Widening of Tolo Highway/ Fanling Highway between Island House Interchange and Fanling

Project Profile

May 1998

Major Works Project Management Office
Highways Department

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APPENDICES

1. BASIC INFORMATION

1.1 Project Title

Widening of Tolo Highway/Fanling Highway
between Island House Interchange and Fanling

1.2 Proponent

Highways Department, Major Works Project Management Office

1.3 Contact Person

1.4 Nature and Description of the Project

The Tolo Highway and Fanling Highway section from Island House Interchange to Fanling are dual 3-lane carriageway forming part of the strategic Route 1. However, a dual 2-lane standard is adopted at several major interchanges along this section of Route 1 and this severely restricts the capacity of this strategic route. It is anticipated that the design capacity for the section of highway between Island House Interchange and Fanling would be exceeded by the year 2006. In order to facilitate the future traffic, it is proposed that this section of highway would be widened to a dual four lane standard before the year 2006.

The scope of the proposed Tolo/Fanling Highway Widening Project include the followings:

(a) widening of the Tolo Highway and Fanling Highway between Island House Interchange and Fanling from the existing dual 3-lane to dual 4-lane;

(b) widening of the Island House Interchange, Tai Po North Interchange and the Lam Kam Flyover from dual 2-lane to dual 3-lane including realigning the various slip roads;

(c) provisioning of a 3.3m hard shoulder where site conditions permit;

(d) improving the existing sub-standard merging arrangements at the south bound carriageway of the Wo Hop Shek Interchange;

(e) modification and/or reconstruction of 18 highway structures comprising over bridges, underpasses and footbridges intersecting the highways;

(f) re-provisioning of existing emergency telephones and provisioning of closed circuit television cameras along the widened carriageways and interchanges;

(g) provision of mitigation measures which may be identified and/or recommended in the subsequent assessments; including the noise barriers which have been identified in the Final Report for the Noise Impact Assessment for 24 hrs Opening of Border Crossing (Aug. 1996); and

(h) associated geotechnical, landscape, drainage works and traffic aids.

1.5 Location of the Project

The location of the Project is shown at **Annex A**.

1.6 Number and Types of Designated Project

"Widening of Tolo Highway/ Fanling Highway between Island House Interchange and Fanling" is the only project covered by this project profile. The project is classified as Category A.1 under Schedule 2 of the EIA Ordinance.

2. OUTLINE OF THE PLANNING AND IMPLEMENTATION PROGRAMME

2.1 Project Planning and Implementation

It is proposed to implement the project by employing consultants to undertake the investigation study, detailed design and the supervision for the construction phase of the project.

2.2 Project Timetable

According to the project implementation programme, a consultant will be appointed in February 1999 to undertake the investigation study and associated EIA for the project. Taking into account the time required for the project design and necessary statutory procedures, it is anticipated that the earliest date for starting the construction will be in mid 2002 and completion by the end of 2005.

3. POSSIBLE IMPACT ON THE ENVIRONMENT

3.1 Major Elements of the Surrounding Environment

The existing and planned sensitive receivers along the section of the Tolo Highway and Fanling Highway are outlined in Section 3 of the **Annex B**.

3.2 Construction Impacts

A general overview of potential construction impacts arising from the proposed project, together with various practical methods to mitigate the effects of those impacts are described in Section 4 of **Annex B**.

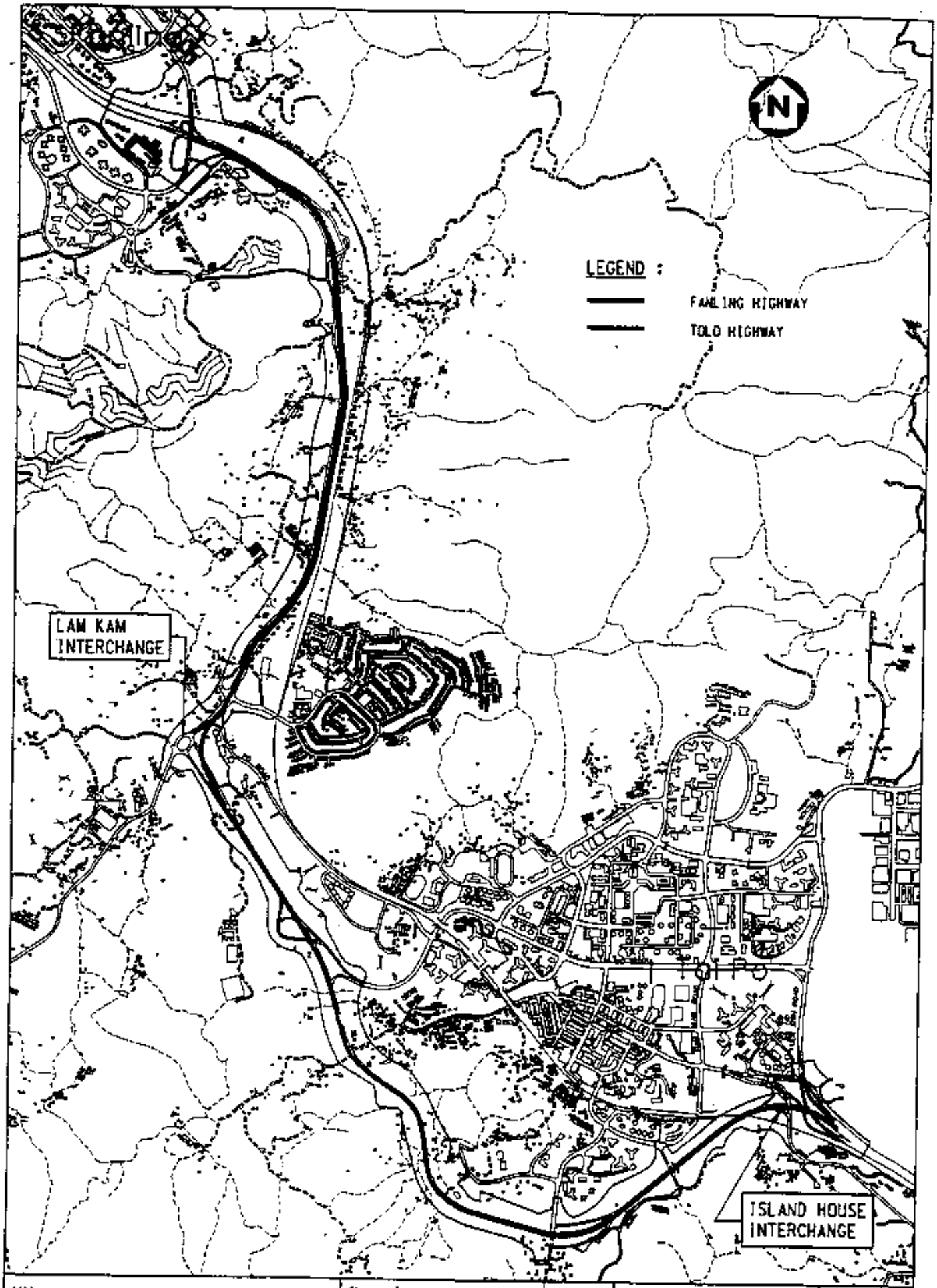
3.3 Operations Impacts

A general overview of potential operation impacts that may arise during the operation of the project, together with various practical mitigation measures are described in Section 5 of **Annex B**.

4. Conclusion

Study requirements for a further EIA for the captioned project are described in Section 6 of **Annex B**.

Annex A



title: Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling	drawn by: C. T. SIU	date: May 97	drawing no.: PMHP975/1SK/008	scale: 1 : 25 000
	approved: H. K. Yim	date: May 97		
	office: MAJOR WORKS PROJECT MANAGEMENT OFFICE		HIGHWAYS DEPARTMENT HONG KONG	

Annex B

Widening of Tolo Highway/ Fanling Highway between Island House Interchange and Fanling

Preliminary Environmental Review

20 February 1998

WIDENING OF TOLO HIGHWAY/FANLING HIGHWAY BETWEEN ISLAND HOUSE INTERCHANGE AND FANLING

PRELIMINARY ENVIRONMENTAL REVIEW

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1. INTRODUCTION

Project Background

1.1 The section of Tolo Highway and Fanling Highway between the Island House and Fanling are dual 3-lane carriageway forming part o f the strategic Route 1. At Tai Po North Interchange and Lam Kam Flyover, a dual 2-lane is adopted and this severely restricts the capacity of this strategic route. Serious congestion occurs frequently with queues often stretching from the Island House Interchange up to Fanling in the morning peak periods.

1.2 The NENT Development Strategy Review indicated that, by 2006, the forecast traffic demand in the southbound direction of the Tolo Highway section between Island House and Hong Lok Yuen and the Fanling Highway section between Hong Lok Yuen and Fanling would exceed their design capacities. In order to provide a long term solution to the anticipated traffic problems, it is necessary to widen the Tolo Highway and the Fanling Highway to dual 4-lane standard before 2006.

Scope of Project

1.3 The scope of the proposed Tolo/Fanling Highway Widening Project include the followings:

(a) widening of the Tolo Highway and Fanling Highway between Island House Interchange and Fanling from the existing dual 3-lane to dual 4-lane;

(b) widening of the Island House Interchange, Tai Po North Interchange and the Lam Kam Flyover from dual 2-lane to dual 3-lane including realigning the various slip roads;

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(h) associated geotechnical, landscape, drainage works and traffic aids.

