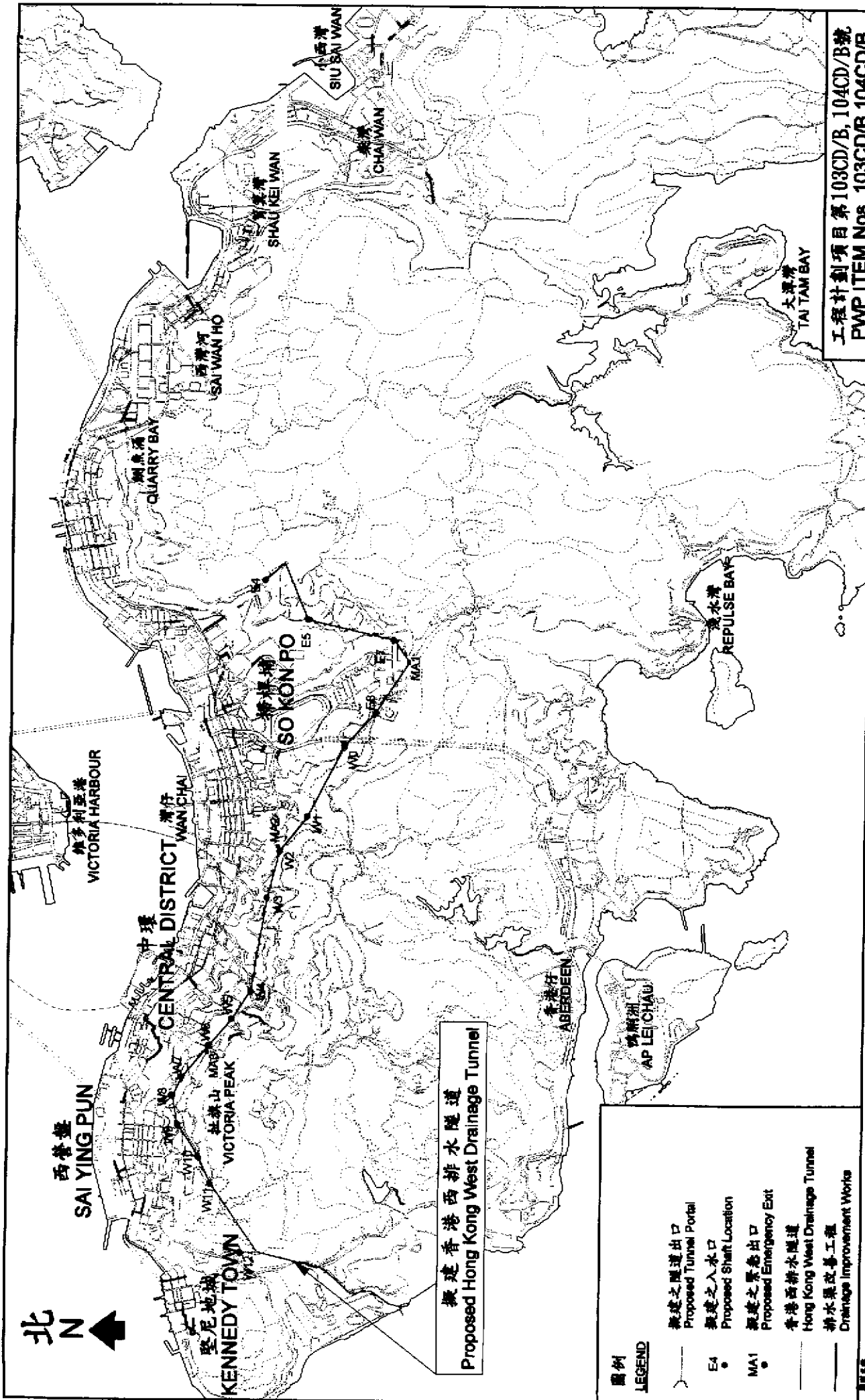


**圖例**  
**LEGEND**

- 建議之香港西排水隧道  
Proposed tunnel alignment
- 接納之區域  
Area to be intercepted
- ▨ 受保障之區域  
Area to be protected

港島北兩水排放系統改善工程 - 香港西排水隧道和下游集水區改善工程  
 DRAINAGE IMPROVEMENT IN NORTHERN HONG KONG ISLAND -  
 HONG KONG WEST DRAINAGE TUNNEL AND LOWER CATCHMENT IMPROVEMENT  
 -- AREAS TO BE INTERCEPTED AND PROTECTED BY DRAINAGE TUNNEL

工程計劃項目第103CD/B, 104CD/B號 PWP ITEM Nos. 103CD/B, 104CD/B	圖則編號 Drawing No. DPM 0006	縮尺 Scale 1 : 40 000	<p>香港特別行政區政府渠務署 DRAINAGE SERVICES DEPARTMENT GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION</p>
繪圖日期 Date 15-03-2001	校核日期 Date 15-03-2001	繪圖人 Drawn by T.C. CHAN	
校核人 Checked Y.F. KAN		工程管理部 PROJECT MANAGEMENT DIVISION	



擬建香港西排水隧道  
Proposed Hong Kong West Drainage Tunnel

- 圖例  
LEGEND
- 擬建之隧道出口  
Proposed Tunnel Portal
  - E4 擬建之入水口  
Proposed Shaft Location
  - MA1 擬建之緊急出口  
Proposed Emergency Exit
  - 香港西排水隧道  
Hong Kong West Drainage Tunnel
  - 排水渠改善工程  
Drainage Improvement Works

工程計劃項目第103CD/B, 104CD/B號 PWP ITEM Nos. 103CD/B, 104CD/B	縮尺 Scale 1 : 50 000
繪圖員 Drawing by T.C. CHAN	日期 Date 15 - 03 - 2001
校核 Checked Y.F. KAN	日期 Date 16 - 03 - 2001
工程管理部 PROJECT MANAGEMENT DIVISION	

港島北雨水排放系統改善工程-香港西排水隧道和下游集水區改善工程  
DRAINAGE IMPROVEMENT IN NORTHERN HONG KONG ISLAND  
- HONG KONG WEST DRAINAGE TUNNEL AND LOWER CATCHMENT IMPROVEMENT



香港特別行政區政府渠務署  
DRAINAGE MANAGEMENT DEPARTMENT  
GOVERNMENT OF THE  
HONG KONG  
SPECIAL ADMINISTRATIVE REGION