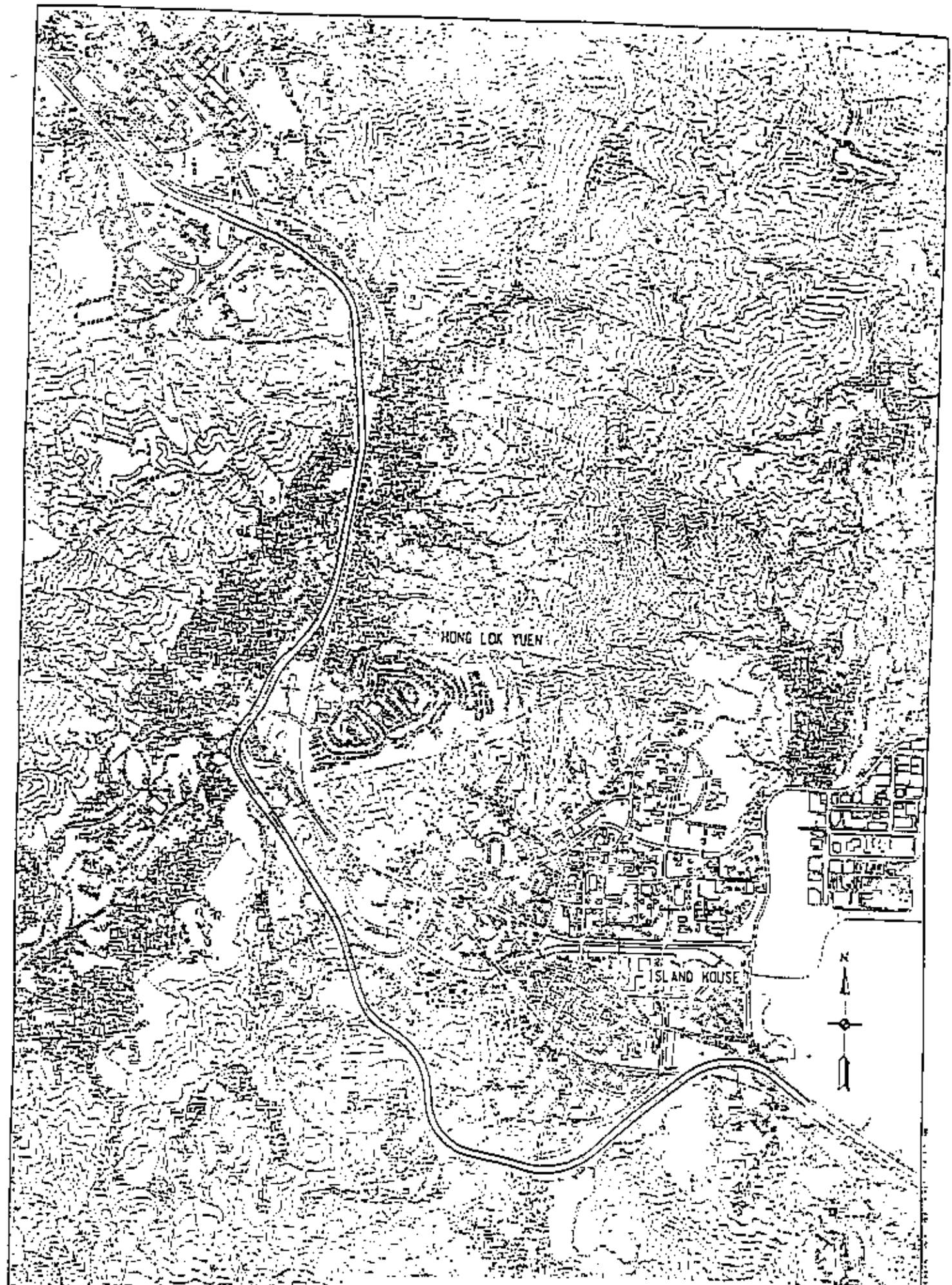
1.4 The location of the proposed works is illustrated on Figure 1.1.

Programme of Implementation

1.5 It is anticipated that the earliest date for starting the construction will be in mid 2002 for completion in end 2005.

Purpose of Preliminary Environmental Review (PER)

1.6 The purpose of this PER Report is to present the findings of preliminary investigation, identify the possible environmental impacts of the proposed project including any insurmountable constraints on the works for the Project and recommend any further action that is required.



AGREEMENT NO. CE 28/97
WIDENING OF TOLO/FANLING HIGHWAY BETWEEN
ISLAND HOUSE INTERCHANGE AND FANLING
FIGURE 1.1 - LOCATION PLAN

2. ENVIRONMENTAL LEGISLATION AND PLANNING GUIDELINES

Introduction

2.1 This section highlights the relevant environmental legislation and guidelines which are currently applicable to the proposed project.

Noise

2.2 Control of noise is provided through the Noise Control Ordinance (NCO) (Cap. 400), it's regulations and four technical memoranda (TMs). Three of the TM's, which are relevant to this project, apply to construction noise and the fourth relates to non-construction noise. The NCO sets out methods for identifying Noise Sensitive Receivers (NSR's) and imposes controls on construction works which are carried out in close proximity to any noise sensitive receiver (NSR).

2.3 The Technical Memorandum on Noise from Construction Work in Designated Areas (referred as TM1) details permissible noise levels generated from the use of Specified Powered Mechanical Equipment (SPME) other than percussive pilling and/or the carrying out of Prescribed Construction Work (PCW) within the Designated Areas (DAs) (referred as TM1). In areas, other than a DA, or when the construction work does not involve the use of SPME nor the carrying out of PCW, the Technical Memorandum on Noise from Construction Work other than Percussive Piling (referred as TM2) details permissible noise levels for construction work. Both TM1 and TM2 provide the method for calculating noise impacts.

2.4 The criteria of noise from construction work, other than percussive piling and works involve the use of SPME, was adopted from TM2. No work using powered mechanical equipment is allowed during any defined restricted period unless a Construction Noise Permit (CNP) has been obtained by the Contractor to do so. Basic Noise Levels (BNLs) are ascribed according to the Area Sensitivity Rating (ASR) as shown in Table 2.1.

Table 2.1 Area Sensitivity Rating

Type of Area Containing Noise Sensitive Receiver		Degree to which NSR is affected by Influencing Factors		
		Not Affected	Indirectly Affected	Directly Affected
(i)	rural area, including country parks or village type development	A	B	B
(ii)	low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
(iii)	urban area	B	C	C
(iv)	area other than those above	B	B	C

Source : TM2

2.5 Acceptable Noise Levels (ANLs) for construction works, other than percussive piling and works involve the use of SPME, are calculated from the BNLs following corrections for the duration of the CNP and for multiple site situations. For this project, the ANLs are assumed to be the same as the BNLs and are provided for reference for each ASR in Table 2.2

Table 2.2 Acceptable Noise Levels for Construction

Time Period	ANL, dB(A), $L_{eq(5\ min)}$		
	ASR A	ASR B	ASR C
All days during the evening (1900 - 2300 hours), and general holidays (including Sundays) during the daytime and evening (0700 - 2300 hours)	60	65	70
All days during the night time (2300 - 0700 hours)	45	50	55

Source : TM2

2.6 The criteria of noise, from construction works involving the use of SPME other than percussive piling, was adopted from TM1. No work using SPME and PCW is allowed during any defined restricted period unless a Construction Noise Permit (CNP) has been obtained by the Contractor to do so. Acceptable Noise Levels (ANLs) for construction works involving the use of SPME, are calculated from the BNLs following corrections for the duration of the CNP and for multiple site situations. For this project, the ANLs are assumed to be the same as the BNLs and are provided for reference for each ASR in Table 2.3

Table 2.3 Acceptable Noise Levels for Construction (Works involving the use of SPME)

Time Period	ANL, dB(A), $L_{eq5\ min}$		
	ASR A	ASR B	ASR C
All days during the evening (1900 - 2300 hours), and general holidays (including Sundays) during the daytime and evening (0700 - 2300 hours)	45	50	55
All days during the night time (2300 - 0700 hours)	30	35	40

Source : TM1

2.7 Furthermore, EPD recommend the maximum noise level should not exceed 75 dB(A) at any dwelling during periods not restricted under the NCO. In EPD's Practice Note ProPECC PN2/93 it is recommended that the maximum perceived noise level at schools should be 70dB(A) with a further reduction of 5dB(A) during examinations, for those periods not restricted under the NCO. Under this Practice Note the commensurate maximum noise level at dwellings is 75 dB(A).

2.8 The Technical Memorandum on Noise from Percussive Piling (referred as TM3) sets out the requirements for working under a permit system. Construction noise permits (NCP's) are required for percussive piling and determination of the permitted hours of operation and other conditions where necessary. Percussive piling is prohibited during the restricted periods unless specifically exempted. Acceptable Noise Levels (ANLs) are provided in TM3 for buildings with various types of windows or ventilation systems. The ANLs are given in Table 2.4 below.

Table 2.4 Acceptable Noise Levels for Percussive Piling

	NSR Window Type or Means of Ventilation	ANL, dB(A), $L_{eq5\ min}$ (dB(A))
(i)	NSR (or part of NSR) with no windows or other openings.	100
(ii)	NSR with central air conditioning system.	90
(iii)	NSR with windows or other openings but without central air conditioning system.	85

Source : TM3

2.9 For NSR's which are hospitals, medical clinics, educational institutions, courts of law or other receptors which are considered to be particularly sensitive to noise, a further reduction of 10dB(A) shall be applied to the ANLs given in Table 2.3 above.

2.10 In addition to the foregoing, subsidiary regulations control noise levels emanating from hand held percussive breakers and air compressors and require compliance with the relevant noise emission standards and the fitting of Noise Emission Labels.

2.11 For the period of operation, the Hong Kong Planning Standards and Guidelines (HKPSG) provide road traffic noise standards of:

(a) 70 dB(A) L_{10}(1 hour) at the facades of domestic premises, hotels, hostels and offices;

(b) 65 dB(A) L_{10}(1 hour) at the facades of educational institutions, places of worship and law courts; and

(c) 55 dB(A) L_{10}(1 hour) at the facades of hospitals, clinics, homes for aged, diagnostic rooms, wards etc.

2.12 Operational standards which are indicated above apply to sensitive uses which rely on open windows for ventilation.

Air Quality

2.13 Air quality is regulated through the Air Pollution Control Ordinance, Cap. 311, which provides, inter alia, statutory Air Quality Objectives (AQOs) for each Air Control Zone (ACZs). ACZ's have been declared for the whole of the Territory, and the associated AQOs are provided as Table 2.5.

Table 2.5 Hong Kong Air Quality Objectives

Pollutant	Concentration $\mu g/m^3$ (i) Averaging Time				
	1 Hour (ii)	8 Hours (iii)	24 Hours (iii)	3 Months (iv)	1 Year (iv)
Sulphur Dioxide	800		350		80
Total Suspended Particulate (v)			260		80
Respirable Suspended Particulate (v)			180		55
Nitrogen Dioxide	300		150		80
Carbon Monoxide	30000	10000			
Photochemical Oxidants (as ozone (vi))	240				
Lead				1.5	

(i) - Measured at 298°K (25°C) and 101.325 KPa (one atmosphere).
(ii) - Not to be exceeded more than three times per year.
(iii) - Not to be exceeded more than once per year.
(iv) - Arithmetic means.
(v) - Respirable Suspended Particulate means suspended particulate in air with a nominal aerodynamic diameter of 10 micrometers and smaller.
(vi) - Photochemical oxidants are determined by measurements of ozone only.

(Source : Air Pollution Control Ordinance)

2.14 In addition to the AQO's certain specified processes are named under the APCO and have specific controls attached. Specified processes which could be relevant to this Project include concrete batching. A special licence is required to operate such plant.

2.15 Furthermore, EPD also recommend that a maximum hourly level of suspended particulates of 500 $\mu g/m^3$ should not be exceeded for construction dust impact assessment.

Water Quality

2.16 Water quality in Hong Kong is governed by the 1980 Water Pollution Control Ordinance (Cap 358) (WPCO). Territorial waters have been subdivided into Water Control Zones (WCZs) with each zone being assigned a series of Water Quality Objectives (WQOs). For this Project the relevant WCZs are Tolo Harbour and Deep Bay, which has been gazetted. The selected WQO's are outlined in Table 2.6.

Table 2.6 Selection of Water Quality Objectives

Water Quality Parameter	Objective		
	Tolo Harbour, Lam Tsuen River Subzones, LT(C) and LT(D)	Tolo Harbour, Tai Po River Subzones, TP(B) and TP(C)	Deep Bay, Indus Subzones
E. coli (no./100ml)	not to exceed 0	not to exceed 1000	not to exceed 0
D.O. (mg/L)	not less than 4	not less than 4	not less than 4
BOD (5 days) (mg/L)	not to exceed 3	not to exceed 5	not to exceed 3
COD (mg/L)	not to exceed 15	not to exceed 30	not to exceed 15
pH	not to exceed 6.5-8.5	not to exceed 6.5-8.5	not to exceed 6.5-8.5
Temperature change (°C)	not to exceed 2	not to exceed 2	not to exceed 2
Suspended Solids (mg/L)	not to exceed 20	not to exceed 20	not to exceed 20
Toxicants	not to be present at levels producing significant toxic effects	not to be present at levels producing significant toxic effects	not to be present at levels producing significant toxic effects

2.17 In 1990 an amendment ordinance was enacted which essentially provided a mechanism for setting effluent standards which are included in the Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM) (WPCO Cap 358, S.21).

Waste Disposal

2.18 The Waste Disposal Ordinance 1980 (Cap. 354) provides the statutory framework for the management of all wastes in Hong Kong by requiring the comprehensive planning for collection and disposal of all wastes. Recent initiatives have focused on the reduction of construction wastes wherever possible, which is particularly pertinent to this project.

3. ENVIRONMENT AND SENSITIVE RECEIVERS

Introduction

3.1 A desktop study has been carried out to determine the landuse and locations of sensitive receivers within 300 m from the Tolo/Fanling Highway for both existing and future scenarios using the 1:1000 survey maps and outline zoning plans (OZP). Site visits have also been carried out to confirm the status of the existing environment and sensitive receivers.

Description of the Study Area

3.2 The section of Tolo/Fanling Highway extends over eight kilometres. Starting from Island House, it passes through the hillside, plantation and woodland areas, which are very hilly, stretching from Tai Po South to the Lam Kam Flyover. Between Lam Kam Flyover and Fanling, it passes through agricultural land and rural areas which are relatively flat. Along its way it crosses Lam Tsuen River and the tributaries of River Indus south of Fanling.

3.3 The existing land use in the study area mainly consisits of lowrise and highrise residential areas, agriculture land, industrial storage areas and workshops, railway line and infrasture facilities. The expected future land use shown on the OZPs, which is shown on Figure 3.1, is in line with the existing land use.

Air and Noise Sensitive Receivers

3.4 As illustrated on Figure 3.2, there are many air and noise sensitive receivers located along the section of Tolo/Fanling Highway. For the purpose of this study, representative sensitive receivers have been identified from initial desktop study and were confirmed by site inspections. The details of the NSRs are summarised in Table 3.1.

Table 3.1 Air and Noise Sensitive Receivers

Air and Noise Sensitive Receivers	E (m)	N (m)'	Distance from Improved Tolo/Fanling Highway (m)
Southwest Tong Hang (SR1)	833385	838655	18
Wo Hop Shek 1 (SR2)	833287	838482	22
Wo Hop Shek 2 (SR3)	833618	838355	30
Kiu Tau (SR4)	833905	837940	22
Nam Wa Po (SR5)	833800	837655	35
West Tai Wo (SR6)	833795	836910	30
Tai Wo (SR7)	833890	836905	33
Tai Hang (SR8)	833763	836670	30
Hong Lok Yuen (SR9)	833765	836315	34
Wai Tau Tsuen (SR10)	833308	835995	35
Kau Lau Ha (SR11)	833000	835545	22
Northwest Shek Kwu Lung (SR12)	833803	834670	24
Shek Kwu Lung (SR13)	834110	834150	38
Mai Wo (SR14)	834425	833707	54
Dynasty View (SR15)	834510	833565	62
King Yuet House (SR16)	835190	833458	110
Ha Wun Yin (SR17)	834875	833293	36
Shau Tong New Village (SR18)	835428	833405	48
Wang Fuk Court (SR19)	836220	834080	13
"Tai Po - Po Ma Shan" (SR20)	835900	833700	88

Existing Air Quality

3.5 The site is located in the Tai Po Airshed, which is geographically confined and has a limited capacity to disperse pollutants. The background air quality of this area has been used as the closest approximation to air quality in the Study area. The data is summarised in Table 3.2.

Table 3.2 Annual Average Air Pollutant Concentrations (1995)

Pollutant	Concentration ($\mu g/m^3$)	AQO - Concentration ($\mu g/m^3$)
Nitrogen Dioxide	45	80
Total Suspended Particulate	84	80
Respirable Suspended Particulate	56	55

(Ref: Environment Hong Kong 1995, EPD)

Existing Noise Environment

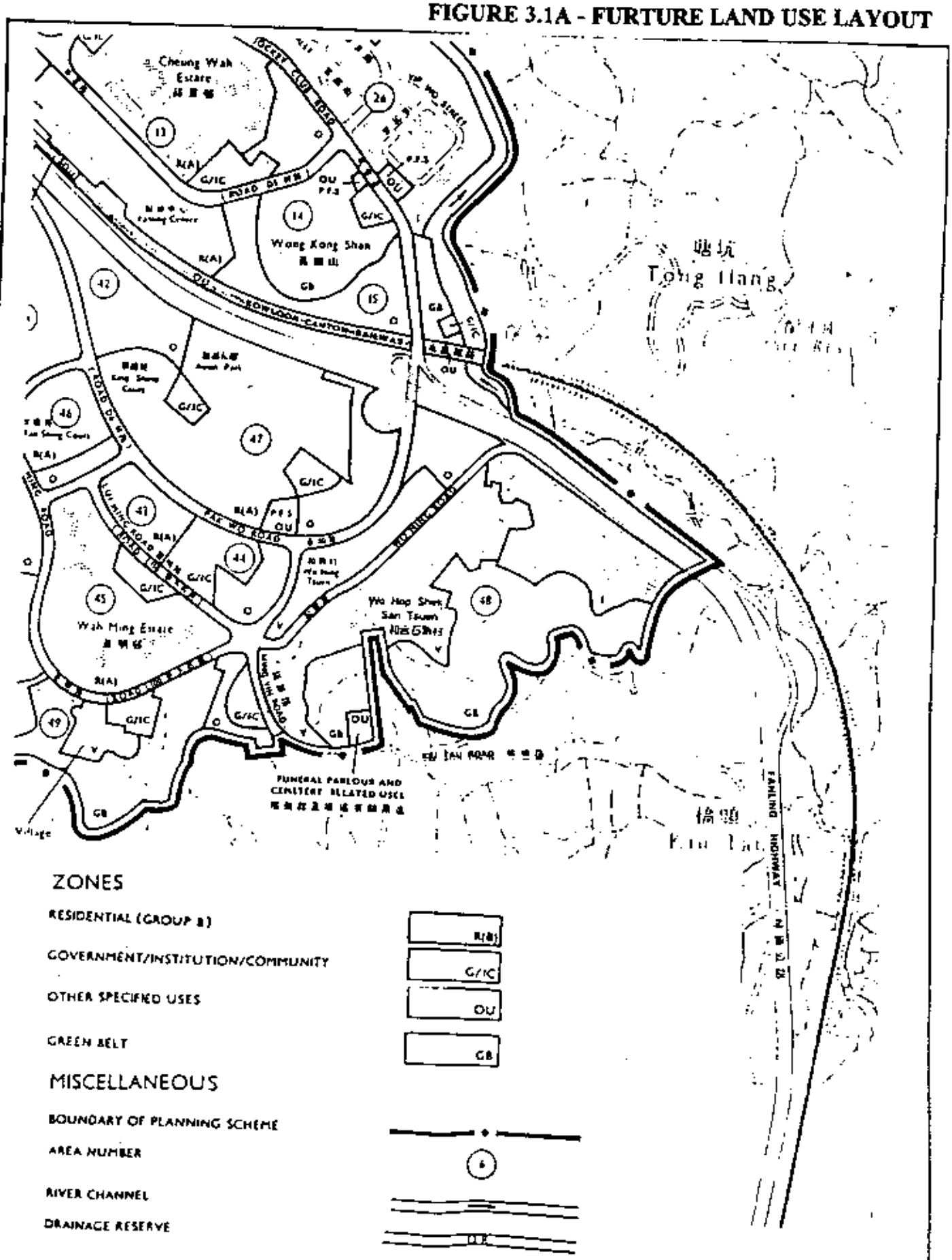
3.6 With reference to the Technical Memorandum (TM2), the Area Sensitivity Ratings (ASRs) of the sensitive receivers have been determined and summarised in Table 3.3.

Table 3.3 Area Sensitivity Ratings of Sensitive Receivers

Noise Sensitive Receiver	Type of Area Containing NSR	Area Sensitivity Ratings (ASRs)
SR1	rural area or village type development affected by IF	B
SR2	rural area or village type development affected by IF	B
SR3	rural area or village type development affected by IF	B
SR4	rural area or village type development affected by IF	B
SR5	rural area or village type development affected by IF	B
SR6	rural area or village type development affected by IF	B
SR7	rural area or village type development affected by IF	B
SR8	rural area or village type development affected by IF	B
SR9	rural area or village type development affected by IF	B
SR10	rural area or village type development affected by IF	B
SR11	rural area or village type development affected by IF	B
SR12	rural area or village type development affected by IF	B
SR13	rural area or village type development affected by IF	B
SR14	rural area or village type development affected by IF	B
SR15	urban area affected by IF	C
SR16	urban area affected by IF	C
SR17	rural area or village type development affected by IF	B
SR18	rural area or village type development affected by IF	B
SR19	urban area affected by IF	C
SR20	urban area affected by IF	C

3.7 Acceptable noise levels for construction (taken as BNLs) are summarised in Table 3.4

FIGURE 3.1A - FURTURE LAND USE LAYOUT



Note:

This figure is abstracted from (Plan No. S/PSS/6) Sha Tin - Outline Zoning Plan

Table 3.4 Acceptable Noise Levels for Construction at Noise Sensitive Receivers

Time Period	Outside DA or PME Works inside DA, dB(A)	SPME Works Within DA, dB(A)
Period 1 All days during the evening (1900 - 2300 hours), and general holidays (including Sundays) during the daytime and evening (0700 - 2300 hours)	ASR B:65 ASR C:70	ASR B:50 ASR C:55
Period 2 All days during the night time (2300 - 0700 hours)	ASR B:50 ASR C:55	ASR B:35 ASR C:40
All other periods	75 for dwellings 70 for schools (65 for examination periods)	

Existing Aquatic Environment

3.8 The section of Tolo/Fanling Highway passes over a number of natural stream courses, including Lam Tsuen River and upper tributaries of River Indus. The water quality of the lower reach of River Indus was rated as "bad" in 1995. This does not reflect the conditions of the upper tributaries near the Tolo/Fanling Highway. The appearance of stream water leading to River Indus suggested that the stream courses can sustain aquatic habitats in a reasonably healthy state. Pollution tolerant species including *Sarotherodon mossambicus* (Tilapia) and *Gambusia affinis* (Mosquito fish) are found in those stream courses leading to River Indus.

3.9 The water quality of Lam Tsuen River and Tai Po River has improved remarkably after implementation of controls under the WPCO and WDO, which control the pollution load from livestock farms. The water quality was rated as "good" to "excellent" in the upper reach. During recent site inspections, no signs of heavy livestock pollution nor heavy algae cover were observed. Apart from pollution tolerant species, *Zacco platypus* (Freshwater minnow), which is usually found in clean streams, was also found in Lam Tsuen River under the Lam Kam Flyover.

Existing Water Quality

3.10 Environmental Protection Department carry out regular water quality monitoring in Lam Tsuen River and Tai Po River in Tolo Harbour. The closest relevant monitoring points are TR12B, TR12C, TR12E and TR13. Selected average monitoring results in 1995 are summarised in Table 3.5.

Table 3.5 Existing Water Quality (Lam Tsuen River and Tai Po River)

Water Quality Parameter	Dissolved Oxygen, mg/L	Suspended Solids, mg/L	Biochemical Oxygen Demand (5 days), mg/L	Chemical Oxygen Demand, mg/L
TR12B				
Annual Median	8.6	5	3	8
Range	(6.2-10.1)	(1-52)	(1-24)	(2-13)
TR12C				
Annual Median	8.6	52	3	23
Range	(7.3-9.7)	(4-630)	(1-23)	(5-81)
TR12E				
Annual Median	8.8	3	2	5
Range	(8.1-9.9)	(1-110)	(1-23)	(2-12)
TR13				
Annual Median	8.0	13	7	12
Range	(6.6-9.9)	(4-120)	(2-29)	(3-53)

(Source: River Water Quality in Hong Kong 1995, EPD)

3.11 For River Indus, the closest monitoring station is in Tin Ping Shan. The water quality monitored at this station is indicative only and is not a true representation of water quality in the section of the River Indus located within the Study Area. While there is no specific water quality data for this part of River Indus, the data would suggest that although the DO levels are high, significant pollution loads have to be assimilated by the water course, as illustrated in the wide range in oxygen demand (biological and chemical) given in Table 3.5.

FIGURE 3.1B - FURTURE LAND USE LAYOUT

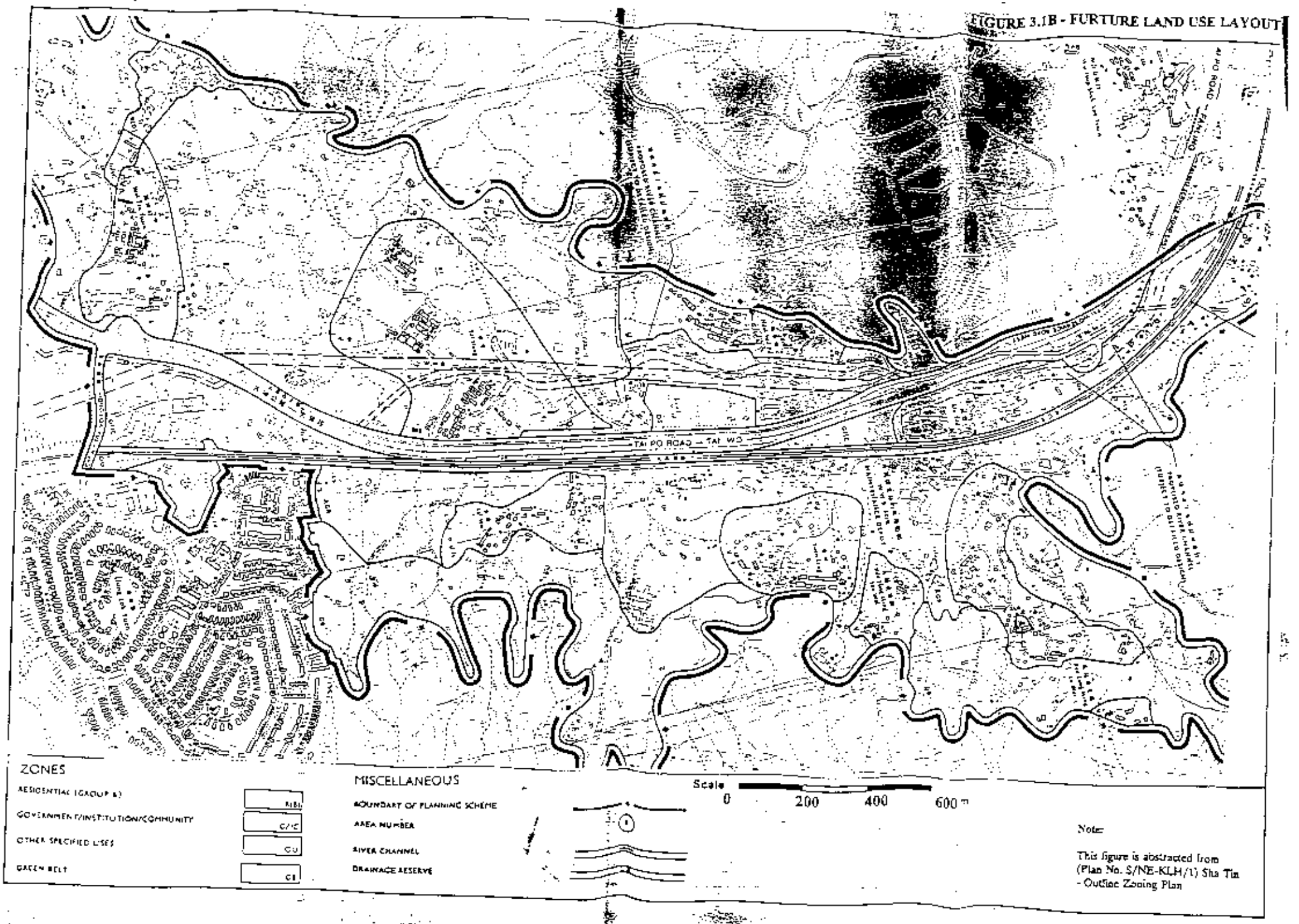
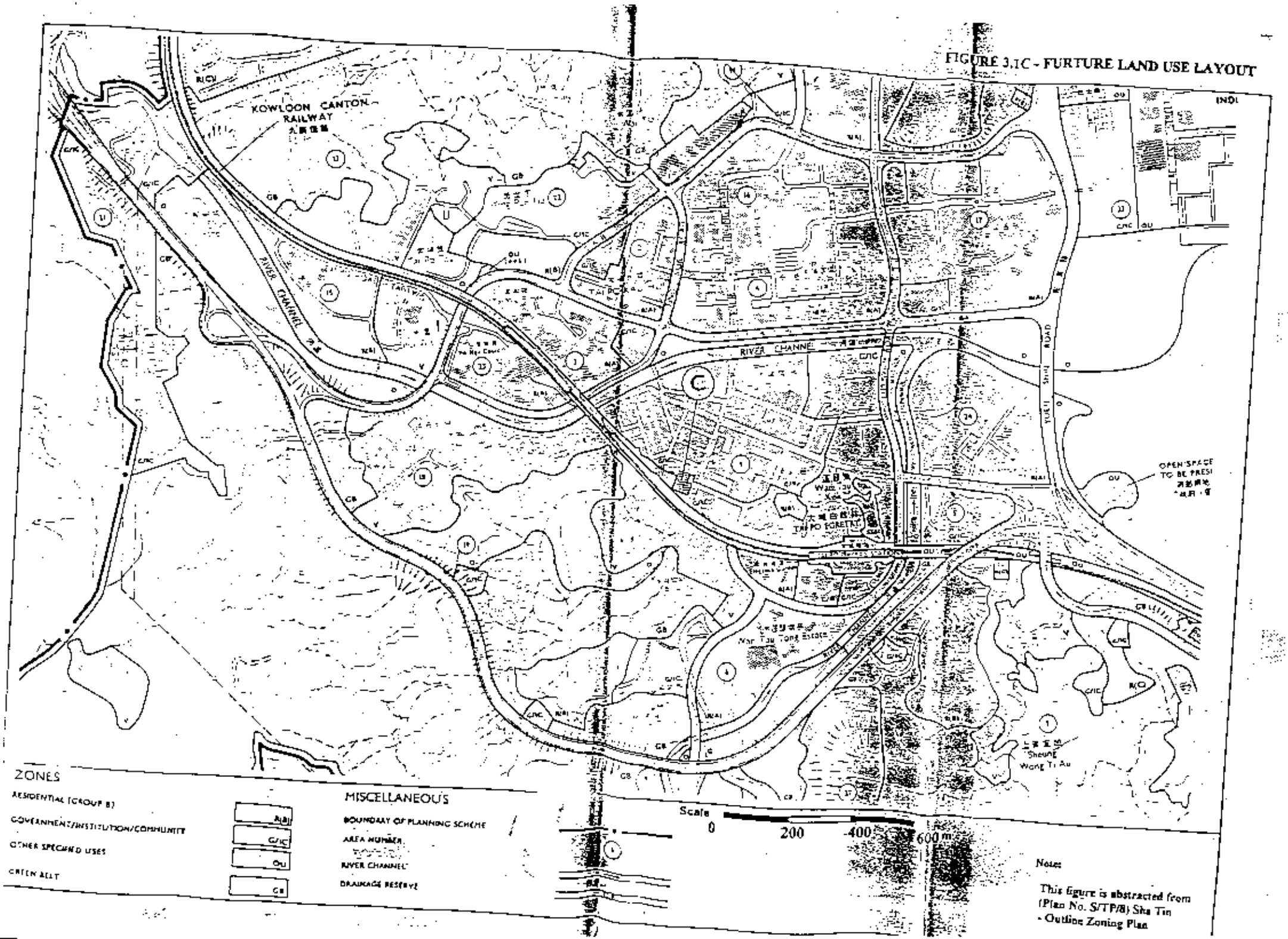
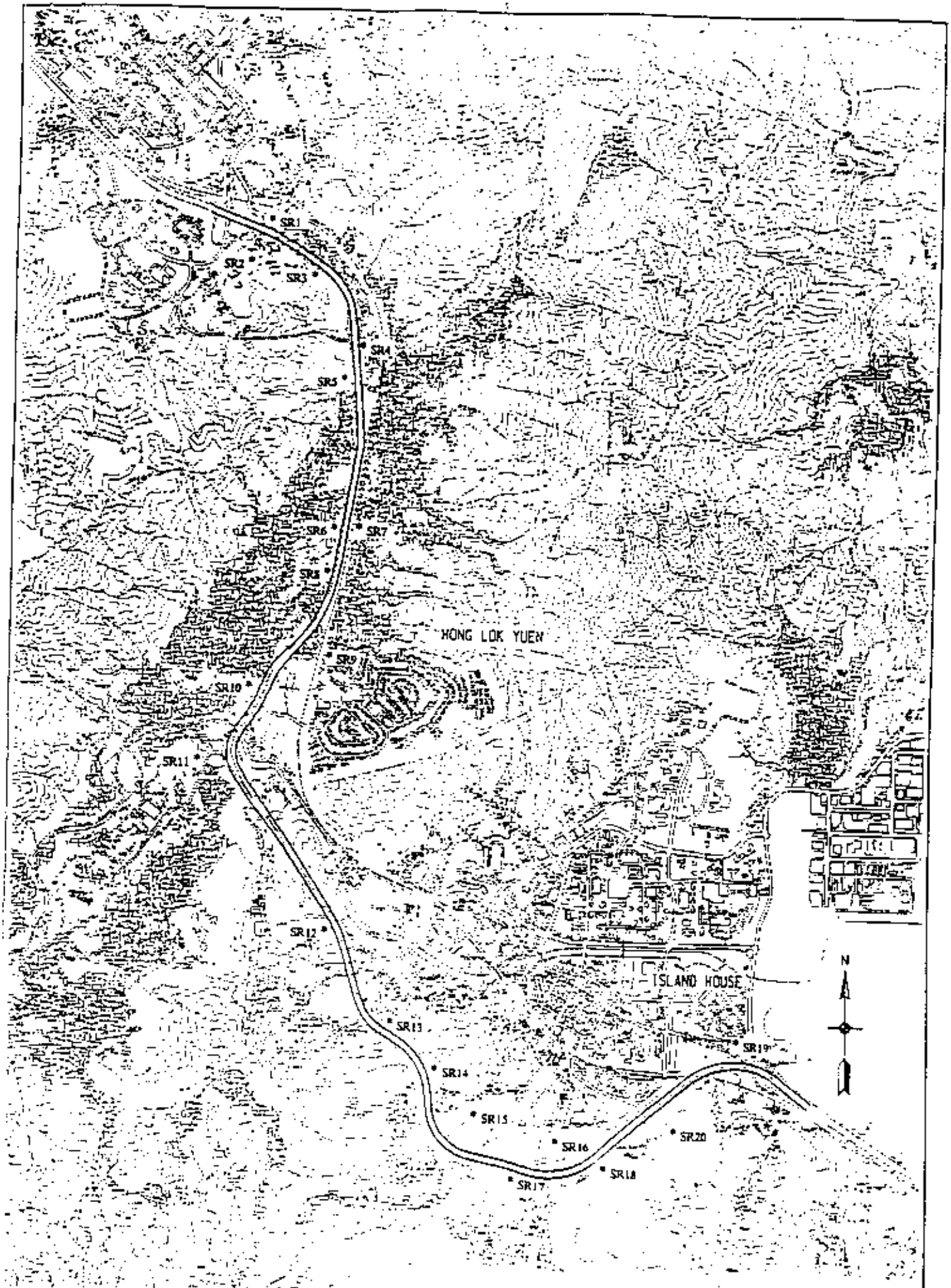


FIGURE 3.1C - FURTURE LAND USE LAYOUT



Notes

This figure is abstracted from (Plan No. S/TP/8) Sha Tin - Outline Zoning Plan



AGREEMENT NO. CE28/97
WIDENING OF TOLO/FANLING HIGHWAY BETWEEN ISLAND HOUSE INTERCHANGE AND FANLING
FIGURE 3.2 - SENSITIVE RECEIVERS

4. CONSTRUCTION IMPACTS

Introduction

4.1 This section provides a general overview of potential construction impacts arising from the proposed project, together with various practical methods to mitigate the effects of those impacts.

Construction Noise

Construction Noise Standards

4.2 The construction noise standards at sensitive receivers are summarised in Table 4.1.

Table 4.1 Construction Noise Standards at Noise Sensitive Receivers

Time Period	Outside DA or PME Works inside DA, dB(A)	SPME Works Within DA, dB(A)
Period 1 All days during the evening (1900 - 2300 hours), and general holidays (including Sundays) during the daytime and evening (0700 - 2300 hours)	ASR B:65 ASR C:70	ASR B:50 ASR C:55
Period 2 All days during the night time (2300 - 0700 hours)	ASR B:50 ASR C:55	ASR B:35 ASR C:40
All other periods	75 for dwellings 70 for schools (65 for examination periods)	

Construction Noise sources

4.3 Noise impacts during construction are likely to be associated with the civil works and construction of the proposed additional lanes to the Tolo/Fanling Highway. To permit an assessment of construction noise to be undertaken, the major equipment used during construction was assumed as:

PME
- 1 air compressor
- 1 silenced generator
- 1 excavator
- 1 excavator mounted pneumatic breaker
- 1 bar bender and cutter
- 1 mobile crane

SPME
- 1 bulldozer
- 1 concrete lorry mixer
- 1 hand-held vibratory poker

4.4 Noise generation can affect sensitive uses and receivers immediately adjacent to the construction sites. The construction noise levels associated with the construction works were calculated and summarised in Table 4.2.

Table 4.2 Estimated Construction Noise Levels

Distance form Notional Source Centre (m)	Estimated Construction Noise Levels (dB(A))		
	Works Outside Designated Areas	Works Within Designated Areas (PME)	Works Within Designated Areas (SPME)
20	93.0	91.9	86.7
40	87.0	85.8	80.7
60	83.5	82.3	77.2
80	81.0	79.8	74.7
100	79.0	77.9	72.7
150	75.5	74.4	69.2
200	73.0	71.9	66.7
250	71.1	69.9	67.8
300	69.5	68.3	63.2
350	68.2	67.0	61.9

4.5 Since the NSRs for this Project are between 13 m and 200 m away from the section of Tolo/Fanling Highway going to be widened, the construction noise levels will exceed the noise standards in Table 4.1. Noise reduction up to 20 dB(A) is required for non-restricted periods. If construction works are to be carried out during restricted periods, further noise reduction is required.

Mitigation Measures

4.6 Construction noise can be abated by such methods as:

(a) selection of silenced equipment, such as silenced compressors and generators;

(b) ensuring that vehicles and plant are properly maintained, especially in relation to exhaust systems;

(c) siting of noisy equipment, such as compressors and generators, as far away from sensitive receivers as possible;

(d) supervision and scheduling of work, eg. avoiding simultaneous operation of noisy equipment, switching off noisy equipment when not in use, and erecting - as early as possible - any new structures which might screen noise sources; and

(e) use of temporary acoustic barriers and acoustic machinery enclosures near particularly sensitive receivers/uses.

Further Construction Noise Assessment

4.7 It is recommended a detailed assessment for construction noise be carried out for this Project. The assessment should include, but not be limited to, the following:

(a) a detailed investigation to identify all the existing and future noise sensitive receivers of the widened highway, which will be afffected by the construction works;

(b) identifying of construction methods for all components of the Project. This is essential to estimate the positions, types and numbers of construction equipment to be used;

(c) obtaining the programming of construction works in order to predict the time pattern of construction noise; and

(d) if noise impacts are found to be higher than acceptable limits, mitigation measures should be proposed. Mitigation measures should also include modification of construction methods and construction programme.

Air Quality

4.8 As stated in Section 3, the site is located in the Tai Po Airshed, which is geographically confined and has a limited capacity to disperse pollutants.

Dust generation

4.9 Concreting works, handling and stockpiling of excavated material, site formation and construction traffic movements on unpaved roads can all impact on air quality in the project area by increasing airborne particulate.

4.10 The predicted total suspended particulate (TSP) levels at the selected air sensitive receivers associated with the widening works were modelled using FDM (Fugitive Dust Modelling) based on the following assumptions:

- Dust sources are the structures for the additional lanes
- The emission rate for heavy construction operation (AP42, Chapter 11.2.4.3) is adopted
- Worst case scenarios were modelled using the meteorological data recorded in Ta Kwu Ling in 1993

The results of FDM modelling are summarised in Table 4.3.

Table 4.3 Estimated Total Suspended Particulate Levels - Construction

Sensitive Receivers	Total Suspended Particulate ($\mu g/m^3$) (Background Concentration Included)	
	1 hour	24 hour
SR1	129	103
SR2	178	123
SR3	886	359
SR4	205	135
SR5	151	118
SR6	476	240
SR7	161	112
SR8	870	344
SR9	141	105
SR10	209	148
SR11	129	105
SR12	400	210
SR13	253	148
SR14	324	168
SR15	223	144
SR16	173	134
SR17	180	120
SR18	141	108
SR19	145	104
SR20	137	106
Site Boundary 1	844	303
Site Boundary 2	177	122
Background TSP level: 84		

4.11 The estimated 1 hour TSP levels exceed the EPD's limit at SR 3, SR 8 and the site boundary. The estimated 24 hour TSP levels exceed the AQO at SR3 and SR8. Mitigation measures will be required to lower the dust levels.

Dust Mitigation Measures

4.12 If the following good construction practices are undertaken on site, the impact of dust and other air pollutants will be minimised:

(a) where possible, storage and handling areas should be located on hard standing to facilitate cleaning and minimise dust generation;

(b) any unpaved areas including access roads, construction areas and stockpiled spoil should be regularly and frequently watered by fixed and/or mobile spray systems;

(c) screens should be erected in tipping areas to minimise dust emissions;

(d) aggregate or other material stored in stockpiles of greater than 20 cubic metres should be enclosed and covered;

(e) the speed of vehicles running over any unpaved areas should be restricted to an appropriate level;

(f) all vehicles entering and leaving the site should have their loads covered;

(g) all vehicles leaving the site should pass through a wheel wash at the site exit. The wheel wash should be cleaned regularly to remove sediment. Mud or similar material deposited on public roads near the site should be removed immediately;

(h) all construction plant travelling to and from the site should be routed - as far as possible - to avoid sensitive receivers in the area;

(i) plant and vehicles should be regularly inspected to ensure that they are operating efficiently and that exhaust emissions are not causing a nuisance. Exhaust systems on site dump trucks should be routed vertically behind the cab; and

(j) dust suppression conditions from EPD's Recommended Pollution Control Clauses should be incorporated into future contract documents and implemented to abate dust impact. There should also be a dust monitoring and audit plan so as to monitor the dust impact and take necessary actions to prevent excessive dust impact.

4.13 It is assumed that the above mitigation measures (especially for watering) will reduce 50 % of dust emission. On this basis it may be surmised that the residual impacts will allow compliance with EPD's limit and the AQO.

Further Construction Dust Impact Assessment

4.14 It is recommended a detailed assessment for construction dust be carried out for this Project. The assessment should include, but not be limited to, the followings:

(a) a detailed investigation to identify all the existing and future air sensitive receivers of the widened highway, which will be affected by the construction works. Dust contours should be plotted for ease of reference;

(b) identifying of construction methods for all components of the Project. This is essential to identify the dust sources, such as haul road, excavation, concreting works, for the whole project;

(c) obtaining the programming of construction works in order to predict the time pattern of dust emission from all dust sources; and

(c) if dust impacts are found to be higher than acceptable limits, mitigation measures should be proposed. Mitigation measures should also include modification of construction methods and construction programme.

Other air pollutants

4.15 Pollutants such as sulphur dioxide, nitrogen oxides and fine particulate may arise from the exhaust emissions of diesel powered vehicles and mechanical plant within the works site. These pollutants are not expected to be significant.

Water Quality

4.16 The site is located in catchments of Lam Tsuen River, Tai Po River and River Indus. These three river have suffered from heavy livestock waste pollution in the past. After the implementation of WPCO and WDO, the water quality has improved especially for Lam Tsuen River, Tai Po River and the upper reach of River Indus.

4.17 The Study Area is located within the area of influence of the Deep Bay Water Control Zone and Tolo Harboour Water Control Zone. Under the provision of the WPCO Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters, stream courses within the Study Area are designated Group D Inland Water (ie draining urban and semi-urban areas). During the construction phase the prevailing constraints will include:

SS	:	not to exceed 30 mg/l
surfactants	:	if the road is washed down for any reason - not to exceed 15mg/l
BOD	:	not to exceed 20mg/l.

Affected Stream courses

4.18 During construction there are mainly seven locations where flows in the existing stream courses could be interrupted by the proposed road improvement scheme. Particular care will need to be taken during construction to protect the water courses from ingress of pollutants such as silt, oil and grease or organic materials which could affect both water quality and the marine life supported by the stream. Good site practices will reduce the potential impacts. These locations are illustrated on Figure 4.1. The details of the affected stream courses are also summarised in Table 4.4.

Table 4.4 Details of Affected Stream Courses

Water Course	Type	Existing Water Quality (Visual Inspection)
F1	Nullah	Good (Fish present)
F2	Natural stream	Average
F3	Earth channel	Good (Fish present)
T1	Nullah and pipe	Good (Fish present)
T2	Natural stream	Good
T3	Stormwater drainage	Good (Fish present)
T4	Nullah	Good

4.19 Key issues to be addressed during construction will be the diversion of the water courses without causing damage by flooding. Even though the levels of suspended solids in the River Indus are high, great care will be required to avoid silt and litter being washed from the construction site into the adjacent water course. Measures will also be required to avoid the discharge of other organic and inorganic pollutants into the water course. It is recommended that a method statement be provided, preferably during detailed design stage, to ensure that the discharge standards stated in the TM are complied. The method statement should also be incorporated into the construction contract.

Surface Water Runoff

4.20 Potential impacts on water quality from construction activities include:

(a) Excavated spoil and general waste arisings may be temporarily stockpiled which, along with the storage of cement, fuels and other materials on site, could result in erosion during periods of rainfall and contaminated runoff from the site;

(b) contamination of surface water with sediments, organic materials, or bentonite slurries or other grouting materials;

(c) general construction activities including diversion of stream courses; and

(d) sewage from the construction workers.

Mitigation Measures to Minimise Water Quality Impacts from Site Runoff

4.21 Good site management practice should ensure that construction impacts on water quality are kept to a minimum. Prevention of surface water contamination during construction involves two basic elements:

(a) Minimising the quantity of water which might become contaminated by high levels of suspended solids (silt) off exposed and disturbed ground surfaces; and

(b) collection and treatment of potentially contaminated water to appropriate standards.

4.22 To minimise the risk of contamination from oil, diesel and solvents:

(a) compounds in the works area should be designed to take account of contaminated surface water. Oil and fuel bunkers, which should be locked and sited on sealed areas, should be enclosed by bunds capable of holding 110% of the bunker capacity in order to prevent discharges due to accidental spillages or breaching of tanks;

(b) Where there is the potential for leakage of oil from construction plant or equipment, layers of sawdust or other absorbent material should be laid underneath or around such items. These clean up materials should be replaced with fresh material on a regular basis. Any polluted materials should be disposed of in an acceptable manner.

4.23 To help minimise aesthetic impacts:

(a) all measures should be adopted to avoid solid materials, litter or wastes being deposited in surface waters; and

(b) to minimise the risk of sediment transport, silt curtains may be considered or control of the rate of release of sediment from dredging by use of closed buckets and control of rate of dredging.

4.24 Sewage generated by the on-site construction workforce has the potential to cause water pollution. Any effluent generated would require appropriate treatment and disposal. All sewage discharges from the study area have to meet the TM Standards and approval from EPD through their licensing process is required.

4.25 To eliminate the risk of pollution from sewage:

(a) all personnel on site should be required to use proper sanitary facilities;

(b) all polluted water should be treated to relevant standards in compliance with the *Technical Memorandum on Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* prior to discharge to the public foul sewerage system as given in Table 2.5.

4.26 The potential for water quality impacts should be limited by the following means:

(a) use of bunds round any temporary stockpiled material to prevent washout into the water course;

(b) where possible, surface excavation work should be scheduled for the dry season;

(c) areas of excavation should be minimised and exposed surfaces stabilised appropriately by covering with aggregate, hydroseeding, etc;

(d) use of precast concrete rather than cast in-situ concrete or the introduction of temporary screens downstream of the works area to trap any material which may be released into the water body and conveyed off-site;

(e) use of silt curtains, closed grabs and controlled rate of dredging;

(f) all stormwater runoff from the study area during construction should be routed through oil/grit separator and/or sediment basin/trap before discharging to the nearby receiving waters;

(g) all stockpiled areas should be covered e.g. by tarpaulin, and intercepting drains should be provided to prevent storm runoff from washing across exposed soil surface or stockpiled area; and

(h) all storm catchbasins/inlets, if any, receiving storm runoff from construction areas should be covered with wire mesh filter on top of which should be placed and crushed stone on top in order to prevent sediment from entering the inlet structure and to reduce potential sediment loading to the receiving waters, such as the Lam Tsuen River or River Indus. In addition, the EPD's ProPECC P/N 1/94 Construction Site Drainage will be followed closely during construction and appropriate clauses, such as the EPD's, RPCC, for additional information on best management practices during construction will be included into the construction contract in order to ensure that the contractor will follow the pollution control plan outlined in the EIA study, and, subject to the findings of the detailed EIA study, an environmental manager will be assigned to oversee the implementation of the pollution control plan.

Solid Waste

Source

4.27 The main source of solid waste during construction is likely to be excavated spoil in excess of the requirements for site formation and landscaping, damaged, used and surplus construction materials, and vegetation stripped from the site. Some municipal type waste, eg. cardboard and plastic packaging, will be generated which will require removal from site at frequent intervals to avoid nuisance. All attempts should be made to re-use and recycle materials on site and to minimise construction wastes.

Mitigation

4.28 As mentioned above, if properly managed in accordance with good site management practice, the impact of handling solid waste on air and water quality in the area will be minimal. In particular:

(a) all vehicles travelling to and from the site should be routed, as far as possible, to avoid sensitive receivers in the area;

(b) solid materials, liner or wastes should not be disposed of in any surface waters, but should be removed to a designated disposal site;

(c) construction waste generated during the construction phase should be sorted on site into inert and non-inert fraction for reuse and recycling a far as practical. Non-inert fraction containing no more than 20% by volume of inert content can be disposed of at landfills, whilst the inert fraction should be delivered to public dumps or other reclamation sites. Inert material means soil, rock, asphalt, concrete, brick, cement plaster/mortar, building debris, building debris, aggregates, etc.

(d) The storage, transportation and final disposal of chemical waste should comply with the Waste Disposal (Chemical Waste) (general) Regulation under the Waste Disposal Ordinance (Cap. 354). The Regulation requires waste producers to arrange proper packaging, labelling and storage of chemical waste before they are transported off-site to licensed facility for disposal. Chemical waste producers can use the collection & disposal services provided by the Chemical Waste Treatment Centre (CWTC) at Tsing Yi which is a licensed facility for collection & disposal of chemical wastes.

Ecology

Terrestrial Impacts

4.29 There are mature trees along both sides of the section of Tolo/Fanling Highway. There is little or no natural woodland immediately adjacent to the highway. Most of the trees (such as Acacia confusa and paper bark) are not natural and were planted as plantation. This suggests that the road side habitats are not natural. The widening work will involve removing all the trees occupied by the new additional lanes and the trees on slopes going to be cut. The major ecological impact will be the removal of these habitats (which are not natural) adjacent to the highway. Such impacts will be localised and will not have far field effects.

Aquatic Impacts

4.30 Aquatic ecological impacts are mostly related to increased suspended solid level. This can affect the respiratory organ of aquatic creatures. Grease and oil can affect the gaseous exchanges of water bodies to the atmosphere. Chemicals can have toxic effects on aquatic creatures.

Mitigation

4.31 A detailed tree survey should be carried out in order to identify the existing conditions, numbers and species of all the trees along the section of Tolo/Fanling Highway. The design of the road alignment should be adjusted as far as possible in order to minimise the amount of trees going to be cut or transplant.

4.32 The mitigation measures detailed for water quality will also minimise any adverse ecological impacts.

Visual and Landscape Impacts

4.33 The proposed widening works will affect the adjacent green belts which have high amenity value. In addition, there will be removal of mature trees and extensive slope cutting. This will incur significant landscape and visual impact to the vicinity.

4.34 It is recommended that a detailed assessment on visual and landscape impact be carried out in order to define the nature and extent of the impacts and the requirements for mitigation measures. The assessment shall cover the following:

(a) a baseline study to provide for a comprehensive and accurate description of the baseline landscape and visual character;

(b) a detailed tree survey in order to quantify the loss of trees as well as confirm the presence of any rare or protected species within the woodland area;

(c) a review of the relevant planning and development control framework;

(d) impact studies to identify the potential landscape and visual impacts (including impacts from noise barriers or enclosures, if any) and predict their magnitude and potential significance; and

(e) recommendations on mitigation measures and implementation programme.

Heritage Impacts

4.35 The widening works may have adverse impacts on sites of unique archaeological, historical or architectural value along the existing highway. It is therefore recommended to carry out a detailed assessment to define the extent of possible impacts and the requirement of mitigation measures.

Traffic Disruption and Public Nuisance

4.36 Disruption of daily activities and general mobility is often associated with construction works. Roads may be temporarily closed off, temporary diversions may be put in place and increased traffic movements can have a significant effect on the passage of traffic.

Construction hazards

4.37 There is a potential for hazards resulting from construction activities occurring while trying to maintain an operational road network. This is particularly important where there is construction of elevated structures. These issues and methods of control would need to be clearly identified prior to construction.

Summary

4.38 The mitigation measures outlined above will ensure that impacts during the construction phase are minimised. No insurmountable problems associated with the construction activities are identified.

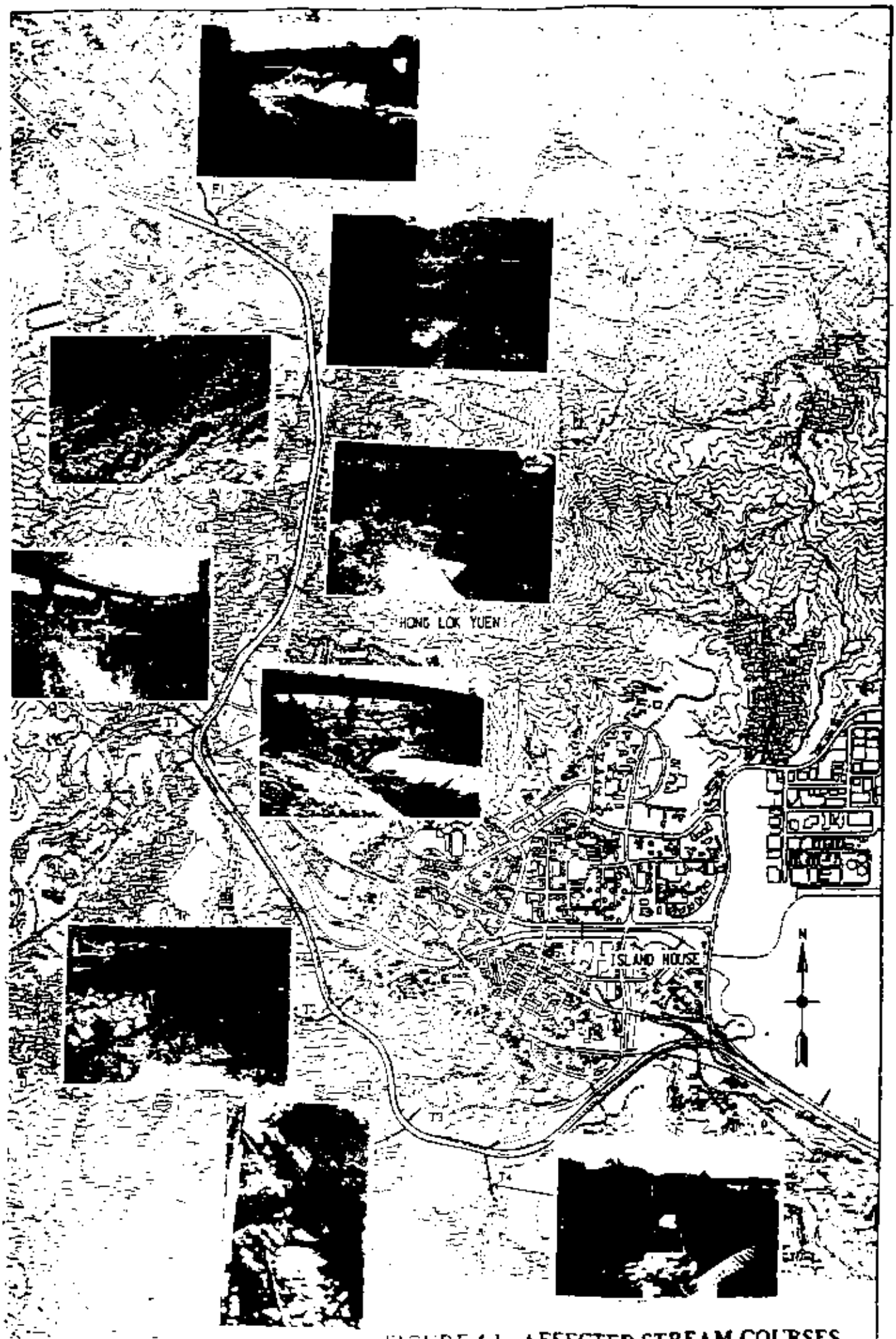


FIGURE 4.1 - AFFECTED STREAM COURSES

5. OPERATION IMPACTS

Introduction

5.1 This section provides a general overview of potential operational impacts arising from the proposed project, together with various practical methods to mitigate the effects of those impacts.

Traffic Noise

5.2 This section of the Tolo/Fanling Highway is a important strategic route. The traffic noise impact at the vicinity of the highway is expected to be severe. The traffic noise levels of the Tolo/Fanling Highway at the selected noise sensitive receivers were modelled in order to quantify the traffic noise impact.

Traffic Flows

5.3 The hourly peak flows of the Tolo/Fanling Highway for the year of 2016 are summarised in Table 5.1.

Table 5.1 Predicted Traffic Flows (2016)

Road Section	Estimated Maximum Hourly Traffic Flow, Veh/hr (% heavy vehicle)	
	North Bound	South Bound
Tolo Highway (Island House to Tai Wo Road)	3842 (43.3%)	4890 (43.3%)
Tolo Highway (Tai Wo Road to Lam Kam Roundabout)	5065 (43.3%)	6447 (43.3%)
Fanling Highway (Lam Kam Roundabout to Fanling)	4568 (43.3%)	5813 (43.3%)

5.4 The predicted traffic noise impacts of the Tolo/Fanling Highway at the selected sensitive receivers are summarised in Table 5.2

Table 5.2 Estimated Traffic Noise Impacts of the Widened Section of Tolo/Fanling Highway

Noise Sensitive Receivers	Estimated Maximum Traffic Noise Level (dB(A), L_{10})	Noise Standards in HKPGS (dB(A), L_{10})
SR1	76	70
SR2	75	70
SR3	81	70
SR4	84	70
SR5	78	70
SR6	81	70
SR7	82	70
SR8	85	70
SR9	76	70
SR10	80	70
SR11	71	70
SR12	66	70
SR13	68	70
SR14	74	70
SR15	77	70
SR16	77	70
SR17	72	70
SR18	79	70
SR19	76	70
SR20	78	70

5.5 The predicted traffic noise levels at most selected NSRs exceed the HKPSG standards severely. Mitigation measures will be required to reduce the traffic noise to acceptable levels.

Mitigation Measures

5.6 Noise barriers, canopies and noise enclosures were proposed in the NIA for 24 Hour Opening of Border Crossings to mitigate the traffic noise caused by the increased traffic flows due to the 24 hour opening of the Border Crossings. The details of the barriers or canopies (relevant to this Study) are summarised in Table 5.3.

Table 5.3 Relevant Mitigation Measures Proposed in the NIA for 24 Hour Opening of Border Crossings

Chainage (m) from Island House	Location	Type
850 to 1100	S/B Road Edge	5 m Barrier
1100 to 1250	S/B Road Edge	3 m Barrier
1250 to 1400	S/B Road Edge	6.6 m Canopy
1400 to 1650	S/B Road Edge	5 m Barrier
1650 to 2000	S/B Road Edge	3 m Barrier
5500 to 5900	S/B Road Edge	4 m Barrier
1350 to 1650	N/B Road Edge	6.6 m Canopy
6030 to 6200	N/B Road Edge	4 m Barrier

After the implementation of the mitigation measures listed in Table 5.3, the traffic noise levels for SR 8, SR 9, SR 16 and SR 18 were estimated to be reduced to 82, 74, 76 and 76 dB(A) L_{10} respectively, which are still higher than the acceptable limit.

5.7 Further mitigation measures are proposed to reduce the traffic noise of the widened Tolo/Fanling Highway. Their details are summarised in Table 5.4.

Table 5.4 Proposed Further Traffic Noise Mitigation Measures

Chainage (m) from Island House	Location	Type
400 to 1700	N/B Road Edge	Canopy
1700 to 2100		2.5 m Barrier
4800 to 5100		1.5 m Barrier
5100 to 5600		8 m Barrier
5700 to 6300		7.5 m Barrier
6400 to 7400		4 - 6 m Barrier
7600 to 7900		2.5 m Barrier
7900 to 8600		6 m Barrier
0 to 800	S/B Road Edge	Canopy (8 m High)
1500 to 1900		8 m Barrier
2100 to 3000		2.5 to 3.5 m Barrier
5700 to 6000		4 m Barrier
6000 to 6700		7 m Barrier
7200 to 7600		6 m Barrier
7900 to 8600		2.5 m Barrier
0 to 800	Road Centre	7 m Barrier
800 to 1600		5 m Barrier
1600 to 2000		4.5 m Barrier
5100 to 5600		4 m Barrier
6800 to 7200		3.5 m Barrier
7200 to 7600		5 m Barrier
7900 to 8500		3.5 m Barrier

5.8 Some modifications are required for the noise barriers proposed in the NIA for 24 Hour Opening of Border Crossings. Their details are summarised in Table 5.5.

Table 5.5 Modifications Required for the Noise Barriers Proposed in the NIA for 24 Hour Opening of Border Crossings.

Chainage (m) from Island House	Location	Type and Modifications Required
850 to 1100	S/B Road Edge	5 m Barrier (increased to 8 m)
1100 to 1250	S/B Road Edge	3 m Barrier (increased to 8 m)
1250 to 1400	S/B Road Edge	6.6 m Canopy (no change)
1400 to 1650	S/B Road Edge	5 m Barrier (increased to 8 m at CH 1500 to 1650)
1650 to 2000	S/B Road Edge	3 m Barrier (increased to 8 m at CH 1650 to 1900)
5500 to 5900	S/B Road Edge	4 m Barrier (no change)
1350 to 1650	N/B Road Edge	6.6 m Canopy (no change)
6030 to 6200	N/B Road Edge	4 m Barrier (increased to 7.5 m)

5.9 It should be noted that the noise barrier details listed above are not detailed enough for construction design. Furthermore, requirements of barriers may need to be revised if more NSRs are studied. Further details should be obtained during the proposed Traffic Noise Impact Assessment (mentioned in Section 6). The results of the preliminary traffic noise assessment show that the residual traffic noise levels at all the NSRs can achieve the noise standards of HKPSG (refer to Table 5.6) and there is no insurmountable problem for the aspect of traffic noise.

Table 5.6 Estimated Residual Traffic Noise Impacts of Widened Tolo/Fanling Highway

Noise Sensitive Receivers	Estimated Maximum Traffic Noise Level (dB(A), L_{10})	Noise Standards in HKPGS (dB(A), L_{10})
SR1	70	70
SR2	70	70
SR3	70	70
SR4	70	70
SR5	70	70
SR6	69	70
SR7	70	70
SR8	69	70
SR9	70	70
SR10	70	70
SR11	70	70
SR12	69	70
SR13	70	70
SR14	70	70
SR15	69	70
SR16	70	70
SR17	70	70
SR18	68	70
SR19	70	70
SR20	70	70

Further Traffic Noise Assessment

5.10 It is recommended that a detailed traffic noise impact study be conducted prior to the detailed design and construction of the project. The detailed study should include, but not be limited to the following:

(a) a detailed investigation to identify all the existing and future noise sensitive receivers of the widened highway;

(b) an assessment of traffic flow (agreed with Transport Department) which represents the worst traffic projections for the appropriate design year within a period of 15 years after opening of the proposed road;

(c) traffic noise from other roads affecting the NSRs should also be assessed to obtain the cumulative traffic noise impacts.

(c) an analysis of technical feasibility and acoustic performance of different noise mitigation measures; and

(d) in the case where there would be unacceptable residual impact even with the implementation of the recommended measures, the constraint on the future developments and landuses, and practical mitigation measures that could be carried out by the affected sensitive receivers should be stated. For existing institutional buildings and residual dwellings, indirect technical remedies in the form of window insulation and air conditioning should be examined.

Air Quality

Preliminary Air Quality Impact Assessment

5.11 Nitrogen dioxide (NO_2) has always been the critical pollutant for road traffic. A preliminary air quality modelling exercise using Caline4 has been performed to predict future NO_2 levels at the selected sensitive receivers.

5.12 The main assumptions of the air quality model are:-

(a) wind speed and stability class are 1m/s and D respectively;

(b) the emission factors were taken from the EURO2 Model for the year 2011;

(c) 20% of NO_x is assumed to be NO_2.

5.13 The results of predicted air quality impacts at the air sensitive receivers are summarised in Table 5.7.

Table 5.7 Predicted Air Quality Impacts

Air Sensitive Receivers	Pollutants (Worst Case) (Background Concentration Included)
	NO_2 ($\mu g/m^3$)
SR1	193
SR2	220
SR3	785
SR4	325
SR5	177
SR6	713
SR7	254
SR8	837
SR9	227
SR10	262
SR11	161
SR12	680
SR13	341
SR14	477
SR15	262
SR16	210
SR17	281
SR18	204
SR19	191
SR20	171

5.14 The estimated NO_2 and levels at SR3, SR4, SR6, SR8, SR12, SR13 and SR14 do not satisfy the hourly AQO of the HKPSG. The air quality impacts of the widened Tolo/Fanling Highway are likey to exceed the AQOs near the highway. It is recommended that a detailed traffic air quality modelling be carried out. The study should include, but not be limited to, the following:

(a) a detailed investigation to identify all the existing and future air sensitive receivers of the Project. For the ease of reference, contours of air pollutant concentrations should be plotted;

(b) an assessment of traffic flows (agreed with Transport Department), with percentage breakdown of vehicles of different categories, which represent the worst traffic projections for the appropriate design year within a period of 15 years after opening of the proposed road;

(c) an assessment of the meteorological conditions of the Study Area to identify the appropriate meterological inputs to be used in further air quality modelling;

(d) other air quality parameters, such as CO and RSP should also be modelled and concentration contours of those air quality parameters modelled should be provided;

(e) if the noise mitigation measures, which will have an effect of dispersion of air pollutants, are proposed, then assessment of air quality impacts due to such noise mitigation measures should be included in the detailed assessment;

(f) other traffic emissions within 500 m radius of the air sensitive receivers must also be included in the detailed assessment;

(g) detailed modelling methodology should be agreed with EPD before any detailed assessment is carried out; and

(h) practicable mitigation measures should be proposed if air quality impacts are found to be higher than acceptable limits. These should include changing the alignment of the improved highway.

5.15 As part of the detailed air quality assessment, the acceptable distance between the highway and the nearest dwellings should be confirmed (with respect to compliance with the AQOs). These data will be used as part of the land resumption evaluation.

Water Quality

Impacts Arising as a Result of Construction

5.16 The key issues will be the control of impacts of oil and grease, suspended solids and BOD from the highway drainage system on receiving water quality. The water quality impact will be minimal.

Visual and Landscape Impacts

5.17 The proposed widening works will affect the adjacent green belts which have high amenity value. In addition, there will be removal of mature trees and extensive slope cutting. This will incur significant landscape and visual impact to the vicinity.

5.18 It is recommended that a detailed assessment on visual and landscape impact be carried out in order to define the nature and extent of the impacts and the requirements for mitigation measures. The assessment shall cover the following:

(a) a baseline study to provide for a comprehensive and accurate description of the baseline landscape and visual character;

(b) a detailed tree survey in order to quantify the loss of trees as well as confirm the presence of any rare or protected species within the woodland area;

(c) a review of the relevant planning and development control framework;

(d) impact studies to identify the potential landscape and visual impacts (including impacts from noise barriers or enclosures, if any) and predict their magnitude and potential significance; and

(e) recommendations on mitigation measures and implementation programme.

5.19 Landscape treatment should be provided to noise barriers or canopies. These should include:

(a) using natural external finish for noise mitigation structures;
(b) barriers surface should be provided with non-reflective materials or finish to reduce glare; and
(c) where possible, trees, shrubs or self-climbing plants should be planted along both sides of noise barriers and along external side of canopies.

Ecology

5.20 No significant ecological impacts are envisaged during the operation phase of the project.

6. CONCLUSIONS

Construction Phase

6.1 The following impacts have been identified during construction phase of the project:

(a) noise
(b) air quality
(c) water quality
(d) solid waste
(e) heritage

6.2 These construction impacts have been examined. It is found that the noise and air quality impacts have the potential to exceed the relevant legislative limits or standards of HKPSG at selected sensitive receivers. It has been assessed that the impacts can however be reduced by the mitigation measures described in Section 4. Water quality impacts and solid waste impacts can also be minimised by adoption of mitigation measures described in Section 4. Visual and landscape impacts are expected to significant. No insurmountable impacts are predicted.

Operational Phase

6.3 Impacts associated with the operation of the widened Tolo/Fanling Highway are as follows:

(a) traffic noise
(b) air quality
(c) water quality
(d) visual and landscape

6.4 Traffic noise impacts are expected to be severe. Extensive mitigation measures are required to reduce the impacts to acceptable limits. The traffic air quality near the Fanling/Tolo Highway may exceed the AQOs. Water quality impacts are expected to be minimal. Visual and landscape impacts will be significant. No insurmountable problems were identified.

Further EIA Studies

6.5 It is recommended that an EIA be carried out for the widening of Fanling/Tolo Highway and it should include:

(a) Construction Noise Assessment;
(b) Construction Dust Assessment;
(c) Traffic Noise Assessment;
(d) Traffic Air Quality Assessment;
(e) Water Quality Assessment;
(f) Heritage Impact Assessment; and
(g) Visual and Landscape Assessment for both construction and operational phases.